European Journal of Orthodontics, 2026, 48, cjag070
https://doi.org/10.1093/ejo/cjag070
Published: 15 October 2026
Abstracts

EOS 2026 Abstracts Book

Houston, oral and poster abstracts from the 101st Congress of the European Orthodontic Society, presented in Dublin, Ireland, from 7-11 June 2026.

The authors of abstracts marked *** have indicated a financial interest.
The authors of abstracts marked ‡‡‡ have been previously published.

Houston Oral Presentations

Abstract citation ID: cjag070.001
HO1 THE EFFECT OF VIRTUAL APPOINTMENTS ON ADHERENCE WITH TWIN BLOCK WEAR: A RANDOMISED CONTROLLED TRIAL

Abeer Hasan, Angus Burns, Padhraig Fleming; *Dublin Dental University Hospital, Trinity College, Dublin, Ireland*

BACKGROUND: The effectiveness of Twin Block therapy relies heavily on patient adherence to the prescribed wear regimen but is often suboptimal. While various strategies have been proposed to address barriers to compliance, the potential role of adjunctive virtual appointmentsin improving adherence has not yet been explored.
AIM: To evaluate effectiveness of adjunctive virtual appointments on adherence with Twin Block wear, measured through objective wear time and occlusal correction.
MATERIALS AND METHODS: This parallel-group, randomised controlled trial (RCT) involved 64 participants (males aged 11–14 years and females aged 10–13 years) with an overjet ≥7 mm. Participants were randomly allocated to a control or intervention group using stratified electronic randomisation. The control group received standard verbal and written instructions at appliance fit. The intervention group received the same information with additional virtual appointments scheduled at 1, 3 and 6 weeks following appliance placement through a secure telehealth platform. Appliance wear-time was objectively recorded using embedded Theramon® microsensors and clinical measurements were taken at standard recall intervals (1, 3, and 6 months). Subjective and objective wear data was compared.
RESULTS: Six participants discontinued treatment. The overall mean daily wear time over six months was 11.96 hours (SD: 4.17, 95% CI: 10.96, 12.42), and mean overjet reduction was 5.9 mm (SD: 2.23, 95% CI: 5.3, 6.5). Virtual appointments were not significantly associated with wear time (β = -1.59, 95% CI: -3.97, 0.80, p = 0.188). Participants consistently overestimated daily wear time by 5.78 hours compared to objectively recorded data.
CONCLUSION: Adjunctive virtual appointments did not enhance daily wear time or overjet reduction with the Twin Block appliance over the six-month study period. Self-reported wear time was consistently overestimated, reinforcing the value of objective compliance monitoring. Alternative strategies to enhance adherence to Twin Block therapy should be explored.

Abstract citation ID: cjag070.002
HO2 EFFECTS OF MICROPLASTIC RELEASE FROM 3D-PRINTED ORTHODONTIC ALIGNERS: A HISTOLOGICAL AND IMMUNOLOGICAL BIOASSAY APPROACH

Francesca Zara[1], Piero Antonio Zecca[2], Marina Borgese[3], Marco Serafin[1], Alberto Caprioglio[1]; [1]*University of Milan, Milan, Italy,* [2]*University of Insubria, Varese, Italy,* [3]*Univerisity of Insubria, Varese, Italy*

AIM: This study aimed to investigate the acute biological effects of micro- and nanoplastics (MPs/NPs) released from 3D-printed orthodontic aligners, focusing on their potential to elicit inflammatory and oxidative responses. Given the dynamic intraoral environment, the use of a biologically relevant invertebrate model (*Hirudo verbana*) allowed for a histological and molecular assessment of short-term exposure to plastic-derived particles.
MATERIALS AND METHODS: MPs/NPs were generated from 3D-printed aligner samples via mechanical stress and ultrasonication. Medicinal leeches were exposed to the resulting plastic dispersion for 24h, 72h, and 1-week (triplicate experiments). Morphological alterations were assessed by light and electron microscopy. Immunological responses were evaluated through CD31 and *Hm*AIF-1 immunostaining, as well as acid phosphatase assays. Oxidative stress was quantified by quantitative PCR (qPCR) analysis of *SOD*and *GST* gene expression. One-way ANOVA with Dunnett's post-hoc test MP/NP-treated vs control (α=0.05).
RESULTS: Exposure to MPs/NPs triggered rapid angiogenesis, confirmed by increased CD31 expression and vascular remodeling over time (24h, p<0.01; 72h, p<0.001; 1-week, p<0.01). Macrophage-like cell activation was significantly evidenced by elevated *Hm*AIF-1 levels (24h, p<0.001; 72h, p<0.01; 1-week, p<0.001) and ACP activity (24h, p<0.001; 72h, p<0.01; 1-week, p<0.001).Oxidative stress markers (*SOD* and *GST*) were significantly upregulated at 24h (p<0.001) and slightly increased at 72 hours only for GST (p<0.05), indicating an acute cellular stress response that decreased at later time points.
CONCLUSIONS: Even brief exposure to MPs/NPs released from 3D-printed aligners can disrupt tissue homeostasis, activating inflammatory and oxidative pathways. These findings raise concerns about the biocompatibility of photopolymer resins and underscore the need for more dynamic, biologically relevant testing models to evaluate the safety of orthodontic materials under clinically realistic conditions.

Abstract citation ID: cjag070.003
HO3 EVALUATION OF SEXUAL DIMORPHISM OF MAXILLARY CENTRAL INCISORS IN THE GREEK POPULATION THROUGH THREE-DIMENSIONAL MORPHOMETRIC ANALYSIS

Filippos Mikelis and Demetrios Halazonetis; *Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece*

AIM: To investigate shape and size variability of the maxillary central incisors and to determine potential sex - related effects in a Greek population, through three - dimensional (3D) geometric morphometric analysis.
MATERIALS AND METHODS: For comprehensive assessment of tooth shape we designed a digitizing template that included three curves, each following the incisal edge, the labial, and the palatal cervical margins, and 80 landmarks, for dense coverage of the labial and palatal surfaces. The three curves were digitized manually, followed by automatic placement of eight equidistant landmarks on each curve, and the 80 surface semi - landmarks (total: 104 landmarks per tooth). Calculation of the average shape was achieved using Procrustes superimposition. An iterative sliding and projection procedure of the semi - landmarks was conducted to minimize bending energy and achieve landmark correspondence between the specimens. Shape - space Principal Component Analysis was used to detect shape variability patterns.

Digital dental casts of one hundred (100) subjects from the National and Kapodistrian University of Athens were used. Sex was equally distributed, and mean age was 15.0 years. The left and right maxillary central incisors were digitized on 3D digital dental casts using Viewbox 4 software. The left incisor was mirrored for symmetry.
RESULTS: The first 10 Principal Components (PCs) cumulatively described 85.9% of the total shape variation. The major shape variations were related to the height/width ratio and the curvature/flatness of the surfaces and edges of the clinical crown. Statistically significant but subtle sex dimorphism in shape (P = 0.003) was detected, with females showing a shorter crown and flatter labial and lingual surfaces. Directional asymmetry was noted between the left and right sides (P = 0.008), the right side exhibiting a clockwise twist of the incisal edge. This asymmetry was statistically significant for the whole sample and the male group (P = 0.027) but did not reach significance in females (P = 0.285).
CONCLUSIONS: This study introduces a detailed 3D perspective of the morphology of maxillary central incisors with comprehensive description of shape variation. Upper central incisors appear to carry directional - specific and sex - linked morphological patterns.

© The Author(s) 2026. Published by Oxford University Press on behalf of the European Orthodontic Society. All rights reserved. For commercial re-use, please contact reprints@oup.com for reprints and translation rights for reprints. All other permissions can be obtained through our RightsLink service via the Permissions link on the article page on our site—for further information please contact journals.permissions@oup.com.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Houston Poster Presentations

Abstract citation ID: cjag070.004
HP2 THE EFFECTS OF THE REHABILITATION OF MASTICATORY FUNCTION ON MASTICATORY MUSCLE FIBRES IN ADULT RATS

Maria Zoi Theodoridou, Aikaterini Lagou, Aouatef Ait-Lounis, Stavros Kiliaridis, Gregory Antonarakis; *University of Geneva, Geneva, Switzerland*

AIM: To evaluate the effect of masticatory function rehabilitation on fibre-type distribution and morphology of adult masticatory muscles using a rat model.
MATERIALS AND METHODS: Twenty-four male Wistar rats received a soft diet to develop masticatory-muscle hypofunction. After 26 weeks, following the cessation of growth, rats were divided into two groups: the first (n=12) continued receiving a soft diet for 12 more weeks (hypofunction group), while the second (n=12) changed to a hard diet restoring normal masticatory function (rehabilitation group). A third group of 12 male Wistar rats received an ordinary hard diet during the whole experimental period (control group). At 38 weeks, masseter and digastric muscles were harvested for immunofluorescence staining to identify fibre types (I, IIA, IIB, IIX), and morphometric analysis was conducted to measure fibre cross-sectional area and minimum diameter.
RESULTS: In the masseter muscle, rats in the rehabilitation group had more type IIA ($p=0.04$), and fewer type IIX fibres ($p=0.045$), than those in the hypofunction group but no difference compared to the control group. No significant differences in fibre cross-sectional area or minimum diameter were observed when comparing the rehabilitation group to the other two groups. In the digastric muscle, rats in the rehabilitation group did not differ significantly from the hypofunction or control groups with regard to the fibre-type distribution, but exhibited larger type IIX fibres than the hypofunction and control group, in terms of cross-sectional area ($p=0.041$ and $p=0.004$ respectively) and minimum fibre diameter ($p=0.038$ and $p=0.003$ respectively) and larger type IIB fibres than the control group in terms of cross-sectional area ($p<0.001$) and minimum fibre diameter ($p<0.001$).
CONCLUSIONS: Rehabilitation of masticatory function leads to a significant change in fibre-type distribution in the masseter muscle toward a greater proportion of type IIA and fewer type IIX fibres, indicating a transition to a faster but fatigue-resistant functional profile. In contrast, rehabilitation leads to a distinct adaptation in the digastric muscle exhibiting hypertrophy of specific fast fibre types (IIB and IIX), reflecting a structural rather than compositional adaptation. These findings underscore the capacity of masticatory muscles to adapt to rehabilitation of masticatory function even in adulthood.

Abstract citation ID: cjag070.005
HP3 AWARENESS, ANNOYANCE AND PREVENTIVE BEHAVIOUR TOWARDS WHITE SPOT LESIONS IN ADOLESCENTS WITH FIXED APPLIANCES: INSIGHTS FROM A CROSS-SECTIONAL PRACTICE-BASED RESEARCH NETWORK STUDY

Sebastiaan van Doornik, Pieter Dijkstra, Yijin Ren, David Manton, Anne Marie Kuijpers-Jagtman; *UMCG, Groningen, Netherlands*

AIM: To analyse, in a multi-practice setting, awareness in adolescents treated with fixed appliances of white spot lesions (WSLs), perceived annoyance, and adherence to caries-preventive clinical practice guidelines (CPGs), and to determine associations between these factors.
SUBJECTS AND METHODS: A cross-sectional survey was conducted amongst 393 adolescents (12–17 years) treated in ten orthodontic practices with fixed appliances within the Orthodontic Research Network Northeast Netherlands (ORN-NN). All participants had been treated for at least three months. A questionnaire assessed adherence to six CPG recommendations, prior awareness of WSLs, perceived annoyance and sociodemographic and treatment characteristics. Annoyance was assessed in 3 items using a 5 point Likert scale (scoring range 3-15). Group differences and associations were analysed using non-parametric tests, Spearman correlations and a multivariable bootstrap regression model.
RESULTS: Eighty-nine (22.6%) adolescents adhered to all six CPG recommendations, with lower adherence observed in boys, older adolescents and those in higher educational tracks. Awareness of WSLs was reported by 37.7% (148/393) of participants and was associated with higher annoyance scores (median 13 vs. 12; $p = 0.004$). Annoyance was weakly associated with adherence ($\rho = 0.149$; $p = 0.003$), whereas awareness itself was not associated with adherence. Attitudes toward WSLs were strongly negative, yet these perceptions were not associated with compliance with caries preventive strategies.
CONCLUSIONS: Concern about WSLs was evident in adolescents but did not translate into meaningful compliance with caries preventive strategies. Both awareness and annoyance were poor predictors of caries preventive behaviours. These findings highlight a clear gap between adolescents' perceptions of WSLs and the actions required to prevent them, emphasising the need for clearer and more effective caries preventive actions during orthodontic treatment.

Abstract citation ID: cjag070.006
HP4 ACCURACY AND GENERALIZABILITY OF AN OPEN-SOURCE DEEP LEARNING MODEL FOR FACIAL BONE SEGMENTATION ON CT AND CBCT SCANS

Mohammed Ghamri[1], Gauthier Dot[2], Nikolaos Gkantidis[1]; [1]*Department of Orthodontics and Dentofacial Orthopedics, School of Dental Medicine, University of Bern, Bern, Switzerland,* [2]*Université Paris Cité, Université Sorbonne Paris Nord, Inserm UMR 1333 Oral Heath, Montrouge, France*

AIM: To evaluate the accuracy and generalizability of DentalSegmentator, an open-source deep learning tool, for efficient and fully automated segmentation of skeletal facial surfaces from computed tomography (CT) scans acquired under different imaging conditions.
MATERIALS AND METHODS: Ten human skulls were scanned with two conventional CBCT scanners, an additional low-radiation CBCT protocol acquired on one of these scanners, and one CT scanner. High-accuracy reference surface models were acquired using an optical scanner. CBCT an CT scans were segmented automatically using DentalSegmentator. Three facial regions (forehead, zygomatic process, maxillary process) were defined on each model for quantitative assessment. Reproducibility was examined by repeating segmentation on eight scans from two randomly selected skulls. Accuracy was measured as the mean absolute distance (MAD) and the standard deviation of absolute distances (SDAD) between segmented and reference models after best-fit superimposition. Non-parametric statistics were applied. Differences across acquisition settings were tested using Kruskal–Wallis and Dunn's tests with Bonferroni correction. The significance threshold was $\alpha = 0.05$.
RESULTS: Repeated segmentations were identical in all cases, confirming perfect reproducibility. Across all acquisition settings and regions, DentalSegmentator produced highly accurate skeletal surface models, with an overall MAD of 0.088 mm (IQR 0.073) and SDAD of 0.061 mm (IQR 0.028). Significant but small differences were detected between imaging systems (MAD: $p < 0.001$; SDAD: $p = 0.003$), with CT scans showing slightly reduced trueness compared with Planmeca-derived CBCT images. Only isolated region-specific differences were observed between scanners. Colour-coded distance maps demonstrated consistent spatial patterns, with deviations remaining below 0.5 mm; the highest values were confined to lateral areas distant from the superimposition reference.
CONCLUSION: The open-source DentalSegmentator tool produced accurate skeletal facial surface segmentations across diverse CT and CBCT settings, demonstrating excellent generalizability, including under low-radiation conditions. Minor differences in trueness between imaging systems were small and unlikely to impact clinical or research use. Deep learning offers a robust and scalable foundation for automated 3D craniofacial surface extraction, supporting broader adoption of AI-driven workflows in both clinical and research contexts.

Abstract citation ID: cjag070.007
HP5 MINIMUM DAILY WEAR THRESHOLD FOR EFFECTIVE TWIN BLOCK APPLIANCE THERAPY: A PROSPECTIVE EVALUATION

Natasha Lemasney[1], Angus Burns[1], Mary Kate Kearney[2], Simon Wolstencroft[3], Padhraig Fleming[1]; [1]*Dublin Dental University Hospital, Dublin, Ireland,* [2]*Loughlinstown Orthodontic Unit, Dublin, Ireland,* [3]*Tallaght Orthodontic Unit, Dublin, Ireland*

BACKGROUND: The Twin Block appliance is an established treatment for Class II Division 1 malocclusion in growing patients. Although traditionally prescribed for full-time wear, emerging evidence suggests that part-time wear may achieve comparable outcomes. There is, however, uncertainty regarding the minimum daily wear threshold required for successful occlusal correction.
AIM: To determine the minimum daily hours of Twin Block wear required to achieve overjet reduction.
METHODS: Participants were recruited from a pool of patients undergoing treatment with a Twin Block appliance in two public orthodontic clinics. Participants were instructed to wear the appliance full-time (22 hours per day). Wear time was objectively recorded using embedded TheraMon™ sensors. Participants were categorised into four wear time groups based on mean daily wear over the first six months, and treatment success was graded according to the percentage overjet reduction.
RESULTS: Fifty-eight participants with mean age of 12.46 years completed the study. The mean baseline overjet was 10.35 mm with mean overjet reduction of 5.89 mm observed at six months. A strong positive correlation was found between

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

wear time and treatment outcome. Complete success (>70% overjet reduction or final overjet ≤3.5 mm) was achieved only in participants who wore the appliance ≥12 hours/day. The proportion of unsuccessful outcomes increased with decreasing wear time. Mean overjet reduction was greatest in the highest wear group (7.1 mm) and lowest in the poorest wear group (3.6 mm). Mean daily wear time at four weeks was also found to be a good predictor of future wear.
CONCLUSIONS: A minimum of approximately 12 hours of daily wear appears necessary to reliably achieve a successful treatment outcome within the first six months of treatment. Initial adherence to appliance wear protocols appears to be a good predictor of future compliance.

Oral Presentations

Abstract citation ID: cjag070.008
OP1 ‡‡‡ HEMISECTION VERSUS CONVENTIONAL EXTRACTION AS INTERCEPTIVE TREATMENT IN CONGENITALLY MISSING MANDIBULAR SECOND PREMOLARS: A RANDOMISED CONTROLLED SPLIT-MOUTH TRIAL

Sarah Abdul Jabbar[1], Shaker Nawaia[2], Vini Rughwani[2], Ken Hansen[1], Julia Naoumova[3]; [1]University Clinic of Orthodontics, Gothenburg, Sweden, [2]Specialist clinic of Orthodontics, Skovde, Sweden, [3]Department of Orthodontics, Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

AIM: To compare conventional extraction with hemisection of the mandibular primary second molars in terms of space closure, tooth angulation, complications and associated economic implications in patients with congenital absence of mandibular second premolars.
MATERIALS AND METHOD: Patients with bilateral agenesis of the second mandibular molars and unerupted second molars were included and randomly allocated to either extraction or hemisection on the left or right side of the mandible. Clinical and radiographic examinations were conducted at baseline (T1) and after a mean follow-up period of 4.2 years (T2). Measurements of the residual spaces and tooth angulation of the mandibular first molar and premolar following extraction were blinded assessed on panoramic radiographs and cast models. The number of visits, chair time, social costs, and direct and indirect costs were calculated using cost minimisation analysis.
RESULTS: A total of 40 patients (25 boys and 15 girls) with a mean age of 10.03 ± 1.07 years at T1 participated. No patient was lost to follow-up. The residual space between the first permanent molar and the first permanent premolar was 2.04 ± 1.67 mm for hemisection and 2.39 ± 1.86 mm for extraction ($p = 0.053$). A larger residual space was observed between the first permanent premolar and the canine on the hemisection side (1.80 ± 1.01 mm) than on the extraction side (1.55 ± 0.92 mm), ($p = 0.045$). No difference was found between the interventions regarding the angulation of the first permanent molar ($p = 0.0914$) or the angulation of the first permanent premolar ($p = 0.7812$). Hemisection resulted in sig[1]nificantly more complications ($p = 0.0176$) and was associated with substantially higher material costs, more chair time and higher indirect costs than conventional extraction ($p < 0.0001$).
CONCLUSIONS: Hemisection is not recommended as an interceptive extraction option for patients with congenitally missing mandibular second premolars, as only minimal, clinically irrelevant differences were observed compared with conventional extraction. Moreover, hemisection is associated with increased costs and a higher risk of complications.

Abstract citation ID: cjag070.009
OP2 TRANSALVEOLAR TRANSPLANTATION OF IMPACTED TEETH: A RETROSPECTIVE STUDY

Jessica Juslin[1], Tuija Teerijoki-Oksa[2], Päivi Jääsaari[2], Auli Suominen[1], Hanna Thorén[1]; [1]University of Turku, Turku, Finland, [2]Turku University Hospital, Turku, Finland

This study aimed to evaluate the survival and success of transalveolar transplantations of impacted teeth and to identify associations with treatment outcomes.

All patients treated with transalveolar transplantation at Turku University Hospital between February 16th, 2016, and June 15th, 2023, were included in this study. Outcome variables were survival and success of the transplanted tooth. Survival was defined as the tooth being present at the final follow-up. At the same time, success required the absence of progressive root resorption, eruption failure, pathologic periodontal pockets, extensive alveolar bone loss, or apical inflammation. The primary predictor variable was tooth type (i.e., premolar, molar or canine). Other explanatory variables were categorized as stage of eruption (partial eruption from bone or impacted in bone), degree of angulation (< 60°or > 60°), stage of root development (≤ r3/4 or > r3/4), and the type of surgical procedure performed (surgical uprighting or extraction and repositioning). Fisher's exact test and bivariate logistic regression were used to assess associations between primary predictors, explanatory variables, and outcomes.

The study sample consisted of 27 patients, with a mean age of 13.9 years (range, 10.4-16.9 years). A total of 32 teeth were transplanted—12 molars, 10 premolars, and 10 canines—with a median follow-up time of 1.0 year (range, 0.2-3.3 years). Some significant associations between primary predictors and explanatory variables were observed. Molars were more often partially erupted ($p < 0.001$), in less severe positions ($p < 0.001$), and treated exclusively by surgical uprighting ($p < 0.001$) compared to one-rooted teeth. The overall survival rate was 87.5%, and the success rate was 62.5%. Canines demonstrated the best outcomes with 100% survival and 77.8% success. Two molars and two premolars were lost due to pericoronitis or ankylosis. No statistically significant associations were found between other explanatory variables and survival. However, teeth with more advanced root development (> r¾) showed significantly higher success rates ($p < 0.05$) than teeth transplanted at earlier developmental stages.

When surgical exposure and orthodontic traction are not feasible, transalveolar transplantation is a treatment alternative to consider, even for teeth at more advanced stages of root development.

Abstract citation ID: cjag070.010
OP3 ‡‡‡ PATIENT EXPERIENCES AND DISCOMFORT ASSOCIATED WITH MID-PALATAL TEMPORARY SKELETAL ANCHORAGE DEVICES

Aoife Barry[1], Vanessa Knode[2], Björn Ludwig[3], Padhraig S. Fleming[4]; [1]School of Dental Science, Trinity College Dublin, Ireland., Dublin, Ireland, [2]University Medical Centre, Johannes Gutenberg, Mainz, Germany., Mainz, Germany, [3]University of Homburg/Saar, Department of Orthodontics., Homburg, Germany, [4]School of Dental Science, Trinity College Dublin, Ireland;, Dublin, Ireland

AIMS: This study aims to evaluate patient experiences with mid-palatal temporary skeletal anchorage devices (TSADs). To assess patient intraoperative and postoperative recovery experiences and discomfort associated with mid-palatal temporary skeletal anchorage devices (TSADs) using a bespoke questionnaire. To assess experiences and discomfort associated with mid-palatal temporary skeletal anchorage devices (TSADs) via Visual Analogue Scales (VAS), ordinal and binary scales. To use quantitative analysis and descriptive statistics to describe the experiences and discomfort associated with mid-palatal temporary skeletal anchorage devices (TSADs).
METHODS: A survey of patients undergoing mid-palatal TSAD insertion was undertaken using a 27-item bespoke questionnaire. Questionnaires were sent using both electronic and surface mail with a 3-month period allowed for response. Pain experience; the use of analgesia; requirement for additional visits; impacts on hygiene, speech, eating, and hobbies; and social impacts were assessed. Reponses involved the use of VAS (Visual Analogue Scale) as well as binary information.
MATERIALS: Demographic data and date of implant placement were recorded. All participants had TSAD placement according to the same protocol. All clinical procedures were performed by the same experienced orthodontist. The supra-structures were connected with the same type of abutment. An impression or scan was taken the day of placement, and an appliance was fitted within one week.
RESULTS: Overall, 152 responses were obtained with 87.5 % describing experience of TSAD insertion being either "as expected" or "better". Procedural pain was reported as mild in 62.5%. Local post-operative pain was scored as moderate in 21.1%. Some functional impairment was reported with 63.2% attributing difficulty with speech and 67.8% difficulty with eating due to the implant. However, these functional impairments were generally considered mild (by 68.1% and 60.2%, respectively) with most very likely to recommend this treatment to others, 65.1% (n= 99) scoring 8 or above out of 10.
CONCLUSIONS: Appreciable levels of pain, discomfort and functional impairment were noted with the use of mid-palatal TSADs. However, any unpleasant experiences were generally regarded as mild with most highly likely to recommend mid-palatal TSADs to prospective patients.

Abstract citation ID: cjag070.011
OP4 ORTHODONTICALLY INDUCED APICAL ROOT RESORPTION IN MAXILLARY INCISORS WITH HISTORY OF TRAUMA

Raj Verma; Postgraduate Institute of Medical education and Research, Chandigarh, India

AIM: The etiologic factors of Orthodontically Induced Apical Root Resorption (OIRR) are complex and multifactorial, but a combination of individual biologic variability,

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

genetic predisposition, and the effect of mechanical factors have been reported previously. Previous history of dental trauma has been suggested as a risk factor.
MATERIALS AND METHOD: Pre-and post-treatment records of consecutively treated patients in the unit of orthodontics OHSC, in between January 2005 – June 2025 with pre-adjusted edgewise appliance and having a history of dental trauma at least 6 months before starting the orthodontic treatment were included in the study. OIRR was evaluated on IOPA Xray's and Scored accordingly.
RESULTS: A total of 236 Maxillary Incisor teeth were evaluated. 118 were in the study group and 118 in control group. Study group consisted of 53 right central, 54 left central, 7 left and 4 right lateral incisors. 6 teeth were avulsed and could not be evaluated. The contra lateral teeth were evaluated as control. 16 teeth were RCT treated at the T0 (pre- treatment) and 21 at T1 (post-treatment). Mean age at time of trauma was 12.2 years and 17.0 years at pre-treatment. One-Sample Kolmogorov-Smirnov Test showed distribution of sample was not normal so non parametric tests were used for evaluation of data. The OIRR grading at pre-treatment showed Grade 1 in 77, Grade 2 in 33 and 1 tooth each in Grade 0 and 3. At post-treatment the OIRR grading showed Grade 1 in 18, Grade 2 in 52, Grade 3 in 34 and grade 4 in 8 teeth. The comparison showed significant differences between root resorption between study group and control at T0 (pretreatment) but the differences were non-significant at T1. The strong correlations which were statistically significant were observed between the incisor retraction and OIRR for both the groups.
CONCLUSION: There is no difference in Orthodontically Induced Apical Root Resorption in Maxillary incisor teeth with history of dental trauma as compared to non-traumatized incisors. Dental trauma alone may be a significant factor of apical root resorption before starting the orthodontic treatment.

Abstract citation ID: cjag070.012
OP5 LONG-TERM OCCLUSAL CHANGES WITH AND WITHOUT ORTHODONTIC TREATMENT: A 30-YEAR LONGITUDINAL STUDY ON MALOCCLUSION SYMPTOMS AND SELF-PERCEPTION

Jolina Bokan, Jonas Q. Schmid, Ulrike Ehmer, Ariane Hohoff, Thomas Stamm; *University of Münster, Münster, Germany*

AIM: To date, there is a lack of evidence on the long-term outcomes of orthodontic treatment. This study aimed to quantify 30-year changes in occlusal traits with and without orthodontic treatment and to assess oral health-related quality of life (OHRQoL) in mid-adulthood.
SUBJECTS AND METHOD: Eligible for inclusion in this longitudinal cohort follow-up were 667 primary school children who underwent two systematic orthodontic examinations (T0: 1981–2001). Data collection at follow-up (T1: 2022–2023) included a clinical examination and intraoral scans to evaluate longitudinal changes in occlusal traits. Participants were grouped by orthodontic treatment history (treated/untreated). OHRQoL at T1 was measured using the OHIP-G14. Statistical analyses included Mann–Whitney U and chi-square tests ($\alpha = 0.05$).
RESULTS: 73 adults could be enrolled and re-examined after a mean observation period of 30.0 ± 5.3 years (treated n = 50; untreated n = 23). From T0 to T1, anterior crowding increased and spacing decreased in both arches for both groups. The most common malocclusion traits were mandibular anterior crowding (untreated T0/T1: 39.1%/65.2% vs. treated T0/T1: 62.0%/68.0%) and maxillary anterior spacing (untreated T0/T1: 78.3%/17.4% vs. treated T0/T1: 54.0%/16.0%). Sagittal relationships shifted toward Angle Class I in both groups. Among participants classified as free of malocclusion at T0, 62.5% of the untreated group demonstrated worsening by T1, whereas the majority of the treated group maintained the status (treated: 75.0%; untreated: 37.5%). OHRQoL impairment at T1 was low overall and similar between the groups (OHIP-G14: treated 2.44 ± 3.78; untreated 3.09 ± 4.70; $p = 0.362$). Yet, among adults with malocclusion at T1, treated participants reported lower impairment than untreated participants (1.27 ± 1.91 vs. 4.00 ± 6.05; $p = 0.025$).
CONCLUSIONS: After 30 years of observation, both groups showed increased crowding, reduced spacing and a tendency toward Angle Class I. Adults with untreated malocclusions reported significantly greater OHRQoL impairment than adults with residual or relapsed malocclusions after treatment.

Abstract citation ID: cjag070.013
OP6 ‡‡‡ APICAL ROOT RESORPTION IN CLASS III PATIENTS FOLLOWING PRONOUNCED MANDIBULAR INCISOR RETRACTION WITH LINGUAL HIGH PRECISION FIXED APPLIANCES: A RETROSPECTICE COHORT STUDY

Julia von Bremen[1], Dimitrios Kloukos[2], Collin Jacobs[3], Lara Bettenhaeuser-Hartung[4], Jonas Q. Schmid[5]; *[1]Private practice, Bad Essen, Germany, [2]Department of Orthodontics and Dentofacial Orthopedics, University of Bern, Bern, Switzerland, [3]Department of Orthodontics, Heinrich Heine University, Duesseldorf, Germany, [4]Department of Orthodontics, Hannover Medical School, Hannover, Germany, [5]Department of Orthodontics, University of Muenster, Muenster, Germany*

AIM: Extensive retraction of mandibular incisors in Class III treatment may increase the risk of orthodontically induced apical root resorption (OIARR). This retrospective cohort study aimed to assess the incidence and severity of OIARR in Class III patients treated nonsurgically with lingual high precision fixed appliances (HPFAs) and significant anterior tooth retraction.
METHODS: Eligible for inclusion were adolescent and adult Class III patients treated with lingual HPFAs (WIN, DW Lingual Systems GmbH) and extraction of lower premolars, who completed treatment between 2015 and 2024. Pre- (T0) and post-treatment (T1) panoramic radiographs were measured for root and crown lengths, with relative root resorption (rRR, %) calculated for each tooth. Clinically relevant OIARR was assessed using the Malmgren index (scores 1–4). Statistical significance of mean rRR (%) changes was assessed using one-sample t-tests ($\alpha = 0.05$).
RESULTS: A total of 25 patients (mean age at T1 26.8 ± 9.7 years; 12 females, 13 males; mean Wits at T0 -6.7 ± 2.5 mm) and 396 mandibular teeth were analyzed. The mean rRR for anterior teeth was 3.15 ± 4.05%, with no cases of severe resorption (Malmgren score 4) and only 6.7% of roots exhibiting clinically relevant shortening (Malmgren score 3). There was no increased risk of OIARR in anterior teeth compared to premolars and molars (3.15% vs. 3.31%).
CONCLUSION: Extensive bodily retraction of lower anterior teeth was not associated with significant OIARR in this Class III cohort. Excellent torque control using HPFAs enabled considerable retraction with low risk of OIARR, supporting this approach as a safe nonsurgical alternative for Class III camouflage.

Abstract citation ID: cjag070.014
OP7 ‡‡‡ ANTEROPOSTERIOR DISPLACEMENTS OF THE JAWS AND INCISORS RELATIVE TO THE FOREHEAD DURING GROWTH: A LONGITUDINAL CEPHALOMETRIC ANALYSIS OF UNTREATED SUBJECTS WITH CLASS I OCCLUSIONS

Will Andrews[1] and Adam Rumann[2]; *[1]University of California San Francisco, San Francisco, United States, [2]Private practice, Cincinnati, United States*

AIM: To evaluate anteroposterior (AP) displacements of the jaws and incisors relative to the forehead in untreated growing subjects with normal (Class I) occlusions.
MATERIALS AND METHOD: Serial lateral cephalograms from 74 untreated subjects (37 female, 37 male) with Class I dental relationships were obtained from the AAOF Craniofacial Growth Legacy Collection. Two timepoints were selected for each subject. Mean age at T1 was 9.9 yrs.; mean age at T2 was 17.6 yrs. T1 tracings were secured over millimeter graph paper with Frankfort Horizontal (FH) aligned horizontally. Superimpositions were guided by anterior cranial base structures, then shifted along FH so that glabella on T1 and T2 shared a common vertical plane (Glabella-Vertical). AP displacements of Point A (Pt A), Point B (Pt B), maxillary central incisor's FA point (U1FA), and mandibular central incisor's FA point (L1FA) were measured relative to Glabella-Vertical (GV). Changes in occlusal plane inclinations were also measured.
RESULTS: Average AP displacement at Pt A was -0.47mm; Pt B +0.71mm; U1FA +0.32mm; and L1FA +0.82mm. Occlusal plane inclination decreased 2.3^0 on average. Displacement of L1FA was significantly different between genders (M, +1.16mm; F, +0.47mm; p=.04). No significant differences between genders were found for any other variable.
CONCLUSIONS: AP jaw and incisor positions were effectively static relative to GV during normal growth between ages 9 and 18 with untreated Class I occlusions. On average, no landmark studied underwent AP displacement relative to GV that exceeded 1mm. The occlusal plane tended to rotate counterclockwise. In subjects with Class I relationships, pretreatment jaw and incisor positions do not undergo significant AP changes relative to GV during growth after 9 years of age regardless of gender. GV could thus serve as a reliable AP diagnostic landmark in growing patients.

Abstract citation ID: cjag070.015
OP8 QUANTIFICATION AND VISUALIZATION OF 3D FACIAL AGING IN INDIVIDUALS OF EUROPEAN ANCESTRY

Yi Fan[1], Anthony Penington[2], Marie Cornelis[1], Paolo Cattaneo[1], Peter Claes[3]; *[1]Melbourne Dental School, Melbourne, Australia, [2]Royal Children's Hospital, Melbourne, Australia, [3]KU Leuven, Leven, Belgium*

AIM: To quantify and visualize the effects of aging on facial morphology in individuals of European ancestry.
METHODS: Three-dimensional facial photographs of 4,038 individuals (1,455 males and 2,583 females), aged 5 to 85 years and of European descent, were analysed.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Morphological changes in the face were modelled using kernel linear regression, with a focus on age-related changes. Age- and sex-specific expected facial shapes were generated for individuals aged 10 to 60 years in five-year intervals. Changes in the face were analysed in the sagittal, vertical, and horizontal directions, with linear distances and angular variations in the upper, middle, and lower regions of the face evaluated.
RESULTS: Facial shape changes decelerate progressively after the age of 25 for both males and females. Facial aging is characterized by the loss of fullness in the forehead, sunken temples, formation of eye bags, deepening nasolabial folds, cheek hollowness, and thinning, lengthening, and retrusion of the lips. Notable changes begin in the 30s, with the most pronounced alterations occurring in the 40s and 50s, intensifying in the 50s and 60s. Although the overall aging trajectory is similar in males and females, the magnitude and rate of change demonstrate sexual dimorphism.
CONCLUSION: This study provides comprehensive insights into age-related facial morphological changes in healthy individuals of European ancestry using 3D photogrammetric analysis. The application of 3D morphometric techniques is critical for accurately assessing facial aging. These findings have important implications for clinical disciplines such as dentistry, plastic and maxillofacial surgery, and forensic medicine.

Abstract citation ID: cjag070.016
OP9 THE ASSOCIATION OF SUPERNUMERARY TEETH FORMATION WITH CRANIOFACIAL SIZE

Sofia Bakirtzi[1], Eva Henninger[1], Luca Friedli[1], Georgios Kanavakis[2], Nikos Gkantidis[1]; *[1]Department of Orthodontics and Dentofacial Orthopedics, University of Bern, 3010 Bern, Switzerland, Bern, Switzerland, [2]Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, 11527 Athens, Greece, Athens, Greece*

AIM: To assess whether the presence, number, and location of supernumerary teeth influence craniofacial size in non-syndromic individuals, and whether these effects differ by sex.
MATERIALS AND METHODS: A retrospective multicenter study was performed using >10,000 orthodontic records from Switzerland and Greece (2002–2023). The sample included 200 individuals with supernumerary teeth (125 males, 75 females; mean age 12.7 ± 5.7 years) and 200 age- and sex-matched controls. Supernumerary teeth were classified by number and location (maxilla vs. mandible). Craniofacial morphology was quantified from pre-treatment lateral cephalograms using geometric morphometrics based on 117 landmarks and semi-landmarks across four anatomical regions. Size was measured as the natural logarithm of centroid size (ln[CS]). Multiple linear regression models tested associations between craniofacial size, sex, age, and supernumerary tooth number or location. Intraobserver reliability was excellent ($n = 30$). Significance was set at $\alpha = 0.05$.
RESULTS: Age and sex were strong predictors of craniofacial size ($P < 0.001$), with larger dimensions in males and older individuals. The number of supernumerary teeth showed a small positive association with maxillary size ($\beta \approx 0.010–0.011$; $P \leq 0.012$), evident only when rare severe cases (>2 teeth) were included, and no significant effects on the cranial base, mandible, or overall facial size. Location-specific analyses indicated that individuals with mandibular supernumerary teeth ($n = 50$) had larger mandibular ($\beta = 0.016$; $P = 0.009$) and maxillary dimensions ($\beta = 0.022$; $P < 0.001$), with males also showing slightly larger overall facial size (+2.5%; $P = 0.014$). Maxillary supernumerary teeth ($n = 145$) showed no significant craniofacial size differences.
CONCLUSION: Supernumerary teeth exert limited, region-specific effects on craniofacial size. While overall facial dimensions remain largely unchanged, mandibular supernumeraries, though uncommon, are associated with modest enlargement of both jaws in males. These findings contrast with the consistently reduced craniofacial size characteristic of tooth agenesis, underscoring the asymmetric developmental impact of tooth number anomalies.

Abstract citation ID: cjag070.017
OP10 AN UNDERSTANDING OF ORTHODONTIST AND ORAL MAXILLOFACIAL SURGEONS IN THE MANAGEMENT OF JUVENILE IDIOPATHIC ARTHRITIS - A COMPREHENSIVE NATIONAL SURVEY

Chung How Kau, Kavita Nayar, Matthew Stoll, Kathlyn Powell; *University of Alabama at Birmingham, Birmingham, United States*

This study aimed to evaluate and compare the understanding, common knowledge and interdisciplinary management practices related to juvenile idiopathic arthritis among board certified orthodontists and oral and maxillofacial surgeons in the United States.
METHODS: A cross-sectional electronic survey was distributed via Qualtrics to orthodontists and oral and maxillofacial surgeons nationwide. The questionnaire assessed demographics, educational background, clinical experience, interdisciplinary collaboration and awareness of juvenile idiopathic arthritis management guidelines. Institutional Review Board approval was obtained from the University of Alabama (IRB #300014323).
RESULTS: A total of 109 complete responses (64 orthodontists and 45 oral and maxillofacial surgeons) were analyzed. Statistically significant differences were observed between specialties and formal juvenile idiopathic arthritis education ($p<0.0001$), clinical involvement in juvenile idiopathic arthritis care ($p=0.01$), belief in multidisciplinary management ($p<0.0001$), and awareness of both guidelines ($p=0.001$) and outcome measures ($p=0.0008$). Oral and maxillofacial surgeons demonstrated greater educational exposure, more direct clinical involvement and stronger familiarity with juvenile idiopathic arthritis management frameworks, whereas orthodontist expressed greater support for craniofacial team-based care.
CONCLUSION: This study highlights substantial disparities in knowledge and preparedness for juvenile idiopathic arthritis management between orthodontists and oral and maxillofacial surgeons. Incorporating interdisciplinary juvenile idiopathic arthritis education into specialty training, fostering collaborative research and developing unified evidence based clinical guidelines are essential next steps. Enhance interprofessional communication, national registries and continuing education initiatives could improve early diagnosis and long term functional and esthetic outcomes for children with juvenile idiopathic arthritis.

Abstract citation ID: cjag070.018
OP11 EASY-READ ORTHODONTIC LEAFLET FOR PATIENTS WITH INTELLECTUAL DISABILITIES

Yit Shern Ho and Ross McDowall; *Portsmouth University Hospital, Portsmouth, United Kingdom*

BACKGROUND: The number of people with learning disabilities in the UK is increasing, with around 286,000 children aged 0–17 affected. Learning disabilities are closely linked to neurodiversity and interestingly research indicates that neurodivergent individuals have an increased prevalence of malocclusion. Parents, who often play a major role in orthodontic decision-making, may have limited literacy skills—1 in 6 adults in England has low health literacy. The Equality Act 2010 requires public services to make reasonable adjustments to ensure accessibility, such as providing information in “easy-read” formats.
AIM: To develop an easy-read orthodontic leaflet to help patients with learning disabilities better understand treatment information before consenting to orthodontic care.
MATERIALS AND METHOD: We first reviewed the existing orthodontic information leaflets available in our department and via the British Orthodontic Society (BOS) website. Currently, there is an excellent easy-read BOS leaflet aimed at the carers instead of the children with additional needs.

According to the easy-read guideline published by the NHS England, an effective easy-read leaflet should:

- Include pairing of text with relevant diagrams or images.
- Use simple, clear language with no jargon.
- Use short sentences.
- Highlight/bold/underline important words.
- Use at least 14 font size
- Maintain an uncluttered layout.

After outlining the key contents, we made the first digital draft. This was reviewed by our senior orthodontic colleagues and the health inequality team. We also collaborated with the graphics team in finalising the leaflet.
RESULTS: An A5 Easy Read leaflet entitled “Your Orthodontic Journey” was created. It consists of 8 pages and includes key orthodontic information such as benefits and risks, timelines, expectations, and follow-up appointments. A QR code was also created to reduce paper waste and save costs. Feedbacks from patients were collected using an online questionnaire. Of these, 60% respondents identified as neurodivergent, while the other 40% did not. 100% positive responses were received, indicating that the leaflet met its objectives.
CONCLUSION: The project the project emphasized the importance of inclusive communication and multidisciplinary teamwork in achieving better healthcare outcomes. On hindsight, involving patients and carers earlier during the drafting process would have been beneficial.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.019
OP12 ‡‡‡ MICROSOFT COPILOT IN ORTHODONTIC EDUCATION: A CROSS-SECTIONAL POSTGRADUATE EVALUATION

Aliki Tsichlaki, Ali Yasser Mohammad Saleh, Robert Samuel David Smyth; *UCL Eastman Dental Institute, London, United Kingdom*

AIM: Large language models (LLMs), such as Microsoft Copilot, are increasingly being used in healthcare, yet evidence regarding their efficacy from a postgraduate perspective remains scarce. This cross-sectional study aimed to evaluate orthodontic postgraduate's perceptions of the accuracy, completeness, and reliability of Microsoft Copilot-generated responses to orthodontic short answer questions (SAQs) compared with human-written, model answers.
METHODS: An online questionnaire survey was distributed amongst orthodontic postgraduates at UCL Eastman Dental Institute, firstly assessing familiarity and use of LLMs in Orthodontic education. The second part of the questionnaire included three devised orthodontic SAQs for which there were three different responses; a 'model' human-written answer (H), developed by two senior clinical academics, and two Artificial Intelligence (AI) responses generated by Microsoft Copilot, one with no prompting (NAI) and one using a structured scientific prompt (SAI). Postgraduates were asked to score each of these blinded responses using an accuracy of information scoring index across six criteria on a scale of 0-2 (maximum total score of 12) for each of the three SAQs. Statistical analyses included Friedman tests with Kendall's coefficient of concordance and Wilcoxon signed-rank tests.
RESULTS: Nineteen orthodontic postgraduates completed the study with responses spread equally across the training years. Awareness of LLMs varied across the training years with Orthodontic LLM usage increasing with each training year. The human-written model answer achieved consistently the highest median scores across all three SAQs with a smaller range. For SAQ 1, the Friedman test showed a statistically significant difference (p=.003), with post-hoc Wilcoxon tests showing significant differences between H vs. NAI (p=.004) and SAI vs. NAI (p=.012). No significant differences were found amongst answers for SAQs 2 or 3. Participants most frequently selected the Human answer as the 'best' response and the NAI as the 'worst'. More junior postgraduates, however, rated the NAI answers more favourably than senior postgraduates.
CONCLUSIONS: Copilot showed potential as a supplementary learning tool, however, its use in specialist domains should be used with caution, as its responses remained suboptimal. Structured AI-literacy training, prompt-engineering awareness, and expert supervision are recommended to ensure safe and effective integration of AI into orthodontic education.

Abstract citation ID: cjag070.020
OP13 EFFECT OF FIXED ORTHODONTIC RETENTION ON PERIODONTAL HEALTH. A DOUBLE-BLIND, PARALLEL-ARM, RANDOMISED CLINICAL TRIAL OF FOUR DIFFERENT BONDED RETAINERS

Dimitrios Kloukos[1], Eleni Zafeiropoulou[2], Eleni Kalimeri[3], Niki Loukogiorgaki[4], Christos Katsaros[1]; [1]*University of Bern, Bern, Switzerland,* [2]*University of Athens, Athens, Greece,* [3]*University of Thessaloniki, Thessaloniki, Greece,* [4]*251 Hellenic Airforce Hospital, Athens, Greece*

OBJECTIVE: To evaluate the effect of fixed orthodontic retainers on the periodontal health of post-orthodontic patients.
MATERIALS AND METHODS: Eighty patients aged 12 years or more were recruited upon completion of their treatment with fixed orthodontic appliances. Participants were randomly allocated to 4 retainer groups, based on the wire used: A) 0.016'x0.022' stainless steel, B) 0.016'x0.022' braided rectangular stainless steel, C) 0.0215'x0.027' stainless steel and D) 0.0215' five-stranded coaxial wire. Retainers were bonded on all anterior teeth, except for Group C retainer that was bonded only to canines. Block randomisation with block size of 4 and 6 was applied through www.random.org. Patients and assessors were blinded to the intervention administered. Plaque (PII) and gingival indices (GI) were evaluated at baseline, 2 weeks, 6 and 12 months after bonding. Mean values were calculated separately for each group and at all time points.
RESULTS: At baseline, total mean PII value was 60.46% (SD 17.15), with mean value for upper teeth being lower than the lower teeth [46.32% (SD 24.48) Vs 54.15% (SD 25.78)]. Group D presented the highest values in all cases (67.41%, SD 17.27 for upper and 63.33%, SD 25.94 for lower teeth). Mean total GI values were 35.62% (SD 20.89), with mean values of lower teeth being higher than the upper teeth [29.96% (SD 20.87) Vs 37.46% (SD 24.79)]. Group A presented the highest recorded values for upper teeth [32.36% (SD 20.20)] and Group C for lower teeth (45.69%, SD 28.06). Plaque Index values were significantly improved with time, while type of retainer and bonded teeth did not seem to exert a significant effect. Gingival Index values were not significantly affected by any of the factors.
CONCLUSIONS: All types of wires used as fixed orthodontic retainers were compatible with periodontal health up to 12 months after removal of orthodontic appliances.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.021
OP14 CLINICIAN CONSENSUS ON PATIENT SUITABILITY FOR A SURGERY FIRST APPROACH TO ORTHOGNATHIC TREATMENT

Beth Bradley[1], Trevor Hodge[1], Cian Lowney[1], Farag Shuweihdi[2], Sophy Barber[1]; [1]*School of Dentistry, University of Leeds, Leeds, United Kingdom,* [2]*University of Leeds, Leeds, United Kingdom*

OBJECTIVES: To determine and reach consensus on which dentoskeletal features influence clinicians' judgement of an individual's suitability for a 'Surgery First' approach (SFA) to orthognathic treatment.
DESIGN: Cross-sectional, mixed-methods consensus study.
SETTING AND PARTICIPANTS: Two UK-based workshops (2025) involving seventeen consultant orthodontists and maxillofacial surgeons experienced in orthognathic care.
MATERIALS AND METHODS: In Workshop 1, participants independently assessed 70 anonymised orthognathic cases using standardised pre-treatment records. Each case was scored for orthognathic and SFA suitability, alongside the influence of eight dentoskeletal features. Quantitative analysis included descriptive statistics, inter and intra-rater agreement. Free-text responses explored clinical reasoning. Findings informed a second, professionally-facilitated virtual consensus workshop using structured discussions and anonymous ranking to prioritise key features.
RESULTS: A total of 1,137 assessments were completed (95.5% response rate). All cases were considered suitable for orthognathic treatment, with 38% deemed suitable for SFA. Agreement on SFA suitability was fair-to-moderate, with good intra-rater consistency. Overall and transverse tooth-fit, when models were hand articulated, were key drivers for SFA suitability. Consensus ranking identified transverse skeletal relationship, incisor inclination, and crowding as important features. Additional features, including centrelines and vertical relationships showed context-dependent importance. Qualitative findings demonstrated greater nuance than rankings alone, highlighting how decisions were influenced by feature combinations and interdisciplinary interpretation.
CONCLUSIONS: SFA suitability is primarily determined by features affecting immediate post-operative occlusal predictability. Clinicians demonstrate fair-to-moderate agreement, with variability reflecting case complexity. These findings provide a UK-specific evidence base to inform case selection and support future clinical trials
comparing SFA with conventional orthognathic treatment.

Abstract citation ID: cjag070.022
OP15 REDUCING THE BURDEN OF ORTHODONTIC CARE FOR CHILDREN WITH CLEFTS: EVALUATING THE EFFECTIVENESS OF PRE-ALVEOLAR BONE GRAFT ORTHODONTICS IN PATIENT WITH UNILATERAL NON-SYNDROMIC CLEFT- A RANDOMISED CONTROLLED TRIAL (PABO STUDY)

Badri Thiruvenkatachari, Manoj Prathap, Syed Altaf Hussain, Charanya Vijayakumar; *Bharath University, Chennai, India*

BACKGROUND: Prealveolar bone graft orthodontics focuses on aligning and derotating teeth adjacent to the cleft, thereby creating space for the graft and improving surgical access. However, the evidence underpinning pre-bone graft orthodontics is weak, there being no prospective trials or other formal studies.
AIM: This multicenteric, parallel group, prospective, 1:1 allocation, randomised, controlled trial was conducted across three centres in India. The trial included patients with complete unilateral CLP, aged between 8 and 13 and upper central incisors erupted. When patients satisfied the inclusion criteria, written informed consent was obtained from the parent and were then randomly assigned to one of the two groups, orthodontic treatment group or no treatment control group. The orthodontic treatment group patients were then provided with a fixed orthodontic appliance with or without an expansion appliance. In the no treatment control group, the patients were seen in the joint clinic around nine months from baseline and planned for ABG surgery. The primary outcome for the trial was the amount of bone fill at six months after post ABG surgery, measured using Bergland index on oblique occlusal radiograph. The secondary outcomes included GOSLON score, ANB measured using lateral cephalometric radiograph, successful eruption of canines assessed clinically, and quality of life measured using CPQ_{8-10} questionnaire. Data was analysed on an intention-to-treat basis.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: Of the 72 participants randomised, 61 completed treatment and had data at the final follow up appointment. Bergland index score evaluating the amount of bone fill to indicate the success of ABG surgery showed no statistically significant difference between the orthodontic treatment group and no treatment control group. The success rate for the orthodontic group was 92.5 % and for the no treatment control group was 97.9 % for the imputed data (OR 1.06, 95% CI 0.19 to 5.65, p= 0.943). The results for GOSLON score and ANB measurement at the end of the trial for the imputed data showed no statistically significant difference.
CONCLUSION: There was no statistically significant difference between the orthodontic treatment group and the no orthodontic control group on the success of ABG surgery in complete UCLP patients.

Abstract citation ID: cjag070.023
OP16 QUALITY OF LIFE IN ADULTS WITH TREATED ORAL CLEFTS: A CLEFT-Q ASSESSMENT

Charissa Reynders, Edwin Ongkosuwito, Mette Kuijpers; *RadboudUMC, Nijmegen, Netherlands*

AIM: This study aimed to investigate differences in perceived appearance, facial function, and oral health–related quality of life between adult and pediatric patients with cleft conditions.
MATERIALS AND METHODS: In this prospective cohort study, 80 adult cleft patients previously treated at Radboud University Medical Center (Nijmegen, The Netherlands) were compared with 236 pediatric cleft patients currently under the care of the same multidisciplinary cleft team. All participants completed the CLEFT-Q questionnaire, which measures patient-reported outcomes across three domains—Function, Appearance, and Oral Health–Related Quality of Life—with subdomains including Appearance of the Face, Lips, Nose, Jaws, Teeth, Cleft Lip Scar, Psychological Function, School Function, Social Function, Speech Distress, Speech Function, and Eating and Drinking. Descriptive analyses were performed for each subdomain, and comparisons between adults and pediatric patients were conducted.
RESULTS: Most subdomains showed normally distributed data and no significant group differences. However, several notable effects emerged. For Teeth, adults scored higher (M = 70.02, SD = 21.82) than pediatric patients (M = 50.22, SD = 15.35), indicating more favorable perceived dental appearance. In speech-related domains, adults reported significantly lower scores on *Speech Distress* (M difference = –62.99, SE = 3.27, 95% CI [–69.48, –56.50]) and *Speech Function* (M difference = –63.15, SE = 2.73, 95% CI [–68.53, –57.78]), reflecting greater perceived speech difficulties. Adults also scored lower on *Eating and Drinking* (M difference = –22.58, SE = 0.45, 95% CI [–23.48, –21.69]), suggesting reduced functional performance.
CONCLUSIONS: Overall, adult and pediatric cleft patients report comparable outcomes across most CLEFT-Q domains. Nevertheless, adults tend to experience greater challenges in speech and eating/drinking function while rating their dental appearance more positively. These findings highlight the importance of long-term follow-up strategies after treatment, particularly focusing on speech and functional rehabilitation.

Abstract citation ID: cjag070.024
OP17 GENETIC VARIATION NEAR ROBO1 IS ASSOCIATED WITH CRANIOFACIAL MICROSOMIA AND RELATED PHENTOTYPES IN THE FINNISH POPULATION

Laura Kaprio[1], Anu Kiukkonen[2], Emma Juuri[1], David Rice[3], Satu Strausz[4]; *[1]Cleft Palate and Craniofacial Centre, Department of Plastic Surgery, University of Helsinki and Helsinki University Hospital, Finland, Helsinki, Finland, [2]Department of Oral and Maxillofacial Diseases, Head and Neck Center University of Helsinki and Helsinki University Hospital, Finland, Helsinki, Finland, [3]Orthodontics, Department of Oral and Maxillofacial Disease, Faculty of Medicine, University of Helsinki and Helsinki Univesrity Hospital, Finland, Helsinki, Finland, [4]Institute for Molecular Medicine Finland, Helsinki Institute of Life Science, University of Helsinki, Helsinki, Finland, Helsinki, Finland*

AIM: Craniofacial microsomia (CFM) is a heterogeneous group of congenital anomalies involving first and second pharyngeal arch–derived structures that are coordinated by early neuronal progenitor cells. Previous studies have implicated several loci including near *ROBO1* and *ROBO2* in the Han Chinese and Latin American populations. We performed a genome-wide association study of craniofacial microsomia in a large, well-characterized European founder population and identified a significant locus near *ROBO1*. Our study aims to expand the current understanding of the genetic and developmental basis of craniofacial microsomia and its phenotypic continuum.
MATERIALS AND METHOD: We performed a genome-wide association study in the FinnGen initiative including 82 CFM cases and 500,104 controls of Finnish ancestry and identified a genome-wide significant locus near *ROBO1* on chromosome 3 (lead rs62256696, beta=0.96, P=2.27×10^{-8}).
RESULTS: Regulatory annotation from embryonic craniofacial tissues (Carnegie stages 13–20) and single-cell datasets indicated enhancer activity at the locus and *ROBO1* expression in neural crest–related lineages. Phenotypic association and LD score analyses highlighted overlap with auditory phenotypes, including congenital malformations of the ear with hearing impairment (rg=0.46, P=4.8×10^{-7}). Previously reported *ROBO1* signals (rs13089920, rs1444472) showed concordant associations in the FinnGen cohort.
CONCLUSIONS: Our findings extend previous observations by demonstrating the relevance of the *ROBO1* locus in a European founder population and support the role of *ROBO1* in the neurodevelopmental basis of CFM and related phenotypes through its role in neuronal patterning and craniofacial morphogenesis.

Abstract citation ID: cjag070.025
OP18 DOES THE METHOD OF SURGERY TO CORRECT SAGITTAL SUTURE CRANIOSYNOSTOSIS HAVE AN EFFECT ON CEPHALOMETRIC FEATURES? A RETROSPECTIVE CROSS-SECTIONAL STUDY

Sami Leinonen[1], Junnu Leikola[1], David Rice[2], Arja Heliövaara[1]; *[1]Cleft Palate and Craniofacial Centre, Department of Plastic Surgery, Helsinki University Hospital and University of Helsinki, Helsinki, Finland, Helsinki, Finland, [2]Orthodontics, Department of Oral and Maxillofacial Diseases, University of Helsinki and Helsinki University Hospital, Helsinki, Finland, Helsinki, Finland*

AIM: The aim of this retrospective cross-sectional study was to investigate the cephalometric features of patients with surgically operated non-syndromic sagittal suture craniosynostosis.
MATERIALS (OR SUBJECTS) AND METHOD: The university hospital's medical records were screened for patients with sagittal suture craniosynostosis from different registries. In total 371 patients were returned. Patients that underwent cranial vault surgery were included. Method of surgery and age at surgery was noted. We then used lateral cephalometric radiographs taken around 8 years of age to study cephalometric features digitally using the Helsinki Analysis in Dolphin Imaging software.

Statistical analysis was carried out to study the effects of surgical methodology and age at surgery to cephalometric features. Cephalometric data between methods of surgery were compared with a two-tailed independent samples t-test. Pearson´s correlation coefficients were calculated for age at surgery in relation to cephalometric data. A multivariate general linear model was calculated with surgical methodology and sex as fixed factors and age at surgery as a covariate. Intraclass correlation coefficients were calculated to assess intrarater reliability.
RESULTS: In total 106 patients with operated sagittal suture craniosynostosis were ultimately included. Out of these 22 underwent surgery with H-craniectomy and 84 with cranial vault remodeling. The female to male ratio in each subgroup was similar. Age at surgery was on average 0.38 years in the H-craniectomy group and 1.65 years in the cranial vault remodeling group. Lateral cephalometric radiographs were taken on average at ages 8.25 years and 8.44 years, respectively.

Patients that underwent H-cranioectomy had statistically significantly smaller Basion-Sella-Nasion angles (mean difference -1.69° with 95% CI -5.13° to 1.74°) and more distal A- and Pogonion points to the Nasion perpendicular (MD -2.70 mm with 95% CI -4.36 mm to -1.05 mm; and MD -3.45 mm with 95% CI -5.86 mm to -1.03 mm, respectively).

Age at surgery had a positive correlation with soft tissue profile (Glabella-Subnasale-Pogonion angle) and a negative correlation with Ba-S-N and ANB-angles and also A-N and Pog-N perpendicular distances.
CONCLUSIONS: In patients with sagittal suture craniosynostosis, the method of surgery and age at surgery seem to have an effect on later cephalometric profile.

Abstract citation ID: cjag070.026
OP19 ORTHODONTIC TREATMENT FOR PROMINENT UPPER FRONT TEETH (CLASS II DIVISION 1) IN CHILDREN AND ADOLESCENTS: A COCHRANE SYSTEMATIC REVIEW

Deise Kühlman[1], Flavia Artese[1], Jayne Harrison[2], José Augusto Miguel[1], Klaus Batista[1]; *[1]Rio de Janeiro State University, Rio de Janeiro, Brazil, [2]Liverpool University Dental Hospital, Liverpool, United Kingdom*

AIMS: This updated Cochrane systematic review (CD003452) evaluates the effectiveness of orthodontic appliances for managing prominent upper incisors in children and adolescents with Class II Division 1 malocclusion. It compares early (ages 7–11) versus late (ages 12–16) treatment and assesses late treatment versus no treatment.
MATERIAL AND METHODS: A comprehensive search of major databases was performed up to 27 August 2025, without language restrictions. Only randomized controlled trials were eligible. Studies comparing early two-phase treatment with late

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

one-phase treatment, or any orthodontic intervention with no treatment, were included. Two reviewers independently screened all records.
RESULTS: The search yielded 3,340 records, of which 21 newly identified studies met the inclusion criteria, contributing to a total of 48 trials (120 papers) included in this review.Studies increasingly reported patient-centred outcomes, with six assessing OHRQoL and seven reporting harms. Early treatment reduced the overjet and ANB after the first phase; however, these differences were no longer evident once both groups completed treatment. There were no clinically important differences in final overjet (MD 0.21 mm; 95% CI −0.10 to 0.51; 343 participants; low-certainty evidence) or final ANB (MD −0.02°; 95% CI −0.47 to 0.43; 347 participants; moderate-certainty evidence). Importantly, early treatment significantly reduced the incidence of incisal trauma (OR 0.56; 95% CI 0.33 to 0.95; 332 participants; moderate-quality evidence), with trauma occurring in 30% of late-treatment participants compared with 19% in the early-treatment group. Compared with no treatment, late treatment with removable functional appliances (MD −1.81°; 95% CI −2.54 to −1.07; 3 trials, 140 participants) and fixed functional appliances with skeletal anchorage (MD −0.74°; 95% CI −1.43 to −0.05; 3 trials, 82 participants) significantly reduced ANB, supported by moderate-certainty evidence. Removable functional appliances also reduced final overjet (MD −4.70 mm; 95% CI −5.34 to −4.05; 3 trials, 166 participants; low-certainty evidence). Two trials comparing Twin Block and other functional appliances showed no significant difference in skeletal effects (MD 0.49°; 95% CI −1.03 to 0.05; 221 participants).
CONCLUSIONS: Moderate-certainty evidence indicates that early treatment effectively reduces incisal trauma, while late removable functional-appliance therapy meaningfully reduces anteroposterior skeletal discrepancy compared with no treatment.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.027
OP20 *** SUCCESS RATE OF PALATAL MINI-IMPLANTS FOR MAXILLARY MOLAR DISTALISATION &NDASH; DIGITAL VERSUS CONVENTIONAL WORKFLOW

Benedict Wilmes, Daniela Balzert, Maximilian Küffer, Dieter Drescher; *University of Duesseldorf, Düsseldorf, Germany*

AIM: In cases of maxillary crowding, molar distalisation is a frequently used treatment option for correcting a Class II malocclusion. Skeletal anchorage can be employed to make this therapy independent of patient compliance and free of dental side effects. Nowadays, insertion and appliances can also be planned virtually and implemented using a digital workflow. This study aimed to investigate the success rate depending on whether a digital or conventional workflow was used.
SUBJECTS AND METHOD: In a retrospective study, the success rate of mini-implant–supported distalisation appliances (n = 426) was evaluated. In Group I (n = 321), appliances were inserted using a conventional workflow (insertion without a guide, impressions, prefabricated components). In Group II (n = 105), the appliances were placed using a digital workflow (CAD/CAM fabrication of guide and slider). The success rate of the anchorage mini-implants was assessed after a minimum follow-up period of 9 months.
RESULTS: In Group I (conventional workflow), failure of the mini-implants occurred in 19 of 321 patients (5.9%), while in Group II (digital workflow), failure of the mini-implants was observed in 3 of 105 patients (2.9%).
CONCLUSIONS: Both conventionally manufactured and CAD/CAM-produced distalisation devices showed excellent success rates for mini-implants placed in the anterior palate. The appliances manufactured via digital workflow demonstrated an even better prognosis. Potential contributing factors include improved oral hygiene accessibility due to the modified design and the use of insertion guides, which increase planning accuracy for the insertion sites

Abstract citation ID: cjag070.028
OP21 SKELETAL ANCHORAGE REINFORCEMENT FOR FIXED CLASS II CORRECTION: A SYSTEMATIC REVIEW WITH META-ANALYSIS INCLUDING RAW PATIENT DATA

Spyridon Papageorgiou[1], Osama Eissa[5], Marco Migliorati[2], André Walter[6], Jadbinder Seehra[3], Martyn Cobourne[3], Alexandra Papadopoulou[4]; *[1]Clinic of Orthodontics and Pediatric Dentistry, University of Zurich, Center for Dental Medicine, Zurich, Switzerland, [2]Service of Digital Orthodontics and Dentofacial Orthopedics, Genova University, Genova, Italy, [3]Faculty of Dentistry, Oral & Craniofacial Sciences, Centre for Craniofacial Development & Regeneration, King's College London, London, United Kingdom, [4]Division of Orthodontics, University Clinics of Dental Medicine, Faculty of Medicine, University of Geneva, Geneva, Switzerland, [5]Department of Orthodontics, Faculty of Dentistry, Tanta University, Egypt, [6]Department of Orthodontics, Universitat Internacional de Catalunya, Barcelona, Spain*

AIM: Orthodontic treatment with fixed Class II appliances is often performed to correct Class II malocclusion with mandibular retrusion mostly and adverse effects in terms of posterior rotation and incisor proclination can have substantial esthetic and functional impacts or even lead to the necessity for treatment re-consideration. It is therefore imperative for both orthodontists and periodontist to be aware the associated risks to inform patients and assess the risk according to patient- and treatment-related characteristics and whether skeletal anchorage reinforcement can reduce these adverse effects.
MATERIALS AND METHODS: Six databases were searched without restrictions until November 2025 for randomized / non-randomized clinical trials on temporary anchorage devices used for anchorage reinforcement during Class II correction and raw patient data was obtained, whenever possible. After duplicate study selection, data extraction and risk-of-bias assessment, random-effects meta-analyses of mean differences (MDs) and their 95% confidence intervals (CIs) were performed, followed by sensitivity and certainty of evidence analyses.
RESULTS: A total of 11 clinical trials (6 randomized / 5 non-randomized), covering 396 patients, were included, while raw patient data could be procured for three of them. Meta-analysis indicated that compared to conventional Class II correction with dentoalveolar anchorage, Class II correction with hybrid dentoalveolar-skeletal anchorage was associated with slightly increased anterior mandibular position (SNB; MD 0.28; 95% CI 0 to 0.56; P=0.04) reduced lower incisor proclination (1i-ML; MD -5.34; 95% CI -8.49 to -2.18; P=0.005). On the other hand, anchorage reinforcement was not associated with significant differences in maxillary position (SNA; MD -0.06; 95% CI -0.46 to 0.33; P=0.71), anteroposterior skeletal relationship (ANB; MD -0.23; 95% CI -0.66 to 0.19; P=0.23) and mandibular rotation (SN-ML; MD -1.28; 95% CI -4.39 to 1.83; P=0.37). Sensitivity analysis indicated robustness to the study design that was used, while the certainty of evidence ranged from moderate to low.
CONCLUSION: Skeletal anchorage reinforcement for Class II correction has limited benefits in terms of slightly increased mandibular advancement and less proclination of the mandibular incisors, while mandibular rotation is still observed. However, most studies are small and used different skeletal anchorage protocols and therefore great uncertainty still exists.

Abstract citation ID: cjag070.029
OP22 ‡‡‡ OBJECTIVE ASSESSMENT OF WEAR TIME DURING ORTHODONTIC ALIGNER THERAPY USING MICROSENSORS - A RANDOMIZED CONTROLLED TRIAL

Hisham Sabbagh, Uwe Baumert, Andrea Wichelhaus; *LMU Department of Orthodontics and Dentofacial Orthopedics, Munich, Germany*

AIM: The clinical effectiveness of aligners is impacted by wear time (WT). This study aimed to objectively assess WT using microsensors and to evaluate whether patient awareness of monitoring affects WT.
METHODS: Trial Design: A single-center, two-arm, parallel-group randomized controlled trial. Participants: 43 adult patients. Interventions: Orthodontic aligner treatment with an integrated microsensor to assess WT. Outcomes: WT across six consecutive appointments, scheduled biweekly. Randomization and Blinding: Patients were randomly assigned to Group 1 or Group 2 in a 1:1 ratio. Patients were either informed about the use of microsensors to register intraoral temperature (Group 1) or to assess patient compliance based on the temperature data (Group 2).Outcome assessment was blinded.
RESULTS: Follow-up: Three patients were lost during follow up. Outcomes: 40 patients were included in the final analysis. A linear mixed model was used to estimate the effect of study arm, age, and sex on mean wear time per wave. There was a significant main effect of study arm, with patients in Group 2 (aware) showing higher wear times than Group 1 ($\beta = 7.78$, 95% CI [3.69, 11.87], $p < .001$), and a significant effect of female sex ($\beta = 5.80$, 95% CI [2.21, 9.39], $p = .002$). Wear time declined significantly at later visits, and a significant interaction indicated that the effect of sex was reduced in the awareness group.
CONCLUSIONS: Awareness of being monitored improved patient compliance and can be used as an effective strategy to enhance wear time during aligner therapy in adults. Trial Registration: German Clinical Trials Register (DRKS00029027) Funding: None.

Abstract citation ID: cjag070.030
OP23 CAN WEAR-TIME MONITORING IMPROVE COMPLIANCE AND REDUCE FUNCTIONAL APPLIANCE TREATMENT DURATION?

Heidi Arponen and Thomas Åberg; *University of Helsinki, Helsinki, Finland*

AIM: This single center, two parallel-arm prospective randomized controlled trial assessed the impact of wear-time monitoring on treatment duration and

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

outcome, as well as patients' subjective satisfaction with Twin-block appliance or head-gear activator in public health care.
MATERIALS AND METHOD: In total, 58 adolescents with Class II malocclusion and treated with either twin-block appliance or head-gear activator were randomized into two equal sized groups; one of which received thermosensitive microsensor wear-time monitoring embedded in the appliance while the other did not. Patients' subjective experience was enquired with a questionnaire at each follow-up visit. Association between treatment time, occlusal outcome, appliance wear-time, and subjective satisfaction with appliance wear was statistically analyzed. The treatment outcomes were analysed on an intention-to-treat and per-protocol basis.
RESULTS: Of the adolescent, 22% were non-compliant or interrupted their treatment. The average appliance wear time was 67% of the prescribed and the average treatment duration was 13 months in those patients with successful treatment outcome. No significant differences were observed in treatment duration, occlusal outcomes, or wear comfort between patients with wear-time monitoring sensors and those without.
CONCLUSIONS: Although incorporating wear-time monitoring in a removable functional appliance did not lead to faster, more effective, or more comfortable treatment, it may still hold promise for improving patient motivation and treatment adherence.

Abstract citation ID: cjag070.031
OP24 THE RELATIONSHIP BETWEEN PRE-TREATMENT SPACE REQUIREMENTS AND TREATMENT SUCCESS

Rebecca Toner[1], Moses Eribo[1], Bahman Honari[1], Kieran Daly[2], Padhraig Fleming[1]; [1]*Dublin Dental University Hospital, Dublin, Ireland,* [2]*Northern Cross Dental Clinic, Dublin, Ireland*

AIM: The advent of machine and deep learning has raised the possibility of increased efficiency and indeed improved accuracy in relation to the interpretation of clinical images. Moreover, the use of deep learning has become imbedded within orthodontics with attempts to utilise this approach in informing treatment planning. The aim of this study was to develop and test an AI-based tool capable of measuring tooth width and dental crowding.
MATERIALS AND METHOD: Sets of pre and post treatment plaster study models were acquired of 245 patients who had treatment completed in a specialist orthodontic practice by a single orthodontist. These models were scanned to create stereolithography (STL) files. These files were used to train an AI tool capable of calculating the mesio-distal widths of each of the teeth in the arches. To test the validity of this model, direct comparison was made between the AI tool and human raters. A sample of twelve sets of pre-treatment study models were known as the "test data". The test data was analysed by a group of five orthodontic clinicians at two separate time intervals.
RESULTS: Statistical analysis confirmed a high level of agreement between human raters and also in relation to the novel AI-based tool. Inter-rater reliability among the human raters was high with Intraclass correlation coefficients (ICCs) ranging from 0.911 to 0.946 between the intervals. Manual measurements also demonstrated a high level of agreement with the AI tool (ICC= 0.956; Mean absolute difference= 0.4 mm).
CONCLUSIONS: The novel AI-based tool demonstrated reliability in calculating mesiodistal widths of teeth in an untreated arch. This tool will be further developed to incorporate other parameters such as arch levelling, to provide a means to calculate the overall space requirement in the arch.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.032
OP25 ‡‡‡ WORK-RELATED BURNOUT IN SPECIALIST ORTHODONTISTS IN THE UK

Sarah Hamadah[1], J. Shute[2], S. Cunningham[1], A. Tsichlaki[1]; [1]*University College London, London, United Kingdom,* [2]*Eastman Dental Hospital, London, United Kingdom*

AIM: Work-related burnout constitutes a significant concern in contemporary occupational settings, with adverse consequences for both individual well-being and organisational performance. Despite the implications of burnout, there remains limited research examining burnout among orthodontic specialists. The aim of this study was to assess work-related burnout amongst orthodontic specialists in the UK. The objectives were to identify both demographic and work-related factors that may affect burnout.
MATERIALS AND METHODS: This was a cross-sectional, online questionnaire-based study, consisting of two parts, (i) demographic and work-related information and (ii) the Copenhagen Burnout Inventory (CBI) consisting of 3 domains – personal, work-related and clinical. Ethical approval was obtained. The questionnaire was distributed through email invitations via the national orthodontic society. Data were analysed using both descriptive and analytical statistics in IBM SPSS Statistics (version 30).
RESULTS: A total of 125 completed questionnaires were returned. The majority of respondents were female (61.6%) and identified as White (73.6%), with the highest number of respondents aged 45–54 years and having spent more than 10 years in practice. Mean burnout scores were highest for *Personal* burnout (48.3), followed by *Work-related* (46.1) and *Clinical*(39.4). Ethnicity significantly influenced *Clinical* burnout, with higher scores among Asian/Asian British respondents compared to White respondents ($p = 0.010$). Sector of employment was also significant, with higher burnout among those working in specialist practice compared with those in hospital settings ($p = 0.006$). Practice owners and practice associates reported significantly higher *Clinical* burnout than those working in hospitals as consultants ($p = 0.012$). Where respondents perceived that they had good workplace support, there were statistically significantly lower burnout scores across all three CBI domains.
CONCLUSION: Work-related burnout among UK orthodontic specialists was in the low to moderate range, although it is very important to note that a small proportion of respondents experienced severe burnout.

These findings highlight the need for targeted wellbeing initiatives and structured support systems within orthodontic settings in order to reduce the risk of burnout occurring.

Abstract citation ID: cjag070.033
OP26 DEEP LEARNING-BASED ESTIMATION OF PALATAL SUTURE MATURITY WITH CEPHALOGRAM

Wei Lu[1], Tingting Zhao[2], Carlos Flores-Mir[3], Hong He[4], Fang Hua[5]; [1]*State Key Laboratory of Oral & Maxillofacial Reconstruction and Regeneration, Key Laboratory of Oral Biomedicine Ministry of Education, Hubei Key Laboratory of Stomatology, School & Hospital of Stomatology, Wuhan University, Wuhan, China,* [2]*Centre for Dentofacial Development and Sleep Medicine, School & Hospital of Stomatology, Wuhan University, Wuhan, China,* [3]*Mike Petryk School of Dentistry, Faculty of Medicine and Dentistry, College of Health Sciences, University of Alberta, Edmonton, Canada,* [4]*Department of Orthodontics, Hubei Provincial Clinical Research Centre for Dentofacial Deformities in Children, School & Hospital of Stomatology, Wuhan University, Wuhan, China,* [5]*Centre for Evidence-Based Stomatology, Centre for Orthodontics and Paediatric Dentistry at Optics Valley Branch, School & Hospital of Stomatology, Wuhan University, Wuhan, China*

AIM: This study aimed to explore mid-palatal suture maturity estimation based on cephalogram through deep learning (DL) algorithms.
SUBJECTS AND METHOD: A total of 497 paired CBCTs and cephalograms, which were required for orthodontic diagnostic and treatment purposes, from two distinct hospital settings were collected to form the internal and external datasets. Data augmentation and five-fold cross-validation strategies were applied. Six ResNet backbone-based DL algorithms were initiated via transfer learning and trained at a batch size of 16. The AdamW optimizer and an early-stopping strategy were employed in the training process. These models were subsequently tested on the held-out external dataset. To enhance transparency and interpretability, the Gradient-weighted Class Activation Mapping was applied to offer insights into the models' decision-making process. DeLong's test was applied to statistically compare the discriminative capacity of different models.
RESULTS: The results suggested that ResNet-based algorithms exhibited excellent classification performance, which was further enhanced by the TKSGA module. Among them, the ResNet-18A achieved the best accuracy of 0.95 (95% CI: 0.90-1.00) and the best Area Under the Curve of the Receiver Operating Characteristic (AUC) of 0.99 (95% CI: 0.96-1.00) on the external dataset. Nevertheless, there was no meaningful difference among the models. The heatmaps revealed morphological characteristics of patients' dentition, cervical vertebrae development status, and nasopharyngeal airway development as primary areas of interest for the DL models.
CONCLUSIONS: This study suggested that assessing the craniofacial structures depicted on a lateral cephalogram, coupled with advanced DL algorithms, can be an alternative to CBCT for estimating MPS maturity. With the TKSGA module, the models exhibited high accuracy and reasonable decision patterns consistent with clinical knowledge.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.034
OP27 EVALUATION OF THE CONSISTENCY OF CLEAR ALIGNER TREATMENT PLANNING DECISIONS IN CLASS II MALOCCLUSIONS

ASAD SHAMASNA and ASLI BAYSAL; *Izmir Katip Celebi University Faculty of Dentistry, İzmir, Turkey*

INTRODUCTION-AIM: To evaluate the consistency of orthodontists' treatment decisions regarding the use of lateral cephalometric radiographs in treatment planning for Class II malocclusion patients using clear aligners.
MATERIALS AND METHODS: The study included the diagnostic records of six patients aged 11–17 years with Class II skeletal malocclusion. A two-stage online survey (T1 and T2) was administered to 216 orthodontists; participants were randomly assigned to two groups: Group A (without cephalometric data) and Group B (with cephalometric data added at stage T2). Participants were asked to create a treatment plan for each case. Treatment plan preferences and the factors influencing these plans were evaluated at the intra-group and inter-group levels; decision changes were statistically analyzed using the Chi-square, McNemar, and Kappa tests.
RESULTS: The inclusion of cephalometric data has contributed to clinicians reassessing their existing plans within skeletal and biomechanical limits rather than fundamentally changing treatment decisions. It has been determined that cephalometric analyses have a greater impact on treatment plans in cases where the skeletal component is severe and in borderline cases. The consistency of treatment decisions has been found to be unrelated to clinician experience.
CONCLUSIONS: Cephalometric radiography is not mandatory in every case for transparent aligner treatment planning. However, its inclusion in planning for severe skeletal malocclusion or borderline cases may increase diagnostic accuracy and decision reliability. Therefore, it is recommended that cephalometric data be selectively integrated into digital planning.

Abstract citation ID: cjag070.035
OP28 THE EFFECTIVENESS OF TELEORTHODONTICS & ARTIFICIAL INTELLIGENCE DURING ORTHODONTIC ALIGNMENT: A RANDOMISED CONTROLLED TRIAL

Tina Sangha[1], Maxim Milosevic[1], M. Ali Darendeliler[1], KEREM DALCI[1], Oyku Dalci[2]; *[1]The University of Sydney, Sydney, Australia, [2]Sydney Local Health District, Sydney, Australia*

OBJECTIVE: To determine the effectiveness of artificial intelligence supported remote monitoring during orthodontic alignment in comparison to conventional scheduling.
DESIGN: Single centre, two arm parallel randomised controlled trial.
SETTING: University clinic providing statutory orthodontic care
PARTICIPANTS AND INTERVENTIONS: 36 patients, aged ≥10-29 years, in permanent dentition, needing non-extraction treatment were randomly allocated into experimental (AI) or conventional scheduling (CS) groups. Empower self-ligating brackets and a standardised archwire sequence was used. AI group participants were monitored with Dental Monitoring (DM) weekly scans. They were recalled for archwire changes when DM identified archwire passivity, as per the default value of < 0.045mm movement/week or 0.2mm/month. CS patients were recalled every 6-8 weeks for archwire progression.
OUTCOMES: Duration of levelling and alignment (L&A), number of visits, overbite were recorded, and patient satisfaction surveys were issued.
SEQUENCE GENERATION: Unstratified 1:1 subject allocation sequence was used.
ALLOCATION CONCEALMENT: Sequentially numbered sealed, opaque envelopes were used.
BLINDING: Blinding was not possible during treatment; however investigators were blinded to groups during data analysis.
RESULTS: One patient in the AI group was unable to do the scans but completed the study. Outcomes were assessed using both intention-to-treat (ITT) and per-protocol (PP) analysis. The number of days for L&A was on average 20 days longer in the AI group per ITT analysis (95%CI = 0.07-40.7; p=0.049). In PP analysis, the difference was 19 days longer for AI group, (95%CI= -1.99-39.22, p=0.08). There were 10/51 instances in AI Group patients, where the 12-week threshold was exceeded. Scan adherence data showed that 72.4% of scans were on time (p<0.001). Delays were mostly 2 days-1 week (16.6%), more than 4 weeks delay happened in 4 occasions (1%). The number of visits did not differ significantly between groups. Patients found the DM app easy to use.
CONCLUSIONS: The use of AI did not result in a reduction in treatment duration or number of visits during the levelling and aligning phase with self-ligating full fixed appliances, when using the default archwire passivity settings of the Dental Monitoring software at the time of this investigation. Scan adherence may also have affected these outcomes.

Abstract citation ID: cjag070.036
OP29 PATIENT AND PARENT PERCEPTIONS OF ORTHODONTIC TREATMENT, RETENTION AND REMOTE MONITORING

Rhian Fitzgerald[1], Micheal Cronin[1], Emer O Leary[2], Owen Crotty[3]; *[1]University College Cork, Cork, Ireland, [2]Corabby Dental and Orthodontics, Midleton, Ireland, [3]Crotty Orthodontics, Cork, Ireland*

AIM: Travel for orthodontic treatment can be burdensome for patients and is a huge contributor to orthodontics carbon footprint. We designed this study to assesses patient and parent perceptions of a smartphone app to remotely monitor their orthodontic treatment, to improve patient quality of life and sustainability.
SUBJECTS AND METHODS: Patients (≥11 years), and their parents where patients were minors, completed a questionnaire assessing areas including: orthodontic appointment travel time, digital literacy, and willingness to use a monitoring app during orthodontic treatment or retention. Participants were recruited from a University Teaching Hospital and two community Orthodontic practices, one of which uses a remote monitoring app routinely.

The study was powered on the questions:

For those in active treatment: How likely would you be to use/recommend an app (recommended by your orthodontist) to monitor your/your child's orthodontic treatment?".

For those in retention "How likely would you be to use/recommend an app (recommended by your orthodontist) to monitor your/your child's orthodontic retention?".

RESULTS: 786 participants completed the study, 291 parents and 495 patients. Mean travel time to appointments was 45 minutes (SD 24).

97% of parents and 94% of patients owned a smartphone.

95% of all participants strongly/somewhat agreed that they felt comfortable using smartphone apps and 97% felt that using technology on a smartphone was easy. 35% of parents and 23% of patients used a dental or health app, most commonly MyFitnessPal, Apple Health and Flo.

Of those using a monitoring app for orthodontic treatment, 71% were very/somewhat likely to recommend it. 74% of app users were very/somewhat likely to recommend it its use for retainers.

Of those not currently using a monitoring app, 80% would be very/somewhat likely to use it during active treatment and 74% would be very/somewhat likely to use it during the retention.
CONCLUSIONS: Patients and parents felt very positive towards using an app to support their orthodontic treatment and retention remotely. This demonstrates the appetite amongst service users for such an app and a study to assess if travel burden is reduced and patient satisfaction is improved.

Abstract citation ID: cjag070.037
OP30 ASSESSING LARGE LANGUAGE MODELS FOR ORTHODONTIC TREATMENT PLANNING FROM DIAGNOSTIC CASE SUMMARIES MODELLED ON "MEMBERSHIP IN ORTHODONTICS" EXAMINATION STANDARDS

Miltiadis Makrygiannakis[1], Simon Littlewood[2], John Scholey[3], Eleftherios G Kaklamanos[4]; *[1]European University Cyprus, Nicosia, Cyprus, [2]St Luke's Hospital, Bradford Teaching Hospitals NHS Foundation Trust, Bradford, United Kingdom, [3]Royal Stoke University Hospital, University Hospitals of North Midlands NHS Trust (UHNM), Royal Stoke University Hospital, Stoke-on-Trent, United Kingdom, [4]Aristotle University of Thessaloniki, Thessaloniki, Greece*

AIM: To evaluate the performance of large language models (LLMs) in generating safe, structured, and evidence-based orthodontic treatment plans from diagnostic case summaries modelled on Membership in Orthodontics examination standards.
MATERIALS AND METHODS: Eleven diagnostic summaries representing a range of orthodontic conditions were constructed, together with an additional series of summaries based on variations of Class II division 2 malocclusions. Each summary was submitted once to three LLMs (ChatGPT-4o, Gemini Advanced, Copilot) using a standardised prompt requesting a full treatment plan, anchorage considerations in all planes of space, and supporting literature. After anonymisation, responses were graded by two orthodontists using a simplified 3-point rubric (fail/adequate pass/excellent pass) derived from the Royal College of Surgeons diagnostic summary (Structured Clinical Reasoning) marking scheme, separately for 'aims, objectives and treatment planning/justification' and 'anchorage management'. Inter-examiner agreement (Kendall's tau, Cronbach's alpha, intraclass correlation coefficients) and between-model differences (Friedman and Wilcoxon tests) were calculated.
RESULTS: Inter-examiner agreement was high for all models (Kendall's tau 0.67–0.99; ICC 0.64–1.00). For the 11 varied diagnostic summaries, ChatGPT-4o received

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

more “adequate passes” for aims/objectives/treatment planning (5–6 out of 11) than Gemini Advanced and Copilot (1 out of 11 each), with no model achieving “excellent passes”. All models failed in anchorage management for these cases. Mean scores on a 1–3 scale were 1.50 for ChatGPT-4o, 1.14 for Copilot, and 1.09 for Gemini Advanced (Friedman p<0.001; ChatGPT-4o scored significantly higher than both, p≤0.008). For the variations of the Class II division 2, Gemini Advanced achieved the highest mean scores for aims/treatment planning (2.4 vs. 1.9 for ChatGPT-4o and Copilot; Friedman p=0.018; Gemini significantly higher than both, p=0.049), with the greatest number of “excellent passes” recorded. Anchorage management scores improved (mean 1.9–2.1), but “excellent passes” remained rare.
CONCLUSIONS: General-purpose LLMs sometimes generate adequately structured orthodontic treatment plans that meet examination-style criteria for selected cases. However, they consistently underperform in anchorage planning and do not meet the passing standard for diagnostic summary assessment. At present, they should be used only as adjuncts, and not replacements for expert clinical reasoning and decision-making.

Abstract citation ID: cjag070.038
OP31 ‡‡‡ POSTERIOR AIRWAY SPACE DEVELOPMENT DURING AND AFTER ORTHODONTIC TREATMENT – ARE THERE PREDICTIVE FACTORS?

Niko Bock[1], Henry Eilers[2], Gianluca Sonntag[3], Katharina Klaus[1], Sabine Ruf[1]; *[1]University of Giessen, Giessen, Germany, [2]Private practice, Giessen, Germany, [3]Private practice, Hanau, Germany*

AIM: Posterior airway space (PAS) has been shown to increase during growth in both Class I and Class II:1 cases. However, these changes are based on average values and respective data show a large interindividual variation. Therefore, it was the aim of the current study to determine possible predictive factors for PAS development during and after orthodontic treatment and to compare Class I and Class II:1 patients.
SUBJECTS AND METHOD: Patients of the Department of Orthodontics, University of Giessen, Germany, of whom lateral cephalograms from before (T0) and after (T1) treatment as well as after ≥ 12 months of retention (T2) were available:

- 383x Class I (multibracket appliance treatment): age at T0=12.8±2.3 years, overjet=3.9±1.2mm, ANB=2.9±1.3°, ML/NSL=32.5±5.8°, ArGo’Gn=123.3±6.9°
- 503x Class II:1 (Herbst-multibracket appliance treatment): age at T0=13.8±3.4 years, overjet=7.8±2.4mm, ANB=5.0±2.1°, ML/NSL=32.0±5.9°, ArGo’Gn=122.4 ±6.5°

To assess the PAS changes, the size of the area between the hard palate and the epiglottis (PAS area) as well as the distances p, t, pC2, pC3, pC4 were analyzed.

In addition, all PAS changes (T0-T1, T1-T2, T0-T2) were analyzed for correlations with the variables age, skeletal maturity, sex, body mass index, ANB angle, Wits appraisal, ML/NSL angle, ArGo’Gn angle to determine possible predictive factors.
RESULTS: The PAS area exhibited the following mean values at T0/T1/T2: 528±153/575±131/615±147mm² (Class I) and 514±153/631±175/632±161mm² (Class II:1). The measured distances showed average changes of +3 to +24% (Class I) and +10 to +24% (Class II:1) during T0-T2.

For the Class I sample one moderate association was determined as possible predictive factor: skeletal maturity (T0) showed a negative correlation (r=-0.405) with PAS area (T0-T2). In addition, weak associations were determined for age (r=-0.306) and sex (r=0.318) with PAS area (T0-T2) as well as age (r=-0.359) and skeletal maturity (r=-0.377) with distance pC4 (T0-T2).

For the Class II:1 sample, only a weak association (r=-0.362) between age and distance pC4 (T0-T2) was found.
CONCLUSION: On the basis of the current data, only skeletal maturity could be determined as a predictive factor for PAS development in Class I patients.

Abstract citation ID: cjag070.039
OP32 ADENOTONSILLECTOMY OUTCOMES ON DENTOFACIAL FEATURES IN OVERWEIGHT AND NON-OVERWEIGHT CHILDREN WITH OBSTRUCTIVE SLEEP APNEA COMPARED TO CONTROL CHILDREN

Elba Cañellas, Danica Nikolic, Eduard Esteller, Andreu Puigdollers; *Universitat Internacional de Catalunya, Barcelona, Spain*

AIM: Obstructive sleep apnea syndrome (OSA) in children is a highly prevalent disorder that can coexist with obesity, increasing its comorbidities. Adenotonsillectomy is considered the first-line treatment. The purpose of this study is to evaluate the effect of adenotonsillectomy on the apnea–hypopnea index (AHI) and on dentofacial variables in overweight and non-overweight children with OSA, and to compare dentoalveolar variables with a control group.
SUBJECTS AND METHODS: A longitudinal quasi-experimental study was conducted. Children between 2 and 12 years of age were recruited. The sample was divided into three groups: overweight children with OSA (n=38), non-overweight children with OSA (n=104), and a control group (n=127). A child was considered overweight if their body mass index was at or above the 85th percentile. Dental models were obtained from all subjects. Polysomnography and lateral cephalometric radiographs were performed in both experimental groups. These records were repeated one year after adenotonsillectomy. The Mann–Whitney U test was used to compare variables without a normal distribution.
RESULTS: Cephalometric values were similar in both groups of children with OSA, overweight and non-overweight, before and after adenotonsillectomy. Among children with OSA, at T0, overweight participants showed greater lower arch width ($p < 0.05$). At T1, arch widths were similar in both OSA groups. The AHI improved after adenotonsillectomy in both OSA groups, but no significant differences were detected. Children in the control group showed greater arch widths than children in the OSA group ($p < 0.05$) at both T0 and T1. Regarding the change between T0 and T1, only mandibular intermolar width was statistically significant, as it increased significantly in the OSA group while remaining stable in the control group.
CONCLUSIONS: AHI and dentofacial characteristics were similar in both OSA groups, overweight and non-overweight, although overweight children had significantly wider lower arches at T0. Children with OSA presented smaller arches than control children. In the present sample, no statistically significant relationship was found between pediatric OSA and obesity.

Abstract citation ID: cjag070.040
OP33 ASSOCIATIONS BETWEEN OBSTRUCTIVE SLEEP APNEA, SLEEP QUALITY AND DENTOSKELETAL-AIRWAY CEPHALOMETRIC MEASUREMENTS ACROSS THREE AGE GROUPS: A CROSS-SECTIONAL STUDY

Mariana Tinano[1], Margarida Venancio[2], Natascha Fernandes[2], Joana Godinho[2], Luis Jardim[2]; *[1]Faculdade de Ciências Médicas, Belo Horizonte, Brazil, [2]Faculdade de Medicina Dentária da Universidade de Lisboa, Lisbon, Portugal*

AIMS: The aims of the study were: 1) to assess sleep habits in children and adolescents; 2) to identify excessive daytime sleepiness and Obstructive Sleep Apnea (OSA) risk in adults; and 3) to examine associations between sleep questionnaire outcomes and dentoskeletal/airway cephalometric measurements.
MATERIAL AND METHODS: The sample included 150 pre-treatment orthodontic patients, evenly distributed among children (6–11 years), adolescents (12–17 years), and adults (≥18 years). Sleep disturbances were evaluated using the Children’s Sleep Habits Questionnaire (CSHQ) for children and the Sleep Self Report (SSR) for adolescents. Adults completed the Epworth Sleepiness Scale (ESS) and the STOP-Bang questionnaire to assess excessive daytime sleepiness and OSA risk.

Associations between categorical variables (sex, sleep disturbances, and daytime sleepiness) were analyzed using chi-square tests, while Fisher’s exact test assessed the association between sex and OSA risk. Independent t-tests or Mann-Whitney U tests were used to evaluate relationships between dentoskeletal and airway cephalometric measurements and the presence of sleep disturbances, daytime sleepiness, or high OSA risk. Statistical significance was set at $p < 0.05$.
RESULTS: The CSHQ identified sleep disturbances in 72% of children. Those affected showed reduced middle pharyngeal, oropharyngeal ($p < 0.05$), and velopharyngeal widths ($p < 0.01$), increased soft palate length ($p< 0.01$), and mandibular retrusion with posterior rotation ($p < 0.05$).

Sleep disturbances were reported in 48% of adolescents according to the SSR, without significant cephalometric differences. Sex did not influence sleep outcomes in children or adolescents.

Among adults, 16% were at high risk for OSA, with men showing significantly higher risk ($p < 0.001$). High-risk adults demonstrated greater hyoid–C3 distance ($p < 0.01$), reduced upper pharyngeal width, increased soft palate width, smaller ANB angle and anterior mandibular rotation ($p < 0.05$). Additionally, 38% presented excessive daytime sleepiness, which was associated with a smaller SNB angle ($p < 0.05$) but showed no significant association with sex or OSA risk.
CONCLUSIONS: Airway dimensions and dentoskeletal characteristics appear to contribute meaningfully to the occurrence of sleep disturbances in both children and adults, underscoring the importance of orthodontic assessment in early screening for sleep-related breathing disorders.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.041
OP34 GLASS IONOMER OPEN EXPOSURE (GOPEX) AND CLOSED EXPOSURE OF PALATALLY DISPLACED CANINES: A RANDOMISED CONTROLLED TRIAL COMPARING POSTOPERATIVE PAIN PERCEPTION AND COMPLICATIONS

Anna Dahlén[1], Viktoria Tagesson[2], Ken Hansen[3], Larisa Krekmanova[4], Julia Naoumova[1]; *[1]Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, University Clinic of Orthodontics, Public Dental Service, Region Västra Götaland, Gothenburg, Sweden, [2]Clinic of Orthodontics, Public Dental Service, Region Västra Götaland, Lidköping, Sweden, [3]University Clinic of Orthodontics, Public Dental Service, Region Västra Götaland, Gothenburg, Sweden, [4]Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, Department of Paediatric Dentistry, Gothenburg, Sweden*

AIM: The objective was to compare glass ionomer open exposure (GOPEX) with closed exposure (CE) in terms of patient-reported outcomes, surgical duration, and complications.
MATERIALS AND METHOD: The trial design was a single-centre, randomised controlled trial, with a 1:1 allocation of two parallel groups. Patients aged ≤ 18 years, with a unilateral PDC in sector 2-5, requiring surgical exposure were randomly allocated to GOPEX or CE. Patient-reported outcomes, including pain perception, analgesic use, bleeding, swelling and jaw function impairment, were collected through a questionnaire completed over the phone daily from the day of exposure until symptom resolution. Surgery duration, recorded by the operator, and complications within four weeks, was obtained from the patient's record. The outcome assessor and the individual conducting the follow-up calls were blinded to group allocation. Repeated-measures analyses were used for longitudinal data. Mann–Whitney U-test and chi-square test was used for other between-group comparisons.
RESULTS: Of the 92 patients randomized, 83 completed the intervention: 43 in the GOPEX group (mean age 13.7 ± 1.5 years) and 40 in the CE group (mean age 13.6 ± 1.2 years). Substantial inter-individual variation in postoperative pain, recovery time, and surgical duration was observed in the two groups. For both groups combined, 27% were not pain-free after 7 days. Across the entire postoperative period, there were no significant differences between groups in pain levels, proportion of pain-free patients, analgesic use, or chewing difficulty. During the first postoperative week, however, the GOPEX group reported higher pain (fold change: 1.78; 95% CI: 1.07–2.99; p = 0.028). Fewer GOPEX patients were pain-free at one week, and they consumed more analgesics on postoperative days 4 and 5. Surgery duration was comparable between groups, and complications were rare and similar.
CONCLUSIONS: Although the GOPEX group reported more pain during the first postoperative week, overall pain scores and analgesic consumption across the full postoperative period did not differ between groups. No significant differences were found in surgery duration or complications.

Abstract citation ID: cjag070.042
OP35 LOWER ANTERIOR TEETH IN STAGE III-IV PERIODONTITIS: ORTHODONTIC TREATMENT EFFECTS AND INFLUENCING FACTORS: A PROSPECTIVE CLINICAL & CBCT STUDY

Egle Zasciurinskiene and Liveta Rastokaite; *Orthodontic Department, Lithuanian University of Health Sciences, Kaunas, Lithuania*

AIM: Due to scarcity of the literature, study aimed to analyse influencing factors on clinical and radiographic outcomes of orthodontic treatment (OT) of lower anterior teeth (AT) in subjects with stage III-IV periodontitis.
METHODS: Study included 50 subjects (mean age 45.4 years (SD 9.95) stage III-IV periodontitis), who underwent fixed appliance OT. CBCT was performed before (T1) and after (T2) OT. Gingival recession (GR), periodontal probing depth (PPD), clinical attachment level (CAL) and alveolar bone level (ABL) were measured at T1 and T2. The effects of age (≤45/>45 years), sex, malocclusion (Class I/II/III), crowding/spacing, periodontitis stage (III/IV), periodontal phenotype (thin or normal/thick) were analysed.
RESULTS: OT resulted in mean PPD, CAL and ABL improvements (p<0.05). Mean GR change was very small. When data were adjusted for patient sex, gender, and other dental characteristics, significant effects of OT were found for PPD (p=0.001) and CAL (p=0.001).

Periodontal variables improved in both sexes, except GR, which worsened in males (p<0.05).

Mean GR showed no change in both age groups (p>0.05) and remained greater in older patients. Mean ABL improved significantly in older patients (p=0.03).

All parameters improved regardless of periodontitis stage (p>0.05), except for GR with no improvement.

Positive treatment effects were found for mean PPD and CAL across all three malocclusions (I, II and III) with no difference between them (p>0.05).

Baseline mean GR values were higher (p<0.05) in thin phenotype subjects. Mean GR had tendency to worsening in thin phenotype compared to small improvements in normal/thick phenotype subjects, leaving a significant phenotype-related between subject effect (p=0.03).

At baseline, mean values of all periodontal parameters were higher (except PPD) in subjects with crowding compared to subjects with spacing (p<0.05). After OT significant between-subject (crowding/spacing) effects were found for mean GR change (p=0.03), CAL change (p=0.04), and ABL change (p=0.03).
CONCLUSION: OT with fixed appliances resulted in mean PPD and CAL improvements of lower anterior teeth. Age >45 years, male sex, thin phenotype and crowding were significant predictors for worse mean GR changes. Mean ABL improvements were small and more significant in older subjects.

Abstract citation ID: cjag070.043
OP36 OCCLUSAL AND PERIODONTAL FACTORS IN ORTHODONTICALLY TREATED VS. UNTREATED ADULT PATIENTS WITH AND WITHOUT GINGIVAL RECESSIONS: A PRELIMINARY PREDICTION MODEL

Charlotte De Bruyn[1], Lien Limbos[1], Maria Cadenas de Llano Perula[1], Ana Belén Castro Sarda[2]; *[1]Department of Oral Health Sciences-Orthodontics, KU Leuven and Dentistry, University Hospitals Leuven, Leuven, Belgium, [2]Department of Oral Health Sciences-Periodontology, KU Leuven and Dentistry, University Hospitals Leuven, Leuven, Belgium*

AIM: To build-up a preliminary prediction model for buccal gingival recessions on the lower incisors, based on the periodontal and occlusal parameters of a prospective patient cohort.
MATERIALS AND METHOD: Healthy patients >18 years-old with and without buccal gingival recessions on the lower incisors were prospectively included. Age, sex, smoking habits, medication, periodontal parameters (plaque and bleeding index, probing depth, gingival biotype, recession extent), history of dental injury, orthodontic treatment and parafunctions were assessed. Occlusal parameters (overjet, overbite, intercanine and intermolar distance, arch length discrepancy, incisal contacts) were measured on digital casts. Lower incisor inclination was measured on available lateral cephalograms. Principal component analysis was used to determine the correlation between variables. Strongly-correlated variables were retained. The dataset was divided into training (60%, where the model was built) and validation (40%) sets. The final model was performed with linear discriminant analysis, giving each involved parameter a specific weight depending on its contribution to the model.
RESULTS: 223 patients were included (136 female, 87 male, mean age 32.73±14.22 years), 117 with and 106 without recessions. Patients with recessions (p=0.00001) and history of orthodontics were significantly older (p=0.00001) in both genders. Age, presence of recession, parafunctions, history of orthodontic treatment, lower intercanine and intermolar distance, sagittal molar occlusion and overbite were used in the prediction model. When validated in the complete sample, the model had acceptable performance (sensitivity 67.2%, specificity 69.2%, area under the curve (AUC) 0.7343), performing slightly better in patients without (sensitivity 70.2%, specificity 74.8%, AUC 0.7798) than in patients with (sensitivity 64.5%, specificity 64.1%, AUC 0.6822) history of orthodontic treatment.
CONCLUSIONS: This preliminary model can help clinicians predict the risk for gingival recessions on the buccal aspect of the lower incisors in adult patients based on their baseline periodontal and occlusal characteristics. Further optimization is ongoing.

Abstract citation ID: cjag070.044
OP37 COMPARISON OF TWO-PHASE VERSUS ONE-PHASE TREATMENT OF DEEPBITE IN GROWING PATIENTS: A LONGITUDINAL RETROSPECTIVE STUDY

Irene Lomonaco, Veronica Giuntini, Lorenzo Franchi; *Postgraduate Orthodontic Program, Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy*

AIM: To compare the outcomes of one- versus two-phase treatments of deepbite in growing patients.
MATERIALS AND METHOD: Thirty-four patients (13 females and 21 males) with deepbite (overbite, OB ≥ 4.5 mm) were retrospectively selected from the archives of the Orthodontic Clinic, Careggi University Hospital, Florence, Italy. Patients were divided into two groups: the two-phase treatment group (GT2P; 17 patients) received an early phase of treatment during the intermediate mixed dentition (cervical vertebral maturation stages CS1–CS2) followed by a second phase in the permanent dentition (CS3–CS4); the one-phase treatment group (GT1P; 17 patients) received

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

a single treatment phase during the permanent dentition (CS3–CS4). In GT2P, the first treatment phase was carried out with removable appliances with an anterior bite plane, with or without extraoral traction. The final phase of treatment in both groups consisted of fixed appliances (FA). Skeletal and dentoalveolar variables were measured on lateral cephalograms obtained before (T0) and after (T1) FA. Baseline comparisons (T0) were performed using independent-sample t-tests, while treatment changes (T1–T0) were assessed using ANCOVA with T0 values as covariates.

RESULTS: At T0 (mean age: GT2P = 12.6 ± 1.4 years; GT1P = 13.1 ± 1.1 years), GT2P exhibited a significantly smaller OB (4.1 ± 1.2 mm vs 5.6 ± 0.9 mm; $p < 0.001$) and a significantly greater upper incisor–palatal plane angle (111.5° ± 5.1° vs 104.8° ± 6.7°; $p < 0.002$) compared with GT1P.

Regarding between-group comparisons of treatment changes (T1–T0), no statistically significant differences were observed for any cephalometric variables. In particular, OB decreased by −0.8 ± 1.0 mm in GT2P and by −2.5 ± 1.6 mm in GT1P ($p = 0.118$), while the upper incisor–palatal plane angle increased by 1.2° ± 4.2° and 9.2° ± 7.9°, respectively ($p = 0.070$), indicating effective deepbite correction in both groups without significant upper incisor proclination.

CONCLUSIONS: No significant differences were found between the two-phase and one-phase treatments. Therefore, initiating a two-phase therapy in the mixed dentition does not provide relevant clinical advantages compared with a later single-phase approach in the permanent dentition for the correction of deepbite.

Abstract citation ID: cjag070.045

OP38 *** SURVIVAL RATES OF 882 INTERRADICULAR MINI-SCREWS FOR MAXILLARY TOTAL ARCH DISTALISATION IN COMBINATION WITH A COMPLETELY CUSTOMIZED LINGUAL APPLIANCE FOLLOWING A RELIABLE INSERTION PROTOCOL WITH MULTIPLE CLINICIANS

Dirk Wiechmann[1], Frauke Beyling[2], Robert Leven[2], Dimitrios Kloukos[3], Lara Bettenhäuser-Hartung[1]; *[1]Hannover Medical School, Hannover, Germany, [2]Private Practice, Bad Essen, Germany, [3]Department of Orthodontics and Dentofacial Orthopedics, University of Bern, Bern, Switzerland*

AIM: Maxillary Total Arch Distalisation (MTAD) with interradicular mini-screws (MSs) in combination with Completely Customized Lingual Appliances (CCLAs) is a predictable concept for Class II correction in adolescents and adults. The aim of the study was to investigate the survival rates of MSs following a reliable insertion protocol in an orthodontic practice with different clinicians.

SUBJECTS AND METHOD: From March 2017 to February 2025, a total of 882 interradicular MSs were inserted in the maxilla for MTAD in combination with a CCLA in one orthodontic specialist practice. The surgical procedures were performed by 10 different clinicians (6 orthodontist specialists / 4 postgraduate students in orthodontics) on 259 patients (male: 77 / female: 182) with an average age of 29.4 ± 13.3 years (minimum 12.4 / maximum 74.8). The interradicular insertion of the screws was carried out according to a defined protocol that all clinicians were required to follow strictly. In most cases, two MSs were placed per quadrant (palatal: 458 / buccal: 422) without the use of an insertion guide. Loading of the MSs was also performed according to precisely defined criteria based of scientific data (150-200 cN). The buccal MSs were generally removed no later than 5 months after insertion, while the palatal MSs remained in place until the end of Class II correction.

RESULTS: On average the buccal MSs were removed as planned after 4.3 ±1.78 months, the palatal MSs remained in the mouth twice as long (8.6 ±4.45 months). Of the 882 interradicularly inserted mini-screws, 12 (1.4%) failed prematurely (palatal 10 / buccal 2).

CONCLUSIONS: When a strict insertion protocol is followed by each clinician and the mini-screws are loaded optimally using simple yet force-defined mechanics, interradicular MSs provide reliable anchorage for MTAD in combination with CCLAs.

Abstract citation ID: cjag070.046

OP39 ‡‡‡ DENTOALVEOLAR CHANGES FOLLOWING EXTRACTION OF MANDIBULAR PRIMARY SECOND MOLARS IN PATIENTS WITH CONGENITALLY MISSING SECOND PREMOLARS-A LONGITUDINAL RANDOMIZED CONTROLLED TRIAL

Shaker Nawaia[1], Nameer Al-Taai[2], Sarah Abdul Jabbar[3], Ken Hansen[4], Julia Naoumova[5]; *[1]Clinic of Orthodontics, Public Dental Service, Region Västra Götalandsregionen, Skövde, Sweden, [2]Hamdan Bin Mohammed College of Dental Medicine, MBRU University,, Dubai, United Arab Emirates, [3]Clinic of Orthodontics, University Dental Care, Public Dental Service, Region Västra Götaland, Gothenburg, Sweden, [4]Clinic of Orthodontics, University Dental Care, Public Dental Service, Region Västra Götaland,, Gothenburg, Sweden, [5]Department of Orthodontics, Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden*

BACKGROUND: Early management of congenitally missing mandibular second premolars may influence craniofacial growth, yet the long-term effects of extracting the primary second molars remain unclear.

OBJECTIVES: To evaluate the skeletal and dental effects of extracting mandibular primary second molars in patients with congenitally missing mandibular second premolars and to compare with historical control data.

TRIAL DESIGN: Prospective, randomized longitudinal split-mouth trial.

MATERIALS AND METHODS: This longitudinal study is based on 40 patients (aged 9–12 years) with bilateral agenesis of mandibular second premolars, who were randomly assigned to either extraction or hemisection of the primary second molar. Randomization to determine the side and order of extraction or hemisection was performed using an online tool, with allocation concealment ensured by sequentially numbered, opaque, sealed envelopes prepared in advance by the author responsible for treatment assignment, who was not involved in patient care. The present study examines the overall treatment effect, regardless of the method applied in the split-mouth design. Cephalometric analyses were performed at baseline (T1) and after 4 years (T2). Dental casts were evaluated at T2 to measure residual space. A control group of 29 untreated individuals with normal occlusion was included for comparison. All measurements were conducted by an independent examiner blinded to the treatment assignment.

RESULTS: In the extraction group both the maxilla and the mandible exhibited forward growth ($P < .05$), while only minor changes were detected in the control group. Extraction caused significant retroclination of the lower incisors by 4.5° ($P < .01$) and retrusion by 1.8 mm ($P < .01$), leading to an increased overjet of 1.2 mm ($P < .05$) and overbite of 1.5 mm ($P < .05$). Compared with controls, dental changes were significantly greater in the extraction group ($P < .05$). Residual space after extraction showed no significant correlation with cephalometric changes.

CONCLUSION: Extraction of mandibular primary second molars in cases of agenesis induces favourable dental changes without detrimental skeletal effects. This approach may be a viable option in selected patients, although caution is recommended for those with deep bite tendencies.

Abstract citation ID: cjag070.047

OP40 CLINICAL FACTORS INFLUENCING SMILE ESTHETICS AND TREATMENT NEED IN CLASS II MALOCCLUSION

BURCAK ABUS[1], FUNDAGUL BILGIC ZORTUK[1], MEHMET KARADAG[2]; *[1]Hatay Mustafa Kemal University, Faculty of Dentistry, Hatay, Turkey, [2]Hatay Mustafa Kemal University, Faculty of Medicine, Hatay, Turkey*

AIM: Orthodontists frequently rely on cephalometric measurements and dental model analyses to assess treatment needs and esthetic outcomes. This study aimed to investigate the relationships between cephalometric parameters, anterior crowding, overjet, overbite, and orthodontists' evaluations of smile esthetics and treatment need in individuals with Class II malocclusion.

MATERIALS AND METHOD: A total of 134 patients who met the inclusion criteria (48 males, 86 females; mean age 15.64 ± 3.35 years) were retrospectively analyzed. Pretreatment cephalometric measurements, as well as maxillary and mandibular anterior crowding, overjet, and overbite values, were determined by an experienced orthodontist. Standardized pretreatment facial photographs were independently evaluated by a panel of four orthodontists using a 5-point Likert scale for smile esthetics and orthodontic treatment need. Pearson correlation analysis was performed to assess the relationships between objective clinical measurements and subjective evaluation scores. Intra-observer reliability was assessed using intraclass correlation coefficients (ICC).

RESULTS: Both Likert scales demonstrated high intra-observer reliability (smile esthetics: ICC = 0.858; 95% CI: 0.814–0.894; $p < 0.001$; treatment need: ICC = 0.853; 95% CI: 0.790–0.897; $p < 0.001$). Smile esthetics showed a strong negative correlation with maxillary anterior crowding ($r = –0.555$; $p < 0.001$) and a weak but statistically significant negative correlation with mandibular anterior crowding ($r = –0.172$; $p = 0.047$). Treatment need score exhibited moderate positive correlations with maxillary crowding ($r = 0.374$; $p < 0.001$) and overjet ($r = 0.296$; $p < 0.001$). No statistically significant associations were observed between the subjective ratings and the other cephalometric parameters (U1–SN, facial angle, ANB, FMA, Gogn-SN).

CONCLUSIONS: The results show that pre-treatment maxillary and mandibular crowding leads to both lower smile esthetics ratings and higher treatment need assessments by orthodontists. These findings suggest that anterior crowding, rather than traditional cephalometric variables, plays a key role in shaping clinicians' perceptions of smile esthetics and treatment necessity in Class II malocclusion.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Keywords: Anterior crowding, cephalometric analysis, Class II malocclusion, orthodontic treatment need, overbite, overjet, smile esthetics

Abstract citation ID: cjag070.048
OP41 THE EFFECT OF LOW-LEVEL LASER THERAPY ON THE DEVELOPMENT OF ROOT RESORPTION AFTER APPLICATION OF ORTHODONTIC TEMPORARY BITE RAISERS: A RANDOMIZED CONTROLLED CLINICAL TRIAL

Tracy Tang, Natasha Paul, Narayan Gandedkar, Oyku Dalci, M. Ali Darendeliler; *The University of Sydney, Sydney, Australia*

INTRODUCTION: Occlusal interferences can cause occlusal trauma, resulting in tooth mobility, wear and root resorption. Temporary bite raisers are used to support many orthodontic procedures. However, by creating premature contacts, they may induce occlusal trauma and root resorption. This split-mouth randomized controlled trial was conducted to investigate the effect of low-level laser therapy (LLLT) on root resorption associated with temporary bite raisers.
METHODS: This study involved eleven patients requiring extraction of bilateral maxillary and mandibular first premolars for orthodontic treatment. Light-cured glass ionomer cement (Transbond Plus Light Cure Band Adhesive; 3M Unitek, Monrovia, California) was bonded to the occlusal surfaces of mandibular first premolars to create traumatic occlusion with the opposing maxillary first premolars. One side was assigned by computer-generated randomization to receive LLLT using a continuous beam 650 nm gallium-aluminum-arsenide diode laser, with spot size of 0.5 cm^2 and energy density of 6 J/cm^2 (Wuhan Pioon Technology Co Ltd; Wuhan, China). LLLT was applied on days 0, 7, 14, 21 and 28 on the experimental side, while sham-LLLT was applied on the control side. All first premolars were extracted after 28 days and scanned with a micro-computed tomography (micro-CT) system (SkyScan 1272; Bruker, Kontich, Belgium) to measure the volume of root resorption craters. Subgroup analyses were performed by root surface and by vertical third. Participants were blinded to the intervention. The investigator was blinded during outcome assessment.
RESULTS: All 44 premolars from the 11 patients were analyzed. LLLT-treated teeth had a statistically significant 50% reduction in root resorption crater volume compared to positive control teeth (mean 0.010 mm^3 versus 0.020 mm^3, respectively, $P<0.001$). No adverse effects were observed.
CONCLUSIONS: LLLT has the potential to reduce root resorption associated with occlusal trauma and temporary bite raisers.
REGISTRATION: Australian New Zealand Clinical Trials Registry (ACTRN12624000171516).
PROTOCOL: The protocol was not published before trial commencement.
FUNDING: The Australian Society of Orthodontists Foundation for Research and Education.

Abstract citation ID: cjag070.049
OP42 ‡‡‡ QUALITY ASSESSMENT OF ULTRA LOW DOSE-LOW DOSE ORTHOPANTOMOGRAMS RECONSTRUCTED FROM CONE BEAM COMPUTED TOMOGRAPHY SCANS IN ORTHODONTICS

Rogier H. van Bunningen, Pieter U. Dijkstra, Arjan J.A. Dieters, Wicher J. van der Meer, Anne Marie Kuijpers-Jagtman; *University Medical Centre Groningen, Groningen, Netherlands*

AIM: Ultra low dose-low dose conebeam computed tomography (CBCT) is a recent development that significantly reduces radiation exposure for orthodontic patients. The aim of this study was to analyze image quality of standard dose orthopantomograms (sd-PAN), extracted PAN from standard dose CBCT (extr-PAN), and from reduced dose ultra-low dose-low dose CBCT (rd-PAN).
MATERIALS AND METHODS: In total images of 43 patients were included. Image pairs, sd-CBCT and sd-PAN, of these patients were selected if taken within 6 months of each other. From sd-CBCT, an extr-PAN was extracted and a simulated rd-PAN (sim rd-PAN) was constructed using a filtering technique. Three experienced orthodontists evaluated all images using nine yes/no statements. For subjective statements 1-5 (Observers opinion of technical acceptability and visibility of anatomical structures) observers indicated their (dis)agreement. For objective statements 6-9 (regarding comparability to a gold standard) observers indicated presence of dental structures. Positive response rates were calculated for the subjective statements. Agreement rates with the gold standard were calculated for the objective statements. Thresholds for acceptable image quality were if ≥ 2 observers agreed with the subjective statements or agreed with the gold standard (objective statements) for 90% for sd-PANs and 85% for both extr-PANs and sim rd-PANs. Intra-rater reliability and inter-rater differences were tested using Cohen's Kappa and Related-Samples Cochran's Q Test.
RESULTS: For the subjective statements only the sd-PAN met the threshold for technical adequacy (95.3%) and suitability for orthodontic treatment planning (95.3%). For objective statements 6, 7, and 9 extr-PAN and sim rd-PAN images met the threshold for acceptable quality while the sd-PAN met the threshold for statements 6 and 9. Differences in agreement with the gold standard between images were small (85.7- 87.8%).
CONCLUSIONS: While extr-PAN and sim rd-PAN showed limited diagnostic image quality for orthodontic diagnosis, differences in percentages of agreement with the gold standard for the different images were small. Therefore, given the lower radiation exposure and added value of 3D information from uld ld-CBCT, extr-PAN and rd-PAN might be considered promising alternatives in orthodontic diagnostics, but further research is needed to determine their diagnostic value.

Abstract citation ID: cjag070.050
OP43 PEER VALIDATION OF THE ORTHODONTIC CARE INDEX (OCI): ON A QUEST TO INTEGRATE TREATMENT NEED, - COMPLEXITY, AND -PRIORITY IN A COMPREHENSIVE ASSESSMENT TOOL

Lutgart De Ridder, Maria Cadenas de Llano-Pérula, Guy Willems; *KULeuven, Leuven, Belgium*

AIM: To validate the Orthodontic Care Index (OCI), a comprehensive assessment instrument, encompassing Orthodontic Treatment Need (OTN), Orthodontic Treatment Complexity (OTC), and Orthodontic Treatment Priority (OTP).
MATERIALS AND METHODS: A multi-phase Qualtrics® survey was completed by orthodontists and orthodontic students. In the initial phase, participants scored the influence of previously identified parameters on OTN, OTC, and OTP using a 5-point Likert Scale. In the second phase, they evaluated the OTN, OTC, and OTP of 10 patients from a convenience sample of 100 pre-treatment records, also using a 5-point Likert scale. Gold-standard scores for OTN, OTC, and OTP were derived from the mean participants' scores. Domain scores were calculated as the sum of their parameter scores. To optimize prediction accuracy, multivariable prediction models were constructed via linear regression to estimate domain weights. Model performance was quantified using the proportion of explained variability (R^2) and further assessed through sensitivity and specificity analyses based on a dichotomized gold standard.
RESULTS: The study confirmed that a patient's OTN, OTC, and OTP can be calculated as a weighted sum of the patient's domain scores. The proportion of explained variability for OTN, OTC, and OTP in the full model was 0.546, 0.406, and 0.449, respectively. Classification accuracy was higher when using specific predicted cut-off values. Using a predicted cut-off value of 3.9 for OTN, the full model yielded a sensitivity of 84.8% and a specificity of 79.4%. For both OTC and OTP, a predicted cut-off of 3.6 was applied. This resulted in a sensitivity of 83.8% and specificity of 73.0% for OTC, and a sensitivity of 80.6% and specificity of 71.9% for OTP.
CONCLUSION: Results suggest that the OCI enables comprehensive evaluation of orthodontic treatment need, complexity, and priority. Its use can be valuable not only for individual practitioners but for all stakeholders involved in orthodontic care.

Abstract citation ID: cjag070.051
OP44 THE INFLUENCE OF DENTAL BIOFILM AND METALLIC ORTHODONTIC BRACKETS ON THE PRECISION OF AUTOMATIC BOLTON DISCREPANCY CALCULATION USING CLINCHECK® PRO

Taina Manso, Beatriz Rosa, Felipe Carvalho, Luciana Quintanilha, Flavia Artese; *Rio de Janeiro State Universtiy, Rio de Janeiro, Brazil*

AIM: To evaluate the influence of dental biofilm and metallic orthodontic brackets on the precision of automated calculation of Bolton discrepancies using direct dental digital models.
SUBJECTS AND METHODS: Eleven patients with full permanent dentition and without interproximal restorations underwent intraoral scanning at four different time points under the following conditions: with and without plaque, and with and without orthodontic brackets. A total of 44 digital models were obtained using the iTero Element 5D (Align Technology, San Jose, CA), performed by one operator with a consistent scanning sequence. Sample size was based on prior validation studies. Dental mesiodistal widths were measured using OrthoCAD software (version 5.9.0.36, Align Technology) by two evaluators. Bolton analyses were performed semi-automatically, utilizing tooth measurements taken on OrthoCAD software and automatically by the ClinCheck® Pro software (version 6.0, Align Technology). Statistical analysis was performed using SPSS software (version 29.0.2.0, IBM,

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Armonk, NY). Intra-class correlations were calculated to evaluate inter- and intra-examiner reproducibility for all variables. Normality was checked with Shapiro-Wilk test and means and standard deviations were used to describe the sample distribution. Two-way ANOVA for repeated measures was applied to compare mesio-distal widths of teeth, semi-automated and automated Bolton discrepancies across all four different scanning conditions, followed by Tukey's multiple comparisons test.
RESULTS: Inter- and intra-examiner reproducibility for tooth widths and Bolton discrepancies demonstrated high reliability, with coefficients ranging from 0.87 to 0.99. Mesiodistal widths were generally 0.1mm greater in the presence of plaque, with or without brackets; however, when comparing all scanning conditions, only teeth 11 and 36 showed a significant increase in the presence of plaque ($p < 0.05$). The total Bolton discrepancy, for 12 teeth, did not show significant differences between the automated and semi-automated methods across all four scanning conditions. Nevertheless, the Bolton discrepancy for the six anterior anterior teeth was significantly smaller in 0.3mm ($p = 0.02$) when both biofilm and brackets were present.
CONCLUSIONS: Automated Bolton discrepancy calculation is a reliable clinical tool. However, if intraoral scanning is performed in the presence of dental plaque anterior Bolton discrepancies may be underestimated by 0.3 mm.

Abstract citation ID: cjag070.052
OP45 SKELETAL STABILITY OF THE SURGERY-FIRST APPROACH IN CLASS III PATIENTS TREATED WITH CLEAR ALIGNERS: VERSUS FIXED APPLIANCE: A PROSPECTIVE COMPARATIVE STUDY

Luana Amaro, Arthur Cunha, Henrique Silveira, José Augusto Miguel; *Rio de Janeiro State University, Rio de Janeiro, Brazil*

AIM: This prospective clinical study aimed to evaluate whether clear aligners (CA) affect primary skeletal stability of skeletal Class III patients undergoing a bimaxillary surgery-first approach (SFA), compared with those treated with fixed appliances (FA).
MATERIALS AND METHOD: Eighteen skeletal Class III patients (nine per group) were evaluated using three-dimensional reconstruction models derived from cone-beam computed tomography (CBCT) scans obtained before surgery (T0), at one month (T1), and at six months (T2) postoperatively. Image processing and segmentation were performed using 3D Slicer software. Postoperative stability of the maxilla and mandible from T1 to T2 was assessed by analyzing rotational movements (pitch, roll, yaw) and translational displacements (left–right, anteroposterior, and superoinferior), calculated from landmark-based measurements. Maxillary stability was evaluated using point A, the incisive foramen, and the greater palatine foramina, whereas mandibular stability was assessed using point B, pogonion, gonion, the mental foramina, and gnathion. Statistical comparisons of skeletal stability from T1 to T2 and differences between groups were performed using Student's t-test and the Mann–Whitney U test, respectively, with statistical significance set at $P < 0.05$.
RESULTS: Analyzing skeletal differences between T1 and T2, the largest mean deviations in the mandible occurred in pitch rotation, with values of $2.32 \pm 1.67°$ (CA) and $3.11 \pm 2.91°$ (FA). For translational movements, the greatest deviations were observed at pogonion on the Y-axis: 2.74 ± 2.02 mm (CA) and 3.11 ± 0.93 mm (FA). In the maxilla, the largest deviations also occurred in pitch rotation, measuring $0.98 \pm 0.96°$ (CA) and $1.23 \pm 1.23°$ (FA). For point A on the Y-axis, translational deviations were 0.76 ± 0.65 mm (CA) and 0.86 ± 0.66 mm (FA). No statistically significant differences in postoperative skeletal relapse were found between groups.
CONCLUSIONS: The use of clear aligners or fixed appliances in patients treated with the surgery-first approach resulted in comparable postoperative skeletal stability, with both groups demonstrating a similar pattern of mandibular relapse. Based on these findings, a 2-mm overcorrection should be considered during maxillary advancement planning to enhance postoperative stability.

Abstract citation ID: cjag070.053
OP46 SHORT-TERM EFFECT OF HIGH-FLUORIDE TOOTHPASTE ON THE PREVENTION OF CARIES AND DEMINERALIZED LESIONS DURING ORTHODONTIC TREATMENT: A RANDOMIZED CONTROLLED TRIAL

Halah Khalifa[1], Gustavo Araujo[1], Nicklas Strömberg[2], Anna Westerlund[1]; *[1]Dept of Orthodontics, Institute of Odontology, The Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden, [2]Dept of Odontology, Umeå University, Umeå, Sweden*

AIM: Fixed orthodontic appliances increase the risk of dental caries and demineralized lesions due to increased biofilm retention and compromised oral hygiene. High-fluoride toothpaste may reduce this risk; however, evidence on its short-term effectiveness in everyday orthodontic practice is limited. This study evaluated the 6-month effect of high-fluoride toothpaste (5,000 ppm) compared with standard fluoride toothpaste (1,450 ppm) on caries development and demineralized lesions in adolescents undergoing orthodontic treatment.
MATERIALS AND METHODS: A multicenter, parallel-group randomized controlled trial was conducted in 10 orthodontic clinics in Sweden. Adolescents aged 12–18 years scheduled to start fixed appliance therapy were consecutively recruited. In total, 524 patients underwent baseline examination; of these, 466 were randomised (1:1) to use either a high-fluoride toothpaste (5,000 ppm F) or a standard fluoride toothpaste (1,450 ppm F) as part of their home care. Fixed appliances were bonded shortly after randomization. At 6 months, 448 participants were re-examined. Caries was assessed at baseline and 6 months using DeFS/DFS indices derived from visual-tactile clinical examination, standardized digital photographs and quantitative light-induced fluorescence (QLF). Complete 6-month data were available for 442 (clinical), 438 (photographic) and 402 (QLF) participants, respectively. Outcomes were evaluated at both patient and surface levels. The primary outcome was change in DeFS over 6 months. Secondary outcomes included change in DFS, lesion distribution by tooth surface, buccal surface indices (1-, 4- and 8-surface entities) and lifestyle variables.
RESULTS: No significant difference was detected between intervention and control groups in ΔDeFS or ΔDFS at either patient or surface level ($p>0.05$). At baseline, buccal and occlusal surfaces exhibited the highest lesion counts; buccal surfaces showed the greatest progression over 6 months. The QLF and the buccal 4- and 8-surface indices demonstrated higher sensitivity for detecting early caries changes. Frequent consumption of sugary drinks and infrequent toothbrushing were strongly associated with caries progression ($p<0.001$), particularly on buccal and occlusal surfaces.
CONCLUSIONS: High-fluoride toothpaste (5,000 ppm) did not significantly reduce short-term caries development or demineralized lesions over 6 months in adolescents undergoing fixed orthodontic treatment compared with standard toothpaste.

Abstract citation ID: cjag070.054
OP47 *** LONG-TERM OUTCOMES OF INTERCEPTIVE FUNCTIONAL APPLIANCE TREATMENT FOR CLASS II MALOCCLUSION: A POPULATION- BASED STUDY

Sara Waldenström[1], Erika Toft[2], Anna Westerlund[1]; *[1]University of Gothenburg, Gothenburg, Sweden, [2]Västra Götaland Region, Gothenburg, Sweden*

AIM: Interceptive treatment of Class II malocclusion with increased overjet using functional appliances is widely implemented in Sweden, where treatment is often initiated by orthodontists and delivered by general dental practitioners. Despite its extensive use, systematic evaluations of long-term treatment outcomes in this population-based model remain limited. This study assessed the long-term outcome of interceptive functional appliance.
MATERIALS AND METHOD: A retrospective, population-based cohort study was conducted including all patients in the Västra Götaland region who received Class II treatment with an activator-type functional appliance during 2020. Data were obtained from the regional electronic dental record system linked across general and specialist care. Extracted variables comprised sex, age at treatment initiation, treatment duration, number of clinical appointments, appliance type, treatment outcome, documented reasons for failure. Additionally, long-term outcome was evaluated retrospectively five years post-treatment. Treatment need was defined as Index of Orthodontic Treatment Need (IOTN) score ≥4. Data were analysed using descriptive statistics.
RESULTS: A total of 1,270 patients were included, with a slight predominance of boys. The mean age at treatment start was 10.95 years, and mean treatment duration was 18.2 months with an average of 11.6 clinical appointments. The overall treatment success rate was 54%. Lack of cooperation was the most common reason for failure and accounted for the majority of unsuccessful treatments. A tendency toward higher success rates was observed for headgear-activators compared with conventional activators and prefabricated functional appliances. At the five-year follow-up, at least 38% of the original cohort had IOTN ≥4, indicating a persisting or renewed orthodontic treatment need.
CONCLUSIONS: Interceptive functional appliance treatment for Class II malocclusion showed limited long-term effectiveness, with more than one-third of the cohort demonstrating substantial treatment need five years after treatment. When interpreted in the context of growth-related changes, variation in clinical decision-making and potential refusal of further treatment, these findings suggest that the limited population-level impact of the current interceptive treatment model should be taken into account when developing future strategies for managing Class II malocclusion in publicly funded dental care systems.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.055
OP48 EXPLORING ORTHODONTIC TREATMENT NEED AND DESIRE IN ADOLESCENTS AND YOUNG ADULTS: INSIGHTS FROM THE FIT FUTURES STUDY

Julia Sundquist, Kine-Louise Nikoline Forsbakk Jacobsen, Bo Wold Nilsen, Gro Eirin Holde; *UiT - The Arctic University of Norway, Tromsø, Norway*

AIM: The main objective of this study was to explore the relationship between orthodontic treatment need and desire for orthodontic treatment, and how satisfaction with dental alignment and socioeconomic factors influence this, at two time points in life: adolescence and young adulthood.
SUBJECTS AND METHODS: The study is based on data from the first and third wave of the Fit Futures study; a longitudinal population-based health study from 2010-2022. Students in secondary school in two municipalities in Northern Norway were invited to participate (FF1: n=838, mean age=16.1; FF3: n=509, mean age=26.8). Participants underwent oral examinations, including collection of intraoral models, and completed questionnaires on health and lifestyle. The intraoral models were analyzed, and treatment need was classified according to the Need for Orthodontic Treatment Index. Key variables included were desire for orthodontic treatment, satisfaction with dental alignment, and socioeconomic factors. Data were analyzed using descriptive statistics and regression models.
RESULTS: The majority of participants were satisfied with their dental alignment (FF1=90.3% and FF3=88.0%), and the desire for orthodontic treatment was higher in FF1 (15.0%) compared to FF3 (10.1%). Dissatisfaction with dental alignment was the strongest predictor of treatment desire, with adjusted odds ratio (OR) of 6.0 ($p<0.001$) in FF1 and 20.2 ($p<0.001$) in FF3. Participants with "obvious" or "great" treatment needs were more likely to desire treatment in FF1 (adjusted OR = 2.3, $p<0.001$). Higher socioeconomic status was associated with lower treatment needs and higher satisfaction in FF1 but showed limited significance in FF3. Gender differences were only observed in FF3, with male participants being less likely to desire orthodontic treatment (adjusted OR = 0.4, p=0.020).
CONCLUSION: Satisfaction with dental alignment was the primary determinant of orthodontic treatment desire. While orthodontic treatment need and socioeconomic factors were significantly associated with desire for orthodontic treatment in FF1, their impact was less pronounced in FF3. However, gender differences in treatment desire were evident in FF3. This indicates that the factors affecting the desire for orthodontic treatment could change from adolescence to young adulthood.

Abstract citation ID: cjag070.056
OP49 FRIEND OR FOE? PUBLIC BIAS TOWARD DENTISTS BASED ON SMILE ALIGNMENT

Hadeel Al-Najafi; *Guy's and St Thomas' Hospital, London, United Kingdom*

AIM: To evaluate whether the alignment of a dentist's own teeth influences public perceptions of trustworthiness, professionalism, and likelihood of selecting that dentist for treatment. The study investigates whether straighter teeth lead to more favourable patient judgements compared with mildly misaligned or visibly poorly aligned teeth.
MATERIALS AND METHOD: A cross-sectional online survey was distributed to members of the general public aged 16 and above. Participants viewed three digitally standardised photographs of the same dentist smiling, modified to create three alignment conditions: (1) well-aligned teeth, (2) mildly misaligned teeth, and (3) noticeably misaligned teeth with visible irregularities. Respondents rated trustworthiness, professionalism, friendliness, and likelihood of choosing the dentist for treatment using 5-point Likert scales (1 = low, 5 = high). Demographic information was collected. Statistical analysis included paired t-tests and repeated-measures ANOVA to compare scores across alignment conditions, with significance set at $p < 0.05$.
RESULTS: A total of 152 participants completed the survey (62% female; mean age 29.4 ± 9.7 years). The well-aligned smile condition received significantly higher ratings for trustworthiness (4.48 ± 0.63), professionalism (4.59 ± 0.57), and likelihood of being chosen for treatment (4.38 ± 0.74) compared with the mildly misaligned condition (trustworthiness: 3.39 ± 0.81; professionalism: 3.55 ± 0.77; likelihood of choosing: 3.27 ± 0.82; all $p < 0.001$). The noticeably misaligned condition received the lowest scores (trustworthiness: 2.44 ± 0.90; professionalism: 2.29 ± 0.92; likelihood of choosing: 2.09 ± 0.89; all $p < 0.001$). No significant correlations were found between demographic variables and rating patterns ($p > 0.05$). Qualitative feedback commonly referenced expectations that dental professionals should "have straight teeth themselves."
CONCLUSIONS: Tooth alignment appears to strongly influence public perceptions of dentists. Participants consistently rated dentists with well-aligned teeth as more trustworthy, professional, and preferable for treatment. Misalignment, even when mild, negatively affected ratings across all categories. These findings highlight the presence of alignment-based bias in dentistry and demonstrate how a clinician's own dental alignment may subconsciously impact patient confidence and decision-making. Further research should explore how alignment-related bias influences real clinical interactions and patient selection behaviours.

Abstract citation ID: cjag070.057
OP50 IS A TWO JAW ORTHOGNATHIC SURGERY AN INDEPENDENT RISK FACTOR FOR COMPLICATIONS COMPARED TO SINGLE JAW SURGERY?

Annika Wimmer[1], Rayan Nikkilä[2], Minna Merta[1], Millatuulia Järvinen[1], Juho Suojanen[3]; *[1]Päijät-Häme Joint Authority for Health and Wellbeing, Department of Oral and Maxillo-Facial Surgery, Lahti, Finland, [2]Research program in Systems Oncology, Faculty of Medicine, Univerisity of Helsinki, Helsinki, Finland, [3]Cleft Palate and Craniofacial Centre, Department of Plastic Surgery, Helsinki, Finland*

AIM: The primary objective of this study was to see if orthognathic surgery patients who received bimaxillary surgery had increased complication rate compared to patients who received Lefort 1 or bilateral sagittal split osteotomy (BSSO). The secondary objective was to see if the patient's sex or body mass index were associated with the complication rate.
SUBJECTS AND METHOD: The study population were patients who received Lefort 1, BSSO or bimaxillary orthognathic surgeries during the years 2018-2024. 96 patients received orthognathic surgery (Lefort 16, BSSO 44 and bimaxillary surgery 36). A statistical analysis was made; Pearson's chi-squared test was used for sex and surgery types and Fisher's exact test for Count data for BMI to determine the differences in complication rates.
RESULTS: The complication rate was 18.8% for Lefort 1, 40% for BSSO and 44,4% for bimaxillary surgeries. The most common complication was mandibular plate infection (n=18). Bimaxillary surgery didn't increase the risk of complications compared to single jaw surgeries Lefort 1 (p= 0.1123) and BSSO (p= 0.8225). The sex of the patient (p= 0.2555) and the body mass index (p=0.1409) were not found to be associated with the complication rate.
CONCLUSIONS: Bimaxillary surgery doesn't seem to increase the complication rate compared to single jaw surgery. Additionally, the sex and body mass index of the patient was not associated with the complication rate.

Abstract citation ID: cjag070.058
OP51 THE IMPACT AND QUALITY OF THE SURGERY-FIRST APPROACH FOR ORTHOGNATHIC TREATMENT

Emma Carr, Philip Benington, Ashraf Ayoub; *University of Glasgow, Glasgow, United Kingdom*

AIM: This study aimed to evaluate the impact of orthognathic treatment, and the quality of orthognathic service delivery, reported by patients and clinicians respectively, using validated Patient Reported Outcome Measures (PROMs) and Quality Outcome Measures (QOMs) questionnaires.

The secondary objective was to investigate the level of agreement between the surgeons' and patients' perceptions regarding treatment needs and outcomes.
MATERIALS AND METHOD: This prospective cohort study was conducted on patients who received orthognathic treatment according to the Surgery-First Approach.

Data were collected between October 2023 and October 2025. Ethical approval was obtained from the local Clinical, and Research, Governance Committees.

The PROMS questionnaire, which incorporated the Orthognathic Quality of Life Questionnaire (OQOL), was completed by the patients before surgery, and at four-eight weeks and one-year post-surgery. The QOMs questionnaire was completed by the clinicians before surgery, and at six months and one-year, post-surgery. The data were analysed with SPSS using Chi-squared and Fisher's exact tests to investigate associations between PROMs and QOMs.

It was estimated that a sample size of 31 patients would power the study at 80%, on the assumption that a large effect size would be found.
RESULTS: Thirty-three patients (mean age 26.6 ± 9.0 years) were included in the study. Twenty-nine completed all questionnaires, giving a dropout rate of 12%.

Surgery-first orthognathic treatment significantly improved patients' reported quality of life, facial aesthetics, and oral function. Regarding the primary indications for surgery, a statistically significant association was found between clinicians' and patients' perceptions of facial aesthetic improvement (p=0.007), but not for improvement in function (p=0.078). The level of improved function reported by patients and clinicians showed a strong association (p=0.017), but there was less agreement regarding improved aesthetics (p=0.069).
CONCLUSIONS: The Surgery-First Approach to orthognathic treatment yields measurable improvements in patient-reported, and clinician-assessed, outcomes. Whilst the perceptions of patients and clinicians align regarding aesthetic indications and

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

functional improvements related to surgery, further research is needed to clarify discrepancies in perceived aesthetic benefits and enhance multidisciplinary understanding of treatment impact.

Abstract citation ID: cjag070.059
OP52 A COMPARISON OF TWO BONDED LINGUAL RETAINERS REGARDING STABILITY, COMPLICATIONS, AND PATIENT SATISFACTION AFTER ONE YEAR

ABDULRAHMAN ALSHEHRI, SEBASTIAN SALIMI, ALEN SAMARDZIC, NIELS GANZER, AGNETA KARSTEN; *karolinska Institute, Stockholm, Sweden*

AIM: To compare the stability, complications, and patient satisfaction between two bonded lingual retainers, multi-stranded stainless-steel retainer (MSSR) and gold chain retainer (GCR), for the lower anterior teeth after one year of retention.
MATERIALS AND METHODS: Eighty orthodontically treated subjects with a mean age of 16.7 years were included. They had been treated with fixed orthodontic appliances and blindly randomized into two equal cohorts, each receiving one type of retainer after providing informed consent. Intraoral scanning was performed after bonding of the retainers (T_0), six months (T_6), and finally after one year (T_{12}). Additionally, clinical investigation and patient satisfaction questionnaires were conducted from T_0 till T_{12}.

Teeth stability was assessed using Little's Irregularity Index (LII), intercanine and intermolar distance, maximum rotation, overjet, and overbite, measured using digitized scans with the *ONYXCEPH* program.

Complications like detachment or breakages were recorded at and in between follow-up appointments. Statistical analyses included the Shapiro-Wilk test and histograms for normality, Levene's test for variance homogeneity, and the student's t-test for group differences comparisons due to variables normal distribution and homogeneity of variance.
RESULTS: There was a statistically significant difference (p=0.004) between the retainer groups from T_0 to T_{12} regarding LII with a mean of 0.4 mm for the GCR and a mean of 0.1 mm for the MSSR. The rate of detachment complications was 2.9% for the GCR group and 2.6% for the MSSR group which has been deemed non-significant. No significant differences were identified in patient satisfaction between the two groups over the one-year period.
CONCLUSION: Aside from the statistically significant (but clinically irrelevant) increase in the Little's irregularity index of the GCR, no other significant differences were observed between the two retainer groups after one year of retention. A longer follow-up period is currently ongoing for five years from the time of retainers bonding.

Abstract citation ID: cjag070.060
OP53 CAD/CAM VS CONVENTIONAL MULTISTRANDED FIXED RETAINERS IN ORTHODONTIC PATIENTS: SURVIVAL AND PATIENT SATISFACTION. A 5-YEAR FOLLOW-UP OF A RANDOMIZED CONTROLLED CLINICAL TRIAL

Marie A Cornelis[1], Marie Louise Postawa[2], Helen Pullisaar[3], Vaska Vandevska Radunovic[3], Paolo M Cattaneo[1]; *[1]University of Melbourne, Melbourne, Australia, [2]Aarhus University, Aarhus, Denmark, [3]University of Oslo, Oslo, Norway*

AIM: The primary aim of this 2-arm parallel randomized controlled trial was to compare CAD/CAM vs. conventional multistranded fixed retainers in terms of survival over 5 years. The secondary outcome was patient satisfaction.
MATERIALS AND METHODS: Patients were randomized to CAD/CAM or conventional fixed retainers in both arches, in 1:1 ratio and blocks of four. Allocation concealment was secured by using sequentially numbered envelopes. Patients were blinded. Retainers were bonded at the end of orthodontic treatment, and patients were recalled after 6 months, as well as after 1, 2, 3 and 5 years. First-time retainer failure dates and patterns were recorded. Additionally, patients answered satisfaction questionnaires at the 6-month and 1-year recall visit. Survival analyses were estimated with Kaplan-Meier curves, along with log-rank tests. Linear mixed models were applied for patient satisfaction.
RESULTS: Ninety-eight patients were randomized: 48 in the CAD/CAM group and 50 in the conventional group. No participants were lost to follow-up; every patient attended at least one recall appointment. Eighty-one patients attended the 5-year visit. Within 5 years, 60 upper retainers (30/48 CAD/CAM; 30/50 conventional retainers) and 57 lower retainers (32/48 CAD/CAM; 25/50 conventional retainers) failed, with no significant different survival between the two types of retainers (upper arch: P=0.58, lower arch: P=0.16). The most common pattern of failure was debonding at the wire-composite interface in the upper arch (12/30 CAD/CAM; 13/30 conventional), and debonding at the composite-enamel interface in the lower arch (17/32 CAD/CAM; 18/25 conventional). Upper retainers were more prone to fracture than lower retainers (upper: 7/30 CAD/CAM; 6/30 conventional – lower: 2/32 CAD/CAM; 1/25 conventional). Over 70% of failures occurred within 2 years (upper: 21/30 CAD/CAM; 21/30 conventional – lower: 42/32 CAD/CAM; 22/25 conventional). Patient satisfaction was high in both groups, without significant differences between the groups. No harms were observed.
CONCLUSIONS: There was no difference in failure rates and failure patterns between CAD/CAM and conventional fixed retainers after 5 years. Patient satisfaction was high and was not significantly different for both types of fixed retainers.

Abstract citation ID: cjag070.061
OP54 PATIENT HARM FROM ORTHODONTIC CARE (PART I): TYPES AND FREQUENCY OF PATIENT-REPORTED HARMS FROM A NATIONAL DATABASE

Nikolaos Ferlias[1], Athanasia Grigoroudi[1], Julian Woolley[1], Henrik Paul Nielsen[2], Peter Stoustrup[1]; *[1]Section of Orthodontics, Department of Dentistry and Oral Health, Aarhus University, Aarhus, Denmark, [2]Department of Oral and Maxillofacial Surgery, Copenhagen University Hospital, Copenhagen, Denmark*

BACKGROUND: Patient safety is a fundamental prerequisite for high-quality healthcare and central to clinical practice, including orthodontics. Despite the widespread emphasis on safety in healthcare delivery, knowledge specific to patient safety in orthodontics remains limited.
AIMS: (1) To analyse the reasons why patients file claims for compensation related to orthodontic care, (2) to summarize the events that lead to patient harm, and (3) to describe the types of harms associated with the provision of orthodontic care.
MATERIALS & METHODS: Data from the Danish Dental Compensation Association (DDCA), a national compensation scheme established by law were retrospectively extracted from the electronic database and included all patient-reported claims between June 2017 and August 2024 related to orthodontic care.
RESULTS: A total of 644 patient-reported orthodontic-related claims were reviewed. Of these claims, 196 (30.4%), were recognized as patient harm and led to compensation. Orthodontic treatment was the most frequently reported source of harm 51.5% (n=101), followed by delayed diagnosis (24.5%, n=48) and retention-related complications (9.2%, n=18). Among the 196 approved claims, the most common harm was apical root resorption leading to tooth loss (14.8%, n=29), followed by gingival or soft-tissue injury (13.3%, n=26), worsening of occlusion after treatment (9.2%, n=18), and other harm such as diagnostic delays causing tooth damage (8.2%, n=16).
CONCLUSION: Harm events can occur at any stage during the orthodontic treatment process, including the diagnostic and planning stage. Orthodontic harm mostly occurs in the active phase of treatment, and is frequently a result of root resorption, soft tissue damage, and worsening of the occlusion. There is discrepancy in patient-perceived harms and actual harm events that lead to compensation. This study highlights the need for optimal diagnostics and planning, clinical vigilance across all treatment phases, and clearer communication with patients as expectations and compensability often diverge.

Abstract citation ID: cjag070.062
OP55 ‡‡‡ SKELETAL VERSUS CONVENTIONAL ANCHORAGE IN DENTOFACIAL ORTHOPEDICS: AN INTERNATIONAL MODIFIED DELPHI CONSENSUS STUDY

Maria Denisa Statie, Veronica Giuntini, Lorenzo Franchi; *Scuola di Specializzazione in Ortognatodonzia, Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy*

AIM: To establish consensus of skeletal anchorage versus conventional anchorage in treating: 1. Maxillary transverse deficiency in growing and adult patients, 2. Class II skeletal disharmony due to mandibular retrusion in growing patients, 3. Class III skeletal disharmony in growing patients.
MATERIALS AND METHOD: A four-rounds modified Delphi method was conducted. A steering committee performed a literature selection and compiled a list of 33 statements. An international panel of 25 experts in orthodontics agreed to participate. In each round, panelists were asked to rate their level of agreement with each statement using a 5-point Likert scale and provide comments. Statements that reached consensus were either accepted or rephrased. Statements that did not reach consensus were either rephrased, rejected, or split into two statements or merged with another.
RESULTS: After the four rounds, 24 statements achieved consensus while 9 were rejected. The distribution of consensus statements was as follows: Maxillary transverse deficiency: 4 statements; Class II skeletal disharmony: 10 statements; Class III skeletal disharmony: 10 statements.
CONCLUSIONS: This modified Delphi consensus study aimed to provide guidance for orthodontists in choosing between skeletal and conventional anchorage for various treatment conditions. The study generated 24 consensus statements across

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

three key domains. While the Delphi method provides valuable expert opinions, future studies, including randomized controlled trials, are needed to confirm these findings and address remaining uncertainties. Such efforts will aid in refining orthodontic treatment protocols and enhancing patient outcomes.

Abstract citation ID: cjag070.063
OP56 ‡‡‡ STABILITY OF EXPANSION EFFECTS FOLLOWING MINISCREW-ASSISTED RAPID PALATAL EXPANSION: A PROSPECTIVE LONGITUDINAL COHORT STUDY

Aldin Kapetanović, Hao Chen, Jan Schols, Tong Xi; *Radboudumc, Nijmegen, Netherlands*

AIM: This study aimed to evaluate the dental and skeletal stability one year after Miniscrew-Assisted Rapid Palatal Expansion (MARPE) by using 3D image data.
MATERIALS AND METHOD: Patients with transverse maxillary deficiency from the age of 16 onwards were enrolled consecutively in this prospective longitudinal cohort study. The MARPE appliance was digitally and individually designed and fabricated. Cone-beam computed tomography (CBCT) scans and intra-oral scans (IOS) were acquired before the start of MARPE treatment (T0), immediately after active expansion (T1) and one-year post-expansion (T2). Nasal floor width (NFW), palatal alveolar width at the first molar (M1) and first premolar (P1) (PAW), nasal cavity width (NCW), intermolar width (IMW) and interpremolar width (IPW) were measured to assess the immediate (ΔT0-T1) and net (ΔT0-T2) skeletal and dentoalveolar expansion and relapse (ΔT1-T2). Potential correlations with age, sex and midpalatal suture maturation (MSM) stage were also investigated.
RESULTS: Thirty-one patients (6 men, 25 women, mean age: 26.2 years) were included. The mean follow-up time (T0-T2) was 12.2 months. The initial NFW increase demonstrated a relapse of 0.6 ± 1.2 mm, or 11.6% of the initial expansion($p < 0.01$). Expansion at the alveolar level remained stable during the follow-up. IPW also remained stable during the follow-up (4.2 ± 1.3 mm at T1; 4.4 ± 2.6 mm at T2). IMW exhibited a relapse of 3.8 ± 2.1 mm, or 60.2% of the initial expansion ($p < 0.001$) during T1-T2. There was no statistically significant correlation between stability and age, sex and MSM stage.
CONCLUSIONS: MARPE is an effective therapy for the correction of transverse maxillary discrepancy in late adolescents and adults, achieving a clinically stable skeletal outcome one year after expansion.

Abstract citation ID: cjag070.064
OP57 A RANDOMISED CONTROL TRIAL ASSESSING ORTHODONTIC TREATMENT DURATION IN SURGERY-FIRST VS CONVENTIONAL ORTHOGNATHIC APPROACHES

Harriet Powell[1], Pernille Palsbo Tøttrup[2], Sven Erik Nørholt[2], Thomas Klit Pedersen[2]; *[1]Aarhus University, Aarhus, Denmark, [2]Aarhus University Hospital, Aarhus, Denmark*

AIM: To compare total orthodontic treatment duration between orthognathic surgical patients managed with either a surgery-first or a conventional treatment sequence.
METHOD: A prospective randomised control trial of ortho-surgical participants were recruited and randomly assigned to either a surgery first (n=23) or conventional (n=18) group based on a pre-defined inclusion and exclusion criteria.

The date of appliance bonding and debonding was recorded to calculate total orthodontic treatment duration. Data regarding participants' previous orthodontic treatment experience, presenting malocclusion, and medical history were also collected. An independent samples *t*-test (Welch's correction) was used to compare mean treatment durations between the two groups, with statistical significance set at $p < 0.05$.
RESULTS: The mean orthodontic treatment duration was 13.9 ± 5.4 months for the surgery-first group and 18.1 ± 3.1 months for the conventional group. An independent samples *t*-test demonstrated a statistically significant difference between the two groups ($t = -2.73$; $p = 0.011$), indicating that patients treated with the surgery-first approach completed treatment in a significantly shorter time compared with those treated using the conventional orthognathic protocol.
CONCLUSION: The surgery-first approach resulted in a significantly shorter overall orthodontic treatment duration compared with the conventional orthognathic treatment sequence. These findings suggest that, in appropriately selected patients, the surgery-first protocol may be an effective strategy to reduce total treatment time without compromising treatment outcomes.

Abstract citation ID: cjag070.065
OP58 LONG-TERM OUTCOMES OF AUTOTRANSPLANTED TEETH 26-40 YEARS POST-TREATMENT- A LONG-TERM FOLLOW-UP STUDY

Sandina Sehic[1] and Anders Magnusson[2]; *[1]Department of Orthodontics, The Institute for Postgraduate Dental Education., Värnamo, Sweden, [2]Department of Orthodontics, The Institute for Postgraduate Dental Education Jönköping Sweden. Centre for Oral Health School of Health and Welfare, Jönköping University, Jönköping, Sweden*

AIM: The aim of the present study was to evaluate long-term clinical outcomes of tooth autotransplantation, patient-reported experiences, and oral health–related quality of life (OHRQoL), 26–40 years post-treatment.
MATERIALS AND METHOD: The study material consists of medical records comprising 41 variables recorded in connection with autotransplantation in 132 consecutive patients treated during the years 1984-1998.

The follow-up examinations included a clinical and radiological examination of the transplanted teeth as well as questionnaires about the patients' experiences of the treatment and their oral health-related quality of life (OHIP-14).

The examination and treatment outcomes were assessed according to criteria established by Czachorowska et al. 2002 as Success, Survival or Failure/Missing.

Descriptive analysis was used to report treatment outcome and the patient's experiences and OHRQoL.

Logistic regression analysis was performed to identify causal factors related to the treatment outcomes.
RESULTS: Of the 132 consecutive patients, 54 patients responded and agreed to participate in the study. Due to the size of the dropout, a thorough dropout analysis was performed, showing no obvious bias in the study material. The follow-up period was 26-40 years (mean 32.6 years, SD 4.6). The mean age at treatment start was 15.7 years. Among the transplanted teeth, 51.9% (n=28) were success, 20.4% (n=11) survival, and 27.8% (n=15) were failure/ missing. The overall outcome for survival and success teeth was 72.2% (n=39).

The logistic regression analysis showed no statistically significant variables that correlated to success or failure. However, there was a tendency toward higher odds ratios for operative findings (OR 3.17; p=0.143), root development (OR 2.66 p=0.15) and donor tooth type (molar) (OR 3.60; p=0.25), though none reached statistical significance.

Patient Reported Outcome Measures indicated low discomfort and high long-term satisfaction and no negative impact on OHRQoL (OHIP-14 mean total score 4.4, SD 5.3).
CONCLUSION: Autotransplanted teeth demonstrated stable, long-term survival and success rates 26-40 years post- treatment. Patients who underwent tooth autotransplantation reported high patient satisfaction regarding their treatment and no negative impact on OHRQoL.

Abstract citation ID: cjag070.066
OP59 3D-ANALYSIS OF TOOTH MOVEMENTS WITH CAD/CAM VERSUS CONVENTIONAL MULTISTRANDED FIXED RETAINERS IN FAILURE-FREE INDIVIDUALS AFTER TWO YEARS– SECONDARY DATA ANALYSIS OF A RANDOMIZED CONTROLLED TRIAL

Katharina Klaus[1], Sabine Ruf[1], Monika Sankiewicz[2], Paolo M. Cattaneo[3], Marie A. Cornelis[3]; *[1]Justus Liebig University, Giessen, Germany, [2]Aarhus University, Aarhus, Denmark, [3]Melbourne Dental School, Melbourne, Australia*

AIM: To analyze tooth movements 3-dimensionally in order to detect and quantify possible subclinical changes in failure-free subjects after two years of retention with CAD/CAM versus conventional multistranded fixed retainers.
MATERIALS AND METHODS: 98 patients were initially allocated to CAD/CAM (Memotain, n=48) or conventional multistranded (0.0215-inch six-stranded stainless-steel, n=50) fixed retainer groups. Out of the 86 patients (CAD/CAM n=44; multistranded n=42) attending the 2-year follow-up, in the maxilla 49 (57.0%, CAD/CAM n=26, multistranded n=23) were failure-free (no debondings/ wire fractures) and in the mandible 48 (55.8%, CAD/CAM n=25, multistranded n=23). Their intraoral scans taken at debonding and at the 2-year follow-up were superimposed using the area around the third rugae of the hard palate for the maxilla and the crowns of the premolars and first molars for the mandible. Translational and rotational movements of each tooth within the retained segment were measured in all three planes of space. Descriptive statistics and the Mann-Whitney-U test were applied.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: In the maxilla, median translational movements in all dimensions ranged from 0-0.47mm for both retainers. Conventional retainers presented maximum values up to 2.27mm intrusion and in CAD/CAM retainers, outliers up to 1.85mm protrusion were seen. Regarding rotational movements, conventional retainers showed medians of 0-1.98° (maximum: 6.45° proclination). CAD/CAM retainers presented medians between 0.08-1.72° (maximum: 9.49° clockwise rotation). In the maxilla, no significant differences between the retainer types were observed.

In the mandible, median translational movements in all dimensions ranged from 0-0.23mm in the conventional (maximum: 1.38mm extrusion) and between 0-0.35mm (maximum: 1.34mm intrusion) in the CAD/CAM group. The conventional retainers allowed median rotations of 0.03-1.53° (maximum: 9.88° retroclination), while CAD/CAM retainers showed medians ranging from 0.03-1.02° (maximum: 5.31° clockwise rotation). Significant differences (p<0.024) were seen for rotational movements around the x-axis, representing pro-/retroclination movements, for teeth 41, 42, and 43.

CONCLUSION: Overall, both types of retainers permitted only minimal tooth movements in both jaws within two years. Clinically relevant outliers occurred irrespective of retainer type. In the lower jaw, significant differences between the retainer types were observed for rotational movements around the x-axis.

Abstract citation ID: cjag070.067

OP60 EFFECTIVENESS OF RETAINERS IN ORTHODONTIC PATIENTS: UPPER ACRYLIC VS CLEAR THERMOPLASTIC REMOVABLE RETAINERS, AND LOWER CAD/CAM VS ANALOGUE FIXED RETAINERS. A MULTI-CENTRE CLINICAL TRIAL

Calvin Wong, Paolo M Cattaneo, Laura Chen, Marie A Cornelis; *Univeristy of Melbourne, Melbourne, Australia*

AIMS: To longitudinally compare the survival and dental stability across 4 different retainers: two upper removable retainers: (1) acrylic and (2) clear thermoplastic; and two lower fixed retainers: (1) CAD/CAM custom-bent canine-to-canine and (2) analogue canine-and-canine.

MATERIALS AND METHODS: This prospective multi-centre clinical trial was conducted across three orthodontic clinics in Melbourne. Upper removable and lower fixed retainers were issued at the end of orthodontic treatment (T0), and patients were recalled at 12 months (T12). First-time retainer failures were recorded. Arch length (AL), inter-canine width (IC), inter-molar width (IM) and Little's Irregularity Index (LII) were digitally measured. Survival analysis was performed through Kaplan-Meier survival plots and the log-rank test. Independent t-tests compared groups at T12 and paired t-tests assessed changes within groups.

RESULTS: Eighty-one patients were enrolled. In the upper arch, 30 patients received an acrylic retainer and 30 received a clear thermoplastic retainer. In the lower arch, 38 patients received a CAD/CAM custom-bent (Bender II) canine-to-canine retainer and 20 received an analogue canine-and-canine retainer. By T12, thirteen of 58 lower fixed retainers failed, with statistically significant higher failure rates in the CAD/CAM group (12/38=31.6%) compared to the analogue group (1/20=5%) (p<0.02). Nine of 60 upper removable retainers failed, with no statistically significant differences in failure rates between acrylic (4/30=13.3%) and clear thermoplastic retainers (5/30=16.7%). At T12, there were no statistically significant differences in AL, IC, IM and LII between both upper groups and both lower groups. Within the groups, upper arch widths and LII increased in the acrylic (IC: 0.49mm, p<0.001; IM: 0.40mm, p<0.05; LII: 0.99mm, p<0.001) and clear thermoplastic groups (IC: 0.44mm, p<0.001; IM: 0.38mm, p<0.05; LII: 0.92mm, p<0.001). Lower LII increased in the CAD/CAM (0.46mm, p<0.001) and analogue groups (0.74mm, p<0.001). IC increased (0.26mm, p<0.05) in only the analogue group.

CONCLUSION: Lower CAD/CAM custom-bent canine-to-canine fixed retainers exhibited significantly higher failure rates than analogue canine-and-canine fixed retainers. In contrast, survival did not differ between upper acrylic and clear thermoplastic removable retainers. At T12, both arches demonstrated increases in LII regardless of retainer type. Arch width changes were not clinically significant.

PREVIOUSLY PUBLISHED ABSTRACT: no

Scientific Poster Presentations

Abstract citation ID: cjag070.068

SP3 ETCH AND FLOWABLE COMPOSITE TIPS: WHICH ARE THE MOST ECONOMICAL AND ENVIRONMENTALLY SUSTAINABLE?

Laura Brooks[1], David Edwards[2], Alex Cash[1]; [1]*Queen Victoria Hospital, East Grinstead, United Kingdom,* [2]*Newcastle University, Newcastle upon Tyne, United Kingdom*

AIM: Sustainability within oral healthcare is an emerging topic with a focus on 'Reduce, Reuse, Recycle and Rethink'. The aim was to test various disposable etch/flowable composite tips available in the UK to determine which one has the least retained material waste once finished. A secondary aim was to calculate the number of etch/flowable composite tips used on average in a UK hospital based orthodontic department per year to calculate the weight and the financial cost of the retained material in the tips annually.

MATERIALS AND METHOD: Twenty-five tips of seven etch and five flowable composite tip brands were weighed by one clinician before and after the etch/flowable composite had been expressed through the tip. The material waste was calculated from the difference between the two weights of each tip. Different tip brands were compared using a one-way analysis of variance (ANOVA) with Tukey multiple comparison test. The number of etch and composite tips used per year was calculated using NHS procedure codes. The cost of the material was obtained from the NHS procurement website.

RESULTS: Retained waste between the different brands of etch (F (6,168)= 37.69, p=<0.001) and flowable composite tips (F (4,120), p=<0.0001) was found to be significant. There was a mean waste difference per tip of 54% between the most (0.02508g) and least (0.05376g) efficient etch brand and 18% between the most (0.07768g) and least (0.09424g) efficient flowable composite tip brand. This translates to 25 to 54 full tubes of etch and 11 to 13 full tubes of flowable composite wasted per year depending on the tip brand. The cost difference per year in wasted etch and flowable composite between the most and least efficient tips was £168.48 and £89.88 respectively.

CONCLUSION: This study highlights significant differences in retained material of different brands in dental delivery tips. Recommendations: companies to develop more efficient delivery tips/systems, to publish data on retained material waste in dental tips, novel cleaning and recycling techniques for dental waste and the use of biobased plastic materials.

Abstract citation ID: cjag070.069

SP4 ‡‡‡ A CROSS-SECTIONAL STUDY OF THE AWARENESS AND KNOWLEDGE OF DENTAL ADVERTISING GUIDELINES AMONG RECENT DENTAL GRADUATES IN MALAYSIA

VIVIAN ONG, YASMIN KAMARUDIN, SARITHA SIVARAJAN, NOR AZLIDA MOHD NOR; *UNIVERSITI MALAYA, KUALA LUMPUR, Malaysia*

INTRODUCTION: Dental institutions often include advertising ethics as part of the undergraduate curriculum to instill professional standards. However, there is limited evidence on graduates' awareness and understanding of advertising guidelines in their subsequent practice.

AIM: To assess the awareness and knowledge of dental advertising guidelines among recent dental graduates in Malaysia and to compare the outcomes between those from public and private universities.

MATERIALS AND METHODS: This cross-sectional study was conducted in 2024 involving recent dental graduates from eight Malaysian universities. A newly designed and validated questionnaire was used to assess awareness and knowledge across seven domains of dental advertising ethics: (1) Provision of dental information, (2) Display of fees, (3) Recommendation of specific products, (4) Online professionalism, (5) Description of clinic facilities and services, (6) Patient testimonials, and (7) Advertisement of specific treatment. The questionnaire was distributed via Google Forms using cluster sampling to ensure proportionate representation from public and private dental schools from different regions in Malaysia. Descriptive and inferential statistics were used to compare responses between graduates of public and private universities.

RESULTS: In total, 253 participating graduates completed the online questionnaire. Awareness among public university graduates was significantly higher than that of their private counterparts (p-value < 0.05). The mean knowledge score was 61.8%. The domain with the highest knowledge score was 'online professionalism' (71.30%), whereas the lowest scoring domain was 'recommendation of specific products' (46.77%). Public university graduates scored significantly higher in the domains of 'Description of clinic facilities and services' and 'Advertisement of specific treatment' (p-value < 0.05).

CONCLUSION: Participants from public universities reported significantly higher awareness and performed better in specific domains related to dental advertising ethics. These findings highlight the importance of a standardized and comprehensive education on ethical advertising practices across all dental institutions.

Abstract citation ID: cjag070.070

SP6 EFFECT OF PRESSURE APPLICATION DURING ATTACHMENT FABRICATION ON ATTACHMENT SIZE AND EXCESS COMPOSITE IN CLEAR ALIGNERS

Irem Sisman[1] and Sabri Ilhan Ramoglu[2]; [1]*Private Practice, Istanbul, Turkey,* [2]*Altınbaş University, Faculty of Dentistry, Department of Orthodontics, Istanbul, Turkey4*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: This study aimed to evaluate the effect of applying pressure on clear aligner templates during attachment fabrication on attachment dimensions and the amount of excess composite, considering different attachment types and adhesive viscosities.
MATERIALS AND METHOD: Two phantom models, each consisting of one maxillary and one mandibular arch, were constructed using 48 extracted human teeth (from central incisors to first molars). Guided templates containing three attachment types—horizontal, vertical, and optimized—were fabricated using three different aligner templates. Three composite resins with varying viscosities were tested: (1) 3M™ Filtek™ Supreme Flowable Restorative, (2) AO Bracepaste Medium Viscosity Adhesive, and (3) Tokuyama Estelite Sigma Quick. For each material, two application protocols were compared: pressure applied with dental tweezer and no pressure applied. All attachments were light-cured for 20 seconds using a standardized light source (Ultradent Valo Cordless, USA). The models were scanned in 3D and analyzed using Geomagic Control X software. Statistical analyses were performed at a significance level of $p<0.05$.
RESULTS: No statistically significant differences were found in attachment dimensions between the pressure-applied and non-pressure groups across all composite materials ($p>0.05$). However, the amount of excess composite was significantly lower in the pressure-applied groups for all adhesive types and attachment designs.
CONCLUSIONS: Applying pressure to the clear aligner template during attachment fabrication effectively reduces excess composite without altering attachment dimensions. This suggests that pressure-assisted placement may enhance clinical efficiency and finishing quality, independent of adhesive viscosity.

Abstract citation ID: cjag070.071
SP7 ACCURACY, QUALITY, AND READABILITY OF 'GOOGLE AI OVERVIEWS' FOR PREOPERATIVE ORTHOGNATHIC SURGERY INFORMATION

Rachel O Donoghue[1], Minseo Yung[2], Conor Bowe[1], David McGoldrick[1]; [1]*St James Hospital, Dublin 8, Ireland,* [2]*St James, Dublin 8, Ireland*

AIM: To evaluate the quality, reliability, and readability of preoperative information regarding orthognathic surgery provided by Google's integrated Artificial Intelligence (AI) Overview feature.
MATERIALS AND METHOD: This descriptive, cross-sectional study assessed AI Overview responses to seven predefined frequently asked questions (FAQs) sourced from a professional surgical association. The answers were independently rated by two blinded Oral and Maxillofacial Surgery NCHDs. Primary quality assessment utilized the Global Quality Score (GQS, 1-5 scale), and reliability was assessed via the Modified DISCERN tool (1-3 scale). Readability was quantified using the Simplified Flesch-Kincaid formula via the NHS readability tool, yielding a Readability Age (years). Inter-rater reliability was determined using Cohen's Kappa (κ).
RESULTS: The inter-rater reliability was moderate ($\kappa=0.49$, $p<001$). The AI-generated information scored exceptionally high for quality, with a mean GQS of 4.86 ± 0.35 (on a 5-point scale). Modified DISCERN scores suggested high reliability across all domains, with the highest mean score for Clarity (3.00 ± 0.00) and the lowest for Currency (2.57 ± 0.51). The average Readability Age was 15.89 years, ranging from 15.1 to 16.8 years.
CONCLUSIONS: Google AI Overview provides highly accurate and reliable information for common orthognathic surgery questions. However, the text complexity, which requires an average reading age of 16 years, significantly exceeds the recommended 11- to 13-year standard for public health materials. While valuable as an informational tool, the AI-generated content requires professional confirmation due to its high reading level and inherent uncertainty regarding currency.

Abstract citation ID: cjag070.072
SP8 ORTHODONTISTS' AWARENESS AND SCREENING PRACTICES FOR SLEEP-DISORDERED BREATHING: A NATIONAL SURVEY IN AUSTRALIA

Tassneem Elagib[1], Marie Cornelis[1], Andrew Gikas[1], Maurice J. Meade[2], Paolo M. Cattaneo[1]; [1]*The University of Melbourne, Melbourne, Australia,* [2]*The University of Adelaide, Adelaide, Australia*

AIM: Sleep-disordered breathing (SDB) is associated with significant adverse health outcomes, including impaired growth, behavioral issues, and cardiovascular complications. Early identification is crucial for timely intervention and improved long-term health. Orthodontists, due to their frequent and longitudinal contact with growing patients, are uniquely positioned to screen for early signs of SDB during routine clinical visits. The purpose of this cross-sectional study was to survey the awareness, clinical practices, and perceived barriers related to SDB screening among orthodontists in Australia.
MATERIALS AND METHOD: A pilot-tested electronic survey was distributed to 485 full members of the Australian Society of Orthodontists using Qualtrics online platform and included a combination of multiple-choice, Likert-scale, and open-ended questions. The questions focused on demographics, screening methods, perceived barriers, and attitudes toward education and interdisciplinary collaboration. Responses were analyzed descriptively using R software.
RESULTS: The response rate was 36%. Most respondents were experienced clinicians working in private practice (72%) and in urban/suburban settings (89.6%). Only a minority reported routine SDB screening, with the highest rates in Western Australia (9%) and New South Wales (8.9%), while nearly 30% reported no screening practices at all.

Screening practices varied across age groups, with school-aged children being the most assessed (29.8%), followed by adolescents and adults (27% each), then preschool-aged children (16.3%). Most orthodontists estimated that 5–10% of patients may have SDB. Clinical assessment predominantly relied on unstructured questions and clinical examination (42.3%), while validated sleep questionnaires were rarely used (11.2%). Where SDB was suspected, referral to relevant healthcare providers was the predominant action. The main barriers to routine screening were limited training (34.2%), lack of collaboration with physicians (30.8%), and absence of standardized screening protocols (33.6%). Most respondents expressed strong support for additional training (70%) and agreed that SDB screening should be formally included in the postgraduate orthodontic curriculum (87%).
CONCLUSIONS: Although Australian orthodontists recognize the importance of SDB screening, implementation remains inconsistent. Further training is required to improve early detection of SDB risk factors in orthodontic practice and ensure timely referral to appropriate healthcare providers.
PREVIOUSLY PUBLISHED ABSTRACT: no
Keywords: sleep-disordered breathing, orthodontics, screening, training, surveys and questionnaires

Abstract citation ID: cjag070.073
SP9 FROM VIRTUAL SETUP TO CLINICAL RESULTS: A SYSTEMATIC REVIEW ON INVISALIGN® SMARTTRACK PREDICTABILITY

Amal Bader Farraj, Miryam Rabin, Shmuel Einy; *Galilee Medical Center, Naharriya, Israel*

AIM: This systematic review aimed to provide a comprehensive evaluation of predictability across the dentition in adults treated with Invisalign® SmartTrack using a single series of aligners.
MATERIAL AND METHODS: A systematic search of Ovid MEDLINE (1946–December 2024), including In-Process, In-Data-Review, and Epub Ahead of Print, followed PRISMA guidelines, was conducted and registered in PROSPERO (CRD420251002641). Eligible studies were those reporting on planned and achieved tooth movements with SmartTrack. Data were extracted using the PICOS framework. Weighted predictability was calculated where possible, and regression analyses tested associations between planned movement magnitude and predictability. Risk of bias was assessed with ROBINS-I (v2) and certainty of evidence with GRADE.
RESULTS: Twenty-five studies were included (4 prospective, 21 retrospective). Most movements demonstrated moderate predictability (40–80%), varying by tooth morphology, movement type and prescribed magnitude. Higher predictability was reported for mesiodistal molar angulation, cusp-tip expansion, molar intrusion and mandibular incisor rotation. Torque, premolar rotation, buccolingual inclination, extrusion and overbite reduction outcomes were less predictable, with highly predictable outcomes often confined to minor displacements. Overcorrection improved predictability for molar angulation, premolar extrusion and canine expansion but reduced it for rotations and tipping. Failures (>110% or opposite-direction movement) were mainly attributed to poor aligner grip, occlusal interferences, or biomechanical constraints. The overall risk of bias was moderate to serious, with low-to-moderate certainty of evidence.
CONCLUSIONS: Clear aligner therapy with SmartTrack material achieves a wide range of orthodontic movements with variable, movement-dependent, moderate predictability. Optimal outcomes rely on targeted overcorrection, careful calibration of movement magnitude, and the use of adjunctive mechanics and staged refinements. Standardized, high-quality prospective studies with patient-level analyses are needed to establish evidence-based clinical guidelines for aligner biomechanics.
Keywords: Clear aligner therapy (CAT), Invisalign®, SmartTrack material, Tooth movement predictability, Overcorrection, Aligner Biomechanics, Tooth movement magnitude

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.074
SP10 EVALUATION OF SKELETAL AND SOFT TISSUE CHANGES IN CLASS II MALOCCLUSION TREATED WITH INVISALIGN® MANDIBULAR ADVANCEMENT AND TWIN-BLOCK APPLIANCES

Amal Bader Farraj[1], Miryam Rabin[1], Eyal Katzhendler[2], Gilad Har Zion[3], Shmuel Einy[1]; [1]Galilee Medical Center, Naharriya, Israel, [2]Hebrew University of Jerusalem, Jerusalem, Israel, [3]Private Practice, Jerusalem, Israel

AIM: This study aimed to compare the skeletal, dental, and soft tissue effects of the MA and TB appliances in growing Class II patients.
MATERIALS AND METHODS: This retrospective study included 34 adolescents with skeletal Class II malocclusion (17 treated with MA and 17 with TB). Lateral cephalograms were analyzed at the start (T1) and end (T2) of functional therapy using OrthoData Cephalometric Analysis Software. Skeletal, dental, and soft tissue parameters were measured, and inter- and intra-group comparisons were performed using t-tests or nonparametric equivalents ($p < 0.05$).
RESULTS: Both appliances produced significant sagittal correction, with reductions in ANB (MA: −1.92° ± 1.6; TB: −1.78° ± 1.24) and Wits appraisal (MA: −3.43 ± 1.79 mm; TB: −3.07 ± 2.45 mm). Vertical facial height increased with both appliances, though the FMA angle increased significantly only in the TB group (1.82° ± 2.18). Maxillary incisors exhibited retroclination (MA: −12.63° ± 8.30; TB: −5.41° ± 5.55), while mandibular incisors proclined similarly in both groups. Both appliances reduced overjet and overbite, with TB producing a greater bite-opening effect. The MA appliance also induced significant upper lip retrusion (−2.31 mm) and a reduction in facial convexity (−2.18°).
CONCLUSIONS: Both appliances effectively corrected skeletal Class II malocclusion through combined skeletal and dentoalveolar changes. The MA appliance demonstrated superior vertical control and more favorable soft tissue adaptation, with comparable sagittal and dental outcomes to the Twin Block.

Abstract citation ID: cjag070.075
SP14 A COMPARISON OF POLY-ETHER-ETHER-KETONE (PEEK) RETAINERS VERSUS MULTI-BRAIDED STAINLESS-STEEL RETAINERS: A RETROSPECTIVE COHORT STUDY

Estelle Kramer, Johanna Maertens, Lucky van Gennip; RadboudUMC, Nijmegen, Netherlands

AIM: The need for orthodontic stability after orthodontic treatment remains critical, and the search for the optimal fixed retainer material is ongoing. Poly-Ether-Ether-Ketone (PEEK), a semi-crystalline thermoplastic polymer, is an emerging material as a promising alternative to metal retainers. This study aimed to compare the survival of PEEK retainers with that of multi-braided stainless-steel (MBSS) retainers and to assess the influence of various treatment-related factors on the longevity of PEEK retainers.
MATERIALS AND METHOD: A retrospective cohort study of 914 OrthoMere patients (2019–2024) compared conventionally fabricated MBSS retainers with digitally designed PEEK retainers. Both were bonded using a standardized clinical protocol. Retainer failure was defined as detachment, fracture, or loss of intended function. Survival and failure characteristics were assessed using appropriate statistical analyses.
RESULTS: MBSS retainers showed a significantly higher risk of failure than PEEK retainers (HR = 1.98; 95% CI, 1.61-2.43). In total, 990 failures occurred involving 1777 teeth. Failures occurred most frequently in the upper canines (U3; 25.9%), followed by the upper lateral incisors (U2; 23.6%) and lower lateral incisors (L2; 15.3%). The cause, identified in 51.1% of cases, was most often interference from hard foods (45.4%). Debonding predominated (90.1%; MBSS 89.3%), while fractures were uncommon (PEEK 3.9%; MBSS 4.1%).
CONCLUSIONS: This study underlines the promising position Poly-Ether-Ether-Ketone (PEEK) has within orthodontic retention. However caution should be taken due to the retrospective nature of the study. Further prospective research needs to point out the clinical relevance of PEEK within orthodontic practices.

Abstract citation ID: cjag070.076
SP17 PREDICTING THE SUCCESS OF FUNCTIONAL APPLIANCE TREATMENT WITH A TWIN-BLOCK: A PROSPECTIVE COHORT STUDY

Deirdre Coffey and Susi Caldwell; University of Manchester, Manchester, United Kingdom

INTRODUCTION/AIM: Functional appliances are used with a view to achieving growth modification in orthodontics with the Twin-Block being the most utilized appliance in the UK. Despite the numerous reported effects with the Twin-Block, there is huge variability in treatment responses and there is a lack of consensus on the patient factors associated with greater success. The primary aim of this study was to identify any pre-treatment patient factors (clinical and radiographic) associated with a greater success of FA treatment with a TBA. A secondary aim of this study is to use these findings to develop a predictive equation to aid clinicians in case selection for FA treatment.
MATERIALS AND METHODS: This was a prospective cohort study. The study sample was selected from patients referred to the orthodontic units within Manchester University NHS Foundation Trust who were deemed suitable for Twin-Block treatment. Each patient was fitted with a Twin-Block appliance based on Clarks original design. Baseline clinical and radiographic measurements were taken at baseline (T1) and after six months of appliance wear (T2). The primary outcome was the percentage reduction in overjet from T1 to T2 and its association to the pre-treatment clinical and radiographic factors. The secondary outcome was to use these findings to aid in developing a predictive equation.
RESULTS: Data on 39 participants (24 males and 15 females, mean age 13.5 years +/- 1.3 years) was included in the final analysis. There was no significant relationship between overjet reduction at T2 and any pre-treatment morphological features of the sample. An association was identified between the extent of overjet reduction and the inclinations of the upper and lower incisors inclinations however, neither were statistically significant. Although a predictive equation was produced, the poor coefficient of determination (16%) limits its ability to predict the change in overjet.
CONCLUSION: The findings from this study did not identify a correlation between any pre-treatment clinical and radiographic factors and enhanced treatment success with functional appliance treatment with a Twin-Block. These findings generally mirror the existing evidence base which demonstrates inconclusive evidence regarding the predictive factors for treatment success with a Twin-Block.

Abstract citation ID: cjag070.077
SP19 ‡‡‡ SOLVING THE PUZZLE OF CENTRAL INCISOR IMPACTION

Basil Mumtaz and Deise Caldas Kühlman; DBM Dental Care / HiDent Educational Institution, Mansoura, Egypt

AIM: To present a structured, evidence-based protocol for the diagnosis and management of impacted maxillary central incisors, emphasizing the integration of surgical planning and orthodontic biomechanics to achieve optimal esthetic and functional outcomes.
MATERIALS AND METHODS: A series of clinical cases with impacted maxillary central incisors were analyzed to illustrate the principles of early diagnosis, radiographic assessment, flap design, and biomechanical strategies for guided eruption. The treatment sequence emphasized multidisciplinary coordination, using cone-beam computed tomography (CBCT) for three-dimensional evaluation, minimally invasive surgical exposure, and controlled force application for traction.
Interactive case discussions were also incorporated to evaluate different clinical scenarios and outcomes.
RESULTS: The reviewed cases demonstrated that timely diagnosis, appropriate surgical exposure, and well-controlled orthodontic mechanics led to predictable eruption and alignment of the impacted incisors. Patients exhibited improved soft-tissue profiles and stable periodontal health. Adherence to biomechanical principles, including light continuous forces and root protection of adjacent teeth, minimized complications such as root resorption or ankylosis. The proposed protocol provided consistent esthetic and functional success.
CONCLUSIONS: Effective management of central incisor impaction requires early recognition, meticulous surgical planning, and biomechanically sound orthodontic intervention. A structured, interdisciplinary protocol ensures optimal eruption guidance, root preservation, and stable esthetic outcomes. Applying these principles enables clinicians to effectively “solve the puzzle” of central incisor impaction and achieve predictable, patient-centered results.

Abstract citation ID: cjag070.078
SP20 ‡‡‡ EXOSOMES DERIVED FROM BMMSCS PROMOTE B10 CELL DIFFERENTIATION BUT NOT IL-10 PRODUCTION

Yingzhi Gu[1], Jiran Wang[1], Xiaozhe Han[2], Yuxing Bai[1]; [1]Beijing Stomatological Hospital, Capital Medical University, Beijing, China, [2]College of Dental Medicine, Nova Southeastern University, Florida, United States

AIM: The role of IL-10-producing regulatory B cells in inflammatory diseases has recently gained substantial attention. Here, we evaluated the function of mouse bone marrow mesenchymal stem cell-derived exosomes (BMMSC-Exos) and their effect on B-cell differentiation. This study aimed to establish an association

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

between BMMSC-Exos and purified B cells and further explored the anti-inflammatory effect of B10 cells.
MATERIALS AND METHOD: The expression of inflammatory factors, such as IL-1β, TNF-α, and bone metabolism-related factors, including RANKL, OPG, and secreted IL-10, was investigated by RT-qPCR and ELISA. Populations of CD1dhighCD5+ B cells were analyzed by flow cytometry and immunofluorescence. Cell viability was assessed by CCK8 assay.
RESULTS: The results showed that when B cells were separated from BMMSCs by Transwell, IL-1β, TNF-α, and RANKL were downregulated, whereas IL-10, OPG/RANKL, and CD1dhighCD5+ Breg proportion were upregulated in the cocultured groups. Conversely, when B cells were cultured with BMMSC-Exos, increasing concentrations of exosomes increased the proportion of CD1dhighCD5+ and IL-10+CD45+ Bregs; however, the secretion of both pro-inflammatory cytokines and IL-10 were decreased.
CONCLUSIONS: We found that BMMSC-Exos induce the differentiation of B cells toward the CD1dhighCD5+ and IL-10+CD45+ Breg phenotype but cannot increase the secretion of IL-10 in vitro.

Abstract citation ID: cjag070.079
SP24 ‡‡‡ VALIDATION OF A SEMI-AUTOMATED EVALUATION OF THE ABO ELECTRONIC CAST RADIOGRAPH-EVALUATION SCORE AS A MEASUREMENT TOOL FOR ORTHODONTIC OUTCOME

Gina Marie Georgi[1], Melika Khanloo[1], Till Köhne[1], Cita Nottmeier[1], Christian Hirsch[2]; [1]Department of Orthodontics, University Medical Center Leipzig, Leipzig, Germany, [2]Department of Paediatric Dentistry, University Medical Center Leipzig, Leipzig, Germany

AIM: This study aims to evaluate the accuracy and reproducibility of a semi-automated evaluation of the Electronic Cast Radiograph Evaluation (E-CRE) model score, as developed by the American Board of Orthodontics (ABO), compared to manual measurements.
MATERIALS AND METHODS: A total of 67 study models of patients who had completed orthodontic treatment were available, both as digital scans and as plaster models. Manual and digital evaluations followed the E-CRE guidelines, assessing six criteria: alignment, marginal ridges, buccolingual inclination, occlusal relationships, overjet and the root angulation. The digital models were graded using a semi-automated software tool in OnyxCeph3TM, while the plaster models were scored manually using the ABO measurement gauge. In addition, 20 models were scored manually and digitally by a second observer to assess inter-observer reliability.
RESULTS: The inter-observer reliability was excellent for digital measurements (ICC 0.94–1.00) and higher compared to those for manual measurements (ICC 0.90–0.97).

The correlation between digital and manual measurements was very high, with correlation coefficients ranging from 0.95 to 0.99. However, the digital evaluation produced slightly higher scores for alignment than the manual measurement (mean difference: +0.93; $p < 0.001$). In contrast, buccolingual inclination was rated marginally higher in the manual assessment (mean difference: - 0.18; $p < 0.001$). No significant discrepancies were detected for marginal ridges, occlusal relationship or overjet.
CONCLUSIONS: Semi-automated evaluation of ABO E-CRE scores using OnyxCeph3TM is highly reliable and involves less interpersonal variance than manual grading. However, scores measured digitally are in average 0.79 point higher than those measured manually (Scores below 30 are considered as acceptable treatment outcome).

Abstract citation ID: cjag070.080
SP25 CLINICAL APPLICATIONS AND EFFECTIVENESS OF 3D PRINTING TECHNOLOGY IN PEDIATRIC ORTHODONTICS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Yu Hua Yan[1] and Yu Li Lan[2]; [1]Tainan Municipal Hospital (Managed by Show Chwan Medical Care Corporation), Tainan, Taiwan, [2]Tzu Chi University, Hualien, Taiwan

AIM: This systematic review and meta-analysis evaluated the clinical applications, therapeutic effectiveness, and translational potential of 3D printing technology in pediatric orthodontics, with a focus on customized treatment design and efficiency enhancement.
MATERIALS AND METHOD: A systematic search was conducted in PubMed, Cochrane Library, Embase, CINAHL, and CEPS for studies published in English and Chinese up to October 2025. Eligible studies involving 3D-printed orthodontic appliances for pediatric patients were screened following PRISMA guidelines. Risk of bias was assessed using the Cochrane RoB 2.0 tool, and quantitative synthesis was performed using Review Manager 5.4.1. Effect sizes were expressed as standardized mean differences (SMD) with 95% confidence intervals (CI).
RESULTS: A total of 53 articles were identified; 9 studies (n = xxx pediatric patients) met inclusion criteria for meta-analysis. Compared with conventional fabrication techniques, 3D-printed orthodontic devices demonstrated significant improvement in treatment efficiency and clinical precision (SMD = −0.93; 95% CI: −1.45 to −0.39; $Z = -3.38$; $p < 0.001$). Notable benefits included enhanced appliance fit, reduced chairside time, and improved workflow through digital planning and rapid prototyping. Evidence was strongest for clear aligners, palatal expanders, and customized functional appliances.
CONCLUSIONS: 3D printing represents an emerging paradigm shift in pediatric orthodontics, offering precise personalization, higher treatment predictability, and improved clinical workflow efficiency. However, cost barriers, software proficiency requirements, and equipment availability may limit widespread implementation. Future research should prioritize long-term outcomes, cost-effectiveness analyses, and standardization of digital workflows to support broader clinical adoption.
Keywords: 3D printing, pediatric orthodontics, additive manufacturing, digital dentistry, customized appliances, meta-analysis

Abstract citation ID: cjag070.081
SP26 EXPLORING DIGITAL ORTHODONTIC CARE AND TELE-ASSISTED MODELS FOR PEDIATRIC PATIENTS: PRELIMINARY INSIGHTS FROM TAIWAN AND COMPARISON WITH EUROPEAN TRENDS

Yu Hua Yan; Tainan Municipal Hospital (Managed by Show Chwan Medical Care Corporation), Tainan, Taiwan

BACKGROUND AND AIM: Digital transformation in orthodontics has accelerated globally, driven by advances in intraoral scanning, AI-based treatment planning, virtual consultations, and patient remote monitoring. The European Orthodontic Society (EOS) has highlighted digital workflows and tele-orthodontics as emerging care models. Taiwan is beginning to explore similar applications in pediatric orthodontics. This study aims to examine digital pediatric orthodontic care trends, present early exploratory experience from Taiwan, and compare developmental trajectories with European practice.
METHODS: A narrative review and exploratory clinical model were adopted. International and Taiwan literature on digital orthodontics and tele-care was synthesized. Potential applications were evaluated within a regional hospital pediatric dental clinic using digital imaging documentation, parent communication tools (LINE-based support), cloud-based charting, and remote educational interactions. Feasibility, workflow implications, and clinical touchpoints were mapped and compared with documented European digital orthodontic pathways.
RESULTS: Digital tools demonstrated promise in pre-visit information exchange, parental counseling, treatment reminders, remote observation of minor orthodontic progress, and reinforcement of oral care behaviors. These applications improved communication efficiency and reduced unnecessary revisit demand. Compared with Europe, Taiwan benefits from high digital penetration and strong user acceptance, yet adoption remains exploratory due to absence of formal reimbursement mechanisms, regulatory clarity, clinician training pathways, and resource variation across regions. European systems show more established integration within standardized orthodontic workflows.
CONCLUSION: Digital pediatric orthodontic care and tele-assisted models hold potential to enhance patient engagement, continuity of care, and clinic workflow efficiency in Taiwan. While still early in adoption, Taiwan's infrastructure supports broader development. Future work should focus on creating standardized protocols, strengthening workforce training, integrating AI-based image assessment, and evaluating cost-effectiveness and policy frameworks to align with European advancement trends.
Keywords: Pediatric orthodontics, digital dentistry, tele-orthodontics, hybrid care, Taiwan, European comparison, remote monitoring

Abstract citation ID: cjag070.082
SP27 ENVIRONMENTAL IMPACT OF ORTHODONTIC TREATMENT: A FAST-TRACK COMPARATIVE LIFE-CYCLE IMPACT ASSESSMENT OF SELF-LIGATING METAL BRACKETS AND CLEAR ALIGNERS

Johanna Heezen[1], Geer van den Dungen[2], Mette Kuijpers[1], Edwin Ongkosuwito[1]; [1]RadboudUMC, Nijmegen, Netherlands, [2]Orthodontie Amersfoort, Amersfoort, Netherlands

AIM: Sustainability is a prominent topic in modern-day society, with a continuous trend toward reducing environmental impact. The growing amount of plastics pose environmental concerns, as does the release of greenhouse gasses during waste management. This study compares the environmental burden of clear aligners- versus self-ligating metal brackets (fixed appliances) and aims to visualize the phase(s) in production where improvements could best reduce impact.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

MATERIALS AND METHOD: A simplified fast-track life cycle impact assessment (LCIA) was performed for four illustrative patient cases (two aligner, two fixed appliances). All data and results were derived from the Industrial Design & Engineering Materials open access database (Idemat, 2024) and supplemented with manufacturer specifications. The functional unit was defined as "completion of one full orthodontic treatment course per patient". System boundaries included material production, manufacturing, transport, and end-of life disposal. Patient travel and clinical energy use were excluded. Environmental indicators were expressed as carbon footprint (kg $C0_2$-eq), cumulative energy demand (CED, megajoules (MJ)), and total ReCiPe score (Pt).
RESULTS: Clear aligners show a higher environmental impact in all assessed categories. Mean carbon footprint ranged from 20.58 – 24.75 kg $C0_2$ for clear aligners and 0.22 kg $C0_2$ in fixed appliance treatment. The Total ReCiPe ranges 0.54 – 0.66 Points (Pt) for clear aligners in contrast to 0.01 Pt in treatment with self-ligating metal brackets. These absolute values should be interpreted cautiously as they might overestimate true magnitudes.
CONCLUSIONS: Within the limitations of a small sample size and a simplified data model, fixed appliance treatment showed lower environmental impact than clear aligner treatment. The results are exploratory and require validation through larger, clinically based studies incorporating sensitivity analyses and multi-source datasets. The 'materials' phase seems a key contributor, stimulating environmentally conscious decision making.

Abstract citation ID: cjag070.083
SP29 BODY DYSMORPHIC DISORDER: TRANSLATION, CROSS-CULTURAL ADAPTATION AND VALIDATION OF THE BODY IMAGE DISTURBANCE QUESTIONNAIRE AMONG MALAYSIAN ORTHODONTIC POPULATION

Ruzanna Hussain, Nurul Aliaa Ahmad Fauzi, Zamri Radzi; *Universiti Malaya, Kuala Lumpur, Malaysia*

AIM: Body Dysmorphic Disorder (BDD) is increasingly recognized in orthodontic practice, where dissatisfaction with facial appearance may influence treatment expectations and outcomes. This study aimed to translate, culturally adapt, and validate the Body Image Disturbance Questionnaire (BIDQ) for use among Malaysian orthodontic patients to provide a reliable tool for early identification of negative body image perceptions.
MATERIALS AND METHODS: The English BIDQ underwent a forward–backward translation based on international methodological standards. Bilingual translators and eight experts—orthodontists, psychiatrists, methodologists, and linguists—evaluated conceptual equivalence and cultural suitability. Iterative revisions resolved semantic discrepancies. The translated version was tested with 30 adult orthodontic patients to determine clarity and comprehension. Further evaluation included item- and scale-level content validity indices (I-CVI, S-CVI), face validity indices (I-FVI, S-FVI), and inter-rater agreement (Kappa) was assessed.
RESULTS: The Body Image Disturbance Questionnaire (BIDQ) was successfully translated and culturally adapted for the Malaysian population using the forward–backward translation method, resulting in the Malay version (M-BIDQ). A panel of eight experts conducted content validation and achieved a perfect Content Validity Index (CVI) score of 1.00 for relevance and representativeness, with a Kappa coefficient of 0.78, indicating substantial agreement among raters. Face validation with 30 adult orthodontic patients confirmed the clarity and comprehensiveness of the questionnaire, yielding a high Face Validity Index (FVI) score of 0.89.
CONCLUSIONS: The M-BIDQ represents the first validated Malay instrument specifically designed to assess body image disturbance in orthodontic settings. Its excellent content and face validity confirm its suitability for clinical and research use. The adaptation process ensured not only linguistic but also cultural sensitivity, enhancing patient comprehension and response accuracy. The M-BIDQ offers orthodontists a practical screening tool to recognize patients at risk of BDD-related dissatisfaction before or during treatment. Further psychometric validation, including factor structure and criterion testing, is recommended to expand its application across wider Malaysian populations.

Abstract citation ID: cjag070.084
SP32 EFFECT OF CLEAR ALIGNERS ON ROOT LENGTH IN ENDODONTICALLY TREATED TEETH: A SYSTEMATIC REVIEW

Ioanna Pouliezou[1], Nefeli Katanaki[2], Nikolaos P. Kerezoudis[3], Iosif Sifakakis[1]; *[1]Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece, [2]Division of Orthodontics, University of Geneva, Geneva, Switzerland, [3]Department of Endodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece*

AIM: To systematically synthesize available research addressing the potential effects of clear aligner orthodontic treatment on root length changes in endodontically treated teeth.
MATERIALS AND METHOD: Four electronic databases were searched until May 2025 and lists of references from relevant publications were screened to identify studies (randomized clinical trials, controlled clinical trials, and observational studies) written in the English language with no date restriction. Clinical studies comparing clear aligner orthodontic treatment in endodontically treated teeth versus vital pulp teeth in humans, using cone beam computed tomography or panoramic radiographs to evaluate root resorption, were assessed. Following study selection and data extraction, the risk-of-bias assessment was evaluated with the Newcastle-Ottawa tool for the observational studies.
RESULTS: A total of 173 studies were retrieved, and ultimately 2 observational cohort studies were included in the systematic review, encompassing 135 patients (69.6% female; with an average age of 22.5 years). The present review found an association between endodontic status and root resorption, with vital pulp teeth (VPT) exhibiting a greater degree of resorption compared to root canal treated teeth (RCT). Clear aligner (CA) orthodontic treatment resulted in less root resorption than fixed orthodontic appliances (FAs).
CONCLUSIONS: Limited evidence indicates that clear aligner orthodontic treatment leads to a lower occurrence of root resorption and fewer cases of severe root resorption in endodontically treated teeth. Based on findings from studies comparing CAs to FAs, there is overall significantly greater resistance to root resorption in RCT than VPT, irrespective of the orthodontic treatment modality (CAs or FAs).
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.085
SP33 ‡‡‡ *** ALVEOLAR BONE MODELING OBSERVED IN RESPONSE TO TREATMENT WITH SLB (DAMON ULTIMA SYSTEM) AND EARLY LIGHT ELASTIC OF PATIENTS WITH SKELETAL CLASS III MALOCCLUSION

Bashar Muselmani[1] and Stefan Kopp[2]; *[1]Practice for Orthodonticts, Kaiserslautern, Germany, [2]Clinic for Orthodontic, Frankfurt, Germany*

AIM: Objectives to investigate the skeletal and dental alveolar changes of patients with skeletal Class III malocclusion treated with early light elastic protocol and Damon Ultima system.
MATERIALS AND METHOD: This retrospective cephalometric study was performed on a sample of 20 patients with a skeletal Class III malocclusion. (12 males, 8 females, age 12.7 +/- 1.5 years) treated with early light elastic protocol and Damon Ultima system. The cephalometric analysis was performed at the beginning (T1) and the end of the orthodontic therapy (T2). Angular and linear cephalometric variables were blindly measured by one investigator and repeated after 6 weeks. An error measurement (Dahlberg's formula) study was performed to evaluate the intra-examiner reliability. A paired-sample t test ($p < 0.05$) was used to compare each variable from T1 to T2.
RESULTS: In T2, the post-treatment cephalometric values showed a forward displacement of the maxilla, resulting in a statistically significant ($p < 0.0001$) increase of the SNA angle. ANPg and Wits appraisal improved significantly compared with T1. Significant increases were found in measurements for the Po Or-NBa angle ($P<0.05$), Go-Me/S-N ratio ($P<0.01$), lower facial height proportion ($P<0.05$), interincisal angle ($P<0.01$). The decreases in the gonion angle ($P<0.01$), upper gonion angle ($P<0.01$), and L1-ML angle ($P<0.01$) were also statistically significant post treatment (T2).
CONCLUSIONS: The early elastic protocol with Damon Ultima system was effective for the treatment of Class III malocclusion in growing patients, with favorable maxillary advancement and control of vertical skeletal relationships.

The lateral radiograph and cephalometric analysis showed a good balance of the skeletal pattern, a good profile of the soft tissue, and proper inclinations of the maxillary and mandibular incisors in relation to maxilla and mandible.

Abstract citation ID: cjag070.086
SP34 *** BRACIE: A DIGITAL ORTHODONTIC COMPANION

Todd Smyth[1] and Robert Craig[2]; *[1]University College Cork, Cork, Ireland, [2]NA, NA, United Kingdom*

AIM: To produce an innovative, fun and easy to use App that allows patients to track treatment progress with a photo diary, record appointment details, and access orthodontist's instructions. Other features include a brushing aid for maintenance of oral hygiene and a library of information leaflets accessible in a convenient way.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

MATERIALS AND METHODS: An iOS App was developed that allows entry of appointment details, instructions, and photographs to track treatment progress. This aims to motivate patients, improve compliance and act as an information resource. The orthodontist can also record a voice memo for verbal instructions or motivation. Reminders for future appointments can set and added automatically into the user's smartphone calendar.

Images of the dentition can be taken by the patient as treatment progresses. These are recorded in the Gallery, forming an easy to view record of progression and improvement in aesthetics.

A toothbrushing timer and guide was developed that demonstrates the surfaces to brush in real time alongside recording frequency of brushing over time. Frequency is displayed in a heat map, providing at a glance assessment of compliance. The timer automatically adjusts to the oral hygiene regime set out in most recent appointment.

The App contains a database of information relating to orthodontic treatment. The most relevant articles can be flagged for future reference. This was developed using British Orthodontic Society information leaflets to ensure accuracy of advice.

RESULTS: Development of an innovative and patient centred App that bridges the gap between the clinic and the patient's home. It involves patients in their own care and offers information in a convenient way alongside tracking their own progress.

CONCLUSION: This iOS App aims to enhance patient engagement and compliance by integrating appointment tracking, photographic progress recording, voice memos, and oral hygiene aids. The evidence-based information library supports patient education, bridging the gap between clinic and home. Overall, it promotes motivation, understanding, and aims to improve treatment outcomes through convenient digital support.

Abstract citation ID: cjag070.087

SP35 DIGITAL VERSUS ARTIFICIAL INTELLIGENCE AUTOMATED TRACING: A COMPARATIVE ANALYSIS OF LANDMARKS RELIABILITY, ACCURACY AND EFFICIENCY IN LATERAL CEPHALOGRAMS

Izzati Mohd Shaharuddin[1], Niall McGuinness[2], Finn Geoghegan[3], Aman Ulhaq[4]; *[1]The University of Edinburgh, Edinburgh, United Kingdom, [2]Edinburgh Dental Institute, Edinburgh, United Kingdom, [3]Trinity College Dublin, Dublin, Ireland, [4]York Hospital, York, United Kingdom*

AIM: The aim is to compare the accuracy and reliability of artificial intelligence-based cephalometric tracing tools (WebCeph and Angelalign) relative to manual digital tracing using Dolphin software.

MATERIALS AND METHOD: 51 lateral cephalograms were traced using three software programs: Dolphin, WebCeph, and Angelalign. 24 anatomical landmarks were identified for each radiograph. Intra-rater reliability was assessed by retracing 20 lateral cephalograms after two weeks. Radial errors were calculated by comparing the AI-generated coordinates to the reference Dolphin tracings. Paired t-test was used to compare the radial errors between Dolphin-Webceph and Dolphin-Angelalign tracings. The Intraclass Correlation Coefficient (ICC) was used to assess the intra-rater reliability and the reliability of the AI-tracing tools. Repeated-measure ANOVA was used to assess the time efficiency of each tracing tool and to compare the coordinates obtained from the three tracing tools.

RESULTS: 23 of 25 variables showed excellent agreement (ICC≥0.75), indicating strong consistency in tracing with the Dolphin software. Of the 24 landmarks evaluated, 10 demonstrated statistically significant differences ($p<0.05$) in radial error values between Dolphin-Angelalign and Dolphin-Webceph. These landmarks included Sella, Pogonion, Gonion, A point, L1 apex, Glabella, Pronasale, Subnasale, soft tissue Pogonion, and Labrale Inferius. The findings suggest that Angelalign consistently exhibits smaller radial error values than WebCeph across most landmarks when evaluated against manual digital Dolphin tracings. This trend was statistically significant ($p<0.05$) in 10 landmarks and eight landmarks showing lower radial error in Angelalign. All ICC values for Angelalign (ranging from 0.937 to 0.994) indicated excellent agreement, demonstrating high reliability. In contrast, ICC values for WebCeph (ranging from 0.094 to 0.994) showed greater variability. In terms of time efficiency, WebCeph (5.396±1.032 seconds) and AngelAlign (7.279±0.912 seconds) were significantly faster than Dolphin (106.054±8.459 seconds). All pairwise comparisons showed significant differences ($p<0.001$). Repeated-measures ANOVA across 24 landmarks revealed sporadic significant differences in *x*- and *y*-coordinates, with no consistent pattern identified.

CONCLUSIONS: Angelalign aligned closely to Dolphin across landmarks, suggesting better reliability and accuracy. While AI tools offer considerable improvement in efficiency for cephalometric analysis, it is crucial to consider the performance differences between programmes when applying them in clinical settings.

Abstract citation ID: cjag070.088

SP36 ‡‡‡ SIMPLIFIED TABLE-BASED ANALYSIS FOR BIMLER CEPHALOMETRIC EVALUATION

Roberto Martins; *Independent Reseacher, Porto Alegre, Brazil*

AIM: The aim of this study is to present a simplified Bimler cephalometric diagnostic chart designed to improve the speed and clarity of skeletal and functional interpretation, enabling orthodontists to identify key variables at a glance and to make faster, more reliable clinical decisions.

MATERIALS AND METHOD: A series of concise tables was developed to reorganise essential Bimler cephalometric parameters into clearly structured analytical schemes. The tables included sagittal, transverse, and vertical measurements, mandibular posture, maxillary growth characteristics, and soft-tissue patterns. Data were collected in a longitudinal clinical setting beginning in 2001. The system was applied to more than 200 patient records (ages 8–42 years) in private practice and by collaborating clinicians. All cases had been previously assessed using conventional Bimler charts. Diagnostic interpretation time, error rate, and clinician agreement were compared between the traditional charts and the simplified tables. Error frequency was defined as discrepancies in the classification of skeletal imbalance. Inter-observer agreement was analysed qualitatively based on consistency of diagnosis among clinicians.

RESULTS: Use of the simplified tables reduced the average diagnostic interpretation time from 14.2 ± 3.1 minutes to 6.8 ± 1.9 minutes per patient ($p < 0.001$). Error frequency decreased from 12.4% to 3.8%, demonstrating greater diagnostic stability. Clinicians reported faster recognition of mandibular deviation, transverse deficiency, and functional imbalance. In 91% of cases, the simplified charts enabled identification of the primary cephalometric variable without the need for remeasurement. Feedback indicated that the system was particularly helpful in cases of mild skeletal discrepancies and mixed dentition, where conventional records required multiple cross-checks. The reduced cognitive load and improved visual organisation contributed directly to faster and more consistent diagnostic outcomes.

CONCLUSIONS: The simplified table-based approach increased speed, reliability, and clinical consistency in Bimler cephalometric interpretation, while simultaneously reducing diagnostic error. The clear visual layout enhanced clinical reasoning and accelerated treatment planning. These findings suggest that simplified diagnostic tables represent a valuable complementary tool for orthodontists using Bimler analysis, particularly in high-volume clinical environments or multidisciplinary practices. The method demonstrates potential for wider international adoption and digital integration in future orthodontic workflows.

Abstract citation ID: cjag070.089

SP43 A FOUR CYCLE AUDIT ON THE QUALITY OF ORTHODONTIC PHOTOGRAPHY AT THE ROYAL SURREY COUNTY HOSPITAL

Suhavi Singh, Lorna Hirst, Gursharan Minhas; *Royal Surrey County Hospital, Surrey, United Kingdom*

A FOUR CYCLE AUDIT ON THE QUALITY OF ORTHODONTIC PHOTOGRAPHY AT THE ROYAL SURREY COUNTY HOSPITAL

AIM: To evaluate and improve the standard of orthodontic clinical photography at the Royal Surrey County Hospital (RSCH) against auditable benchmarks outlined by the Institute of Medical Illustrators (IMI) and the British Orthodontic Society (BOS). High-quality standardised imaging is essential for diagnosis, treatment planning, education, and medico-legal documentation.

MATERIALS AND METHOD: A four-cycle Quality Improvement Audit (2022–2025) was conducted in collaboration with the Medical Illustration Department. Twenty consecutive patients were assessed per cycle (n = 80). Twenty-seven domains were audited per IMI standards across extra- and intra-oral views. The target standard was set at ≥ 90 % compliance per domain. Following Cycle 1, root-cause analysis identified recurring faults—particularly inadequate buccal shots due to incorrect angulation and limited retraction. Interventions introduced through successive PDSA cycles included (i) staff teaching on retraction and camera angulation, (ii) revision of data-collection sheets, (iii) equipment review and standardisation of retractors, and (iv) ongoing feedback to medical photographers. Data were analysed descriptively and compared across cycles.

RESULTS: Initial compliance (Cycle 1) showed 50 % of extra-oral and 25 % of intra-oral photographs achieving 100 % across all domains. Problematic domains included molar relationship (35 %), buccal view at 90° (52.5 %), and occlusal view at 90° (55 %). After the first teaching intervention (Cycle 2), improvements were observed: molar relationship 65 %, buccal view at 90° 80 %, and occlusal view at 90° 80 %. Subsequent cycles (3 & 4, 2024–25) demonstrated sustained performance, with > 90 % compliance in all extra-oral parameters and ≥ 85 % in all intra-oral domains.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Patient satisfaction surveys (n = 30) reported > 95 % positive experience with the Medical Illustration process.
CONCLUSIONS: Targeted interventions and interdisciplinary collaboration significantly improved compliance with national standards for orthodontic photography at RSCH. The introduction of structured teaching, retractor review, and continuous feedback successfully enhanced diagnostic image quality and sustainability. Continued periodic audit is recommended to maintain high standards amid staff turnover and equipment change.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.090
SP44 ‡‡‡ THE RELATIONSHIP BETWEEN DENTAL OCCLUSION AND BODY POSTURE: A SYSTEMATIC REVIEW

Maryna Bilous and Myroslava Drohomyretska; *Shupyk National Medical Academy of Postgraduate Education, Department of Orthodontics, Kyiv, Ukraine*

AIM: To systematically evaluate the current evidence on the interrelationship between the stomatognathic and postural systems, with emphasis on diagnostic methodologies and analytical tools used to investigate their connection.
MATERIALS AND METHOD: A comprehensive systematic search was conducted in PubMed, MEDLINE, ScienceDirect, Google Scholar, and the Cochrane Library for studies published between January 2010 and November 2025. Additional papers were identified through reference screening. Eligible studies included original research analysing the association between dental occlusion and body posture in paediatric, adolescent, mixed-age, or adult populations. Exclusion criteria were abstracts without full text, systematic reviews, and studies with fewer than twenty participants. Forty-three full-text papers met the inclusion criteria and were assessed through qualitative narrative synthesis. Twenty-six studies involved paediatric or adolescent samples, seventeen examined adult or mixed-age populations, and five provided methodological or theoretical context.
RESULTS: Evidence from the included studies suggests a significant association between malocclusion and postural parameters, including spinal curvature, cervical alignment, balance control, and gait characteristics. Eight studies reported a strong relationship between malocclusion and global body posture, five demonstrated significant associations with the cervical vertebral column and head posture, five identified links with the podal system, and three described correlations with gait parameters. However, methodological variability, heterogeneity of instrumentation, and differences in population characteristics limited the ability to conduct quantitative synthesis or infer causality. Associations appeared more consistent and pronounced in paediatric populations, where growth and neuromuscular adaptation may amplify functional interdependence.
CONCLUSIONS: Current evidence supports a functional and bidirectional relationship between occlusal condition and postural control, particularly evident in children and adolescents. The quality of evidence was strong for associations involving body posture and the podal system and moderate for cervical alignment and gait parameters. These findings underline the importance of multidisciplinary collaboration among orthodontists, physiotherapists, and orthopaedists in assessment and management. Further longitudinal cohort studies using standardised postural evaluation protocols are warranted to clarify causal mechanisms and to optimise integrated clinical approaches for postural and occlusal rehabilitation.

Abstract citation ID: cjag070.091
SP45 QUALITY OF LIFE IN AMELOGENESIS AND DENTINOGENESIS IMPERFECTA PATIENTS: A FACE-Q KIDS ASSESSMENT

Coral Martín Fernández, Ewald Bronkhorst, Edwin Ongkosuwito; *Radboud UMC, Nijmegen, Netherlands*

AIM: Hereditary dental disorders such as *Amelogenesis Imperfecta* (AI) and *Dentinogenesis Imperfecta* (DI) show disrupted enamel and dentin formation. Adolescents and young adults with these disorders often experience social distress, aesthetic concerns, and functional limitations that may negatively affect their psychosocial well-being. This study aims to assess quality of life in this patients using the Dutch version of the FACE-Q Dental module, a validated patient-reported outcome measure for individuals aged 7–29 years.
MATERIALS AND METHODS: Between April 2023 and June 2025, patients that had visited the clinic at Radboud University Medical Center aged 7–29 years diagnosed with non-syndromic AI or DI were invited to participate. Diagnosis was confirmed through clinical records and medical history. Participants completed the Dutch FACE-Q Dental module assessing facial appearance, oral function, and quality of life. Additional condition-specific questionnaires were administered to capture patient perspectives more comprehensively. A control group included 127 individuals that were referred for a general first orthodontic consultation. For statistical purposes, Rasch scores were calculated for each domain, and independent-samples *t*-tests were conducted to compare the groups.
RESULTS: The patient group included 46 individuals with AI or DI.; Significant differences were observed between patients and controls in the *Eating and Drinking* and *Appearance Distress* domains. In the *Eating and Drinking* domain, controls (M = 25.78, SD = 1.88) scored significantly higher than patients (M = 22.08, SD = 4.72), with a mean difference of 3.70 points (t(50.463) = -5.160; p < 0.001). In the *Appearance Distress* domain, controls (M = 28.74, SD = 2.28) also scored higher than patients (M = 26.61, SD = 5.73), with a mean difference of 2.13 points (t(50.298) = -2.453; p = 0.009). These findings indicate that patients experience greater difficulties with eating and drinking and higher appearance-related distress than healthy controls, suggesting that these conditions affect daily functioning and psychosocial well-being.
CONCLUSIONS: Patients with AI and DI exhibit significantly lower quality-of-life scores related to eating, drinking, and appearance compared to healthy controls. These results highlight the need for multidisciplinary team care that address both the functional and psychosocial aspects of hereditary dental disorders.

Abstract citation ID: cjag070.092
SP46 ‡‡‡ ANALYSIS OF THE UPPER INCISOR INCLINATION PRIOR TO ORTHOPAEDIC TREATMENT OF CLASS III TO DETERMINE THE ANCHORAGE OF THE EXPANDER (DENTAL OR DENTOSKELETAL-SUPPORTED)

Claire Koutsandreou and Paula Santana Nuez; *Universidad de Sevilla, Sevilla, Spain*

AIM: The study aimed to assess upper incisor inclination in Class III patients treated with a facial mask, comparing tooth-borne and bone-borne anchorage.
MATERIALS AND METHOD: A retrospective comparative study was conducted at the University of Seville, on 60 patients (mean age 11.2 years), divided into two groups of 30. Group 1: tooth-borne expander (HYRAX) + facial mask (mean age 9.9 years). Group 2: bone-borne expander (MARPE) + facial mask (mean age 12.4 years). Treatment combined rapid maxillary expansion with facial mask (400–500 g, 14–16 h/day, 9–12 months). Cephalograms were taken at baseline (T0) and post-treatment (T1). Data were analysed with repeated-measures GLM, Bonferroni tests, $\alpha = 0.05$.
RESULTS: The HYRAX group showed significant increases in angular measurements (IS-PP: +3.57 ± 3.89°, U1-SN: +3.49 ± 4.09°, IS-NA: +2.31 ± 4.26°, U1-FH: +2.90 ± 4.40°), indicating a buccal tipping of the incisors. Conversely, the MARPE group exhibited decreases in the same variables (from −3.82 ± 2.66° to −4.53 ± 3.23°), suggesting improved dentoalveolar control. Intergroup comparisons revealed statistically significant differences ($p < 0.05$) for all angular measurements.
CONCLUSIONS: The type of anchorage in maxillary expansion significantly influences upper incisor inclination. HYRAX causes upper incisor proclination (more in hyperdivergent patients), while MARPE produces generalized retroclination with minimal pattern variation. Maxillary expansion with facial mask improves sagittal skeletal relationships, with stronger effects in MARPE and hyperdivergent patients. Skeletal anchorage is preferred for better dentoalveolar control, ensuring stability and long-term aesthetics beyond skeletal maturation criteria.

Abstract citation ID: cjag070.093
SP48 ‡‡‡ BIOMECHANICAL IMPLICATIONS OF REMOVING ANTERIOR CROWN LABIAL TORQUE IN STAINLESS STEEL REVERSE CURVE OF SPEE ARCH WIRES DURING DEEP BITE

Farah A. Shakhtour[1], Flavia Pires Rodrigues[1], Asmaa Altaie[1], Kazim Al-Nimri[2]; [1]*University of Leeds, Leeds, United Kingdom,* [2]*Jordan University of Science and Technology, Irbid, Jordan*

OBJECTIVES: To investigate the isolated effect of removing anterior crown labial torque (CLT) from 0.019×0.025-inch stainless steel (SS) reverse curve of Spee (RCOS) arch wires on lower anterior and posterior vertical and horizontal movements, as well as the duration required to correct deep overbite.
MATERIALS AND METHODS: Fifty-four individuals with deep overbite were randomized into two groups: Group I (SS RCOS with anterior CLT) and Group II (SS RCOS without CLT). In Group II, the anterior CLT was neutralized by adding crown lingual torque before forming the reverse curve. A customised guidance mould ensured identical RCOS curvature in both groups. Standardized pre- and post-levelling lateral cephalograms were superimposed along the mandibular corpus axis to evaluate vertical and horizontal tooth positional changes. Shapiro–Wilk assessed normality of all cephalometric measurements. Baseline skeletal/dental characteristics were compared using independent t-tests, and gender distribution using

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Chi-square. Intergroup comparisons of dental changes during levelling were performed using independent t-tests with a significance threshold of $p<0.05$.
RESULTS: Forty-two individuals completed treatment. The groups were matched in all pre-treatment skeletal and dental variables. Group I exhibited significantly greater lower incisor proclination (4.8° vs. −0.3°, $p\leq0.001$) and forward movement (0.93 mm vs. −0.01 mm, $p<0.001$). In contrast, Group II demonstrated significantly greater distal tipping of the lower molars (p=0.03–0.008). Mean distal tipping of the lower first and second molars in Group I was 0.5° and 4.09°, compared with 3.35° and 7.72° in Group II. Vertical positional changes did not differ significantly between groups for either the anterior or posterior teeth ($p>0.05$). Removal of CLT reduced levelling duration by approximately 25 days.
CONCLUSIONS: Eliminating anterior crown labial torque reduces unwanted incisor proclination and forward displacement and shortens levelling time. However, this modification increases molar distal tipping, which may require additional anchorage to maintain posterior control.

ACKNOWLEDGEMENT: This research was funded by the Deanship of Research, Jordan University of Science and Technology. The authors also acknowledge the University of Petra for supporting the PhD studies of Farah Shakhtour, and the University of Leeds for support toward attendance at the European Orthodontic Conference 2026.

Abstract citation ID: cjag070.094
SP49 PATIENT ADHERENCE IN ORTHODONTICS: A SCOPING REVIEW

Ronald Max van der Bie, Annemieke Bos, Jan Joseph Mathieu Bruers, Ronald Edwin Gaston Jonkman; *Academic Centre for Dentistry Amsterdam, Amsterdam, Netherlands*

BACKGROUND: Patient adherence is a key factor in achieving orthodontic treatment success. Despite an evolution in orthodontic healthcare, no recent comprehensive reviews are available on adherence in orthodontics. This scoping review provides an evidence-based overview of the literature available on multiple aspects of adherence in orthodontics, during both active
treatment as well as during the retention phase. Knowledge gaps identified in the literature are listed.
METHODS: The protocol for this scoping review was preliminary registered in the Open Science Framework (https://doi.org/10.17605/OSF.IO/EC6QD). This protocol was drafted according to the guidelines of the PRISMA extension for Scoping Reviews (PRISMA-ScR). The following electronic databases were searched: Embase, PubMed and Web of Science Core Collection. The following key terms, including synonyms and subheadings of the MeSH terms, were used: 'treatment adherence and compliance' and 'orthodontics'. Inclusion criteria were studies investigating any form of adherence in orthodontics published in English from 2006 onwards. Exclusion criteria were studies investigating adherence in patients unable to coincide with their therapist's recommendations and advice because of an intellectual or physical disability, patients with oral cleft and craniofacial conditions and patients treated solely for obstructive sleep apnea. Non-peer-reviewed studies and case reports were excluded as well.
RESULTS: A total of 3284 articles were identified, 60 of which met the criteria for final inclusion.
CONCLUSIONS: A reasonable amount of research on patient adherence in orthodontics has been conducted. It appears only conclusions based on objective measurement methods provide valid evidence, however there is a large discrepancy in reported findings. Also, studies do not relate the degree of adherence to treatment results or stability, which could be explained by the study's relatively short examination periods. This makes it difficult to provide clear statements on the impact of the degree of adherence on desired treatment results or orthodontic stability. At this moment, there is no conclusive evidence on which factors have a significant impact on patient adherence or how adherence can be promoted. It is recommended to conduct research with larger study populations followed up over a longer period, or to conduct retrospective research using data of patients who completed comprehensive orthodontic treatment.

Abstract citation ID: cjag070.095
SP50 WIRELESS SENSOR-INTEGRATED SMART CLEAR ALIGNERS FOR ORTHODONTIC FORCE MEASUREMENT

Miao Liu[1], Siqi Zeng[2], Jiebo Li[2], Ning Zhang[1]; *[1]Department of Orthodontics, Beijing Stomatological Hospital and School of Stomatology, Capital Medical University, Beijing, China, [2]Key Laboratory of Biomechanics and Mechanobiology (Beihang University), Ministry of Education, Institute of Medical Photonics, Beijing Advanced Innovation Center for Biomedical Engineering, School of Biological Science and Medical Engineering, Beihang University, Beijing, China*

AIM: To integrate wireless sensors with clear aligners for accurate measurement of orthodontic forces.
MATERIALS AND METHODS: Wireless sensors were fabricated using polydimethylsiloxane (PDMS) via laser sintering, followed by stability analysis and force calibration. Integrated smart aligners were produced by co-pressing PDMS, 3M single-sided adhesive, and clear aligner films. In vitro validation was conducted on 3D-printed models simulating incisor en-masse retraction and molar intrusion (0.1–0.5mm deformation). Biosafety was assessed via CCK-8 assays and Calcein AM/PI staining of human oral gingival fibroblasts cultured with 1–14 day aligner extracts, plus rat mucosal irritation, blood tests, and visceral HE staining. In vivo long-term testing (14 days) was performed on volunteers with central incisor en-masse retraction (0.2mm deformation).
RESULTS: The sensor maintained good stability for 14 days, with the encapsulated aligner showing excellent aesthetics and responsiveness. Orthodontic forces were 0.5–1.3N for 0.1–0.5mm en-masse retraction of the right upper central incisor and 0.1–0.65N for 0.1–0.5mm intrusion of the left lower first molar. Fibroblast survival rate exceeded 85% with all extracts; no mucosal irritation or systemic toxicity was detected in rats. In vivo, initial force (2.14N at 0.2mm retraction) dropped rapidly to 0.99N at 8 hours, stabilized after 4 days, and decreased to 0.51N on day 14.
CONCLUSIONS: Sensors offer good aesthetics and, when integrated with clear aligners, enable sensitive and stable long-term monitoring of orthodontic forces in the oral cavity.

Abstract citation ID: cjag070.096
SP51 ‡‡‡ SKELETAL AND DENTOALVEOLAR CHANGES IN THERAPY OF CLASS III MALOCCLUSIONS WITH BOLLARD MINIPLATES

Raphael Mohammad, Josef Kucera, Rene Foltan; *Department of Stomatology, First Faculty of Medicine and University Hospital, Charles University, Prague, Czechia*

AIM: The aim of this study was to evaluate effects of orthopedic therapy with Bollard miniplates and elastic forces on skeletal and dentoalveolar changes in patients with skeletal Class III. Another aim was to study whether a patient´s age, sex and growth parameters influence the efficiency of the therapy.
MATERIAL AND METHOD: The study included 71 patients (34 males, 37 females) aged between 10 and 15 years (mean age = 12.86 yrs) with skeletal Class III treated with Bollard miniplates and elastic forces according to De Clerck protocol. Cephalograms were analyzed at different time periods (T1 – entry examination, T2 – 6 months, T3 – 1 year, T4 – 2-4 years after the therapy).
RESULTS: The therapy resulted in statistically significant increase in values SNA ($p < 0,0001$),, ANB $p < 0,0001$)and WITS ($p < 0,0001$) which shows the maxilla protraction. The most significant changes were found one year after the beginning of the therapy (T1-T3). The impact of the orthopedic therapy on the growth of the mandible was not statistically significant. Significant changes in the lower incisors proclination (1-ML) $p = 0,0074$), ventral movement of upper incisors (1:NPo) ($p < 0,0001$) and growth rotation of the mandible to anterior rotation were also found (Go°) ($p = 0,0027$).. Patients´ sex and age showed no statistically significant impact on the therapy efficiency. The therapy is more efficient in patients with hypodivergent or normodivergent growth of jaws.
CONCLUSION: Orthopedic therapy with Bollard miniplates is effective for the maxilla protraction in patients with skeletal Class III. The most significant changes were reported one year after the therapy.

Abstract citation ID: cjag070.097
SP52 ‡‡‡ *** DEROTATIONAL MOVEMENT GENERATED BY 3D-PRINTED ALIGNER WITHOUT ATTACHMENTS: A PILOT STUDY

Geng Lim Lee, Siti Adibah Othman, May Nak Lau; *Department of Orthodontics, Paediatric & Special Care Dentistry, Faculty of Dentistry, Universiti Malaya, Kuala Lumpur, Malaysia*

AIM: 3D-printed aligners made with Tera Harz TC-85 (Graphy Inc, Seoul, Korea) are recognised for their shape memory properties and precise fit, minimising the necessity for attachments. This study aimed to pilot test the effectiveness of these aligners in derotating round-shaped teeth without the use of attachments.
MATERIALS AND METHOD: A prospective pilot study was conducted on four patients who presented with five rotated premolars (four maxillary first premolars and one mandibular second premolar) exhibiting rotations greater than ten degrees. Each aligner was designed with a three-degree derotation for the studied premolar and was worn full-time for ten days, except during meals and tooth brushing. The study involved wearing five aligners for a total of fifty days. The rotation angle of the studied premolar was derived from the angle formed between the premolar axis and a fixed reference axis. The effectiveness of 3D-printed aligner in derotating

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

the premolars without attachment was then determined by the percentage change in the rotation angle of the studied premolars based on the planned derotation.
RESULTS: Of the four participants (three males, one female; mean age 22.8 ± 6.76 years), three participants developed transient allergic reactions to the aligner (one participant to the second aligner and two participants to the third), manifesting inflammation, burning sensation, or dry mouth. One participant withdrew due to an allergic reaction, the remaining three completed the study. The effectiveness of derotation was 6.7% (two premolars), 20.0% (one premolar), and 66.7% (one premolar). The highest percentage change was observed in the participant who did not experience an allergic reaction, who was also the youngest (16 years old).
CONCLUSIONS: The effectiveness of 3D-printed aligners in derotating round-shaped teeth without attachments was inconsistent, ranging from 6.7% to 66.7%. This variability may have been influenced by inconsistent aligner wear secondary to allergic reactions.

Abstract citation ID: cjag070.098
SP53 TOOTH SIZE RELATIONSHIP FOR IDEAL OCCLUSION OF LATERAL SEGMENT TEETH

Jiwon Shin, Jungwoong Yang, Jeong-Sub Lee, HyeKyung Kang, Bumsoo Kim; *Wonju Severance Christian Hospital, Wonju-si, Republic of Korea*

The purpose of this study was to investigate the tooth size relationship between maxillary and mandibular lateral segment teeth for ideal occlusion. Sixty-two patients who had Class I molar and Class I canine relationships in postorthodontic treatment were divided into two groups according to the four premolar extractions during orthodontic treatment: extraction group (n=22; male 7, female 15) and non-extraction group (n=40; male 13, female 27). After measuring the tooth size of all teeth up to the first molar on the post-treatment stone models, the ratio and difference of several combination groups from lateral segment teeth were calculated and analyzed statistically. As a result of the study, the ratio of mandibular to maxillary premolars in the extraction group (104.11%) was larger than that in the non-extraction group (102.39%). Premolar size discrepancy showed no difference between the two groups. The size of mandibular premolars was larger than that of maxillary premolars (Mean 0. 32 mm, SD 0.44). By using the ratio and difference of the premolars and lateral segment teeth presented in this study , along with the conventional methods to analyze tooth size discrepancy, it will be helpful to achieve ideal lateral segment occlusion.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.099
SP54 A QUALITY IMPROVEMENT PROJECT ON E-CONSENT IN ORTHODONTICS

Aoibheann Wall, Rachel Hutchinson, Christopher Donaldson, Allan Jones; *Kingston Hospital, London, United Kingdom*

AIM: Consent for treatment is a key element of care. The traditional paper-based consent process can lead to medicolegal risk, system inefficiencies, and doesn't support shared decision making. Digital consent has been shown to improve the process in these three areas. Less risk, more efficient, better decision making. As a result, Kingston Hospital recently introduced an e-consent platform trust-wide. E- consent uses the digital process of obtaining informed consent for treatment using an electronic system instead of traditional paper forms. The aim of this project is to get feedback from clinicians and patient in its implementation. To review this information and reflect on ways to improve e-consent.
MATERIALS AND METHOD: A questionnaire to clinicians and to patients was used to obtain data. Both questionnaires were piloted for content validity. Each questionnaire consisted of 15 questions. The data was collected from September 1st to October 30th 2025.
RESULTS: In total 9 Orthodontic Clinicians completed the questionnaire. All respondents found it easy/ very easy to fill in the form, 99% said they felt confident or very confident on using the e-consent system. 67% said they felt it improved patients understanding of their treatment while 44% felt it saved time.

In total, 20 patients completed the questionnaire, 91% said it explained their treatment well with 90% stating they found the form easy to complete. 87% said they felt safe giving information electronically. 100% said they would use e-consent again.
CONCLUSIONS: E-consent is well accepted by patients and staff at Kingston Hospital. From the results an action plan was devised:

1. To present the result at a local audit meeting
2. To develop a virtual patient information leaflet on e-consent
3. To develop custom templates to share amongst staff to help with time efficiency
4. To reassess in 6 months.

Abstract citation ID: cjag070.100
SP56 CUSTOMIZED 3D-PRINTED SURGICAL TEMPLATES FOR MAXILLARY REPOSITIONING: A SYSTEMATIC REVIEW

Hanyi Li[1], Cheryl Lee[1], Chee Weng Yong[2], Ming Tak Chew[1], Yijin Ren[3]; *[1]National Dental Centre Singapore, Singapore, Singapore, [2]National University of Singapore, Singapore, Singapore, [3]UNIVERSITY MEDICAL CENTRE GRONINGEN, UNIVERSITY OF GRONINGEN, Groiningen, Netherlands*

AIM: Accurate maxillary repositioning is fundamental to achieving stable functional and aesthetic outcomes in combined orthodontic–orthognathic treatment. A wide variety of three-dimensional (3D) printed surgical templates have been introduced to enhance surgical precision. However, large variability in design and inconsistent terminology makes it challenging for orthodontists and surgeons to compare outcomes, adopt best practices, or select the most suitable workflow. This systematic review aims to analyse the existing literature on 3D-printed surgical templates used in orthognathic surgery, map current design strategies, and propose a clinically relevant classification system based on design features and reported outcomes.
MATERIALS & METHODS: A comprehensive search of PubMed, Embase, and Cochrane databases was conducted and reported following PRISMA-SR guidelines. Extracted data included template design characteristics, maxillary repositioning accuracy, effects on operative workflow, complications, and any reported clinical advantages or limitations relevant to orthodontic–surgical planning. Cohen's Kappa assessed inter-rater agreement, while descriptive and qualitative analyses were used to summarize study characteristics, template types, and accuracy. Owing to substantial heterogeneity in study designs and outcomes, no meta-analysis was performed, and results were synthesized descriptively.
RESULTS: Thirty-five studies met the inclusion criteria. A classification framework was proposed with two main categories—Bone-Borne and Tooth-Bone-Borne templates—and three subcategories: (1) osteotomy guides integrated with patient-specific implants, (2) osteotomy guides used with pre-bent fixation plates, and (3) osteotomy and repositioning guides used in conjunction with intraoperative implant bending. Across studies, most templates demonstrated acceptable accuracies (within 2mm), with minimal complications reported. However, differences in surgical workflow, required instrumentation, and intraoperative flexibility were noted.
CONCLUSION: Marked heterogeneity remains in the design and reporting of 3D-printed surgical templates for maxillary repositioning, making it challenging for orthodontic–surgical teams to compare accuracy and integrate these tools into routine practice. The proposed classification system offers a unified framework to clarify terminology, support multidisciplinary communication, and guide more standardised evaluation of emerging 3D-printed surgical workflows in future orthognathic research.

Abstract citation ID: cjag070.101
SP58 EVALUATION OF EFFICACY OF A CLEAR ALIGNER FUNCTIONAL APPLIANCE FOR THE TREATMENT OF CLASS II MALOCCLUSION IN ADOLESCENTS

David Stuhmcke, Ali Darendeliler, Narayan Gandedkar; *University of Sydney, Sydney, Australia*

AIM: This prospective study evaluated the efficacy of the Smartee™ S8-GSTB™, a clear aligner-based functional appliance, in the management of growing adolescent with Class II malocclusion. Outcomes were compared with those achieved using a conventional appliance, the Sydney Bonded Twin Block (SBTB).
METHODS: Twenty-three patients with Class II Division 1 malocclusion at cervical vertebrae maturation stages (CSVM) 3-4 (mean age 12 years; range 11-14 years) were treated with the Smartee™ S8-GSTB™ for nine months. Cone-beam computer topography (CBCT) scans were obtained at baseline (T1) and post-treatment (T2). Lateral cephalogram and orthopantomogram (OPG) were constructed from the CBCTs to assess the skeletal and dentoalveolar changes between T1 and T2. Findings were compared with published outcomes from 17 patients treated with the SBTB by Lalli
RESULTS: Eighteen patients completed treatment; five discontinued. In the Smartee group, overjet decreased by 7.66mm (SD 1.59, 95% CI [6.93-8.39]); the lower incisors proclined by 4.63° (SD 3.83, 95% CI [2.86-6.40]); the upper incisors retroclined by 5.8° (SD 4.21, 95% CI [3.86-7.74]); the mandibular unit length (Co-Gn) increased by 4.71mm (SD 3.39, 95% CI [3.14-6.27]); the mandibular corpus length

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

(Go-Me) increased by 2.39mm (SD 2.18, 95% CI [1.39-3.39]); the ANB angle reduced by 3.64° (SD 1.44, 95% CI [2.98-4.31]), SNA reduced by 0.9° (SD 1.54, 95% CI [0.22-1.65]), SNB increased by 2.6° (SD 1.54, 95% CI [1.90-3.32]), Wits appraisal decreased by 7.2mm (SD 1.86, CI [6.34-8.06]) and mandibular plane angle (SN-MP) decreased by 0.8° (SD 1.85, 95% CI [-0.05-1.65]). These outcomes closely resembled those of the SBTB. Statistically significant differences between groups were limited to SNB angle ($p = 0.012$), ANB angle ($p = 0.001$), Wits appraisal ($p = 0.015$) and mandibular plane angle ($p=0.01$): the Smartee group showed greater SNB increase, ANB reduction and mandibular plane angle whereas Wits appraisal decreased more with the SBTB.
CONCLUSION: The Smartee™ S8-GSTB™ was effective in correcting Class II malocclusion and produced skeletal and dentoalveolar changes comparable to the SBTB. Statistically significant differences in ANB angle, SNB angle and mandibular plane angle between groups were small and unlikely to be clinically meaningful. Treatment success was strongly influenced by patient compliance.

Abstract citation ID: cjag070.102
SP59 USE OF CBCT FOR TREATMENT PLANNING OF IMPACTED CANINES: FINDINGS FROM A RETROSPECTIVE CLINICAL REVIEW

Nusaybah Elsherif[1], Preena Shah[2], Shanthi Sidhom[1]; [1]*Watford General Hospital, London, United Kingdom,* [2]*Northwick Park Hospital, London, United Kingdom*

AIM: To assess the value of CBCT findings on orthodontic treatment planning for impacted canines.
MATERIALS AND METHODS: Retrospective review of patients seen in the Orthodontic department at Watford General Hospital with an impacted canine where a small-volume CBCT, reported by an Oral and Maxillofacial Radiologist, was performed over a 24-month period (June 2022 and June 2024). Root resorption of adjacent teeth was graded and compared between the original 2D image and the subsequent findings from the CBCT. The influence of the CBCT findings on the final treatment plan was assessed.
RESULTS: A total of 88 patients with 123 impacted canines were included with a mean age of 15.4 years old. 10% (n=12) of impacted canines caused resorption on adjacent teeth visible on the 2D image and this increased to 40% (n=49) on the subsequent CBCT image. A total of 58 adjacent teeth were affected by root resorption, 69% (n=40) were lateral incisors, 21% (n=12) central incisors, and 10% (n=6) were first premolars. A total of 17 patients (19%) had a change in the treatment plan following the CBCT, most commonly a change to the extraction pattern, 30% (n=5). The most common type of root resorption affecting adjacent teeth was slight root resorption on lateral incisors (41%, n=24) classed as resorption affecting up to half of the dentine thickness to the pulp.
CONCLUSIONS: CBCT adds value to treatment planning as it is a more accurate way of detecting root resorption compared to 2D imaging, but it does not necessarily always change the treatment plan as demonstrated in our review. However, the information gathered adds to the clinical picture which is useful in a valid consent process particularly when discussing risk of treatment and alternative treatment options.The debate regarding increased radiation dose and whether the benefits of the findings from the CBCT will outweigh the risks of the dose are case and patient dependent. An update of guidelines particularly in the current climate of CBCT imaging in orthodontics is necessary.

Abstract citation ID: cjag070.103
SP61 TELEPHONE FOLLOW-UP ON LONG-TERM ADHERENCE AND REASONS FOR FAILURE OF ORAL APPLIANCE TREATMENT IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

Satu Leinonen[1] and Riitta Pahkala[2]; [1]*Department of Oral and Maxillocafial Diseases, Kuopio University Hospital, Kuopio, Finland,* [2]*Department of Oral and Maxillofacial Diseases, Kuopio University Hospital, Kuopio, Finland*

AIM: To evaluate the adherence of patients with obstructive sleep apnea (OSA) to oral appliance (OA) treatment over seven years and to investigate the reasons for failure of OA therapy.
SUBJECTS AND METHOD: A total of 58 adults with OSA were referred for OA therapy to the Department of Oral and Maxillofacial Diseases, Kuopio University Hospital. Mean (SD) apnea-hypopnea-index AHI was 19.5 (10.0). At 7-year telephone follow-up, the study group consisted of 32 men and 18 women. Mean (SD) age was 58.2 (SD 10.9). Subjects were inquired about their experience and adherence to OA treatment, the possible reason for failure of this therapy and the current treatment method of sleep apnea. Statistical analyses included the chi-square test, Fisher´s exact test, t-test, and logistic regression analysis.
RESULTS: At the 7-year follow-up, 32% of subjects were regular users of OA. Most of the patients had discontinued OA therapy within 4 years. The most important reasons for failure of this therapy were TMJ or masticatory muscle pain, inconvenience to wear OA, incompatibility of OA due to dental procedure, and poor response to OA therapy. Long-term OA adherence seemed to be successful in patients with complete response (residual AHI $\leq$ 5 events/h) to OA use in the early stage of treatment ($p=0.034$). Further, there was a change from one OSA treatment modality to another; OA was the first line therapy in 34 patients, while 22 subjects changed the care modality to CPAP after failure of OA therapy.
CONCLUSIONS: Subjects with an excellent OA therapy outcome in the early stage of treatment were more likely to continue use of OA long-term. Although most of the patients were satisfied with OA therapy in one-year follow-up, only one person had regular check-ups afterwards. The results indicate that the needs of long-term OA users should be considered when developing the care pathways in health care system. To best meet a subject's individual treatment need, and to prevent suboptimal use of OA, a patient-tailored therapy including regular check-ups is recommended.

Abstract citation ID: cjag070.104
SP65 THE OMBIT STUDY: OROFACIAL MYOFUNCTIONAL BEHAVIOUR, OROFACIAL STRENGTH, AND ORAL HEALTH-RELATED QUALITY OF LIFE IN CHILDREN WITH AND WITHOUT ANTERIOR OPEN BITE

Charis Van der Straeten[1], Quinten Philibert[2], Guy De Pauw[2], Kristiane Van Lierde[1]; [1]*a Center for Speech and Language Sciences (CESLAS), Department of Rehabilitation Sciences, Ghent University, 9000 Ghent, Belgium,* [2]*Department of Oral Health Sciences, Ghent University, 9000 Ghent, Belgium*

AIM: Anterior open bite (AOB) is a multifactorial malocclusion associated with non-nutritive sucking habits (NNSH) and orofacial dysfunction, yet little is known about the specific orofacial strength and endurance profile. This study aimed to evaluate myofunctional history, orofacial myofunctional status, orofacial strength, and OHRQoL in children in the mixed dentition stage with AOB, compared to controls without AOB.
METHODS: Sixteen children with AOB (mean age 97.8 months, SD 6.12 months) and sixteen matched controls (mean age 97.2 months, SD 8.84 months) participated in this cross-sectional study. Dental and orofacial history were evaluated via parental questionnaire. Palatal morphology were assessed using intraoral scans. Orofacial functions were evaluated with the Orofacial Myofunctional Evaluation with Scores (OMES) protocol and ultrasound imaging. Maximum isometric pressure and endurance of tongue and lips were measured using the Iowa Oral Performance Instrument (IOPI). OHRQoL was assessed using the COHIP-Ortho.
RESULTS: There were no statistically significant differences between the AOB and nonAOB group in palatal morphology, save for open bite (AOB: -2.3mm, nonAOB: +3.2mm, $p < .001$). Regarding dysfunctions, oral habits, which were observed significantly more often in the AOBgroup ($p = .043$, $\varphi = .43$, large effect). Children in the AOBgroup engaged in recurrent open mouth behaviour significantly more frequently than children in the nonAOBgroup ($p = .015$, $\varphi = .49$, large effect). Two-thirds of participants had a history of NNSH, with no difference in occurrence; the AOBgroup was on average 2.3 years older at cessation of NNSH during daytime ($p = .004$, Cohen's $d = 1.543$, very large effect) and nighttime (2.3 years older, $p = .002$, Cohen's $d = 1.634$, very large effect). Endurance of the tongue in the anterior position was 4.2s longer in the AOBgroup ($p = .043$, $r = .36$, moderate effect); no other significant differences in maximum isometric pressure or endurance in tongue or lips were found. No significant differences were observed between the groups in OMES or COHIP-Ortho scores.
CONCLUSIONS: Given the absence of orofacial strength and endurance deficits, early functional screening and function-focused orofacial myofunctional therapy, rather than strength-based training, may optimize prevention and management in children with AOB.

Abstract citation ID: cjag070.105
SP66 ‡‡‡ FUNCTIONAL APPLIANCES AND AIRWAY IN DENTOSKELETAL CLASS 2 MALOCCLUSION: A COMPREHENSIVE UMBRELLA REVIEW WITH RE-ANALYSIS OF META-ANALYSIS

Fabrizia d'Apuzzo[1], Annapurna Kannan[2], Ludovica Nucci[1], Letizia Perillo[1], Sridevi Padmanabhan[2]; [1]*University of Campania Luigi Vanvitelli, Naples, Italy,* [2]*Sri Ramachandra Institute of Higher Education and Research (DU), Chennai, India*

AIM: The potential influence on respiratory health of functional appliances has recently gained attention, though evidence remains inconsistent. This umbrella review and meta-analysis evaluated the impact of functional appliances on the

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

upper airway area and volume, and any patient-centered reported outcomes in the literature.
MATERIALS AND METHODS: The protocol was registered in PROSPERO (CRD42024540778). Systematic reviews and meta-analyses including growing patients with Class II malocclusion treated with removable or fixed functional appliances were selected. Studies involving non-interventional designs, craniofacial syndromes, major comorbidities, or diagnosed obstructive sleep apnea were excluded. A comprehensive search was performed across MEDLINE, Cochrane, Scopus, Web of Science, LILACS, and Ovid up to October 2024, following PRISMA guidelines. Grey literature was screened via OpenGrey. Risk of bias was assessed using ROBINS-I. Study overlap was evaluated through Corrected Covered Area (CCA) and GROOVE indices. Quantitative re-analysis of three CBCT-based meta-analyses was conducted using random-effects models.
RESULTS: Nine reviews met the inclusion criteria, eight with low risk of bias and moderate-to-high overlap (CCA = 10.97%). The oropharyngeal airway demonstrated the most significant volumetric increase across studies. Functional appliances significantly increased oropharyngeal airway volume, especially with Herbst (up to 7759 mm^3) and Twin Block (up to 1727 mm^3). Re-analysis showed a large, significant effect for oropharyngeal changes (SMD = 1.41; 95% CI: 0.57–2.26) and a moderate effect for total airway volume (SMD = 0.71; 95% CI: 0.31–1.11). Meta-regression analysis revealed that while functional appliances may contribute to airway expansion, the effect size was smaller and less consistent in the nasopharynx compared to the oropharynx. The hypopharyngeal volume changes did not reveal a consistent pattern. No studies reported the wear time and quality of life or any patient-centric outcome.
CONCLUSION: The functional appliances significantly impact airway dimensions, particularly in the oropharynx. Herbst and Twin Block appliances demonstrated the most consistent effects. While removable appliances tended to induce greater volumetric increases, fixed functional appliances were associated with the most substantial individual airway expansions. However, variability among studies highlights the need for standardized CBCT evaluation protocols and a more adequate follow-up period to determine treatment and outcome stability on the airway.

Abstract citation ID: cjag070.106
SP68 CEPHALOMETRIC EVALUATION OF MAXILLARY TRANSVERSE DEFICIENCY AND FUNCTIONAL MANDIBULAR DEVIATION IN UNILATERAL POSTERIOR CROSSBITE

Anzhelina Krasteva, Miroslava Yordanova, Svetlana Yordanova, Stanislava Georgieva; *Medical University Plovdiv, Plovdiv, Bulgaria*

AIM: To determine the relationship between maxillary constriction and mandibular deviation from the facial midline in untreated patients with residual craniofacial growth presenting with unilateral posterior crossbite.
MATERIALS AND METHODS: A total of 47 patients (mean age 16.59 ± 1.89 years) with unilateral posterior crossbite were examined at the Department of Orthodontics, Faculty of Dental Medicine, Plovdiv. All subjects underwent frontal cephalometric analysis.
Measurements included:

- Transverse distance between points J–jugularis (left–right)
- Deviation of point Me–menton from the facial midline, defined according to Sassouni V.

Statistical analysis was performed using IBM SPSS version 28.0.0.
RESULTS: The mean maxillary width within the cohort was 54 ± 6.10 mm. A statistically significant inter-sex difference was identified (p = 0.003), with males exhibiting a greater median maxillary width (58.00 mm) relative to females (52.77 mm). No significant association was observed between age and maxillary width (p = 0.367).The shift of point Me from the facial midline demonstrated a median value of 2.90 mm (IQR = 2.10) for the total sample. This Menton deviation showed no statistically significant dependence on sex (p = 0.066), although males presented a higher median deviation (3.67 mm, IQR = 2.23) compared with females (2.49 mm, IQR = 1.59). A statistically significant but weak correlation was identified between mandibular deviation and age (p = 0.024). No significant relationship was detected between maxillary width and functional mandibular deviation (p = 0.187). A multivariate regression analysis was subsequently conducted, yielding predictive equations for the dependent variables: maxillary width as a function of sex, and mandibular deviation as a function of age.
CONCLUSION: The obtained results have significant clinical importance, emphasizing the need for an individualized approach in diagnosis and therapeutic planning of orthodontic treatment. Younger age (under 17 years) may provide a more favorable starting point for orthodontic treatment on patients with unilateral posterior crossbite.

Abstract citation ID: cjag070.107
SP69 CEPHALOMETRIC PARAMETERS AND AIRWAY CHANGES IN RELATION TO ORTHOGNATHIC CLEFT SURGERY- A PILOT STUDY

Asiyah Ayob, Aufa Dahlia Bahar, Mang Chek Wey, Muhammad Kamil Hassan; *Universiti Malaya, Kuala Lumpur, Malaysia*

INTRODUCTION: While cephalometric parameters are essential as a reliable predictive criterion for planning orthognathic surgery in cleft lip and palate (CLP) patients, the impact of these procedures on the posterior airway space (PAS) remains poorly understood.
AIM: The objective of this study is to explore the correlation between the skeletal, dental, and soft tissue cephalometric parameters and the various orthognathic surgical interventions performed on patients with cleft lip and palate (CLP), and the consequential dimensional alterations in the pharyngeal airway space (PAS).
MATERIALS AND METHODS: This retrospective pilot study examined the pre- and post surgical lateral cephalograms of 13 non-syndromic CLP patients (average age 21.38 years, SD 6.318) from the University Malaya Medical Centre who underwent surgery between 2013 and 2023. A total of ten cephalometric parameters and PAS dimensions (nasopharynx, oropharynx, hypopharynx, deep pharynx) were analysed using digital software (WinCephVer11/RiseCorporation) for patients receiving maxillary advancement, Le Fort I maxillary advancement with mandibular setback (bimaxillary surgery), or Le Fort I maxillary advancement with distraction osteogenesis (DO). The reliability and consistency of the measurements (ICC) was found to be 0.9.
RESULTS: Distinct cephalometric profiles were observed for each surgical group. Maxillary advancement showed minimal insignificant increase in PAS across all areas (p > 0.05): nasopharynx (2.60mm), oropharynx (1.90mm), hypopharynx (0.15mm), and deep pharynx (3.05mm). DO also increased PAS: nasopharynx (1.18mm, p= 0.503), oropharynx (0.20mm, p= 0.960), hypopharynx (1.58mm, p= 0.493), and significantly improved the deep pharynx (3.45mm, p= 0.026). Conversely, bimaxillary surgery resulted in a slight increase in nasopharyngeal space (3.55mm, p= 0.07) and deep pharynx (0.02mm, p= 0.986), but decreased hypopharyngeal (−2.30mm, p= 0.275) and oropharyngeal dimensions (−3.80mm, p <0.061). Due to small sample size, no significant association was found (Kruskal-Wallis's test).
CONCLUSION: Variations in cephalometric parameters may guide surgical indications depending on the functional needs of CLP patients. While maxillary advancement and DO tend to increase PAS, bimaxillary surgery compromised some airway dimensions. Due to the limited number of samples, these findings require careful consideration, necessitating further multicentre research. (Funding: DPRG fund UMG007E-2024)

Abstract citation ID: cjag070.108
SP70 WIDTH OF GINGIVAL RECESSION ON TEETH IN ANTERIOR CROSSBITE IN PATIENTS WITH COMPLETED MAXILLARY GROWTH

Silviya Krasteva[1], Stilyana Krasteva[2], Anzhelina Krasteva[1]; [1]*Medical University Plovdiv, Plovdiv, Bulgaria,* [2]*dr.a.krasteva@gmail.com, Plovdiv, Bulgaria*

AIM: To evaluate the width of facial gingival recession in teeth exhibiting anterior crossbite in patients with completed maxillary skeletal growth.
MATERIALS AND METHODS: Eighty patients (36 women and 44 men), aged 18–52 years, were examined, comprising a total of 960 teeth in anterior crossbite. The width of gingival recession was measured intraorally using an electronic digital caliper (mm), from the most apical point of the gingival margin to the cemento-enamel junction.
RESULTS: In the maxilla, the facial width of gingival recession was greater in teeth with crossbite compared to those without; however, when assessed individually for each of the six anterior teeth, the differences were not statistically significant. The mean recession width across all six teeth was significantly greater in teeth with crossbite (4.46 mm) compared with non-crossbite teeth (4.05 mm) (p = .003).In the mandible, teeth in crossbite demonstrated significantly greater facial gingival recession than teeth without crossbite, with the difference reaching statistical significance when the six anterior teeth were analyzed collectively. The association between anterior crossbite and increased facial gingival recession was more pronounced in the mandibular arch than in the maxillary arch.
CONCLUSION: Anterior crossbite is associated with increased facial gingival recession in the mandibular anterior teeth. No statistically significant relationship between crossbite and gingival recession width was observed in the maxillary arch.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

The mandibular central incisors appear most susceptible to gingival recession, likely due to their thin buccal bone coverage and the reduced apical basal bone in this region.

Abstract citation ID: cjag070.109
SP71 VERTICAL EFFECTS FROM CLASS II ELASTICS: INSIGHTS FROM CEPHALOMETRIC ANALYSIS

Konstantin Georgiev, Yuliya Nestorova, Silviya Krasteva; *Medical university, Plovdiv, Bulgaria*

AIM: The aim of the study was to assess the vertical cephalometric changes induced by class II elastics in growing patients.
MATERIALS AND METHODS: The study consisted of 35 patients aged between 10 and 16 years (mean age 13.83 ±2.15) treated with fixed appliances. After levelling and aligning the upper and lower arches, thick stainless-steel archwires were inserted in both jaws. Patients were instructed to wear elastics (0.25 in, 6.5 oz) between the lower first molar and upper canine bilaterally for 20 hours a day. All subjects had lateral cephalograms taken just before starting treatment with Class II elastics and after reaching class I molar relationships. Both cephalograms were traced and the vertical parameters ◅MP/SN, ◅MP/SpP, ◅OcP/SN and Jarabak index were assessed. The dynamics in these parameters was monitored by paired-samples t-test at an allowable error level (alpha) of 5% ($p < 0.5$).
RESULTS: Three of the parameters exhibited a significant change. ◅MP/SN slightly increased by + 0.30 °, from 32.88 ± 5.90 ° to 33.18 ± 6.50 °, but without statistical significance ($p = 0.499$). ◅MP/SpP increased from 26.54 ± 5.80 ° to 27.81 ± 6.43 °, with a significant difference of + 1.27 ° ($p = 0.008$). The third parameter ◅OcP/SN showed a significant increase of + 1.47 °, from 15.29 ± 4.68 ° before treatment to 16.75 ± 4.25 ° after treatment ($p = 0.013$). Significant reduction was also found in the S:Go / N:Me ratio, from 68.14 ± 5.17% to 67.25 ± 5.33%, with a significant difference of -0.89%, $p = 0.009$.
CONCLUSIONS: Treatment with class II elastics causes clockwise rotation of the lower jaw; hence should be applied with caution in hyperdivergent patient.

Abstract citation ID: cjag070.110
SP72 ‡‡‡ OPEN MOUTH POSTURE SYNDROME (OMPS): CLASSIFICATION

Can-Florian Keles[1], Omar Fawzi Chawshli[2], Ute Ulrike Botzenhart[3]; *[1]Paracelsus Medical University, Salzburg, Austria, [2]Hawler Medical University, Erbil, Iraq, [3]University of Medical Sciences, Poznań, Poland*

AIM: The aim of this evidence synthesis was to examine the evolution of the scientific framework used to investigate the aetiology of malocclusion and facial dystrophy, to identify methodological gaps in historical mouth-breathing research, and to introduce a new classification system that incorporates the postural pathologies underlying Open Mouth Posture Syndrome (OMPS).
MATERIALS (OR SUBJECTS) AND METHOD: A structured evidence synthesis was conducted following predefined eligibility criteria. Peer-reviewed clinical, observational and mechanistic studies addressing oral posture, airway function, tongue-rest position, craniofacial adaptation and related etiopathogenic pathways were retrieved from PubMed, Scopus and Google Scholar up to 2023. Approximately 500 articles were screened. Studies were assessed for relevance to structural, functional and postural mechanisms contributing to open-mouth posture. Data were extracted into thematic domains that allowed comparison across heterogeneous methodologies. Cross-disciplinary consultation involving orthodontists, otolaryngologists, sleep-medicine specialists and myofunctional therapists aided in refining the final diagnostic categories. No meta-analysis was performed due to variability across study designs.
RESULTS: The synthesis showed that past research on mouth breathing largely concentrated on nasal obstruction and airflow limitation, without adequately accounting for compensatory postural behaviours, tongue-rest dysfunction and craniofacial adaptation. The aggregated evidence demonstrated that OMPS is a multidimensional postural syndrome rather than a purely respiratory condition. On this basis, a five-subtype OMPS classification was constructed: (1) Obstructive, (2) Habitual, (3) Anatomical, (4) Sleep-Disordered-Breathing-Related, and (5) Tongue-Related Pathologies. Several subtypes include additional subcategories that capture distinct structural or functional variations—for example, differing patterns of tongue-related dysfunction or varying habitual compensatory postures. These refinements increase diagnostic specificity and represent a methodological advancement by formalizing mechanisms previously described inconsistently in the literature.
CONCLUSIONS: This structured evidence synthesis clarifies long-standing gaps in the conceptualization of open-mouth posture and provides a comprehensive classification system that integrates postural, structural and functional contributors to malocclusion and facial dystrophy. The proposed taxonomy enhances diagnostic consistency, supports hypothesis-driven research and offers a meaningful gain for science and the scientific method. Given that classification in this area has remained largely unchanged for nearly 40 years, this system represents a timely and necessary progression.

Abstract citation ID: cjag070.111
SP73 SAGITTAL DISCREPANCIES ASSOCIATED WITH TEMPOROMANDIBULAR DISORDER

Nika Korelc[1], Eva Štular[1], Jasmina Primožič[2]; *[1]Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia, [2]Department of jaw and dental orthopedics, Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia*

AIM: This study examined the relationship between temporomandibular disorders (TMD) and sagittal discrepancies at different stages of dental development. We examined how the incidence of TMD symptoms and signs varies across stages of dental development, how they relate to sagittal discrepancies, and which discrepancies are associated with greater risk for the occurrence of TMD at each stage.
SUBJECTS AND METHOD: This retrospective cross-sectional study, included 418 subjects (210 women, 208 men) who had their first orthodontic examination between 2020 and 2023. Based on their stage of dental development they were classified into five groups: deciduous, early mixed, mixed, late mixed, permanent without, and permanent with all erupted second permanent molars. We recorded the incidence of various TMD symptoms and signs within each group and analyzed it with the chi-square test. Logistic regression models were used to determine the association of sagittal discrepancies with particular TMD symptoms and signs.
RESULTS: Sagittal discrepancies were present in 41.1% of all subjects; their prevalence differed significantly between stages of dental development ($p=0.008$). The prevalence of crossbite in the intercanine sector (ICS) was 19.6%, and it differed significantly between stages of dental development ($p=0.001$). Angle classification differed significantly between stages of dental development ($p=0.001$). The value of the sagittal overjet within the normal range differed significantly between stages of dental developmental ($p=0.011$). Difficulty chewing was reported by 13.2% of the subjects, 7.9% experienced problems in the temporomandibular joint (TMJ) area, and 3.4% reported pain in the TMJ region. Clicking in the TMJ was present in 3.4%, crepitation in 0.7%, limited mouth opening in 11%, and mandibular deviation during mouth opening and closing in 6.2% of the subjects. In deciduous and mixed dentition, difficulty chewing was influenced by bilateral singular antagonism (SA) ($p=0.001$), reverse sagittal step ($p=0.039$), and crossbite in ICS ($p=0.002$). TMJ pain was influenced by unilateral distal occlusion ($p=0.019$). In permanent dentition, sagittal discrepancies did not influence the occurrence of TMD symptoms.
CONCLUSIONS: The greatest risks for TMD development are SA, reverse sagittal step, and crossbite in ICS, nevertheless, given the multifactorial nature of TMD, sagittal discrepancies alone cannot account for its occurrence.

Abstract citation ID: cjag070.112
SP74 ALTERNATE RAPID MAXILLARY EXPANSION AND CONSTRICTION VERSUS RAPID PALATAL EXPANSION COMBINED WITH FACE MASK: WHICH IS A MORE EFFECTIVE METHOD FOR MAXILLARY PROTRACTION?

Nuri Tanrısever and Hatice Gökalp; *Ankara University Faculty of Dentistry, Department of Orthodontics, Ankara, Turkey*

AIM: Class III malocclusion characterized by maxillary deficiency is treated with orthopedic approaches during the growth period and with Le-Fort I osteotomy in adulthood. Achieving effective maxillary protraction during growth typically requires mobilization of the circummaxillary sutures through expansion prior to facemask (FM) therapy.Although rapid palatal expansion (RPE) separates not only the midpalatal suture but also contributes to the disarticulation of the circummaxillary sutures, its effect on these sutures is often more limited than expected due to their strong interdigitation.To enhance sagittal advancement by disarticulating the circummaxillary sutures, Liou and Tsai introduced the Alternate Rapid Maxillary Expansions and Constrictions (Alt-RAMEC) protocol in combination with a Double-Hinged Screw Maxillary Expander (DHME), which shifts the center of rotation toward the pterygoid plates, thereby producing a more pronounced anterior displacement of the maxillary segments.The aim of this study is to evaluate by comparing with Le-Fort I whether the Alt-RAMEC/DHME produces greater anterior maxillary displacement compared with the RPE/FM approach.

Material Metod: The material of this single-center retrospective study included 42 individuals with skeletal Class III malocclusion characterized by maxillary deficiency

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

who were treated with Alt-RAMEC/DHME, RPE/FM and Le-Fort I selected from the archives of Ankara University Department of Orthodontics.Skeletal and dental changes in the sagittal and vertical planes at T0 and T1 were measured linearly on lateral cephalometric radiographs using the AutoCAD program.Data was analyzed using SPSS 26 at a significance level of p?0.05.
RESULTS: In the late skeletal period, the shorter-duration Alt-RAMEC/DHME obtained a level of maxillary advancement comparable to that achieved with RPE/FM applied at an earlier developmental stage.The magnitude of advancement in both protocols remained lower than that obtained with Le-Fort I.The RPE/FM results were longer and more dentoalveolar compared to Alt-RAMEC/DHME. Both methods produced mandibular posterior rotation, which was more pronounced in RPE.
CONCLUSION: In the maxillary deficiency during the late growth period, skeletal maxillary advancement can be achieved using the Alt-RAMEC protocol alone, without the need for FM.Considering this outcome, the indication for Le-Fort I may be re-evaluated.The RPE/FM resulted in greater dentoalveolar effects compared with Alt-RAMEC/DHME.

Abstract citation ID: cjag070.113
SP75 DENTOSKELETAL FEATURES IN PATIENTS WITH MANDIBULAR CANINE IMPACTION

Dana Kloudová[1] and Lucie Řehořová[2]; [1]2nd Medical Faculty, Charles University, Prague, Czechia, [2]private firm, Prague, Czechia

AIM: The aim of this retrospective study was to evaluate whether there is any difference in dentoskeletal features in patients with mandibular canine impaction compared with patients with physiologically erupted mandibular canines.
MATERIALS AND METHODS: Study group (SG) was represented by 95 patients with unilateral or bilateral mandibular canine impaction. 25 patients were removed from the original SG size (120) due to the presence of odontoma, other tumours, fibrous dysplasia, craniofacial syndromes cysts or trauma. The control group was represented by 95 patients with all physiologically erupted teeth. Panoramic radiograph, lateral cephalogram and imaging SW InVivo 6 were used for analysis of the following dental and skeletal variables: impaction side (left, right), localisation of impacted canine (buccal, lingual, in crest), presence of deciduous canine, inclination of cusp of impacted canine (mesial, distal, vertical), intercanine width, dental midline shift, angle ANB, WITS, skeletal class (I-III), incisor mandibular plane angle (IMPA) and width (W) of mandibular symphysis.
RESULTS: A statistically significant association was found between mandibular canine impaction and persistence of deciduous canine ($p < 0.0001$), buccal localisation ($p < 0.0001$), dental midline shift ($p = 0.004$), mesial axial inclination ($p < 0.0001$) and IMPA ($p < 0.0001$). There was no statistically significant association with impaction side ($p = 0.425$), symphysis anatomy ($p = 0.808$), intercanine width ($p = 0.652$), ANB angle ($p = 0.392$), WITS ($p = 0.584$) and IMPA ($p = 0.649$)
CONCLUSIONS: Patients with mandibular canine impaction have statistically higher persistence of deciduous canine, buccal localisation of impacted teeth, dental midline shift, mesial axial inclination of the crown of impacted teeth and higher IMPA compared with control group.

Abstract citation ID: cjag070.114
SP76 COLOR CHANGES OF TRANSPARENT ORTHODONTIC STRAIGHTENING ALIGNERS DUE TO COLORING COMPONENTS IN BEVERAGES: IN VITRO STUDY

Gabriele Trakinyte[1], Dominykas Trakinis[2], Arunas Vasiliauskas[1], Giedre Trakiniene[1]; [1]Lithuanian University of Health Sciences, Kaunas, Lithuania, [2]ETH Zurich, Zurich, Switzerland

AIM: To determine whether transparent orthodontic aligners change color from coloring components in the most consumed beverages.
MATERIALS AND METHOD: The study group consisted of 77 aligners samples divided into 11 groups of 7 specimens. The control group samples were immersed in the distilled water, while the other groups were the following: Coca-Cola, apple juice, black tea, red wine, green tea, dark beer, Fanta, orange juice, cappuccino, black coffee. The color changes of the samples were measured with a standard colorimeter (datacolor, ColorReaderPro) 3 times: before immersion, after 12 hours and after 7 days. IBM SPSS 28.0.1.1 was used for statistical analysis. The statistical significance of the effects of different solutions on clear orthodontic aligners was tested using one-way and two-way dispersive analysis (ANOVA). The difference in results between variables was considered statistically significant when $p < 0.05$.
RESULTS: The results showed that all solutions after 12 hours caused color changes compared to the control group. The smallest color changes, compared to the control distilled water group, were seen in the dark beer, apple juice, orange juice, cappuccino, Fanta, Coca-Cola groups (ΔE varied from 1.25 to 1.33). The green tea and red wine samples changed slightly more (ΔE varied from 1.72 to 1.82). The largest change after twelve hours was observed in the black coffee ($\Delta E = 3.78$) and black tea ($\Delta E = 2.68$) group. After 7 days, only the apple, orange juice, and Coca-Cola groups showed a slight change in the color of the orthodontic aligners (ΔE varied from1.51 to 1.53), while the color changes intensified in all other groups. The most significant changes were seen in the black coffee ($\Delta E = 5.2$) and the black tea ($\Delta E = 3.93$) groups.
CONCLUSIONS: All evaluated beverages caused color changes of the clear orthodontic aligners even after 12 hours and 7 days, the most pronounced of which were in the black coffee and black tea groups.

Abstract citation ID: cjag070.115
SP77 THE INFLUENCE OF BEVERAGES ON THE AESTHETICS OF ORTHODONTIC LIGATURES: IN VITRO STUDY

Dominykas Trakinis[1], Gabriele Trakinyte[2], Arunas Vasiliauskas[2], Giedre Trakiniene[2]; [1]ETH Zurich, Zurich, Switzerland, [2]Lithunian University of Health Sciences, Kaunas, Lithuania

AIM: The aim of this in vitro study was to investigate the influence of certain liquids on the color changes of aesthetic orthodontic elastic ligatures.
MATERIALS AND METHOD: The study samples of aesthetic orthodontic ligatures were divided into 11 groups of 7 specimens and placed in the containers with the corresponding liquids. The ligatures of the control group were not immersed in the liquids. The following beverages were tested: Coca-Cola, Fanta, green tea, black tea, orange juice, carrot juice, beetroot juice, apple juice, black coffee, turmeric solution. Measurements of the color changes of the ligature sticks were performed after 10 days of soaking, using a spectrophotometer (Ocean Optics USB4000 UV-VIS). Statistical analyses were performed using IBM SPSS 28.0.1.1. The statistical significance of the effects of different solutions on elastic ligatures was tested using one-way repeated measures analysis of variance (ANOVA, Fisher PLSD test). The difference in results between variables was considered statistically significant when $p < 0.05$.
RESULTS: When evaluating the effect of solutions on the color changes of orthodontic transparent ligatures, it was found that black coffee (ΔE=19.93) and turmeric solutions (ΔE=17.65) changed the color of the ligatures the most, followed by black tea (ΔE=17.51), carrot juice (ΔE=14.99) and Fanta (ΔE=14.08). Meanwhile, green tea (ΔE=13.86), beetroot ΔE=12.54), apple (ΔE=11.39), orange juice (ΔE=9.08) and Coca-Cola (ΔE=11.29) stained the ligature sticks less. All the liquids produced high clinically visible changes of color (NBA units varied from 8.35 to 18.34).
CONCLUSIONS: The data from this experiment suggested that the most pronounced statistically significant color change over 10 days was observed in the coffee, turmeric, and black tea groups.

Abstract citation ID: cjag070.116
SP79 *** THE RELATIONSHIP BETWEEN PALATAL DIMENSIONS AND CRANIOFACIAL SKELETAL STRUCTURES: A TWIN-BASED HERITABILITY ANALYSIS

Monika Šidlauskienė, Mantas Šidlauskas, Antanas Šidlauskas, Arūnas Vasiliauskas, Austė Antipovienė; Lithuanian University of Health Sciences I LSMU, Kaunas, Lithuania

AIM: This study aimed to evaluate the relationship between maxillary depth (MD), palate surface area (PSA), and palate volume (PV) with craniofacial skeletal structures, and to determine the extent to which these palatal traits are genetically influenced in post-growth twins.
MATERIALS AND METHOD: The sample included 53 twin pairs (mean age 17.82 ± 3.05 years). 3D palatal measurements—MD, PSA and PV—were obtained from digital dental models using standardized gingival and distal boundaries. Craniofacial skeletal parameters assessed on lateral cephalograms included: anterior facial height (N-Me), posterior facial height (S-Go), palatal plane length (PNS–ANS), mandibular body length (Go-Gn), cranial base length (S-N), maxillary position (SNA), mandibular position (SNB), and maxillomandibular sagittal relationship (ANB). Pearson correlation coefficients were used to evaluate associations between palatal and skeletal variables ($p < 0.05$). Heritability estimates (a^2) were derived using ACE/ADE twin modelling.
RESULTS: Significant correlations were primarily observed between palatal morphology and vertical skeletal dimensions. PSA showed positive associations with N-Me ($r = 0.37$, $p < 0.001$), S-Go ($r = 0.32$, $p = 0.001$), PNS–ANS ($r = 0.26$, $p = 0.007$) and Go-Gn ($r = 0.28$, $p = 0.004$), indicating that individuals with larger palatal surface areas exhibit increased anterior and posterior facial heights. PV demonstrated a similar correlation pattern, supporting proportional relationships between palatal volume and vertical facial morphology. MD correlated significantly with N-Me (r =

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

0.20, p = 0.038). Associations with cranial base length (S-N) was not statistically significant. Heritability analysis revealed strong genetic influence on palatal morphology, with a^2 = 0.61 for PSA, 0.69 for PV, and 0.56 for MD. Sagittal skeletal indicators demonstrated even higher heritability ($a^2 \approx 0.74–0.79$).
CONCLUSIONS: Maxillary depth, palate surface area and palate volume showed consistent phenotypic associations with vertical craniofacial skeletal dimensions, indicating coordinated structural relationships within the craniofacial complex. High heritability estimates for palatal traits suggest that these features share substantial genetic variance with vertical facial morphology. Palatal morphology reflects genetically mediated growth patterns. Clinically, palatal morphology may serve as an early indicator of vertical skeletal tendencies and support individualized orthodontic planning.

Abstract citation ID: cjag070.117
SP80 A RANDOMIZED CONTROLLED TRIAL OF ANIMAL-ASSISTED THERAPY FOR MANAGEMENT OF DENTAL ANXIETY AND PAIN IN NEUROTYPICAL AND NEURODIVERGENT PEDIATRIC PATIENTS

Laura Jacox, Caroline Sawicki, Christina Graves, Eric Hodges, Kimon Divaris; *University of North Carolina, Chapel Hill, United States*

AIM: Dental anxiety (DA) impacts one in four children and poses a considerable barrier to dental care. Pediatric patients could benefit from alternative non-pharmacological behavior management techniques for DA and pain. Animal-assisted therapy (AAT) is established in medicine in many clinical settings, yet data on AAT use in dentistry are limited- due to a lack of validated outcomes and well-powered randomized controlled trials (RCTs).Use of AAT in dentistry continues to grow; as a result, best use practices and data informing AAT's efficacy for DA management are needed. A prospective RCT protocol was developed and tested to identify clinically feasible and valid outcome measures to assess impacts of AAT in children (aged 4-8 years old) during a dental hygiene visit.
METHODS: Patients were randomized into 3 groups, including an active control (coloring a dog picture), a short or a long exposure to AAT. N=165 patients were enrolled, with 55 per group including 40 neurotypical and 15 neurodivergent children with Attention-deficit/hyperactivity disorder or Autism Level 1 or 2 who were verbal and could comply. Observational behavioral coding, salivary stress hormones, heart rate and validated DA, pain, and next visit expectation scales were outcome measures, compared across groups using descriptive statistics, one-way ANOVAs and linear regression models.
RESULTS: Data indicate high feasibility of the protocol and outcome measures in pediatric dental contexts. Observational coding identified more relaxed behaviors following AAT compared to control. Both short and long AAT result in significant improvements in next visit expectations and dental perceptions, with 78% and 79% of patients reporting being more excited to return to the dentist after their experiences with long and short AAT, respectively, relative to 55% of controls (p=0.04). Children who received AAT had elevated heart rates, potentially related to excitement about the canine.
CONCLUSIONS: Our study demonstrates that the protocol and outcome measures can be reliably utilized in pediatric behavioral studies of DA and pain, with relevance to orthodontics. Findings indicate that AAT can be successfully integrated into dental settings to provide more positive dental experiences for neurotypical and neurodivergent children, with potential to reduce long-term DA and avoidance behaviors.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.118
SP81 MULTI-OMICS SIGNATURES OF LONG COVID IN SALIVA DURING EARLY SARS-COV-2 INFECTION

Laura Jacox, Kasey Linton, Kimon Divaris, Christina Graves, Di Wu; *University of North Carolina, Chapel Hill, United States*

AIM: Long COVID, a complex multisystemic illness, is associated with persistent fatigue, respiratory, and neurological symptoms following SARS-CoV-2 infection. There are no clinical diagnostic or prognostic tests for this condition, due to its heterogeneous manifestations and multifactorial pathophysiology. Characterizing the oral cavity during acute infection elucidates potentially predictive signatures and mechanisms of pathogenesis.
METHODS: SARS-CoV-2+ saliva (N=46) collected during acute-phase infection was analyzed for proteomic, metabolomic, microbial, and immunological signatures. Patients were recontacted 1-3 years post-acute infection to fill out validated surveys on Long COVID symptoms. Samples from patients who developed severe (n=7) and moderate (n=16) symptoms 1-3 years post-acute infection were compared to controls who recovered (n=23). For demographic variables, descriptive statistics were reported and group differences were tested using non-parametric Kruskal-Wallis tests when data was non-normally distributed, followed by Bonferroni multiple testing correction. For cytokine and antibody data, group differences were assessed using multiple linear regression with age and gender as covariates to control for interactions. Proteomics data were normalized, batch corrected, and analyzed using student t-tests with FDR correction and log2 fold changes. Pathway enrichment analysis was conducted using Mummichog Functional Analysis module in MetaboAnalyst 6.0.
RESULTS: Long COVID cohorts expressed greater abundance of pro-inflammatory cytokines and microbiota, with dysregulated immune responses and energy metabolism. Proteomic analyses indicate early stress pathway activation and impaired cellular damage repair capabilities in individuals with severe symptoms.
CONCLUSIONS: The oral cavity holds promise for characterizing Long COVID development, and impaired recovery and repair mechanisms may contribute to persistence of sequelae. Characterizing salivary biomarkers during and after acute infection may lead to development of prognostic and diagnostic salivary tests for patients with SARS-CoV-2 to inform care.

Abstract citation ID: cjag070.119
SP82 DO RESIN COMPOSITES USED FOR CLEAR ALIGNER ATTACHMENTS EXHIBIT SIGNIFICANT COLOR CHANGES AND FLUORESCENCE PROPERTIES? A PRELIMINARY IN VIVO STUDY

İsmail Çevik[1] and Hanife Nuray Yılmaz[2]; [1]*Marmara University Institute of Health Sciences Department of Orthodontics, İstanbul, Turkey,* [2]*Marmara University Faculty of Dentistry Department of Orthodontics, İstanbul, Turkey*

AIM: To evaluate fluorescence properties and color stability of two resin composites used for clear aligner attachments.
MATERIALS AND METHOD: Twenty-two patients (mean age:19.9±6.1 years) looking for clear aligner therapy were included in this prospective study. Two composite resins, GC Aligner Connect and VOCO AlignerFlow LC, were used to produce clear aligner attachments in a split-mouth design. Randomisation was performed by coin-toss to select the composite for upper right quadrant of the mouth. Remaining quadrants were bonded with other composite from opposite side. Intra-oral scans were taken with 3Shape TRIOS 3, directly after bonding and 8 weeks later to evaluate color changes. Attachment shades were recorded with 3Shape Shade Measurement tool. To compare shade differences, CIEDE2000 (ΔE) formula was used. For fluorescence assessment, extra-oral photos with UV light using cheek retractors were taken following initial bonding in a room with artificial lighting. Photoshop's color picker tool was used for recording brightness differences (L*color coordinate) of teeth and attachments in upper anterior region. Mann-Whitney U test was performed for statistical analysis.
RESULTS: Eighty-six attachments were evaluated for fluorescence properties. The brightness differences between attachments and teeth for VOCO AlignerFlow LC and GC Aligner Connect were 17.74±4.22 and 9.93±3.65, respectively (p<0.001). For the color change assessment, 468 attachments were evaluated. ΔE values for VOCO AlignerFlow LC and GC Aligner Connect were 3.35±1.91 and 2.95±2.13, respectively, which was statistically significant between the groups (p<0.026). Regarding the attachment types (optimised versus conventional), there were no statistically significant color change difference within and inter-groups (Optimised, ΔE_{GC}:2.9±2.13, n=106; ΔE_{VOCO}:3.41±2.03, n=102) (Conventional, ΔE_{GC}:2.99±2.13, n=130; ΔE_{VOCO}:3.30±1.83, n=130). Comparing the color changes of anterior and posterior attachments within and inter-group, there were no statistically significant differences, except on the posterior region between VOCO AlignerFlow LC (ΔE:3.5±1.16) and GC Aligner Connect (ΔE:2.76±1.5) (p<0.017).
CONCLUSIONS: With respect to fluorescence properties, VOCO AlignerFlow LC was brighter than GC Aligner Connect. Although the color change difference between VOCO AlignerFlow LC and GC Aligner Connect was statistically significant, it's clinically insignificant since the value was below than the reported visible amount.

Abstract citation ID: cjag070.120
SP83 ASSOCIATION BETWEEN ANATOMICAL NASAL OBSTRUCTION AND MAXILLARY CONSTRICTION IN ADOLESCENTS: STUDY ON POSTERO-ANTERIOR CEPHALOGRAMS

Fabrizia d'Apuzzo[1], Ludovica Nucci[1], Mariagiovanna Ferraioli[1], Letizia Perillo[1], Valmy Pangrazio-Kulbersh[2]; [1]*University of Campania Luigi Vanvitelli, Naples, Italy,* [2]*University of Detroit Mercy, Sterling Heights, United States*

AIM: The identification of nasal obstruction and oral breathing patterns is of great importance in planning an interceptive treatment approach for young subjects. Thus, the objective is to investigate the possible association between anatomical

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

nasal obstruction and maxillary constriction using postero-anterior cephalograms (PA) in nontreated adolescents.
MATERIALS AND METHODS: This retrospective observational study was performed by analyzing initial PA of 92 subjects in permanent dentition (forty-nine males and forty-three females) who presented with or without maxillary transverse deficiency, aged between 12 and 17 years. Linear and angular measurements were taken on PA cephalograms to assess nasal obstruction caused by turbinate hypertrophy or nasal septal deviation. Interval estimation of the prevalence of different variables within gender groups was calculated using the Clopper-Pearson method with a 95% confidence level. Fisher's Exact tests were used to evaluate the possible association between two variables with the presence of maxillary contraction.
RESULTS: A higher percentage of females showed maxillary constriction (55.81%), but with no significant differences due to gender in our sample. The correlation between turbinate hypertrophy and maxillary constriction yielded a non-significant p-value of 0.27, whereas nasal septal deviation showed a slightly significant result with a p-value of 0.06, indicating a statistical significance with a 10% level of confidence and not 5%.
CONCLUSIONS: The hypothesis was rejected. Inferior turbinate hypertrophy and nasal septal deviation do not directly correlate with a reduction in transverse skeletal dimensions of the maxilla assessed on two-dimensional PA cephalograms. However, a tendency was observed between decreased maxillary transverse dimension and nasal septum deviation. In contrast, three-dimensional evaluations in a larger sample could yield further insights to be discussed.

Abstract citation ID: cjag070.121
SP84 PREDICTING SUCCESS RATE AND DURATION OF ORTHODONTIC TRACTION WITH GOLD CHAIN BONDING: A NOVEL PREDICTION MATRIX

Tze Ning Cheng, Elaine Li Yen Tan, Cheryl Ker Jia Lee, Yi Lin Song, Li Qian; *National Dental Centre Singapore, Singapore, Singapore*

AIM: Orthodontic traction with Gold Chain Bonding (GCB) facilitates the eruption of impacted teeth. This study evaluates factors influencing traction success and assesses a novel GCB traction complexity matrix in a local population.
MATERIALS AND METHODS: A retrospective cohort study conducted at the National Dental Centre Singapore analysed 495 impacted teeth from 421 patients (2014 to 2021). Radiographic and patient variables, along with treatment outcomes and duration were assessed, and complexity scores were derived using the GCB traction complexity matrix. Logistic regression and AUROC analyses evaluated predictors of success and duration.
RESULTS: Success correlated with crown and apex position, vertical height, and angulation, but not with apex formation and root form. Vertical height also influenced treatment duration. The GCB traction complexity matrix showed moderate predictive power (AUROC: 73.7%, 95% CI (64.2%, 83.2%)).
CONCLUSIONS: Crown and apex position, vertical height and angulation can serve as predictors of success, with vertical height also a predictor of treatment duration. The GCB traction complexity matrix can be used to guide case selection and optimize treatment planning.

Abstract citation ID: cjag070.122
SP85 CEPHELOMETRIC MORPHOLOGY IN PATIENTS AGED 16 AND OLDER WITH CLEFT PALATE ONLY

Alicja Zawiślak[1], Katarzyna Grocholewicz[2], Joanna Janiszewska-Olszowska[2]; *[1]1) Pomeranian Medical University in Szczecin 2) Institute of Mother and Child, Warsaw, Poland, [2]Pomeranian Medical University, Szczecin, Poland*

AIM: The aim of this study was to evaluate cephalometric craniofacial morphology in patients aged 16 and older with cleft palate only (CPO) compared to age-matched healthy controls, and to identify statistically significant differences in skeletal and dental parameters.
MATERIALS AND METHODS: The study included 46 patients aged 16 and older with CPO and age-matched healthy controls. Lateral cephalometric radiographs were analyzed for skeletal and dental parameters, including SNA, SNB, ANB, SNPg, NSBa, GntgoAr, NL-NSL, ML-NSL, ML-NL, H, 1+:1- angle, 1+:NA angle, 1-:NB angle, Nasolabial angle, Pg:NB, 1+:NA, 1-:NB, Wits appraisal, and Index. Mann-Whitney U tests were used to compare groups, with $p<0.05$ considered statistically significant.
RESULTS: Significant differences between groups were observed ($p<0.05$). The study group showed higher values for GntgoAr (127.91±8.97° vs. 123.33±7.23°), NL-NSL (12.29±5° vs. 8.03±3.55°), ML-NSL (34.74±7.76° vs. 31.22±6.75°), 1+:NA angle (27.53±10.07° vs. 21.4±10.59°), and 1+:NA (4.21±2.79 mm vs. 2.13±2.63 mm). The control group showed higher SNA (80.91±3.3° vs. 77.82±4.42°), ANB (3.22 ±2.65° vs. -1.12±4.33°), 1-:NB angle (25.94±7.42° vs. 20.96±7.89°), Nasolabial angle (110.83±12.74° vs. 98.58±19.12°), and Wits appraisal (0.42±2.63 mm vs. -3.35±4.28 mm). Other parameters, including SNB, SNPg, NSBa, ML-NL, H, 1+:1- angle, Pg:NB, and 1-:NB (mm), showed no significant differences.
CONCLUSIONS: Patients aged 16 and older with CPO exhibit significant cephalometric differences compared to age-matched healthy controls, with skeletal and dental variations suggesting maxillary deficiency, altered mandibular morphology, and compensatory dental inclinations. These findings highlight the importance of age-specific craniofacial assessment in orthodontic diagnosis and treatment planning in CPO patients.

Abstract citation ID: cjag070.123
SP86 RELIABILITY OF AI-DRIVEN CEPHALEOMETRIC ANALYSIS IN PATIENTS AGED 14–23 WITH CLEFT PALATE ONLY

Alicja Zawiślak[1], Natalia Kazimierczak[2], Wojciech Kazimierczak[2], Joanna Janiszewska-Olszowska[3]; *[1]1) Pomeranian Medical University in Szczecin 2) Institute of Mother and Child, Warsaw, Poland, [2]Kazimierczak Private Medical Practice, Bydgoszcz, Poland, [3]Pomeranian Medical University, Szczecin, Poland*

AIM: This study aimed to assess the reliability of AI-assisted cephalometric analysis in patients aged 14–23 with cleft palate only (CPO) and to investigate whether craniofacial features specific to CPO affect AI landmark detection.
MATERIALS AND METHODS: The study included 50 patients with CPO and an age-matched healthy control group. Lateral cephalograms were analyzed manually by two orthodontists using Ortodoncja 9 software and automatically by AI (CephX, ORCA Dental AI Inc., Israel). Each examiner and the AI performed two separate measurements with a two-week interval. Intra-rater repeatability and inter-rater agreement were evaluated using Lin's concordance correlation coefficient (CCC) and Bland–Altman plots. Statistical analyses were performed using R (version 4.3.3).
RESULTS: AI-based measurements demonstrated excellent intra-rater reliability across all parameters (CCC >0.90) in both groups. Manual analyses showed slightly lower repeatability, particularly for angular measurements. Bland–Altman analysis confirmed consistent agreement between repeated AI measurements without clinically meaningful bias. Small, consistent differences were observed when comparing AI and manual measurements. Although the reliability of AI measurements was slightly reduced in the CPO group compared to controls, it remained within clinically acceptable limits. Notably, the AI achieved CCC ≥0.97 for every parameter, with perfect agreement (CCC = 1.00) for the ANB angle, L1/NB (mm), and interincisal angle.
CONCLUSIONS: AI-assisted cephalometric analysis offers highly reliable measurements and reduces intra- and inter-observer variability in patients with CPO. Minor discrepancies compared to manual assessments are clinically negligible. These results support the use of AI tools in orthodontic evaluation, including in patients with craniofacial anomalies.

Abstract citation ID: cjag070.124
SP87 CORRECTION OF A ROTATED MAXILLARY CANINE USING CLEAR ALIGNER TREATMENT: A COMPARISON OF SIX COMMERCIAL PRODUCED DIGITAL TREATMENT PLANS

Stuart Burns, Amritraj Singh Jabbal, Parmjit Singh; *College of Medicine and Dentistry, Birmingham, United Kingdom*

AIM: The current literature provides limited evidence regarding maxillary canine de-rotation using clear aligner treatment (CAT) but highlights the unpredictability of this movement. No established gold standard protocol exists for aligner companies to program digital treatment plans (DTPs) for this movement, nor has any study compared this specific movement across different brands. The aim of this comparative study was to compare six different aligner DTPs for the de-rotation of a maxillary canine and to test the null hypothesis that there is no difference between each company's DTP for the same case study. The study will analyse if the DTPs follow current literature recommendations for de-rotating a maxillary canine using CAT.
SUBJECTS AND METHOD: One case study was selected who presented as a healthy 30-year-old female complaining of "squint upper teeth". The participant had a Class I incisor relationship on a Class I skeletal base with normal vertical proportions. The overjet was 2mm and the overbite was mildly increased. There was mild crowding on both upper and lower arches with rotated maxillary canines. The molar relationship was Class I bilaterally with dental midlines coincident. The case was complicated by generalised gingival recession and a Bolton's tooth-size discrepancy. The clinical records for the case were submitted to six aligner companies: Angel®,

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

ClearCorrect®, Invisalign®, Smartee®, Spark™ and SureSmile®. The DTPs were analysed using each manufacturer's planning software. The DTPs were compared against each other, and the current literature recommendations.
RESULTS: There was great variation between the six company's DTPs. As an overview, the number of active aligners used to de-rotate the maxillary canines varied from 8, for ClearCorrect®, to 33, for Smartee®.
CONCLUSION: The null hypothesis that there is no difference between each aligner company's DTP was rejected, thus indicating that there is great variation between each company's algorithms for planning CAT. The differences in each CAT DTP highlights the importance of clinician-led planning and communication to the aligner technicians. Of the brands tested, Spark™ followed the current literature recommendations the closest.

Abstract citation ID: cjag070.125
SP88 ASSESSING THE LEARNING CURVE OF DIGITAL INTRAORAL SCANNING FOR ORTHODONTIC POSTGRADUATES

Sarah Aljebreen, Aliki Tsichlaki, Robert Samuel David Smyth; *UCL Eastman Dental Institute, London, United Kingdom*

AIM: Developing confidence with digital scanners is now expected in orthodontic training. This study aims to assess the learning curve of orthodontic postgraduates using the iTero™ 2D+ scanner through scan timing and quality assessment.
PARTICIPANTS AND METHOD: An observational *in-vivo* study was conducted at a single centre in the United Kingdom involving twelve orthodontic trainees (Years 1–3) with no, or minimal prior scanning experience. Following a standardised training session, each participant performed twenty complete intra-oral scans using an iTero™ 2D+ scanner over an eight week period. For each episode, the calibrated main researcher recorded total scanning time directly from the scanner display and assessed scan quality using a 15-point rubric, adapted from manufacturer criteria. This involved evaluating gingival tissue capture, distal walls of terminal teeth, interproximal anatomy, occlusal surface completeness, and accuracy of centric occlusion. Intra- and inter-rater reliability of quality scoring were assessed using intraclass correlation coefficients. As each participant completed multiple scans and baseline performance varied among individuals, we analysed log-transformed scan time using mixed-effects regression with maximum-likelihood estimation. Spearman's rank correlation was used to assess the association between scanning time and scan quality.
RESULTS: Mean scan time decreased from 545.25 seconds (9 minutes and 5.25 seconds) on the first scan to 306.08 seconds (5 minutes and 6.08 seconds) on the twentieth scan ($p < 0.001$). The mixed-effects coefficient for episode was −0.0296 corresponding to an average of 2.9% reduction in scan time per each additional attempt. Mean scan quality scores remained consistent throughout the study (overall mean 12.1 ± 1.4) with scores of 10.8 and 11.3 for the first and last scans, respectively. No significant association was observed between scan quality and scan time (Spearman's $\rho = 0.04$; $p = 0.53$). Intra-rater reliability was excellent (ICC = 0.89) and inter-rater reliability was good (ICC = 0.75).
CONCLUSIONS: Orthodontic trainees exhibited a quantifiable learning curve relating to intraoral scanning, achieving substantial efficiency gains after limited practice without compromising scan quality. Structured training combined with regular practice can therefore help inexperienced orthodontic trainees become confident users of intraoral scanners early on in their training.

Abstract citation ID: cjag070.126
SP90 ‡‡‡ PATIENT UNDERSTANDING OF ORTHODONTIC RETENTION REQUIREMENTS: A TWO-CYCLE AUDIT OF AWARENESS AND INFORMATION PROVISION

Naomi Barton and Lucy Davenport-Jones; *St George's Hospital, London, United Kingdom*

AIM: To evaluate patients' understanding of orthodontic retention requirements following fixed appliance treatment including duration, function, and consequences of non-compliance. Also to determine whether targeted educational interventions improved awareness in a re-audit cycle.
MATERIALS AND METHOD: A prospective two-cycle audit was undertaken in St George's Hospital Orthodontic department; Cycle 1 was conducted in April 2025 and Cycle 2 in August 2025. The gold standard was that 100% of patients should be aware of the need for retainers post-treatment. Patients in active fixed appliance treatment completed an anonymous validated 9-item questionnaire assessing awareness of retainer necessity, duration, function, consequences of non-compliance and NHS policies relating to retreatment. Following the first cycle, the department implemented enhanced verbal explanations and renewed distribution of written and digital retention information including a patient information video displayed in the waiting room prior to re-audit. For both audit cycles, questionnaire responses were anonymised, collated using Microsoft Excel and analysed descriptively using percentage frequencies for each item. Findings were compared against the predefined standards.
RESULTS: In the first audit cycle 'C1' (n=33), 76% of patients were aware of the need for retainers, 27% understood the daily duration of wear, 52% could explain their function, and 36% recalled receiving written or digital information. All patients (100%) recognised what retainers look like, and 82% were aware of charges for replacement retainers.

In the second cycle 'C2' (n=35), awareness of retainer necessity increased to 86% (C1+10%), although this remained below the 100% standard. Understanding of daily wear duration increased to 49% (C1+22%), and correct understanding of function of retainers improved to 71% (C1+19%). Recognition of the appearance of retainers decreased to 91% (C1-9%), and awareness of charges for replacement retainers declined to 66% (C1-16%). Acknowledgment of receipt of written or digital information increased slightly to 39% (C1+3%). Although several domains showed improvement, key knowledge gaps persisted despite the intervention.
CONCLUSIONS: Patients demonstrated partial but inadequate understanding of essential retention requirements. Despite improvements following intervention, awareness of function and the consequences of non-compliance remained suboptimal. Further repeated retention counselling is required, incorporating verbal, written and digital aids at multiple treatment stages.

Abstract citation ID: cjag070.127
SP91 COMPARISON OF THE DISTAL MOVEMENT OF MAXILLARY FIRST PERMANENT MOLARS AND ANCHORAGE LOSS USING NON-SKELETAL ANCHORED DISTALIZING APPLIANCES

Payam Forghani, Laura Andreeva, Victoria Gurgurieva; *Medical university of Sofia - Faculty of Dental Medicine, Sofia, Bulgaria*

AIM: The purpose of this study was to compare the amount of distal displacement and angular tipping of maxillary first permanent molars produced by non-skeletally anchored distalizing appliances and to evaluate the anchorage loss on supporting teeth.
MATERIALS AND METHOD: A systematic literature review was conducted to identify the ten most frequently used non-skeletal anchored distalization appliances: Pendulum, Clear Aligners, K-Loop Appliance, Distal Jet, Bonded Molar Distalizer (BMD), Intraoral Bodily Molar Distalizer (IBMD), First-Class Appliance, Keles Slider, Fastback Appliance, and Carriere Motion II. The databases PubMed, Scopus, Web of Science, ScienceDirect, and Google Scholar were searched using specific keywords related to non-skeletal distalization. Sixty-eight articles published after 2000 met the inclusion criteria and were included for qualitative and quantitative analysis. The collected data comprised the amount of linear distalization (mm), distal tipping (°) of maxillary first molars, anchorage loss and statistical comparisons between appliance groups.
RESULTS: The comparative evaluation demonstrated substantial variability in distalization efficacy among the analyzed devices. The Pendulum appliance achieved the highest mean distalization (3.9 ± 1.1 mm) accompanied by greater tipping ($8.6 \pm 3.8°$). The Carriere Motion II achieved a smaller distal displacement (2.4 ± 0.9 mm) but demonstrated reduced tipping ($5.6 \pm 1.0°$). The Keles Slider and IBMD exhibited almost bodily movement, showing minimal angular change (0.9°–1.2°). Clear aligners achieved moderate distalization (2.0 mm) with minimal tipping (1.3°) and distinctive anterior torque control, expressed as incisor retrusion rather than proclination. Statistically significant differences were observed among devices for distal movement of the maxillary first ($p = 0.025$) and second molars ($p = 0.031$).
CONCLUSIONS: All examined non-skeletally anchored appliances were effective in distalizing maxillary molars within 2–5 mm. However, their biomechanical patterns varied considerably. Devices such as the Pendulum offered greater displacement with more tipping, while the Keles Slider and IBMD provided improved root control. Clear aligners presented the slowest yet most controlled movement. These findings emphasize that appliance selection should balance the clinical goals of movement magnitude and control of molar inclination. Standardized methodologies are required for future comparative analyses to ensure reproducibility and reliable clinical interpretation.

Abstract citation ID: cjag070.128
SP92 INFLUENCE OF THE UPPER FIRST MOLARS INCLINATION DURING TREATMENT WITH PRINTED LASER-SINTERED TOOTH-BORNE RAPID MAXILLARY EXPANDER

Emanuel Emiliyanov, Gergana Gurgurova, Mirela Georgieva; *Medical University of Sofia, Faculty of Dental Medicine, Sofia, Bulgaria*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: Rapid maxillary expansion (RME) is widely accepted treatment method for maxillary transverse deficiency (MTD). Tooth-borne expanders use the teeth for anchorage, offering less skeletal than dentoalveolar effects. Their most common side effect is increased buccal molar inclination. The printed laser-sintered tooth-borne rapid maxillary expanders (PLSTBRME) have presice expansion screw positioning, aiming to reduce the molar inclination and increase the bodily movement of the upper first molars (UFM). The aim is to determine the change in the inclination of the UFM in patients treated with PLSTBRME.
MATERIALS AND METHOD: The study included 28 patients (12 males and 16 females) with a mean age of 12.43 ± 2.62 years. All patients were diagnosed with MTD and were treated with PLSTBRME.

Measurements of the inclination of the right (ANG-16) and left (ANG-26) UFM relative to the Hard palate plane (HPP) were made. The measurements were performed on CBCTs before and after expansion and were measured in degrees.

HPP – The plane through the most lateral points of the bony palate.

ANG-16 and ANG-26 — The inner angles between the axial tooth planes (defined from F16/F26 – midpoint of the central fossa, to R16/R26 – midpoint between the roots) and the HPP.

MxOW – Maxillary Occlusal Width – The distance between the central fossa of the UFM.

Data analysis was done using IBM SPSS Statistics 27.0.1.0. software.
RESULTS: The mean change in the upper molars inclination was not statistically significant (ANG-16 – 0.600 ± 6.420 and ANG-26 – 2.190 ± 4.510). The minimum and maximum values were deemed to be significant (MIN_{ANG-16} – -10,60; MAX_{ANG-16} – 18,30 and MIN_{ANG-26} – -6,00; MAX_{ANG-26} – 12,60).

A statistically significant regression relationship was found between ANG-16 and ANG-26 and the change in MxOW. The relationship is described by the following equation ($R^2 = 0.465$, $p < 0.001$):

d_MxOW = 3.262 + 0.118×d_ang16 + 0.138×d_ang26

Where d_MxOW is the change in maxillary occlusal width due to the angulation of the UFM d_ang16 and d_ang26. According to the standardised Beta coefficients, d_ang16 (0,576) has greater influence than d_ang26 (0475).
CONCLUSIONS: The PLSTBRME is a feasible treatment option for reducing the molar inclination.

Abstract citation ID: cjag070.129
SP93 MEAN CHANGE IN THE MAXILLARY OCCLUSAL WIDTH DURING TREATMENT WITH DIGITALLY DESIGNED RAPID MAXILLARY EXPANDER

Emanuel Emiliyanov[1], Gergana Gurgurova[1], Venelin Marinov[2]; [1]Medical University of Sofia, Faculty of Dental Medicine, Sofia, Bulgaria, [2]Medical University of Sofia, Faculty of Medicine, Sofia, Bulgaria

AIM: The digital planning of orthodontic appliances enhances their functionality, enabling them to facilitate biomechanical consequences and precisely position every element in order to reduce deleterious effects. Digitally designed rapid maxillary expanders (DDRME) have precisely positioned expansion screws, bands covering the anchorage teeth, and rigid connecting structures to improve clinical outcome. The screw is set to be closest to the level of the centre of resistance (CR) of the upper first molars (UFM) and perpendicular to their axial planes, in order to reduce the buccal molar tipping and increase the bodily movement of the UFM. The aim is to determine the mean change of the maxillary occlusal width in the area of the UFM after treatment with DDRME.
MATERIALS AND METHOD: The study included 28 patients (12 males – 42.9% and 16 females – 57.1%) with a mean age of 12.43 ± 2.62 years. All patients were diagnosed with maxillary transverse deficiency associated with unilateral or bilateral posterior crossbite. The most common etiological factor for this deformity was functional breathing disorders (impaired nasal breathing). All patients were treated with individually planned DDRME.

The protocol included 20–28 screw activations once a day - 1/4 turns (0.25 mm) until slight overcorrection of the normal transverse occlusal relationship, was achieved.

Measurements of the Maxillary occlusal width (MxOW) were performed on a coronal slice of the CBCT image at the level of the CR of the upper first molars, before and after expansion.

MxOW – The distance between the central fossa of the upper first molars (MxOW1 – before expansion and MxOW2 – after expansion).

Data analysis was done using IBM SPSS Statistics 27.0.1.0. software.
RESULTS: A significant difference was found between the values of MxOW before and after treatment. The mean values of MxOW were as it follows: MxOW1 – 43,32 ± 3,25mm and MxOW2 – 46,95 ± 3,32mm.

The mean change of MxOW was – 3,64 ± 1,31mm. The minimum and maximum values were: MIN_{MxOW} – 0,88; MAX_{MxOW} – 6,43. Normal transversal occlusal relationship was achieved in all patients.
CONCLUSIONS: DDRME is a effective tretament option for increasing the maxillary transverce dimension and achieving normal trasnversal occlusal realtionship.

Abstract citation ID: cjag070.130
SP94 ASSISTING EAR-NOSE-THROAT TREATMENT BY IMPACTING THE NASAL CAVITY WITH TOOTH-BORNE RAPID MAXILLARY EXPANSION

Greta Yordanova[1], Venelin Marinov[2], Emanuel Emiliyanov[1], Gergana Gurgurova[1]; [1]Medical University of Sofia, Faculty of Dental Medicine, Sofia, Bulgaria, [2]Medical University of Sofia, Faculty of Medicine, Sofia, Bulgaria

AIM: Ear-Nose-Throat (ENT) specialists often diagnose nasal constrictions. Increasing the nasal dimensions will assist their treatment and improve the patency of the nasal airways. The hard palate is a part of the maxilla and lines the floor of the nasal cavity. This interconnection suggests that changes in the transverse dimension of the hard palate will lead to corresponding changes in the nasal cavity. Rapid maxillary expansion (RME) is one of the most common treatment methods for maxillary transverse deficiency (MTD). RME has a triangular expansion pattern both in axial and coronal planes. In the coronal plane the triangular pattern has a gradual decrease in linear measurement dimensions towards the frontonasal suture. The aim is to determine the nasal cavity changes in patients treated with tooth-borne RME.
MATERIALS AND METHOD: The study included 28 patients (12 males – 42.9% and 16 females – 57.1%) with a mean age of 12.43 ± 2.62 years. All patients were diagnosed with MTD and were treated with tooth-borne RME.

Measurements of the transverse changes – Hard palate width (HPW) and Nasal cavity width (NCW) were performed on a coronal slice of the CBCT image at the level of the centers of resistances of the upper first molars, before and after expansion.

HPW— The distance between the most lateral points of the bony palate

NCW— The distance between the widest parts of the lateral nasal walls

Data analysis was done using IBM SPSS Statistics 27.0.1.0. software.
RESULTS: A significant difference was found between the values of NCW and HPW before and after treatment. The mean values of HPW were as it follows: HPW1 – 25,75 ± 3,41mm and HPW2 – 26,94 ± 3,36mm. For NCW the mean values were: NCW1 – 29,79 ± 2,64mm and NCW2 – 31,19 ± 2,39mm.

The mean change of the parameters was: HPW – 1,19 ± 1,25mm and NCW – 1,40 ± 0,93mm. The minimum and maximum values were: MIN_{HPW} – -1,60; MAX_{HPW} – 4,00; MIN_{NCW} – 0,12; MAX_{NCW} – 3,60. Judging by the mean values, the expansion in HPW and NCW was synchronous.
CONCLUSIONS: Tooth-borne RME increases the hard palate width, thus changing synchronously the transverse dimension of the nasal cavity aiding ENT treatments.

Abstract citation ID: cjag070.131
SP95 A MULTIDISCIPLINARY ASSESSMENT OF ORAL BREATHING, SPEECH DISORDERS, AND DENTOFACIAL DEFORMITIES IN CHILDREN WITH ADENOID HYPERTROPHY

Gergana Gurgurova[1], Tsvetomira Boycheva[2], Mirela Georgieva[1], Greta Yordanova[1], Venelin Marinov[3]; [1]at Medical University of Sofia, Faculty of Dental Medicine, Sofia, Bulgaria, [2]New Bulgarian University, Sofia, Bulgaria, [3]at Medical University of Sofia, Faculty of Medicine, Sofia, Bulgaria

AIM: Mouth breathing is a pathological condition that leads to several changes and pathological conditions, especially if it is a consequence of adenoid hypertrophy. Those changes are more prevalent when the pathological breathing persists for an extended period. The study aims to analyze speech disorders and orthodontic deformities in the children diagnosed by ENT specialist with Adenoid Hypertrophy (AH) and to develop a multidisciplinary protocol for patient with AH.
MATERIALS AND METHOD: This study presents an evaluation of 28 patients — 14 in the control group and 14 in the experimental group, all aged 4,0–11,9 years, from Sofia, Bulgaria. Both groups contains 6 female and 8 males. The interdisciplinary team assessed each child. An ENT specialist, an orthodontist, and a speech therapist provides an independent assessment.

IBM SPSS Statistics software (version 25) was used to process and analyze the empirical data collected. Both descriptive and inferential statistical analyses were conducted to examine the existence and strength of the relationships among the studied variables.
RESULTS: The results of the study are described from the perspective of three specialists: an ENT specialist, an orthodontist, and a speech therapist. The collected data serve as a basis for developing an assessment approach implemented by a multidisciplinary team. The orthodontic analysis identifies dentofacial deformities of varying severity, including compression of both jaws, crossbite in the distal and

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

frontal segments, open bite, and, in most cases, class II occlusal relations. There is significant relation between AH grade and the severity of orthodontic deformation. The speech-language status establishes a high frequency of disorders in articulating fricatives /s/, /z/, /sh/, /zh/, and affricatives /ts/ and /tsh/, interdental articulation of phonemes from early ontogenesis (plosives /t/ and /d/, nasal /n/), distinguished by an articulation position in the upper front part of the oral cavity. Manifestations of speech disorders and dentofacial deformities are a direct consequence of established pathological breathing, resulting from adenoid hypertrophy; these data are statistically significant.
CONCLUSION: A multidisciplinary team and approach are necessary to assess and treat changes caused by adenoid hypertrophy, thereby preventing the development of craniofacial deformities and speech disorders.

Abstract citation ID: cjag070.132
SP98 EVALUATION OF DENTAL ANOMALIES IN CHILDREN WITH DIFFERENT TYPES OF CLEFT LIP AND PALATE IN THE REPUBLIC OF MOLDOVA

Postaru Cristina[1], Gudumac Eva[2], Railean Silvia[2], Haidarli Doina[3]; *[1]State University of Medicine and Pharmacy Nicolae Testemitanu, Chisinau, Republic of Moldova, [2]State University of Medicine and Pharmacy "Nicolae Testemițanu", Chisinau, Republic of Moldova, [3]Children Hospital, Chisinau, Republic of Moldova*

AIM: Dental anomalies in children with cleft lip and palate are more common. The presence of dental anomalies causes functional and aesthetic disorders, and their study and treatment is important in the rehabilitation process of children with different types of cleft lip and palate. The aim of the study is to evaluate the dental anomalies in children with different types of cleft lip and palate in Republic of Moldova.
MATERIALS AND METHODS: The study included patients with unilateral (group 1), bilateral (group 2) and palatal (group 3) clefts with an average age of 10.5 years, 11.8 years and 9.75 years respectively, who were referred to the "Em Coțaga" Children's Clinical Hospital during the years 2022-2024. Based on 47 orthopantomographies and study models, we evaluated dental positional anomalies, which included the inclination parameters of the central incisors and upper canines relative to the maxillary plane, and among dental number anomalies, we evaluated the number and type of dental agenesis, supernumerary teeth.
RESULTS: In children with unilateral cleft lip and palatal, there is a prevalence of adentia, especially lateral upper incisor from both side in 46.4%, in 3.1% from one side in children with unilateral cleft lip and palatal compared to the group of children with bilateral cleft lip and palatal (11.1%) and cleft palate (12.5%). The position of the central incisors ($p<0.05$) and the upper right canines ($p<0.05$) have a statistically significantly greater inclination in the direction of the bilateral cleft lip and palate compared to children with unilateral cleft lip and palate. In children with unilateral cleft lip and palate, a statistically significant position of the upper left central incisor ($p<0.001$) was determined to be more inclined towards the maxillary plane compared to groups 2 and 3.
CONCLUSIONS: The higher frequency of dental anomalies and position of teeth in children with cleft lip and palatal during the mixed dentition period suggests that rehabilitation requires early interventions to prevent aesthetic and functional complications of the maxillofacial region.

Abstract citation ID: cjag070.133
SP99 AN INVESTIGATION OF FACTORS AFFECTING DENTAL OUTPATIENT SATISFACTION: A CASE OF A HOSPTAL IN SOUTHERN TAIWAN

Ching-Yi Wu; *TAINAN MUNICIPAL HOSPITAL (MANAGED BY SHOW CHWAN MEDICAL CARE CORPORATION), Tainan, Taiwan*

AIM: This study analyzes 2025 dental outpatient satisfaction survey data to explore patient satisfaction across four dimensions: "Hospital Environment," "Waiting Time," "Service Attitude," and "Medical Process." The research objectives were to:

1. Compare differences in dimension scores and overall satisfaction based on demographics (gender, age, education, visit type).
2. Compare the mean score differences among the four dimensions.
3. Investigate the correlation between the four dimension scores and "Overall Satisfaction."

MATERIALS (OR SUBJECTS) AND METHOD: This cross-sectional study used data from the 2025 dental outpatient satisfaction survey, yielding 30 valid samples (N=30). Data were analyzed using the SPSS statistical package. Statistical methods included Independent Samples T-test, One-way ANOVA, Paired Samples T-test, and Pearson Correlation.
RESULTS:

1. Dimension Comparison: Mean satisfaction scores ranked from high to low were: "Hospital Environment" (4.39) > "Medical Process" (4.21) > "Service Attitude" (3.89) > "Waiting Time" (3.59). Paired T-tests showed that the "Waiting Time" score was significantly lower than all other dimensions ($p < 0.05$), making it the lowest-rated item.
2. Demographic Differences: Males' "Overall Satisfaction" (mean 4.74) was significantly higher than females' (4.09) ($p = 0.035$). For education, a significant difference was found in the "Hospital Environment" dimension ($p = 0.012$), where patients with "Elementary school or below" (5.00) reported significantly higher satisfaction than those with "Junior high" (4.13). No significant differences were found for visit type or age group.
3. Correlation Analysis: No significant linear correlation was found between any of the four dimension scores and "Overall Satisfaction."

CONCLUSION: The analysis shows that 2025 dental outpatients were most satisfied with the "Hospital Environment" and "Medical Process." However, "Waiting Time" was the lowest-rated dimension and is the key priority for improvement. It was also observed that male patients had significantly higher overall satisfaction than females. Regarding the hospital environment, patients with lower education (Elementary school or below) provided significantly higher ratings than those with a Junior high education.

Abstract citation ID: cjag070.134
SP100 COMPARISON OF TWO STEREOPHOTOGRAMMETRY-BASED THREE-DIMENSIONAL FACIAL SCANNING METHODS: SMARTPHONE VERSUS 3DMD FACESYSTEM™

SANT Gaël LE[1], Elia KOL[1], François LEFEBVRE[2], Yves BOLENDER[1]; *[1]Orthodontic Department, Faculty of Dental Surgery, University of Strasbourg, Strasbourg, France, [2]Division of Public Health, Methodology and Biostatistics, University Hospitals of Strasbourg, Strasbourg, France*

AIM: The aim of this study was to evaluate the accuracy of three smartphone-based three-dimensional facial scanning applications—Polycam™, 3D Scanner App™ and EM3D™—by comparing them with a professional stereophotogrammetry system (3dMD FaceSystem™). Secondary objective was to identify anatomical regions affected by reduced precision.
MATERIALS AND METHOD: The face of thirty adult participants was scanned using the 3dMD FaceSystem™, followed by facial scans performed with Polycam™, 3D Scanner App™ and EM3D™ on an iPhone 13 Pro™. All acquisitions were performed by the same operator under standardized conditions. After preprocessing and uniform trimming of the models, each smartphone scan was registered to its corresponding 3dMD™ reference using a landmark-based pre-alignment followed by an Iterative Closest Point algorithm. Cloud-to-mesh distances were extracted for all surface points. Quantitative outcomes included absolute mean distances, mean differences, root mean square errors (RMSE) and the proportions of points showing a deviation greater than 2 mm. Qualitative assessment was performed using colour-coded deviation maps. Intra-examiner reliability was evaluated by repeating ten randomly selected registrations.
RESULTS: 90 smartphone scans were analysed, representing 588,513 surface points. Polycam™ showed an absolute mean distance of 0.53 mm, an RMSE of 0.73 mm and 1.91% of points above 2 mm. 3D Scanner App™ yielded similar results, with an absolute mean distance of 0.55 mm, an RMSE of 0.75 mm and 1.73% of points above 2 mm. EM3D™ demonstrated the lowest accuracy, with an absolute mean distance of 1.14 mm, an RMSE of 1.47 mm and 15.40% of points exceeding 2 mm. All applications showed a systematic positive mean difference, indicative of an overestimation relative to the reference. Qualitatively, the least accurate regions across all applications were the perioral and periocular areas, while the cheeks and forehead surfaces were the most consistent. Intra-examiner reproducibility was excellent for all applications (intraclass correlation coefficients between 0.972 and 0.999).
CONCLUSIONS: Polycam™ and 3D Scanner App™ demonstrated clinically acceptable precision and may represent viable alternatives to high-end stereophotogrammetry systems for three-dimensional facial surface acquisition. EM3D™ showed substantially lower accuracy. Anatomical regions involving complex curvature or soft-tissue mobility remain the most prone to deviation in smartphone-based scanning.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.135
SP101 A LONGITUDINAL OBSERVATIONAL STUDY TO EVALUATE THE EFFECT OF ORTHODONTIC TREATMENT ON TEMPOROMANDIBULAR DISORDERS IN ADOLESCENTS WITH DIVERSE TYPES OF MALOCCLUSIONS

Ala Hamidaddin[1], Fahad aleisa[2], Marie Pegelow[1], Nikolaos Christidis[1]; [1]Karolinska, Stockholm, Sweden, [2]Majmaah University, Riyadh, Saudi Arabia

AIM: This study aimed to evaluate whether orthodontic treatment influences the presence of temporomandibular disorders (TMD) following the correction of different malocclusion types in adolescents. The investigation compared age- and sex-matched groups through standardized clinical examinations and validated electronic questionnaires.
MATERIALS AND METHODS: This longitudinal study re-examined 30 adolescents (15 male, 15 female) who had been previously examined prior to orthodontic treatment. At follow-up, 26 participants completed the post-treatment assessment. Two calibrated orthodontic investigators (FA and AH), trained in the standardized and validated TMD examination (DC/TMD) by an orofacial pain specialist (NC), conducted all clinical examinations. Prior to muscle and joint palpation, the examination finger was calibrated using a mechanical pressure algometer to ensure consistent force application. Comprehensive orthodontic assessments included evaluations of sagittal, vertical, and transverse discrepancies, as well as dental spacing and tooth position anomalies.

TMD evaluation followed the DC/TMD Axis I and II protocols. Participants provided electronic consent and completed validated questionnaires via REDCap, including the Graded Chronic Pain Scale (GCPS), Perceived Stress Scale (PSS-4), Patient Health Questionnaire (PHQ-4), Oral Behaviors Checklist (OBC), Jaw Functional Limitation Scale (JFLS-8), Oral Health Impact Profile (OHIP-14), and Orofacial Esthetics Scale (OES). TMD diagnoses were classified as painful or non-painful.
RESULTS: A McNemar statistical analysis was performed to compare pre- and post-treatment outcomes. Among 26 re-examined patients, 5 transitioned from TMD to no-TMD, while 2 developed new TMD-symptoms post-treatment. The overall TMD prevalence decreased from 42.3% to 30.8%, representing an 11.5% reduction. A binary logistic regression examined age, sex, and baseline TMD status as predictors of post-treatment TMD. Baseline TMD status was the only variable approaching statistical significance (OR = 20.7, p = 0.051), whereas sex (p = 0.086) and age (p = 0.196) were not significant predictors.
CONCLUSION: Orthodontic treatment during adolescence may influence temporomandibular function by modulating sensorimotor activity after appliance placement. The discomfort associated with orthodontic tooth movement may transiently reduce parafunctional behaviors, such as clenching or excessive biting, contributing to a decrease in TMD-symptoms following treatment.

Abstract citation ID: cjag070.136
SP102 ‡‡‡ *** IMPACT OF ORTHODONTIC FORCED ERUPTION TIMING ON ROOT DEVELOPMENT OF IMPACTED MAXILLARY CANINES: A LINEAR AND VOLUMETRIC ANALYSIS USING CONE-BEAM COMPUTED TOMOGRAPHY IMAGES

Jeong-Woo Keum, Ye-Hyun Lee, Na-Young Chang, Jong-Moon Chae; *Departments of Orthodontics, Wonkwang University Daejeon Hospital, Daejeon, Republic of Korea*

AIM: To evaluate root development after forced eruption of impacted maxillary canines before or after complete root development of the contralateral canine.
MATERIALS AND METHOD: A total of 50 patients (21 male, 29 female; mean age: 12.4 years) with unilateral impaction of maxillary canines were classified to “Immature group” with incomplete root development of the contralateral canine or “Mature group” with complete root development of the contralateral canine. Volume, total length, crown length, root length, and root/crown ratio (R/C) of the impacted canine and the contralateral canine were measured in the posttreatment cone-beam computed tomography images.
RESULTS: In the immature group, total length and root length of impacted canines were 0.68 mm and 0.51 mm shorter than contralateral canines, respectively (P< .05). In the mature group, volume, total length, root length, and R/C of impacted canines were 37.90 mm^3, 2.43 mm, 2.53 mm, and 0.26 smaller, respectively, than contralateral canines (P< .001). Crown length also showed a statistically significant difference between impacted canines and contralateral canines (P< .05). When differences between impacted canines and contralateral canines were compared between the immature and mature groups, all variables showed statistically significant differences, with the mean difference in total length and root length being 1.75 mm and 2.02 mm larger, respectively, in the mature group, (P< .001).
CONCLUSIONS: Regardless of treatment timing, total length and root length of impacted canines were shorter than those of contralateral canines. Forced eruption of the impacted canine undertaken before root development of the contralateral canine showed better root development in both linear and volumetric measurements.

Abstract citation ID: cjag070.137
SP104 EARLY INTERCEPTIVE TREATMENT OF ANTERIOR CROWDING IN CHILDREN IN THE EARLY MIXED DENTITION WITHOUT POSTERIOR CROSSBITE – A SYSTEMATIC REVIEW

Emil Östlund[1], Sofia Petrén[2], Farhan Bazargani[3]; [1]Örebro University, Örebro, Sweden, [2]Malmö University, Malmö, Sweden, [3]University of Gothenburg, Gothenburg, Sweden

AIM: This systematic review aims to evaluate whether the current evidence supports expansion in the early mixed dentition with anterior crowding without a posterior crossbite.
MATERIAL AND METHOD: This systematic review was conducted according to the PRISMA guidelines and registered at the PROSPERO-register. Medline, Cochrane, Embase, Web of Science were searched systematically. Randomized, prospective and retrospective controlled trials were included if the maxilla was expanded and change in arch perimeter were reported. Risk of bias was assessed using the tools in Cochrane handbook. GRADE was used to assess the reliability of the combined result.
RESULTS: The systematic search identified 2006 studies, with 1134 abstracts screened. This process led to 26 studies undergoing full-text review, of which six were included. The included studies comprised one RCT, one prospective cohort study, and four retrospective cohort studies. All patients in these studies exhibited dental crowding and/or narrow dental arches. Various expansion modalities and protocols were employed. The studies reported changes in arch perimeter ranging from 0.9 to 6.15 millimetres. No harm or adverse effects were reported. The risk of bias assessment revealed serious to critical concerns for both the prospective and retrospective cohort studies, and some concerns were raised for the RCT.
CONCLUSIONS: Maxillary expansion appears to increase the arch perimeter and thus relieve the anterior crowding. The certainty of evidence is low, and the results must be interpreted with caution.

Abstract citation ID: cjag070.138
SP105 ‡‡‡ PREDICTIVE FACTORS FOR SUCCESSFUL EARLY INTERCEPTIVE ORTHODONTIC TREATMENT

Anja Ratzmann and Karl- Friedrich Krey; *University Medicine, Department of Orthodontics, Greifswald, Germany*

PREDICTIVE FACTORS FOR SUCCESSFUL EARLY INTERCEPTIVE ORTHODONTIC TREATMENT IDENTIFIED THROUGH CLASSIFICATION AND REGRESSION TREE ANALYSIS
AIM: The aim of this pilot study was to identify clinical and anamnestic predictors associated with successful early interceptive orthodontic treatment.
MATERIALS AND METHOD: A retrospective analysis was conducted on diagnostic records of 21 patients (11 female, 10 male; mean age 8 years) who received early interceptive treatment. Assessed parameters included sex, family history of malocclusion, mouth breathing, snoring/bruxism, thumb sucking, early feeding type (breastfeeding vs. bottle-feeding), overjet, overbite, and initial orthodontic indication group. Descriptive statistics were performed, followed by a Classification and Regression Tree (CART) analysis to identify variables most strongly associated with treatment success. Treatment success was defined as the complete achievement of the initial therapeutic objectives.
RESULTS: Overall, 17 of 21 patients (80%) achieved the defined treatment goals. CART analysis identified an overjet up to 5.2 mm and absence of a positive family history of malocclusion as the most relevant predictors for successful outcomes. Patients presenting with larger sagittal discrepancies or a positive family history demonstrated notably lower success rates. Additionally, oral habits such as thumb sucking were associated with reduced treatment effectiveness, although they did not emerge as primary decision drivers within the CART model.
CONCLUSIONS: Moderate sagittal deviations appear more responsive to early interceptive orthodontic treatment than pronounced overjet discrepancies. A family predisposition to malocclusion negatively influences treatment prognosis, emphasizing the relevance of early preventive strategies targeting orofacial dysfunctions. These findings highlight the importance of interdisciplinary management in the pediatric population. The applied CART methodology provides a promising analytical framework and may serve as a basis for future predictive models, including AI-assisted approaches, to refine prognostic accuracy in early orthodontic treatment planning.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.139
SP106 DENTICLE PREVALENCE AND CALCIFICATION CHANGES IN PATIENTS UNDERGOING MULTIBRACKET ORTHODONTIC TREATMENT: A RETROSPECTIVE RADIOGRAPHIC STUDY

Anja Ratzmann[1], Karl- Friedrich Krey[1], Siemen Beisser[2]; [1]University Medicine, Department of Orthodontics, Greifswald, Germany, [2]Private Dental Office, Emden, Germany

AIM: This retrospective study aimed to evaluate changes in denticle prevalence during multibracket orthodontic treatment using panoramic radiographs and to assess potential influencing factors including sex and treatment duration. Additionally, the study investigated the preferred localization of denticles and quantified changes in calcification and size of existing denticles.
MATERIALS AND METHODS: Panoramic radiographs of 199 patients (117 females, 82 males; mean age 12.5 years) were assessed at the start (T0) and end (T1) of multibracket treatment. Denticle prevalence was analyzed on both patient and tooth levels. Prevalence changes were evaluated using the McNemar test. Sex-related differences were assessed using Pearson's chi-square test. The influence of treatment duration was examined using Shapiro-Wilk tests for normality followed by Mann-Whitney tests for non-normally distributed data. A generalized linear model was applied to validate associations between sex and treatment duration. Quantitative changes in calcification (mean grey value) and denticle size were evaluated using ImageJ pixel-based analysis.
RESULTS: Denticle prevalence increased significantly from 19.6% at T0 to 28.6% at T1 ($p < 0.05$). Sex-specific analyses revealed similar prevalence at baseline (19.7% females; 19.5% males), but a significantly higher increase in males (rise of 15.9% to 35.4%) compared with females (rise of 4.2% to 23.9%; $p = 0.005$). On tooth level, prevalence increased in all first and second molars of both jaws. Upper molars showed higher initial and final prevalence, while relative increases were comparable across jaws. Treatment duration (mean 16.6 months) showed no significant association with denticle development ($p = 0.90$). Quantitative analyses demonstrated increases in both calcification and size of existing denticles; however, neither sex nor treatment duration showed significant effects on these parameters. Regression analysis confirmed the absence of sex- or duration-related predictive value.
CONCLUSIONS: Multibracket orthodontic treatment is associated with a significant increase in denticle prevalence, with males exhibiting a higher rise than females. Denticles occurred predominantly in maxillary molars. Although denticles showed increased calcification and size during treatment, these changes were not influenced by sex or treatment duration. The elevated prevalence of denticles may serve as a potential radiographic indicator of systemic conditions, highlighting the diagnostic relevance of routine dental radiography.

Abstract citation ID: cjag070.140
SP107 ‡‡‡ RESEARCH TRANSPARENCY IN ARTICLES PUBLISHED IN ORTHODONTIC JOURNALS: IS IT CLEAR?

Matthew Chi Hong Yii[1], Martyn Cobourne[1], Nikolaos Pandis[2], Jadbinder Seehra[1]; [1]King's College London, London, United Kingdom, [2]University of Bern, Bern, Switzerland

AIM: Issues regarding research transparency have been highlighted in the literature. The aim of this investigation was to assess the trend of adhering to the reporting of key transparency practices (data sharing, code sharing, conflict of interest (COI) disclosure, funding disclosure, and protocol registration) by articles published in three leading orthodontic journals.
MATERIALS AND METHOD: A Scopus database search was undertaken to identify articles published in 2013, 2018 and 2023 in three orthodontic journals: European Journal of Orthodontics (EJO), Angle Orthodontist (AO) and American Journal of Orthodontics and Dentofacial Orthopaedics (AJODO). Independent data extraction was performed. Frequency distributions and cross tabulations (COI not disclosed vs COI disclosed) were calculated. Univariable logistic regression was undertaken to detect associations between COI disclosure and publication characteristics, journal type and reporting of transparency practices.
RESULTS: 1498 articles were analysed. No data sharing statement (60.7%) was commonly cited. The intention to share data was stated in approx. 15% articles. No article stated a code sharing statement. Almost 70% articles had not registered a protocol. A third of articles disclosed the funder or sponsor (32.7%), while approximately an equal number of articles disclosed (49.1%) or did not disclose (50.9%) any conflict of interest. Articles published in the EJO had higher odds of reporting protocol registration (OR 7.42; 95% CI: 4.55, 12.10; P<0.01) and funding disclosure (OR 3.44; 95% CI: 2.52, 4.69; P<0.01) compared to AO and AJODO. A COI disclosure statement was more likely to be in articles published in AJODO. The odds of reporting a data sharing statement were higher in articles published in EJO (OR 8.72; 95% CI: 5.72, 13.29; P<0.001). Apart from code sharing, improvements over the 5-year intervals in reporting of transparency indicators were evident.
CONCLUSIONS: Despite improvements over the 5-year intervals, the reporting of research transparency indicators requires improvement in articles published in orthodontic journals. To encourage transparent research conduct and open science practices, journals and their editors should promote reporting of research transparency indicators.

Abstract citation ID: cjag070.141
SP108 OBJECTIVE CHANGES IN DENTAL AND FACIAL PROFILE AESTHETICS FOLLOWING SURGICAL VERSUS NONSURGICAL CAMOUFLAGE ORTHODONTIC TREATMENT IN ADULT SKELETAL CLASS III ANTERIOR CROSSBITE

Tamaki Mohri[1], Ayumi Sato[1], Izumi Honda[1], Atsushi Watanabe[1], Akihiko Kaji[2]; [1]Mohri Orthodontic Office, Tsukuba, Tsukuba, Japan, [2]Hanzomon Familia Orthodontic Clinic, Tokyo, Japan

AIM: This study aimed to compare objective changes in dental and facial profile aesthetics following surgical orthodontic (SO) treatment and nonsurgical camouflage orthodontic (NS) treatment in adult skeletal Class III anterior crossbite. Aesthetic outcomes were evaluated using the Dental Aesthetic Index (DAI), which is negatively correlated with lay judgments of dental appearance, and the Profile Aesthetic Index (PAI), which is positively correlated with assessments of facial profile attractiveness.
SUBJECTS AND METHODS: A retrospective cohort of 40 adult patients with skeletal Class III anterior crossbite was analyzed, consisting of 20 who underwent SO treatment and 20 who underwent NS treatment. DAI scores were assessed using pre- and post-treatment dental casts, while PAI scores were derived from seven soft-tissue measurements on lateral cephalometric radiographs. Statistical analyses examined intragroup changes and intergroup differences. Conventional dentofacial morphological assessments were also performed.
RESULTS: Pretreatment median DAI scores were not significantly different between the SO group (33) and the NS group (42). Both treatment modalities yielded significant improvement, with post-treatment scores of 22 (SO) and 25 (NS), and no significant difference between the groups. Pretreatment median PAI scores were significantly lower in the SO group (30.0) than in the NS group (37.9), reflecting more compromised profile aesthetics in surgically treated candidates. Post-treatment PAI scores increased significantly in both groups, reaching 45.5 in the SO group and 45.3 in the NS group, with no significant intergroup differences.
CONCLUSIONS: Although patients with more compromised pretreatment profile aesthetics were preferentially managed with surgical orthodontic treatment, both SO and NS approaches produced substantial and comparable improvements in objective dental and facial profile aesthetics. In appropriately selected patients, NS treatment can yield facial profile aesthetic outcomes equivalent to those achieved with SO treatment in adult skeletal Class III anterior crossbite.

Abstract citation ID: cjag070.142
SP109 THIRD MOLAR ANGULATION ON PANORAMIC RADIOGRAPHS FOLLOWING PREMOLAR EXTRACTION VS NON-EXTRACTION ORTHODONTIC TREATMENT: A SYSTEMATIC REVIEW AND META-ANALYSIS

Nikolaos Kazanopoulos[1], Konstantina Balkoni[2], Heleni Vastardis[1], Iosif Sifakakis[1], Dimitrios Konstantonis[1]; [1]Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece, [2]In private practice, Athens, Greece

AIM: To determine whether premolar extractions result in more favorable angulation of erupting third molars compared to non-extraction orthodontic treatment.
MATERIALS AND METHOD: MEDLINE and Scopus were searched (up to November 2024) for observational studies comparing third molar angulation after orthodontic premolar extraction versus non-extraction. Only studies with post-treatment angular measurements of third molars were included. Data from eligible studies were pooled using a random-effects meta-analysis to calculate mean differences (MD) and standardized mean differences (SMD) with 95% confidence intervals. Risk of bias was assessed with the ROBINS-I tool, and evidence quality was appraised via GRADE. Meta-regression evaluated effects of age, sex, and 1st vs 2nd premolar on outcomes.
RESULTS: Nine studies (865 patients) were included. Mandibular third molars were significantly more upright in extraction versus non-extraction groups (overall SMD = - 0.37, 95% CI: -0.59 to -0.15; $p = 0.004$). Extraction treatment also resulted in significantly reduced lower third molar angulation relative to the adjacent second molar (M3L-M2L MD = -1.3°, $p = 0.003$) and to the palatal reference plane (M3L-PP MD = -4.9°, $p = 0.02$). Lower third molar angulation to the mandibular plane (M3L-MP)

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

showed no significant difference between groups. Regarding the upper third molars, only the angulation to the palatal plane (M3U-PP) was significantly reduced in the extraction group (MD = -5.8°, p = 0.049), whereas other maxillary angles did not differ significantly between groups. Meta-regression found no significant influence of age, sex, or premolar group on outcomes.
CONCLUSIONS: Orthodontic premolar extractions are associated with a significant improvement in third molar angulation, particularly for mandibular third molars. The more upright positioning observed in extraction cases likely reflects the increased eruption space and a potentially reduced risk of impaction. Maxillary third molars were less affected by extraction therapy. These findings suggest that extraction-based treatment can modestly improve third molar eruption conditions and should be considered during treatment planning.

Abstract citation ID: cjag070.143
SP110 ACCURACY OF COMBINING INTRAORAL AND FACIAL SCAN IN ORTHODONTIC PATIENTS' DIGITAL MODEL: A PROSPECTIVE CROSS-SECTIONAL STUDY

Michail Vasoglou[1], Ioanna Pouliezou[1], Konstantinos Apostolopoulos[2], Georgios Vasoglou[1]; *[1]Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece, [2]Orthodontics Department, School of Dental Medicine, Case Western Reserve University, Cleveland, United States*

AIM: To validate the accuracy of integration of the intraoral scan to the facial scan acquired by the EM3D application, utilizing the Blue-Sky Plan 4 software, creating a digital model of an orthodontic patient, by comparing the same linear measurements on real photographs and images from the digital model of the patient.
MATERIALS AND METHODS: 30 patients (20 females and 10 males; age range 12-30 years) undergoing orthodontic treatment with fixed appliances were recruited in this prospective cross-sectional study from December 2024 to February 2025. Five facial landmarks were marked on each patient: Tragion right, cheilion right and left, subnasale and pronasale. Intraoral scan and facial scan were performed at the same appointment. Facial scan was conducted using an iPhone 13 Pro with the EM3D face scanning application which utilizes the iPhone's TrueDepth camera technology, while the patient was smiling. The STL (Stereolithography) and OBG (Object) files (acquired from intraoral and facial scan respectively) were combined in a digital model using the Blue Sky Plan 4 software. Lateral and frontal photographs of the patient's face, while smiling, were also acquired. Eight linear measurements (Tragion right – bracket #11, Tragion right – incisal #11, Cheilion right - #13, Cheilion left - #13, Subnasale - #11, Subnasale - #21, Pronasale - #11, Pronasale - #21) were digitally performed on the real and digital photographs of the patients using the facial landmarks and certain points on teeth and braces. Paired sample t-test and Wilcoxon signed-rank test were used for statistical analysis.
RESULTS: Only for the measurement R Cheilion tooth #13 a statistically significant difference was recorded (P = 0.004). In the other areas, the differences were not statistically significant.
CONCLUSIONS: The combination of intraoral and facial scan, with the use of a specialized software, can provide a digital model of the orthodontic patient that can be used for diagnosis, treatment planning and outcome assessment.

Abstract citation ID: cjag070.144
SP112 JOB SATISFACTION FROM THE ORTHODONTIC THERAPIST PERSPECTIVE WITHIN THE UNITED KINGDOM

Melissa Sin[1], Jeremy Brown[1], Sarah Lyon[1], Benjamin Lewis[2]; *[1]Edge Hill University, Liverpool, United Kingdom, [2]Betsi Cadwaladr University Health Board, Wrexham, United Kingdom*

BACKGROUND: Orthodontic therapists (OTs) are play an important role in the provision of orthodontic care in the UK. Since the role's launch in 2008, the OT workforce has grown rapidly, yet limited research explores job satisfaction from their perspective.
AIM: Identify current working patterns and environments of OTs in the UK, assess overall job satisfaction, and identify factors impacting job satisfaction
MATERIALS AND METHOD: Online cross-sectional survey informed by an online focus group. Seven OTs, recruited via the Orthodontic National Group (ONG) mailing list, participated in a Microsoft Teams focus group on job satisfaction. A questionnaire was developed using literature, focus group content analysis, and pilot testing. Distribution was via the ONG and BOS mailing lists, social media, and private OT Facebook groups. Data were analysed using descriptive statistics and content analysis, with Chi-squared and Fisher-Freeman-Halton Exact tests to explore associations between demographics, work factors, stress, and job satisfaction.
RESULTS: Job satisfaction was high among OTs. Remuneration, support from supervisors and the orthodontic team, quality of prescriptions, and employee benefits such as pension and sick pay were top influencing factors when seeking OT roles. Negative impacts on satisfaction included poor remuneration, inadequate supervision, insufficient time, excessive wait for supervision, poor prescription quality, lack of appreciation/support from management/orthodontic team, and inappropriate patient caseload. Part-time working, positive supervisor relationships, and responsibilities outside work such as ONG or BOS involvement positively impacted job satisfaction. A statistically significant association was found between overall job satisfaction and stress.
CONCLUSIONS: OT job satisfaction is generally high, although several factors impact job satisfaction. Stress influences overall job satisfaction.

Abstract citation ID: cjag070.145
SP114 PROMOTING ORTHODONTIC CARE EQUITY FOR CHILDREN IN RURAL AREAS: INTERNATIONAL REVIEW OF ORAL HEALTH PROMOTION STRATEGIES AND MOBILE DENTAL SERVICE MODELS WITH IMPLICATIONS FOR TAIWAN

TSAI YU CHEN; *Tainan Municipal Hospital (Managed by Show Chwan Medical Care Corporation), tainan, Taiwan*

BACKGROUND: Malocclusion in childhood can affect oral function, facial development, psychosocial well-being, and long-term oral health. Children in rural or underserved areas face limited orthodontic access due to insufficient specialist supply, geographical barriers, socioeconomic gaps, and lower parental awareness. Addressing orthodontic care equity is increasingly emphasized globally under WHO oral health frameworks and national dental policies. This study reviews international oral health promotion and mobile dental care models, and proposes a strategic framework for improving orthodontic access for children in rural Taiwan.
METHODS: A narrative policy review and international comparison approach was adopted. Key references included WHO oral health action plans, the UK NHS orthodontic referral and prioritization system, Scandinavian school-based dental programs, and mobile pediatric dentistry initiatives in the United States and Australia. Taiwan's existing community oral health, rural outreach, and school-health collaboration initiatives (including public health center partnerships and university social responsibility programs) were synthesized to construct a context-adapted service model.
RESULTS: Findings highlight three essential dimensions in improving orthodontic access equity for rural children: early identification and oral-health literacy enhancement, deployment of mobile dental services with digital support, and coordinated policy and multisector collaboration.

School-based oral-health promotion combined with caregiver education may strengthen awareness of occlusal development and appropriate timing for orthodontic consultation, facilitating early recognition and referral. Mobile dental units supported by digital intraoral imaging and cloud-based record systems can reduce geographical barriers and provide preliminary orthodontic assessments in underserved regions, while digital messaging platforms enable ongoing parental engagement and follow-up reinforcement.

Compared with European regions that benefit from universal dental benefits and established school dental systems, Taiwan holds strengths in digital readiness and flexible educational partnerships. A gradual pilot-to-policy pathway that integrates community participation, mobile delivery, and tele-support represents a feasible approach to advancing orthodontic equity in rural settings.
CONCLUSION: Mobile dental services combined with school-based oral health promotion present a viable strategy to improve orthodontic equity for rural children. Taiwan can leverage community engagement capacity, digital readiness, and educational infrastructure to pilot innovative models. Future steps include proof-of-concept implementation, cost-effectiveness evaluation, and progressive policy alignment to create a sustainable, equitable pediatric orthodontic care framework.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.146
SP117 ‡‡‡ NOVEL METFORMIN-LOADED COMPOSITE RESIN ENHANCES CEMENTUM AND ALVEOLAR BONE REGENERATION

Yuxing Bai; *Capital Medical University, Beijing, China*

AIMS: To develop a new composite resin incorporating metformin that supports cementum and alveolar bone regeneration, aiming to improve periodontal outcomes during orthodontic treatment.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

MATERIALS AND METHODS: 1. Composite resins with different concentrations of metformin were prepared and evaluated for mechanical performance.

2. Metformin release profiles were assessed. Cell identity was confirmed by flow cytometry. Cell viability and proliferation of hPDLSCs were examined using live/dead staining and the CCK-8 assay. Alizarin red staining, alkaline phosphatase staining, and RT-qPCR were used to assess osteogenic and cementogenic differentiation of hPDLSCs.

RESULTS:

1. The newly developed resin showed mechanical properties comparable to those of commercial materials and met clinical requirements.
2. Metformin was released in a sustained manner. The resin significantly enhanced the osteogenic and cementogenic differentiation of hPDLSCs, increased mineral deposition, and upregulated key genes related to bone and cementum formation.

CONCLUSIONS: This study presents a composite resin capable of continuously releasing metformin while maintaining favorable mechanical strength and biocompatibility. The resin markedly promotes osteogenic and cementogenic differentiation of human periodontal ligament stem cells in vitro, enhances mineral formation, and substantially increases the expression of related genes, thereby supporting the regeneration of cementum and alveolar bone.

Abstract citation ID: cjag070.147
SP119 ‡‡‡ LOWER FACIAL THIRD PROJECTION: ANALYSIS USING TRUE VERTICAL LINES FROM SUBNASALE AND SOFT NASION

Sara Peñalver López[1], Alejandro Acevedo Alonso[1], Juan Carlos Silva Montero[1], Carlos Flores-Mir[2], Eduardo Espinar Escalona[1]; [1]*Universidad de Sevilla, Sevilla, Spain,* [2]*University of Alberta, Edmonton, Canada*

AIM: Orthognathic surgery is used to correct severe and complex malocclusions, improving facial aesthetics. However, ideal facial structure positioning remains debated. This study proposes numerical references for surgical planning by determining the optimal sagittal projection of maxillary incisors in aesthetically attractive Caucasian patients.

MATERIALS AND METHOD: An observational, retrospective study was conducted using lateral profile cephalometric and photographic records from 89 patients. Orthodontists, maxillofacial surgeons, and laypeople evaluated these images on a 10-point aesthetic scale. Cephalometric parameters measured included the upper incisor and soft tissue pogonion projections using the Barcelona line and a true vertical line from Subnasale as references.

RESULTS: Results showed that the positions of the upper incisor and soft pogonion significantly influence aesthetic perception. Ideal projection values were 2.38 mm anterior to the Barcelona Line for the upper incisor and 6.02 mm anterior to the same reference for the soft pogonion.

CONCLUSION: The positions of the upper incisor and soft pogonion should be carefully considered to maximize the aesthetic perception in orthognathic surgery among Caucasian patients.

Abstract citation ID: cjag070.148
SP120 MALOCCLUSION TRAITS AND ORAL HEALTH-RELATED QUALITY OF LIFE IN ADOLESCENTS: A MULTICENTRE CROSS-SECTIONAL STUDY

Emma Göranson[1], Lillemor Dimberg[2], Aron Naimi-Akbar[2], Mikael Sonesson[3]; [1]*Centre for Orthodontics and Pediatric Dentistry, Region Östergötland County, Norrköping, Sweden,* [2]*Health Technology Assessment Odontology (HTA-O), Faculty of Odontology, Malmö University, Malmö, Sweden,* [3]*Department of Orthodontics, Faculty of Odontology, Malmö University, Malmö, Sweden*

AIM: To evaluate the impact of malocclusions on oral health related quality of life (OHRQoL) in adolescents using two validated instruments, the generic CPQ_{11-14}–ISF:16 and the condition-specific PIDAQ. The secondary aim was to assess whether demographic characteristics, socioeconomic factors, and dental caries influence the association between malocclusion and OHRQoL.

MATERIALS AND METHOD: A multicentre cross-sectional study comparing adolescents with and without malocclusions (IOTN–DHC 1–2 vs. 3–5). OHRQoL was measured with CPQ and PIDAQ. Demographic and socioeconomic data were obtained from Statistics Sweden (SCB), while caries data were sourced from the Swedish Quality Registry for Caries and Periodontal Disease (SKaPa). Linear regression was conducted using four sequential models: (1) unadjusted; (2) adjusted for demographics; (3) additionally adjusted for socioeconomic factors; and (4) further adjusted for caries.

RESULTS: The study included 645 individuals aged 12–19 years. The negative effect of malocclusions on OHRQoL remained stable across the models 1–4 for both CPQ (β= 6.90–7.79) and PIDAQ (β= 27.51–29-08). OHRQoL was poorer among girls than boys, with β=5.83–6.40 for CPQ and β=18.19–18.28 for PIDAQ (models 1–4). Older adolescents (16–19 years) reported lower OHRQoL than younger adolescents (12–15 years).

CONCLUSIONS: Malocclusions negatively affect OHRQoL in adolescents. This finding was consistent across both the generic instrument CPQ and the orthodontic-specific PIDAQ and remained stable in all models, whether unadjusted or adjusted for demographics, socioeconomic factors, and caries. Girls and older adolescents reported poorer OHRQoL than boys and younger adolescents.

Abstract citation ID: cjag070.149
SP121 STABILITY OF OUTCOMES FOLLOWING RESIN INFILTRATION OF WHITE SPOT LESIONS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Laura Ståhl[1], Spyridon Papageorgiou[2], Anna Westerlund[1], Julia Naoumova[3]; [1]*Department of Orthodontics, Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden,* [2]*Clinic of Orthodontics and Pediatric Dentistry, Center for Dental Medicine, Zürich, Switzerland,* [3]*Clinic of Orthodontics, University Dental Care, Public Dental Service, Region Västra Götaland, Gothenburg, Sweden*

AIM: White spot lesions (WSLs) are frequently encountered in clinical practise, and resin infiltration has gained attention as a treatment option. The aim is to evaluate the stability of both clinical outcomes and patient-reported measures following resin infiltration treatment of WSLs.

MATERIALS AND METHOD: A comprehensive, unrestricted literature search was conducted in six databases for human studies published up to September 2025. Eligible studies included randomized and non-randomized clinical trials involving patients with at least one anterior tooth with WSL treated with resin infiltration, and which reported clinical or patient-reported outcomes with at least a follow-up of three months. Study screening, data extraction, and risk-of-bias assessments were carried out independently by two reviewers. Random-effects meta-analyses were performed to calculate pooled mean changes from post-treatment to follow-up, with corresponding 95% confidence intervals (CIs).

RESULTS: Twenty-nine studies involving 544 patients and 1595 teeth with WSLs were included. Risk of bias assessments revealed limitations, including small sample sizes, short follow-up periods, lack of blinding, and insufficient control of confounders or within-patient clustering. For most outcomes the follow-up effects were inconsistent, resulting in high heterogeneity and non-significant pooled estimates. The largest meta-analysis (six studies) evaluating color change (ΔE) between WSL and sound adjacent enamel from post-treatment to 6 months showed that the pooled average change was 0 (95% CI: -0.42 to 0.41; $p = 0.98$) with substantial heterogeneity ($I^2 = 84\%$). A small meta-analysis demonstrated significant improvements in patient satisfaction (VAS) at one month (2 studies; +11.9 mm; 95% CI +5.9 mm to +17.8 mm; p=0.02). However, these effects were not sustained at 3 (p=0.09), 6 (p=0.2) or 12 months (p=0.94). At 12 months, there were also no significant differences observed for ΔE, fluorescence values or WSL area.

CONCLUSIONS: Existing evidence shows that resin infiltration for white spot lesions yields highly inconsistent and heterogeneous effects across both clinical and patient-reported measures. These findings underscore the need for well-designed, larger, and standardized long-term studies to clarify the stability and effectiveness of the treatment.

Abstract citation ID: cjag070.150
SP122 EFFECT OF AUTOPHAGY ON OSTEOGENIC DIFFERENTIATION IN RAPID MAXILLARY EXPANSION IN RATS

Kai Yang and ChuHai Peng; *School of Stomatology, Capital Medical University, Beijing, China*

AIM: The objective of this study was to investigate the role of autophagy in osteogenic differentiation during rapid maxillary expansion (RME).

MATERIALS AND METHOD: Sixty 6-week-old male Sprague-Dawley rats were selected to establish RME models and divided into 3 groups: the expansion group, expansion + rapamycin group, and expansion + 3-methyladenine (3-MA) group. They were sacrificed on days 0, 1, 3 and 7. Microcomputed tomography (micro-CT), hematoxylin and eosin staining, Masson staining, and immunohistochemistry were performed to investigate the morphological changes of mid-palatal suture, and expression level of osteogenesis (Runx2, Osterix) and autophagy (LC3, Atg5) factors. Furthermore, thirty 6-week-old male Sprague-Dawley rats were selected to establish RME-retention models and were divided into 2 groups: the retention group,

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

and the retention + rapamycin group. They were sacrificed on days 0, 7 and 14. The aforementioned factors were examined.
RESULTS: Compared with the expansion group, rapamycin administration increased the osteogenesis and autophagy factor factors expression and reduced the width of the mid-palatal suture ($p<0.05$), whereas 3-MA administration had the opposite effect ($p<0.05$); Compared with the retention group, the injection of rapamycin increased the level of autophagy and osteogenic expression, and accelerated new bone formation ($p<0.05$).
CONCLUSIONS: Autophagy may play a substantial role in regulating osteogenic differentiation and bone formation during RME.

Abstract citation ID: cjag070.151
SP124 TRANSVERSE ARCH WIDTH AND PALATAL HEIGHT IN PATIENTS WITH PALATALLY AND BUCCALLY DISPLACED MAXILLARY CANINES

Regitze Mørkøv Nommesen and Liselotte Sonnesen; *Postgraduate Education in Orthodontics, Department of Odontology, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark*

AIM: The aim was to investigate differences in maxillary dimensions in children with ectopic maxillary canines compared to controls. Specifically, comparisons were made between 1) palatally displaced canines (PDC) and controls, 2) buccally displaced canines (BDC) and controls, 3) PDC and BDC, and 4) ectopic canines in total and controls.
SUBJECTS AND METHOD: The study included 58 patients with ectopic maxillary canines (38 PDC, 20 BDC, mean age: 12.59 years, +/- 1.49 years) and 21 controls (12.52 years, +/- 1.29 years). Intraoral scans were analyzed for transverse arch width at the first premolars (TCP, TGP) and first molars (TCM, TGM), and palatal height at the premolars (H4) and molars (H6). Measurements were performed using validated digital methods. Linear mixed models adjusted for age and gender were applied. P-values were corrected for multiple testing using False Discovery Rate (FDR).
RESULTS: Compared to controls, all four comparisons showed significantly ($p<0.05$) smaller transverse dimensions both at the first premolars and first molars. Furthermore, significant differences ($p<0.05$) were found for the maxillary height at the first premolars in BDC and in ectopic canines in total compared to controls.
CONCLUSIONS: Children with ectopic maxillary canines exhibit significantly reduced transverse maxillary dimensions compared to controls, particularly at premolar and molar levels. Buccally displaced canines also showed reduced palatal height at premolars. The findings may have implications for early diagnosis and treatment planning.

Abstract citation ID: cjag070.152
SP125 MIND THE GAP: CONE BEAM CT REPORTING COMPLIANCE IN ORTHODONTIC CARE

Neha Mehta[1], David Seymour[1], Vinay Chavda[2]; *[1]York and Scarborough Trust, York, United Kingdom, [2]Birmingham Community Healthcare Foundation Trust, Birmingham, United Kingdom*

INTRODUCTION: Cone Beam CT (CBCT) has transformed contemporary orthodontic practice, enhancing visualisation of root resorption, localisation of ectopic teeth, and planning of combined orthodontic-maxillofacial surgical cases. Three-dimensional imaging improves diagnostic accuracy and aids multidisciplinary management.

In the UK the Ionising Radiation (Medical Exposure) Regulation [IR(ME)R] require all CBCT scans to be formally reported by an appropriately trained operator. At York Hospital, the Head and Neck radiologists do not routinely report CBCTs; this responsibility lies with the referrer. An audit was undertaken following concerns about inconsistent reporting compliance.
AIM: To evaluate whether CBCTs requested in a combined orthodontic-maxillofacial clinic were being formally reported as required by IR(ME)R legislation.
STANDARD: IR(ME)R legislation set standard of 100% reporting for ionising radiation imaging.
MATERIALS AND METHOD: The combined orthodontic-maxillofacial clinic was selected due to its high use of CBCTs for assessment of root resorption and surgical planning. Retrospective review of two cycles was conducted. All patients undergoing a CBCT were included. Data was collected from electronic and physical records and analysed using descriptive statistics.

AUDIT PERIODS:
Cycle 1: May-November'24
Intervention period: November'24-May'25
Cycle 2: December'24-May'25

RESULTS: – CYCLE 1:

A total of 48 CBCTs were requested, with only 7/48 (14.6%) receiving a formalised report. Although pathology was mentioned in 44/48 patient letters, these did not meet the reporting requirement, demonstrating significant non-compliance.
INTERVENTIONS: Targeted interventions addressed barriers identified. A dedicated "CBCT reporting" slot was introduced improving time allocation. Training was strengthened through mandatory CBCT Level 1 and 2 training and creation of various reporting proformas aided reporting. IT processes were improved by linking CBCT requests to consultant notifications. Clearer guidance was established through a new service-level document alongside development of a pathway for selected scans to be externally reported.
RESULTS: – CYCLE 2:

Compliance increased to 28/47 (59.6%), representing a 45% improvement. Documentation of pathology increased from 91.7% to 97.9%. However, the 100% standard remained unmet.
CONCLUSIONS: Targeted interventions improved CBCT reporting within the orthodontic-maxillofacial service, but persistent barriers including limited reporting time and access to dedicated software, continue to restrict compliance. Department-wide re-audit is necessary to assess long-term sustainability.

Abstract citation ID: cjag070.153
SP126 EVALUATING CHATBOT RESPONSES TO GENERATED QUESTIONS ON THE RISKS AND BENEFITS OF ORTHOGNATHIC TREATMENT

Robert Samuel David Smyth and Aliki Tsichlaki; *UCL Eastman Dental Institute, London, United Kingdom*

AIM: To evaluate the accuracy, reliability, quality and readability of responses generated by different large language model chatbots (ChatGPT4o, Microsoft Copilot, Google Gemini 2.5 Flash) in relation to common questions patients may have regarding the risks and benefits of orthognathic treatment.
MATERIALS AND METHODS: Twenty questions on orthognathic treatment risks and benefits were generated from top Google search results and entered into ChatGPT, Copilot, and Gemini. Responses were evaluated for accuracy, reliability, quality, and readability using validated scoring systems. Inter- and intra-rater reliability were assessed using Cohen's kappa and the intraclass correlation coefficient.
RESULTS: Statistical analysis revealed significant differences in chatbot performance across several domains. Copilot achieved the highest scores for reliability and global quality, with Kruskal-Wallis tests indicating significant differences in the modified DISCERN ($p < 0.001$) and Global Quality Scale ($p = 0.046$) scores. Pairwise Mann-Whitney U tests confirmed Copilot significantly outperformed ChatGPT and Gemini in both measures. In contrast, accuracy scores did not differ significantly between chatbots ($p = 0.704$). Readability, assessed via Flesch Reading Ease, varied significantly ($p = 0.005$), with ChatGPT and Gemini producing more readable responses than Copilot. Mann-Whitney U tests showed significant differences between Copilot and both other platforms ($p < 0.01$), but no difference between ChatGPT and Gemini. Intra- and inter-rater reliability were substantial to excellent for categorical measures and excellent for readability.
CONCLUSIONS: Overall, Copilot provided the most balanced and high-quality responses. ChatGPT and Gemini offered more accessible language but were less consistent in reliability and quality. Clinicians should remind patients that while chatbots may offer accessible health information, their responses can vary in accuracy, reliability, and readability. Patients should be encouraged to verify chatbot-generated content with qualified professionals and use such tools as supplementary, not primary, sources of medical advice.

Abstract citation ID: cjag070.154
SP127 IN VITRO EVALUATION OF CELL VIABILITY UNDER DIRECT AND INDIRECT CONTACT WITH SHAPE-MEMORY ALIGER MATERIALS IN IMMORTALIZED HUMAN FIBROBLAST STRAINS

Joana Cruz[1], Sara Gomes[2], Joana Marques[3], Joana Godinho[4], Luis Jardim[5]; *[1]PhD Student, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal, [2]Alumni, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal, [3]Assistant Professor, Biomedical and Oral Sciences Research Unit, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal, [4]Assistant Professor, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal, [5]Full Professor, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal*

AIM: To evaluate the viability, proliferation, and morphologic behavior of HGF-hTERT fibroblasts following direct contact with shape-memory polymer surfaces and indirect exposure to polymer eluents at different concentrations.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

METHODS: Discs measuring 8 mm and 12 mm in diameter were digitally designed and 3D printed in Graphy TA-28 shape-memory resin (Graphy Inc., Seoul, Korea). The 8 mm discs were assigned to the direct-contact group (n = 12), onto which immortalized gingival fibroblasts (HGF-hTERT, ABMgood) were seeded and cultured under standard conditions, in a humidified incubator at 37 °C, 5% CO_2, and 97% humidity. The 12 mm discs (n = 12) were incubated for 24 hours in 1 mL of Dulbecco's Modified Eagle's Medium supplemented with 10% fetal bovine serum and 1% penicillin/streptomycin, according to ISO 10993-12, to obtain pure extracts. HGF-hTERT cells were seeded in 96-well plates and, after 4 hours of adhesion, exposed to 10% and 20% eluents obtained from these extracts. Cell viability was quantified at days 1 and 7 using a resazurin-based method in a fluorescence plate reader and converted to % viability relative to controls. Cell morphology and adhesion were examined by fluorescence microscopy and field-emission scanning electron microscopy (FEG-SEM) at the same time points. Data were reported as mean ± standard deviation or 95% confidence interval. Statistical analysis was performed using independent-samples t-tests (SPSS 28.0 for macOS), with significance set at $p < 0.05$.
RESULTS: Cell viability increased over time in all groups, indicating the absence of cytotoxicity. No statistically significant differences were found using the independent-samples t-tests between groups or between days 1 and 7. A mild reduction in proliferation was noted in the 20% extract group from days 3-7, with viability dropping below the 70% threshold. However, this decrease did not reach statistical significance. Fluorescence microscopy and FEG-SEM confirmed progressive cell proliferation and adhesion, with fibroblasts maintaining normal morphology, well-defined cytoplasmic extensions, and stable attachment on both disc surfaces and coverslips.
CONCLUSIONS: Direct exposure to TA-28 shape-memory polymer discs and indirect eluent exposure did not elicit cytotoxic effects in HGF-hTERT fibroblasts. Both viability and proliferation remained comparable to negative controls, supporting the material biocompatibility.

Abstract citation ID: cjag070.155
SP130 REGIONAL ODONTODYSPLASIA IN PAEDIATRIC PATIENTS – A CHALLENGE FOR DIAGNOSIS AND TREATMENT: A CASE SERIES STUDY

Helena Overton-Smith[1], Rebecca John[1], Nikki Atack[2]; [1]*Paediatric Dentistry Department, Bristol Dental Hospital, Bristol, United Kingdom,* [2]*Department of Orthodontics, Bristol Dental Hospital, Bristol, United Kingdom*

AIM: The purpose of this article is to highlight the importance of early identification and explore the management of five cases of Regional Odontodysplasia (ROD) and one potential case of ROD, emphasising the crucial role of multidisciplinary collaboration.
MATERIALS (OR SUBJECTS) AND METHOD: ROD is an uncommon dental developmental condition with an unknown aetiology and leads to qualitative and quantitative defects of enamel and dentine. Both the permanent and/or primary dentition can be affected and can involve one or more quadrants. Clinical presentations include wide pulp chambers, discolouration, and dysplasia of the tooth crown, which could lead to an increased risk of caries. ROD requires multidisciplinary input to provide a comprehensive treatment plan and to address both the immediate and long-term functional and aesthetic needs in a growing young person.

The cases presented to the Dental Hospital following a referral from their general dental practitioner or tertiary referral from a hospital consultant for assessment and treatment planning of teeth with dental abnormalities. The cases include two females and three males who were diagnosed with ROD, and one male with possible ROD, between the ages of 5 and 16 years.
RESULTS: Both the primary and permanent dentition have been affected in all except one case where only the primary dentition was involved. Unilateral presentation occurred in 66% of cases and the upper left quadrant was involved in 50% of cases, including the potential ROD case. Only one case showed mandibular involvement. There was an increased prevalence of males with ROD.

One case resembles Segmental Odontomaxillary Dysplasia (SOD), however, as the bony expansion had normal trabeculation and density, it was surmised that this was ROD rather than SOD.

Treatment included extractions, partial dentures, and root canal therapy for anterior incisors in two cases. Multidisciplinary input from the orthodontic department was required for all cases.
CONCLUSIONS: There is a range of severity and presentations within the presented ROD cases which makes diagnosis and management challenging. Clearer diagnostic guidelines may aid in distinguishing differential diagnoses. Multidisciplinary input is essential in providing a comprehensive treatment plan for a patient with ROD.

Abstract citation ID: cjag070.156
SP131 FINITE ELEMENT ANALYSIS OF MINIMALLY INVASIVE MIDPALATAL SURGICALLY ASSISTED RAPID PALATAL EXPANSION

Kinan Zeno[1], Mariane Kmeid[1], Ingrid Karam[1], Samah Al-Mohtar[2], Joseph Ghafari[1]; [1]*American University of Beirut, Beirut, Lebanon,* [2]*King Abdullah University of Science and Technology, Thuwal, Saudi Arabia*

BACKGROUND: Palatal expansion and suture opening are difficult to achieve in adults, necessitating adjunct surgery. The modes of expansion and their effects on the supporting dentition of minimally invasive surgery need exploration.
AIMS: Evaluate in various modalities of midpalatal surgically-assisted expansion the stresses on maxillary teeth to determine the least amount of stress with greatest amount of expansion, considering variations in compact bone thickness.
METHODS: A finite element model was created with palatal expansion of 8mm applied to a 3D model of the maxilla with tooth-borne or mini-screw-anchored bone-borne appliances. Five clinical setups were simulated: S1-control with tooth-borne expander (TBE); S2-TBE with sagittal palatal osteotomy (SPO); S3, S4-TBE+SPO and appliances fixed with 0.016*0.022inch (S3) and 0.019*0.025inch (S4) stainless steel archwires, S5- bone-borne expander with SPO. Cortical bone thickness was varied based on research of human cadavers. Stresses and displacements were compared among the setups.
RESULTS: S3 and S4 exhibited the least stress on anchor teeth and greatest posterior expansion. S5 resulted in absent stress on teeth and greatest anterior expansion. Stresses at first premolars (PM1) and first molars correlated positively in TBE setups, with higher stress at PM1. Expansion was negatively correlated with stresses on teeth and cortical bone thickness in TBE setups, but not in S5.
CONCLUSIONS: In conjunction with palatal osteotomy, optimal posterior expansion was achieved with the tooth-borne expander combined with fixed rectangular archwires across the maxillary teeth. Bone-borne expansion favored anterior expansion apparently because of the more anterior position of the expander.

Abstract citation ID: cjag070.157
SP132 COMPARISON OF CONVENTIONAL AND RAPID HIGH-INTENSITY LIGHT-CURING ON THE POST-CURE DEGREE OF CONVERSION OF RESIN-BASED ORTHODONTIC ADHESIVE SYSTEMS

Ivona Profeta Krznar[1], Senka Meštrović[2], Zrinka Tarle[3], Danijela Marovic[3], Matej Par[3]; [1]*Private Orthodontic Practice, Krapina, Croatia,* [2]*Department of Orthodontics, University of Zagreb, School of Dental Medicine, Zagreb, Croatia,* [3]*Department of Endodontics and Restorative Dentistry, University of Zagreb, School of Dental Medicine, Zagreb, Croatia*

AIM: To compare the effect of conventional and rapid high-intensity light-curing as well as bracket presence on short-term and 24-h post-cure degree of conversion (DC) of commercially available resin-based orthodontic adhesive systems.
MATERIALS AND METHOD: Three materials (Enlight (Ormco), Heliosit (Ivoclar), and Transbond XT (3M)) were tested under two curing conditions: conventional (2x10 s at 1100 mW/cm^2, Bluphase G2 (Ivoclar)) and rapid high-intensity (2x3 s at 2900 mW/cm^2, Bluephase PowerCure (Ivoclar)). Materials were assigned to three groups based on bracket material and presence during curing: control group (CG, without bracket), metal bracket group (MB), and ceramic bracket group (CB). In the CG and CB groups, samples were cured directly above the material/bracket, while in the MB group, from the mesial and distal sides of the bracket. DC was evaluated using a Fourier-transform infrared (FTIR) spectrometer with a diamond attenuated total reflectance (ATR) accessory at short-term intervals (2, 6, 10 min, n=6 per group) and after 24 h (n=8 per group). A three-way ANOVA was used to evaluate the effects of the factors "Material," "Bracket," and "Curing mode". In cases of significant factor interactions, main effects were evaluated using one-way ANOVA (α=0.05).
RESULTS: Conventional curing resulted in significantly higher short-term DC (44.4%–64.7%) compared to rapid curing (42.2%–60.0%) for all materials and groups, with the largest difference of 10.6% (Enlight CB 2nd min). The 24-h DC values were also statistically higher for conventional curing (54.4%–82.8%) than rapid curing (49.5%–81.4%), with the highest difference of 4.7% (Heliosit MB), except for Transbond XT in CG. According to partial eta-squared values (in parentheses), "Bracket" was the most influential factor for short-term DC (0.842), while "Material" had the greatest effect on 24-h values (0.994). The interaction between "Material" and "Bracket" was the most influential for both short-term (0.738) and 24 h-DC (0.252).
CONCLUSIONS: Conventional light-curing resulted in higher short-term and 24-h DC values than rapid high-intensity light-curing. Short-term DC values were more influenced by external factors (bracket and curing mode), while 24-h DC values were more material-dependent. The interaction between material and bracket outweighed that between material and curing mode.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.158
SP134 *** INTEGRATING MANDIBULAR POSITION INTO CLEAR ALIGNER PLANNING: A CASE DEMONSTRATION OF DIAGNOSTIC AND OCCLUSAL IMPACT

Hui Xiong and Hong He; *School & Hospital of Stomatology, Wuhan University, Wuhan, China*

Clear aligners enable precise management of tooth movement; however, their effectiveness may rely on the accurate assessment of the functional mandibular position. Patients exhibiting discrepancies between centric relation and centric occlusion (CR–CO), or those with temporomandibular joint (TMJ) disorders, may present occlusal relationships that are misleading in their habitual bite, which could result in erroneous digital setups and unstable clinical outcomes.
AIM: The purpose of this case study is to demonstrate how the assessment and stabilization of mandibular position influence clear aligner planning and occlusal outcomes.
MATERIALS AND METHODS: A 14-year-old female patient presented with dental crowding, mandibular retroposition, a discrepancy between centric occlusion and centric relation, and bilateral condylar morphological alterations with signs of arrested resorption. Initial examinations—including cone-beam computed tomography (CBCT), TMJ imaging slices, and occlusal analysis—revealed unstable condylar seating. A stabilization splint was prescribed to establish neuromuscular balance and identify a reproducible mandibular position. After ten months of splint therapy, centric relation records were utilized to create a revised digital setup. Biomechanical strategies involved targeted torque control, regulation of vertical dimensions, arch coordination, and carefully staged sagittal correction. Multiple iterations of ClinCheck were performed to match the verified mandibular position.
RESULTS: Following mandibular stabilization, digital planning resulted in occlusal relationships that were significantly different from those in the initial habitual bite setup. The aligner plan based on CR achieved Class I molar and canine relationships, improved overbite and overjet, and provided stable posterior occlusion. During treatment, no TMJ symptoms were observed, and follow-up imaging confirmed the stability of the condylar position. Torque expression, vertical control, and intercuspation were more predictable when planned according to CR rather than habitual occlusion.
CONCLUSIONS: This case highlights that the identification and stabilization of the mandibular position prior to the design of clear aligners can diminish occlusal discrepancies, improve predictability, and ensure the safety of the temporomandibular joint. Planning based on centric relation (CR) should be considered an essential aspect for patients displaying functional shifts or morphological changes of the temporomandibular joint.

Abstract citation ID: cjag070.159
SP137 RETROSPECTIVE EVALUATION OF MAXILLARY THIRD MOLAR CHANGES OBSERVED AFTER FACEMASK AND RAPID PALATAL EXPANSION (RPE) TREATMENT IN GROWING PATIENTS WITH MAXILLARY RETROGNATHIA

Eda Gürbüz Dinç, Resul Ekrem Yavuz, Ramazan Tamer, Berfim Hanife Gökcan, Tülin Ufuk Toygar Memikoğlu; *Ankara University Faculty of Dentistry Department of Orthodontics, Ankara, Turkey*

AIM: In this study, the frequently observed impaction and abnormal angulation of maxillary third molars in patients undergoing Face-Mask and RPE protocols are examined.
SUBJECTS AND METHODS: A total of 26 participants aged between 9 and 13 years, who presented with Angle Class III malocclusion and underwent treatment with the Facemask and RPE protocols at the Orthodontics Department of Ankara University Faculty of Dentistry, Training and Research Hospital, were included in the study. Ethical approval was obtained from the Ankara University Faculty of Dentistry Non-Clinical Scientific Studies Ethics Committee on March 10, 2025, under decision number 7/10. A total of 20 parameters were measured using pretreatment and posttreatment panoramic radiographs. Cephalometric radiographs were used in the diagnosis of malocclusion. Pretreatment and posttreatment measurements were compared across malocclusion groups to assess the angulation characteristics of maxillary third molars. The data obtained were analyzed using the SPSS 21 software package.
RESULTS: The measurements revealed a significant increase in the angulation of maxillary third molars on both sides relative to the horizontal reference plane following treatment. Although changes were observed across all parameters, a statistically significant difference was identified exclusively in the parameters representing, on the right side, the complement of the angle formed between the plane passing through the orbital points—accepted as the horizontal reference plane—and the long axis of the maxillary third molar, and, on the left side, the complement of the angle formed between the same reference plane and the long axis of the maxillary third molar. This indicates that RPE and Facemask treatment protocols exert a positive influence on angular changes in the posterior teeth. The forces applied during treatment expand the maxilla transversely and, through the anterior displacement of the dentoalveolar region, contribute to angular alterations in the right and left maxillary third molars.
CONCLUSION: The anterior displacement of the dentoalveolar region appears to have a favorable effect on the angulation of maxillary third molars, potentially eliminating the need for extraction in certain cases. Accordingly, in patients undergoing this treatment, third-molar extractions may be deferred, and their status can be re-evaluated at the completion of therapy.

Abstract citation ID: cjag070.160
SP138 ‡‡‡ *** ASSESSMENT OF 3D MORPHOLOGICAL ALTERATIONS IN THE MAXILLARY ARCH AND PHARYNGEAL AIRWAY AFTER ANTERIOR MAXILLARY DISTRACTION IN INDIVIDUALS WITH UNILATERAL CLEFT LIP AND PALATE

Sanjeev Verma; *Postgraduate Institute of Medical Education and Research, Chandigarh, India*

OBJECTIVE: To evaluate the effects of anterior maxillary distraction (AMD) on maxillary arch dimensions and pharyngeal airway
DESIGN: Prospective study
1. Assessment of 3D Morphological Alterations in the Maxillary Arch
Patients: Seventeen patients (7 males and 10 females) with unilateral cleft lip and palate (UCLP)
Outcome measures: Palatal volume, palatal length, arch length, anterior palate width, posterior palate width, anterior palate height and posterior palate height evaluation at 2 time points: pre-surgical (T0) and 6 months post-surgical (T1) using CBCT scans
2. Assessment of pharyngeal airway
Patients: 20 patients with UCLP and hypoplastic maxilla
INTERVENTION: Group 1 (n =10) Anterior Maxillary Distraction
Group 2 (n =10) Conventional maxillary distraction
Outcome Measures: The primary outcomes assessed on pre- and postsurgical cone beam computed tomography were changes in the nasopharyngeal, oropharyngeal, and total pharyngeal airway area and volume, as well as the minimal axial area
RESULTS: Overjet increased significantly by 11.40 ± 3.75 mm in AMD Group and 12 ± 3.53 mm in CMD Group
Assessment of 3D Morphological Alterations in the Maxillary Arch
A statistically significant increase was observed in palatal volume, palatal length, and arch length following AMD ($p < 0.001$) .There was a significant correlation between palatal volume and palatal length, Assessment of pharyngeal airway
The pre -post distraction changes In AMD Group showed statistically significant increase in nasopharyngeal (48±24.16 mm^2)and decrease in oropharyngeal(58.00 ±37.15 mm^2) area. The changes in nasopharyngeal and oropharyngeal volume were non-significant. In CMD Group (Pre-Post surgery) the nasopharyngeal, oropharyngeal and total pharyngeal area and volume increased by 202.70 ±97.24 mm^2 and 5.02±3.94 cm^3, 176.20±167.63 mm^2 and 7.91 ±8.4 cm^3, and 380.50±304.46 mm^2 and 13.9 ± 13.43 cm^3,respectively
CONCLUSION: The palatal volume, palatal length, and arch length increased after anterior maxillary distraction in patients with unilateral cleft lip and palate. Anterior maxillary distraction had a negligible impact on the pharyngeal airway compared to conventional distraction. The choice between these 2 interventions should also take into consideration associated comorbidities related to pharyngeal airway and speech

Abstract citation ID: cjag070.161
SP139 A LINGUAL CASE FOR THE CLASS II MALOCCLUSION TREATMENT

WEIHONG HEI; *wuhan university, wuhan, China*

A lingual case for the Class II malocclusion treatment.
AIM: to introduce a Chinese lingual braces and the use to treat Class II Malocclusion.
MATERIALS AND METHOD: this is a case report, A class II malocclusion patient was treated using a
Chinese lingual braces, the treatment process was showed.
RESULTS: The treatment results were showed, the profile was improved and the occlusion was improved too.
CONCLUSIONS: Class II malocclusion can be well improved using lingual braces.
PREVIOUSLY PUBLISHED ABSTRACT: no

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.162
SP140 EVALUATİON OF THE RELATİONSHİP BETWEEN BODY MASS INDEX, HEAD POSTURE, AND DİFFERENT MALOCCLUSİON TYPES

Resul Ekrem Yavuz, Özgenur Aksoy, Özge Nur Kartal, Tülin Ufuk Toygar Memikoğlu, Mehmet Okan Akçam; *Ankara University Faculty Of Dental Medicine Department Of Orthodontics, Ankara, Turkey*

OBJECTIVE: The aim of this study was to evaluate the relationship between individuals' body mass index (BMI), postural status, and their skeletal malocclusion types (Class I, II, and III). By examining these parameters together, this study intends to highlight the potential effects of systemic and postural factors on the development of malocclusion.
SUBJECTS AND METHODS: A total of 193 growing patients aged 10–15 years were included. Three head postural angular parameters, four cephalometric skeletal angular measurements, and BMI (calculated from height and weight) were recorded. Cephalometric assessments were performed digitally using Dolphin Imaging® based on Steiner analysis, while posture was evaluated through a validated photographic method captured with a Canon EOS R6 Mark II and analyzed in the ImageJ software program. Statistical analyses were conducted using SPSS 22. Descriptive statistics and normality tests were performed, and correlations between BMI, head posture, and cephalometric measurements were analyzed using Pearson or Spearman tests. The significance level was set at $p < 0.05$.
RESULTS: The findings of this study suggest that BMI exhibits generally weak associations with both craniofacial measurements and postural angles. A statistically significant correlation was identified only between sagittal head posture and the SNB angle ($p < 0.05$), indicating a relationship between postural alignment and the sagittal position of the mandible within the investigated sample.
CONCLUSION: Postural assessment offers additional insight in orthodontic evaluations related to malocclusion, while BMI does not appear to significantly influence craniofacial morphology in this sample.

Abstract citation ID: cjag070.163
SP141 INFLUENCE OF AGING ON WATER SORPTION, SOLUBILITY AND MONOMER RELEASE OF DIRECT-PRINTED ALIGNERS: AN IN VITRO COMPARATIVE STUDY

Claire-Adeline DANTAGNAN, Julia BOSCO, Jean-François NGUYEN; *Université Paris Cité, Université Sorbonne Paris Nord, INSERM, UMR 1333 Oral Health – Team 2 « Biomaterials, Engineering and New technologies for Oral Health », Montrouge, France*

AIM: to investigate the impact of aging in artificial saliva on the water sorption, water solubility and monomer release of direct-printed aligners compared with thermoformed counterparts.
MATERIALS AND METHOD: Two 3D-printing resins (TA-28 (Graphy®) and Clear A V2 (Senertek®)) and one thermoformed material (Duran + (Scheu-Dental®)) were evaluated. Samples of each materials were fabricated and subjected to various tests before and after immersion in artificial saliva at 37°C for 24 hours, 7 days and 14 days : determination of water sorption and solubility (n=60), monomer release by LC-MS (n=24). Data were analyzed using two-way ANOVAs followed by Tukey post-hoc tests.
RESULTS: The 3D-printed aligners showed higher water sorption (15.63±1.02 for TA-28, 17.05± 1.13 for Clear A V2 and 11.01± 0.43 for Duran +, $p<0.05$) compared to thermoformed aligners. There were no significant differences between the three types of aligners for solubility (1.33 ± 0.19 for TA-28, 1.38± 0.13 for Clear A V2 and 1.16 ± 0.21 for Duran +, $p>0.05$).UDMA release was detected for all 3D-printed aligners at 24h with a significant decrease at 7 days (492.6 nM vs 80.8 nM for TA-28, $p<0.05$ and 440.4 nM vs 123.6 nM for Clear A V2, $p<0.05$) and no leaching at 14 days. No bisphenols were identified.
CONCLUSIONS: 3D-printed aligners show greater sensitivity to aging in saliva, with higher water sorption, monomer release compared with thermoformed aligners. Clinical studies are needed to validate the behavior and potential risks of 3D-printed aligners.

Abstract citation ID: cjag070.164
SP142 THE RELATIONSHIP BETWEEN THE DIMENSIONS OF THE UPPER JAW AND REPORTED SLEEP PROBLEMS RELATED TO BREATHING IN CHILDREN

Luka Šimunović[1], Višnja Katić[2], Barbara Mady Maričić[1], Doris Šimac Pavičić[3]; [1]*Private polyclinic Mady Maricic, Rijeka, Croatia,* [2]*Faculty of Dental Medicine, Rijeka, Croatia,* [3]*Medical Faculty, Rijeka, Croatia*

AIM: To investigate the association between maxillary dimensions and reported symptoms of sleep-disordered breathing (SDB) in children.
MATERIALS AND METHOD: The sample consisted of 60 children who underwent standardized measurements of anterior and posterior palatal width. Ideal palatal values were calculated using Tonn's formula and Harth index, and deviations from ideal dimensions were documented. SDB symptoms were categorized as positive or negative based on a cut-off score >0.24, determined through ROC curve analysis of the PSQ Croatian translation. Statistical analysis included descriptive statistics, Pearson correlation testing to assess associations between maxillary dimensions and SDB symptoms, and independent-samples t-tests comparing palatal widths between children with and without reported symptoms. In a subsample of 42 children, modified Mallampati classification was recorded and explored using ANOVA to identify potential differences in symptom severity across classes.
RESULTS: Positive SDB symptoms were reported in 40% of participants. Narrow anterior palatal width was observed in 63.3% of children, while 66.6% displayed narrow posterior width. Pearson correlation analysis revealed no statistically significant association between SDB symptoms and anterior ($r = 0.13$, $p = 0.33$) or posterior palatal width ($r = -0.01$, $p = 0.94$). Comparisons between SDB-positive and SDB-negative groups showed no significant differences in anterior ($p = 0.334$) or posterior palatal width ($p = 0.944$). Sex-related differences were significant, with boys demonstrating wider anterior and posterior palatal dimensions than girls ($p < 0.001$). In the subsample with recorded Mallampati classifications, ANOVA indicated a statistically significant difference in SDB scores among groups ($p = 0.045$), with post-hoc comparisons showing higher symptom scores primarily in children classified as Mallampati class 3.
CONCLUSIONS: Although a high proportion of children presented with narrow maxillary dimensions, these measures were not significantly associated with reported SDB symptoms. The absence of correlation suggests that maxillary width alone may not adequately predict symptom presence. While some variation in symptom severity was observed across Mallampati classes, this relationship appeared secondary to broader anatomical and functional factors. These findings underscore the multifactorial nature of paediatric SDB and highlight the need for larger, more comprehensive studies to clarify the role of craniofacial morphology in symptom development.

Abstract citation ID: cjag070.165
SP146 ‡‡‡ A SCOPING REVIEW OF SUSTAINABLE ORTHODONTIC SUPPLY CHAINS: INNOVATIONS AND WASTE MANAGEMENT IN CLEAR ALIGNER THERAPY

Pimsiri Kanpittaya[1], Chanakan Boonchanachai[1], Kausar Sadia Fakhruddin[2]; [1]*Chulalongkorn University, Bangkok, Thailand,* [2]*University of Western Australia, Perth, Australia*

BACKGROUND: Clear aligner therapy has become a popular orthodontic treatment, with over 14 million users globally. However, its environmental impact is significant, generating over 1000 tons of plastic waste annually, alongside microplastic contamination and high carbon emissions. Despite digital advancements, recycling rates remain low, ranging from only 12% in Asian clinics to 29% in the EU, underscoring the urgent need for sustainable practices in orthodontics.
AIMS: This scoping review aimed to synthesize current evidence on the environmental impact of clear aligner therapy and evaluate sustainable strategies and implementation challenges, guided by the United Nations Sustainable Development Goals (SDGs).
METHODS: This review followed PRISMA-ScR guidelines and was registered in the Open Science Framework (Registration ID: pnjd4). Twenty-seven studies from eight countries (2017–25) were analyzed, focusing on sustainability strategies, waste management, and innovations. Data were synthesized thematically using the 4R framework (Reduce, Reuse, Recycle, Rethink) and aligned with relevant sustainable development goals.
RESULTS: Key findings revealed that (i) staged aligner production and digital workflows reduce waste by 30%–41% and lower carbon emissions by 58%; (ii) bioplastics (e.g. silk fibroin) and 4D-printed shape-memory aligners show promise but face cost and material scalability challenges, and (iii) stakeholder collaboration across manufacturing, clinics, and policy is essential. Barriers include inadequate infrastructure and a lack of lifecycle data.
CONCLUSION: This review fills a critical gap by linking clinical orthodontic innovations to broader environmental and public health goals. Future research must prioritize lifecycle analyses, enzymatic recycling, and AI-driven planning to bridge

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

evidence gaps. By integrating these strategies, orthodontics can balance ecological responsibility with clinical efficacy.

Supported by Faculty Research Grant (DRF 68_017) Faculty of Dentistry, Chulalongkorn University.

Abstract citation ID: cjag070.166

SP147 BIOMECHANICAL EFFECTS OF ATTACHMENT POSITION AND PRESSURE RIDGE DESIGN ON MAXILLARY ARCH EXPANSION WITH CLEAR ALIGNERS: A FINITE ELEMENT ANALYSIS

Yuanyuan Zheng[1], Runzhi Guo[2], Qingyi Dai[3], Weiran Li[2], Yifan Lin[3]; *[1]Shenzhen Maternity and Child Healthcare Hospital, Shenzhen, China, [2]Peking University, Beijing, China, [3]The University of Hong Kong, Hong Kong, Hong Kong*

OBJECTIVES: To investigate the biomechanical effects of attachment position (buccal vs. palatal) and pressure ridge design on maxillary arch expansion using clear aligners through finite element analysis.

METHODS: Five 3D finite element models were established to simulate 0.2 mm aligner-activated expansion with different configurations: (A) no attachment; (B) buccal attachment; (C) palatal attachment; (D) buccal attachment with palatal pressure ridge; and (E) palatal attachment with buccal pressure ridge. Biomechanical analysis quantified tooth displacement and stress distribution across tooth roots and periodontal ligament.

RESULTS: Groups A-D exhibited significant buccal inclination in premolars and first molars, while second molar expansion remained limited. In contrast, Group E demonstrated reversed displacement patterns. Regarding attachment position, palatal attachment (Group C) produced greater crown displacement in mid-posterior segment (second premolar: 0.058 mm; first molar: 0.042 mm) than buccal attachment (Group B). Among the five groups, the buccal attachment with palatal ridge configuration (Group D) showed superior biomechanical performance, achieving greatest first molar expansion (0.057 mm) and optimal torque control (first molar: 3.42°/mm; second molar: 2.96°/mm). Notably, palatal attachment groups (C and E) produced significantly higher von Mises stresses in roots.

CONCLUSIONS: Maxillary arch expansion with clear aligners is primarily achieved by buccal inclination of the posterior teeth. The buccal attachment with palatal pressure ridge design demonstrates biomechanical advantages, including enhanced crown displacement, better torque control, and favorable stress distribution.

PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.167

SP149 LONGITUDINAL EVALUATION OF OROFACIAL MUSCLE STRENGTH, MASTICATORY, AND SWALLOWING FUNCTION AFTER ORTHODONTIC TREATMENT IN ADOLESCENTS

Sumayah Alshami[1], Rayed Aldausari[2], Abhishek Kumar[1], Marie Pegelow[1], Anastasios Grigoriadis[1]; *[1]Karolinska Institutet, Huddinge, Sweden, [2]King Abdulaziz University, Jeddah, Saudi Arabia*

AIM: To evaluate changes in orofacial muscle strength, and masticatory and swallowing function in adolescents three months after completing orthodontic treatment.

MATERIAL AND METHODS: Thirty-one participants indicated for orthodontic treatment were recruited. Of these, 27 completed the designated treatment and the 3-month follow-up post-treatment (mean age = 14.7 ± 2.5 years; 14 girls). Orofacial muscle strength was assessed by measuring maximum voluntary bite force (MVBF), tongue and check pressures. Masticatory efficiency and performance were evaluated through a standardized food comminution test using viscoelastic test food. Swallowing function was assessed using the standardized Test of Masticating and Swallowing Solids (TOMASS). Finally, the standardized and validated Jaw Functional Limitation Scale (JFLS-20) was used to evaluate subjective jaw (masticatory) function. All measurements were compared between baseline (before treatment) and three months after treatment. A P-value of <0.05 was considered statistically significant.

RESULTS: The results of the analysis showed no significant differences in the MVBF (P=0.534), tongue (P=0.328) and check pressure (P=0.547) before and after the treatment. Similarly, there were no significant differences in the number of chewing cycles (P=0.230) and the duration of chewing (P=0.225) of the viscoelastic test food. However, the number of comminuted pieces in the food comminuted test was significantly lower after treatment (2.3±1.6) compared to before treatment (3.7±2.4) (P=0.010). There was also a significantly lower number of bites to eat the test food (cracker) after (2.3±0.8) the treatment than before (2.7±0.8) the treatment (P=0.012) in the TOMASS assessment. Patient-reported outcomes demonstrated improvement, with the JFLS-20 survey showing a significant change (P = 0.039).

CONCLUSION: Within the limitations of the study, the findings indicate that adolescents showed a subtle decrease in comminution ability but required fewer bites to process the test food after treatment. Patient-reported outcomes also improved, suggesting a positive functional impact despite limited changes in objective muscle and chewing measures three months after the completion of orthodontic treatment.

Abstract citation ID: cjag070.168

SP150 INFLUENCE OF IMPACTED CANINES ON MAXILLARY SINUS VOLUME AND DIMENSIONS: SYSTEMATIC REVIEW AND META-ANALYSIS

Mohamad Awos Sulaiman, Nerija Spaičytė, Giedrė Trakinienė, Arūnas Vasiliauskas; *Lithuanian University of Health Sciences, Kaunas, Lithuania*

To assess differences in maxillary sinus volume (MSV) and dimensions (length, width, height) in cases of impacted and non-impacted canines.

Five databases (PubMed, ScienceDirect, Wiley Online Library, Spring Link, Google Scholar) were used to conduct the literature search up to August 2025. Articles analyzing MSV and/or dimensions in patients diagnosed with an impacted canine using cone-beam computed tomography were included. Study selection, data extraction, and methodological quality analysis were performed by four examiners. The Newcastle-Ottawa Scale (NOS) for cohort and case-control studies was used to evaluate the risk of bias. For the meta-analysis, MedCalc software was used.

A total of 1 579 articles were identified; five met the inclusion criteria. For the methodological quality, three articles were graded as "Good" and two as "Moderate". In the meta-analysis, patients with unilateral palatally impacted canines (PICs) demonstrated a significant MSV difference *($P < .001$)*, while those with buccally impacted canines (BICs) did not *($P = .665$)*. Regarding maxillary sinus dimensions (MSD), no significant differences were observed in either group; however, a controversial variation was observed in bilateral PICs. From pre- to post-treatment, PICs showed a difference in MSV. In both PICs and BICs, the maxillary sinus extended more frequently to the incisor and canine regions. For each 1000 mm^3 decrease in sinus volume, the odds of PICs increased by 1.7 times, and vice versa in BICs. Each 1 mm rise in sinus height increased the odds of PIC by 22%.

MSV is generally smaller in PICs, but not in BICs. Bilateral PICs showed reduced sinus dimensions, while unilateral PICs and BICs did not. MSV increases following PIC treatment. Palatally impacted canines are related to smaller or vertically higher sinuses, whereas BICs occur more frequently with larger sinuses. Despite that, further future research is required for more accurate results and conclusions.

Abstract citation ID: cjag070.169

SP151 TITLE: BUCCALLY IMPACTED CANINES AND CRANIOFACIAL SIZE: A GEOMETRIC MORPHOMETRIC ANALYSIS

Iliana Gkotsi[1], Antonia Tsitsopoulou[2], Maria Athanasiou[3], Nikolaos Gkantidis[4], Georgios Kanavakis[5]; *[1]MSc in Medical Research Methodology, School of Medicine, Aristotle University of Thessaloniki, GR-54124 Thessaloniki, Greece, [2]Department of Orthodontics, Universidad CEU San Pablo, Madrid, Madrid, Spain, [3]Department of Orthodontics and Pediatric Dentistry, UZB—University School of Dental Medicine, University of Basel, CH-4058 Basel, Switzerland, [4]Department of Orthodontics and Dentofacial Orthopedics, School of Dental Medicine, University of Bern, CH-3010 Bern, Switzerland, [5]Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, GR-11527 Athens, Greece*

AIM: The aim of this retrospective study was to investigate whether individuals with buccally impacted maxillary canines present differences in craniofacial size compared to a group of matched individuals with normally erupted maxillary canines, using geometric morphometric analysis.

MATERIALS AND METHODS: The study sample included 152 individuals (96 females, 56 males; mean age 14.6± 1.3 years), 76 of which presented with buccal impaction and 76 comprised the control group and were matched for sex and age with the study group. Pre-treatment lateral cephalometric images were digitized in Viewbox 4, using a standardized geometric morphometric protocol with 15 anatomical curves and 127 fixed and semi-landmarks describing the entire craniofacial complex and its individual structures. After semi-landmarks were allowed to slide three times along the respective curvatures, a Procrustes superimposition was performed. Craniofacial size and size of the individual anatomical structures were expressed as the natural logarithm of centroid size (lnCS) for each region. Univariate and multivariate linear regression models were performed to evaluate the association between canine impaction and size, adjusting for age and sex. Effect sizes

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

were reported as beta coefficients (β) with 95% confidence intervals (95% CI) and p-values, while statistical significance was set at α=0.05.
RESULTS: Buccal impaction showed no significant association with craniofacial size in any region. For the entire configuration, the impaction group did not differ from controls (β=-0.01; 95% CI: -0.02-0.01; p=0.309). Similar non-significant effects were observed for the cranial base (β=-0.01; p=0.254), maxilla (β=-0.01; p=0.137) and mandible (β=-0.01; p=0.327). Sex was consistently associated with size, with females showing 3-5% smaller dimensions (p<0.001). Age showed a modest positive effect on most structures (»0.6-1% per year; p<0.001), except for the cranial base.
CONCLUSIONS: Buccal maxillary canine impaction was not associated with craniofacial size in any anatomical region. The absence of an age-related effect on cranial base size is biologically expected, as the cranial base shows no changes after the age of seven. Our findings suggest that buccal canine impaction most likely represents a local eruption disturbance rather than a genetically driven developmental anomaly.

Abstract citation ID: cjag070.170
SP152 TOOTH MOVEMENT PATTERN–BASED ASSESSMENT OF TREATMENT PREDICTABILITY IN THERMORESPONSIVE DIRECT 3D-PRINTED CLEAR ALIGNERS: A PROSPECTIVE RANDOMIZED CLINICAL TRIAL

Jin-Young Choi[1], Jing Liu[2], Nan-Young Kim[1], Ji-Min Park[1], Su-Jung Kim[1]; *[1]Kyung Hee University, Seoul, Republic of Korea, [2]Yonsei University, Seoul, Republic of Korea*

AIM: This randomized controlled trial investigated the clinical performance and directional predictability of direct 3D-printed clear aligners (DPA) produced with a thermoresponsive photopolymer, in comparison with conventional thermoformed aligners (TFA).
MATERIALS AND METHOD: A two-arm, parallel-group, multicenter trial was conducted in adults with ≤5 mm of crowding or spacing per arch who were scheduled for non-extraction clear aligner therapy. 56 subjects were randomly allocated to either the DPA or TFA group (1:1). After 16 aligner stages, anterior alignment was evaluated using Little's Irregularity Index (LII), and the error-to-predict ratio (E2P) was calculated from 3D digital model superimposition to quantify percentage discrepancies between planned and achieved tooth movements in 12 linear and angular directions. Changes in maxillary and mandibular intercanine and interpremolar widths and external apical root resorption of the central incisors were analyzed as secondary outcomes.
RESULTS: 27 participants in the DPA group and 26 in the TFA group completed the protocol. Both systems produced significant reductions in LII, with achievement ratios of planned alignment between 71.5% and 86.2%, and no significant intergroup differences in LII reduction. Direction-specific E2P analysis revealed that DPA showed significantly smaller errors for forward movement, intrusion, and lingual crown torque ($p < 0.001$, $p = 0.004$, $p = 0.035$), whereas TFA exhibited lower discrepancies in distalization and mesial-out rotation (both $p < 0.001$). Intercanine/interpremolar width changes and external apical root resorption were minimal and comparable between groups.
CONCLUSIONS: Both DPA and TFA demonstrated measurable gaps between virtual setups and clinical outcomes, reflecting inherent limitations of clear aligner biomechanics. Nevertheless, their movement profiles differed by direction: DPA showed greater accuracy for labio-lingual displacement–related movements, while TFA provided more reliable mesio-distal translation and rotational control, highlighting the impact of material properties and fabrication workflow on movement predictability.

Abstract citation ID: cjag070.171
SP153 ‡‡‡ UNILATERAL TEMPOROMANDIBULAR JOINT DISORDERS SHOW VERTICAL CRANIOFACIAL ASYMMETRY

HeeYoung Maeng, Jung Han, Seok Hyun Cho, Yoon Jeong Choi; *Department of Orthodontics, Yonsei University College of Dentistry, Seoul, Republic of Korea*

AIM: This study aimed to investigate the impact of unilateral temporomandibular disorders (TMDs), coupled with disc displacement (DD) without reduction and osteoarthritis (OA) on one side of the temporomandibular joint (TMJ) but normal findings on the other TMJ, on facial asymmetry in women.
MATERIALS AND METHOD: The participants were divided into an affected group (42 with unilateral TMD) and control group (49 with healthy TMJs on both sides). An asymmetry index was calculated as the difference between the left and right sides on the posteroanterior cephalograms.
RESULTS: The affected group demonstrated statistically significant increases in the asymmetry indexes of the vertical distance of the antegonial notch and gonion relative to the horizontal reference plane ($P < 0.05$), as well as an upward canting of the maxillary, occlusal, and mandibular planes towards the affected side ($P < 0.05$) compared to the control group. Horizontal asymmetry remained consistent across groups. Parafunctional habits in the affected group correlated with higher asymmetry indexes of antegonial notch distance ($P < 0.05$). Thus, patients with unilateral TMD display more severe vertical facial asymmetry than healthy individuals.
CONCLUSIONS: These findings may assist clinicians in diagnosing vertical asymmetry in patients with unilateral TMD using cephalograms and predicting facial asymmetry progression.

Abstract citation ID: cjag070.172
SP155 ORAL HYGIENE HABITS OF PATIENTS IN FIXED APPLIANCES – A MULTICENTRE AUDIT

Guanhong Li, Aliya Hasan, Paras Haria; *Royal London Hospital, London, United Kingdom*

AIM: The purpose of this audit was to assess whether patients in fixed appliances are complying with oral hygiene advice. The standard was for 100% of patients to be brushing at least twice a day and using interdental cleaning aids daily. The objectives were to assess patients' oral hygiene practices and their understanding of the consequences of poor oral hygiene while in fixed appliances.
MATERIALS AND METHOD: A prospective audit of all patients in fixed appliances attending in a week period was carried out across three hospital units. Patients were given a questionnaire on oral hygiene habits and knowledge of the consequences of poor oral hygiene. Following data analysis, an action plan was created for each hospital, including training nurses in providing oral hygiene instructions and signposting patients to an orthodontic oral hygiene video. A second cycle of the audit was carried out seven months later.
RESULTS: 98 patients responded in Cycle 1 and 55 in Cycle 2, with mean ages of 16.6 years and 18.3 years respectively.

Results from the first cycle found that 68% of participants were brushing at least twice a day. 77% were cleaning interdentally, but only 27% were doing so daily. One third of participants used an electric toothbrush. The overall understanding of risks was poor, with only half of participants reporting that poor oral hygiene has an impact on the gums, and less than 40% knowing that fixed appliances may have to be removed.

In Cycle 2, the proportion of patients brushing at least twice a day increased to 75%, although the rate of interdental cleaning remained similar. The proportion of patients using an electric toothbrush increased (58%). Patient understanding of the consequences of poor oral hygiene improved. The results across the three units were largely similar.
CONCLUSIONS: Only 3 out of 4 patients were found to be brushing at least twice a day, and only one third were cleaning interdentally daily. Signposting to videos and reinforcement from the clinical team led to improvement in oral hygiene practices and understanding of the risks. Further support for patients is needed to reach the standard.

Abstract citation ID: cjag070.173
SP156 SYMPTOMS AND SIGNS OF TEMPOROMANDIBULAR DISORDERS IN PATIENTS WITH HYPOPHOSPHATASIA COMPARED TO CONTROLS ASSESSED BOTH CLINICALLY AND RADIOLOGICALLY

Sebastian Langkilde[1], Asad Khan[1], Liselotte Sonnesen[1], Xenia Hermann[2]; *[1]Postgraduate Education in Orthodontics, Department of Odontology, Faculty of Health and Medical Sciences, University of Copenhagen, Denmark, Copenhagen, Denmark, [2]Resource Center for Rare Oral Diseases, Copenhagen University Hospital, Copenhagen, Denmark, Copenhagen, Denmark*

AIM: The aim was to compare symptoms and signs of temporomandibular disorders (TMD) including number of teeth in occlusal contact in patients with hypophosphatasia (HPP) with healthy controls.
SUBJECTS AND METHOD: The power calculation indicated that 17 participants should be included in each group. 20 HPP patients (16 women, 4 men, mean age 53.10 years) and 39 healthy controls (28 women, 11 men, mean age 31.82 years) were included. Clinical examination according to Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), radiological examinations of the temporomandibular joints (TMJs) by cone-beam-computed tomography (CBCT) scans, and registration of teeth in occlusal contact were performed. All the methods were standard, validated methods with small method errors and high reliability. Comparison between the groups was tested by general linear model and logistic regression analysis adjusted for gender and age. The p-values were corrected for multiple testing comparing groups by the False Discovery Rate (FDR).
RESULTS: Clinically it was found that patients with HPP had a significantly higher prevalence of facial pain ($p = 0.042$), pain on palpation of the TMJs ($p = 0.015$),

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

and crepitation of the joints ($p = 0.021$) compared to controls. Furthermore, patients with HPP had a significantly higher prevalence of arthralgia ($p = 0.032$) and degenerative joint diseases ($p = 0.018$) compared to controls. No significant difference in teeth in occlusal contact between the groups was found. Radiologically, no statistically significant differences were found between the two groups.
CONCLUSIONS: The results indicate that some clinical symptoms and signs of TMD occurred significantly more often in HPP patients compared to controls. Teeth in occlusal contact and radiological deviations of the TMJs and were comparable to controls. The findings may prove valuable for the information given to adult patients with HPP and in treatment planning and during treatment.

Abstract citation ID: cjag070.174
SP158 ADVANCED MANAGEMENT OF SEVERE CLASS II AND III MALOCCLUSIONS: SURGICAL VERSUS CAMOUFLAGE STRATEGIES LEVERAGING DIGITAL PLANNING AND LINGUAL APPLIANCES

Giuseppe Scuzzo[1] and Giacomo Scuzzo[2]; *[1]Department of Orthodontics Università Cattolica del Sacro Cuore, Italy., Rome, Italy, [2]Elineclinic, Rome, Italy*

AIMS: This clinical study aims to compare the effectiveness of orthognathic surgery and orthodontic camouflage in the treatment of severe Class II and Class III malocclusions using digital planning and lingual appliances. It evaluates treatment outcomes, esthetic and functional improvements, and patient satisfaction to determine the most appropriate approach for different clinical scenarios.
MATERIALS AND METHODS: A retrospective analysis was conducted on patients with severe Class II or Class III malocclusions treated with either orthognathic surgery or orthodontic camouflage. Digital treatment planning was performed using 3D imaging, cephalometric analysis, and virtual simulations to assess treatment options. Lingual appliances were used for orthodontic treatment in both groups. Treatment duration, occlusal outcomes, skeletal changes, and patient-reported satisfaction were evaluated.
RESULTS: Patients undergoing surgical treatment showed significant skeletal and occlusal improvements with stable long-term outcomes. Orthodontic camouflage resulted in optimal occlusal corrections but had limitations in cases with severe skeletal discrepancies. Digital planning enhanced treatment precision in both groups, improving efficiency and predictability. Patient satisfaction was higher in both group due to improved facial esthetics
CONCLUSION: Digital planning combined with lingual appliances is an effective approach for managing severe Class II and Class III malocclusions. While orthognathic surgery provides superior skeletal correction and esthetic results, orthodontic camouflage is a viable alternative for select cases with less severe discrepancies. Digital tools enhance treatment planning, optimizing outcomes for both surgical and non-surgical approaches.

Abstract citation ID: cjag070.175
SP159 *** SKELETAL ANCHORAGE-ASSISTED CLEAR ALIGNER TREATMENT OF A PATIENT WITH ANGLE CLASS II MALOCCLUSION: A CASE REPORT

Ezgi VENEDIK and Neslihan Ebru ŞENIŞIK; *Süleyman Demirel University Faculty of Dentistry Department of Orthodontics, Isparta, Turkey*

OBJECTIVE: Growing aesthetic expectations among orthodontic patients have increased the demand for treatment options that are less visible, more comfortable, and easier to maintain than conventional fixed appliances. Clear aligners have therefore become a preferred alternative, especially for young adults who place a high value on appearance throughout treatment. This case report presents the orthodontic management of a patient with skeletal and dental Angle Class II malocclusion using clear aligners supported by skeletal anchorage to achieve controlled maxillary distalization and optimal occlusal correction.
METHOD: A 16-year-old female patient presented with complaints related to dental aesthetics. Radiographic evaluation indicated skeletal Class II malocclusion. Clinical examination revealed dental Class II molar and canine relationships, a 2 mm right deviation of the maxillary midline, a 0.5 mm left deviation of the mandibular midline, 2 mm overjet, and 3.5 mm overbite. Additionally, tooth #12 displayed smaller morphology compared with its contralateral counterpart, tooth #22. Intraoral scanning demonstrated 4 mm of space deficiency in the maxillary arch and 1.5 mm in the mandibular arch. A digital treatment plan was developed to resolve the space discrepancies, correct the midline deviations, and achieve Class I molar and canine relationships. Zygomatic miniplates were surgically placed at the beginning of treatment to provide skeletal anchorage for maxillary distalization. The initial plan consisted of 59 aligners; however, refinement was required, and the treatment was ultimately completed using 74 aligners.
RESULTS: At the conclusion of the treatment, all attachments were removed and tooth #12 was restored to achieve proper morphology. Fixed retainers were bonded in both arches to support long-term stability. The treatment successfully achieved Class I molar and canine relationships, corrected midline deviations, and established ideal overjet and overbite. The patient's dental and facial aesthetics were noticeably improved.
CONCLUSION: The treatment was completed in 18 months. The combined use of clear aligners and skeletal anchorage enabled effective distalization, precise tooth movement, and predictable correction of a Class II malocclusion. The patient exhibited excellent compliance and benefited from a comfortable, hygienic, and aesthetically favorable treatment experience.

Abstract citation ID: cjag070.176
SP160 DIGITAL ANALYSIS OF AGE-RELATED DENTOALVEOLAR CHANGES: A 50-YEAR LONGITUDINAL STUDY

Anas Basim[1], Julia Naoumova[2], Anna Westerlund[3], Maurits Persson[4], Nameer Al Taai[4]; *[1]Hamdan Bin Mohammed College of Dental Medicine, Dubai, United Arab Emirates, [2]Department of Orthodontics, Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden, [3]Department of Orthodontics, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden, [4]Orthodontics, Department of Odontology, Umeå University, Umeå, Sweden*

AIM: Few longitudinal studies have examined age-related dentoalveolar changes extending into late adulthood, and existing research is often limited by small sample sizes, high dropout rates, and insufficient evaluation of measurement reliability. By employing digital measurement techniques and well-defined inclusion and exclusion criteria, this study aims to provide more reliable insights into the trajectory of dentoalveolar changes in individuals with normal occlusion from early adolescence (12 years) to late adulthood (62 years) across four time points.
MATERIALS AND METHOD: Thirty orthodontically untreated subjects (11 males, 19 females) recruited through the Public Dental Health Care system in Umeå, Sweden, were examined at mean ages of 12 (T1), 15 (T2), 30 (T3), and 62 years (T4). Stone casts of the maxillary and mandibular arches were digitized using a high-resolution 3D scanner. Eleven variables were digitally assessed: overjet, overbite, intercanine width, intermolar width, arch depth, palatal height, curve of Spee, clinical crown height, arch length, space deficiency, and irregularity index. Changes across time points were analyzed using the Wilcoxon signed-rank test.
RESULTS: Overjet remained relatively stable during the observation periods, while overbite decreased significantly. Clinical crown height increased significantly in both arches throughout the study period. Palatal height increased significantly up to age 30, and the curve of Spee decreased significantly by age 15. Upper and lower intermolar widths and upper intercanine width showed no significant changes. In contrast, upper and lower arch depths and lower intercanine width decreased significantly across the time points. Arch length in both arches decreased significantly at all intervals, accompanied by significant increases in space deficiency and in the irregularity of the lower incisors up to age 62.
CONCLUSIONS: Age-related dentoalveolar changes continue well into late adulthood. Awareness of these long-term patterns enables orthodontists to refine treatment planning and highlights the importance of well-designed retention strategies to minimize post-retention changes.

Abstract citation ID: cjag070.177
SP161 THE USE OF ARTIFICIAL INTELLIGENCE IN ORTHOGNATHİC SURGERY

Nesli Sude Ozbudak and Beste Kamiloğlu; *Near East University, Mersin, Turkey*

INTRODUCTION: Artificial intelligence (AI) is revolutionizing Orthognathic Surgery by increasing diagnostic accuracy, reducing operator related variability, and enabling high precision 3D simulations. Deep learning based systems have demonstrated strong performance in automatic Cephalometric landmark detection and surgical outcome prediction. However, the clinical validity of these systems, their consistency across different patient populations, and their practical impact on treatment decisions are still debated.
AIM: This study aims to critically evaluate current AI applications in Orthognathic Surgery. Among the focal points are automated Cephalometric Analysis, machine learning ability to predict surgical necessity, 3D soft tissue outcome simulation, and postoperative evaluation. The aim is to determine the accuracy, clinical significance, and potential for integrating these systems into routine practice.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

MATERIALS AND METHODS: A structured literature review was conducted on PubMed, ScienceDirect, and Google Scholar. Research was limited to studies published between 2019–2024. The included studies used AI for automated anatomical landmark detection, Orthognathic surgery prediction, 3D simulation of skeletal and soft tissue movements, or postoperative evaluation. The obtained data were analyzed in terms of diagnostic accuracy, measured error margins, prediction reliability, data requirements, and clinical applicability.
RESULTS: AI showed increased accuracy in landmark detection, rising from 70% previously to 96–98% in recent studies, with the average point localization error reported to be between 1.1 and 1.9 mm. Machine learning models used in predicting surgical necessity have shown 88–93.8% accuracy, high F1 scores, and consistent sensitivity/specificity values. Advanced 3D simulation software predicted postoperative soft tissue outcomes

with correlation coefficients of r = 0.82–0.94 and reduced preoperative planning time by 30–45%. However, some studies have reported a 6°–8° variability in the ANB angle, indicating that technical accuracy does not always translate into clinically sufficient predictability.
CONCLUSIONS: AI demonstrates substantial potential to enhance diagnostic accuracy and predictive performance in Orthognathic surgery, offering meaningful support for surgical planning. However, broader clinical adoption requires multi-center external validation, standardized data protocols, and transparent algorithmic development. Establishing AI as a reliable clinical standard will depend on the creation of transparent, clinically validated models trained on large-scale and ethnically diverse datasets.

Abstract citation ID: cjag070.178
SP162 THE EFFECT OF RAPID MAXILLARY EXPANSION ON CHILDREN WITH OBSTRUCTIVE SLEEP APNEA: A SYSTEMATIC REVIEW AND META-ANALYSIS

Keer Yu[1], Yaqi Li[1], Fang Hua[2], Hong He[3], Tingting Zhao[4]; *[1]State Key Laboratory of Oral & Maxillofacial Reconstruction and Regeneration, Key Laboratory of Oral Biomedicine Ministry of Education, Hubei Key Laboratory of Stomatology, School & Hospital of Stomatology, Wuhan University, Wuhan, China, [2]Centre for Evidence-Based Stomatology, Centre for Orthodontics and Paediatric Dentistry at Optics Valley Branch, School & Hospital of Stomatology, Wuhan University, Wuhan, China, [3]Department of Orthodontics, Hubei Provincial Clinical Research Centre for Dentofacial Deformities in Children, School & Hospital of Stomatology, Wuhan University, Wuhan, China, [4]Centre for Dentofacial Development and Sleep Medicine, School & Hospital of Stomatology, Wuhan University, Wuhan, China*

AIM: Pediatric obstructive sleep apnea (OSA) is a respiratory disorder that may lead to significant neurocognitive and behavioral impairments, systemic inflammation, and cardiovascular and metabolic dysfunction. Studies show rapid maxillary expansion (RME) widens the maxilla and nasal cavity and may help reduce OSA symptoms. This systematic review and meta-analysis summarized recent the international literature on the efficacy of RME in alleviating pediatric OSA.
MATERIALS AND METHOD: We conducted a literature search through PubMed, Embase, Web of Science, the Cochrane Library, and WorldCat from inception to March 2025, a total of 14 studies meeting our inclusion criteria were selected for final analysis. The risk of bias for all included studies were evaluated with the ROBINS-I tool. Meta-analyses were performed with the random-effects model.
RESULTS: Meta-analyses performed with RevMan software (version 5.4) revealed that the apnea-hypopnea index (AHI) decreased within six months following the completion of active RME (MD: -4.04, 95% CI: -6.39 to -1.70, P = 0.0007, I^2 = 93%) and within twelve months (MD: -6.15, 95% CI: -11.66 to -0.64, P = 0.03, I^2 = 97%). Additionally, a significant reduction in the Arousal Index was observed following maxillary expansion, while peripheral capillary oxygen saturation (SpO2%), total sleep time (TST), the lowest peripheral capillary oxygen saturation (Lowest SpO2%), and maxillary width demonstrated significant improvements at various time points after RME treatment.
CONCLUSIONS: Based on the current evidence and its inherent limitations, these findings indicated that RME can effectively enhance the transverse width of the maxilla and improve polysomnographic parameters in pediatric patients with OSA.

Abstract citation ID: cjag070.179
SP163 EVALUATION OF THE RELATIONSHIP BETWEEN DEMIRJIAN DENTAL AGE AND SAGITTAL AND VERTICAL SKELETAL MALOCCLUSION

DUYGU ESKİN and NESLİHAN EBRU ŞENIŞIK; *Süleyman Demirel Üniversitesi Diş Hekimliği Fakültesi Ortodonti Anabilim Dalı, ISPARTA, Turkey*

AİM: The objective of the present retrospective study is to examine the relationship between chronological age and dental age using the Demirjian Dental Age Estimation Method in cases classified as sagittal and vertical skeletal malocclusion.The study seeks to elucidate the correlation between dental maturation and chronological age, as well as the distinction between sagittal and vertical skeletal types. This analysis aims to identify factors contributing to dental maturation.
METHOD: The present study was conducted on 378 patients aged between 9 and 14 years who were examined at the Department of Orthodontics, Faculty of Dentistry, Süleyman Demirel University. Pre-treatment lateral cephalograms (LCR) and panoramic radiographs (OPG) were divided into nine subgroups. Tooth age estimation was performed on OPGs using the Demirjian method. The measurement of sagittal and vertical anomaly indicator angles was conducted on LCRs. Statistical significance was determined using SPSS software with Spearman's correlation coefficient values of $p < 0.05$ and $p < 0.01$, and logistic regression analysis was also performed.
FİNDİNGS: A significant correlation was identified between Demirjian dental age and chronological age across all sagittal and vertical categories ($p < 0.001$). Furthermore, gender exhibited a statistically borderline significant contribution (P= 0.051). A negative relationship was found between dental age and ANB in Class II and Class I malocclusions; whereas in Class III malocclusion, positive relationships were observed between dental age and ANB. It was determined that the multiple parameters, which evaluated the ANB*Wits interaction together rather than a single sagittal parameter, was a stronger predictor (P< 0.001). A significant correlation was identified between dental age and SNGoGn (P<0.001).
CONCLUSİON: The strongest predictor of dental maturation is chronological age, followed by the ANB*Wits interaction. It was determined that dental maturation is delayed as the severity of skeletal sagittal anomaly increases. Dental maturation is more advanced in individuals who are normodivergent, while it presents a delay in individuals who are hyperdivergent. In cases of skeletal anomalies, if the timing of parental referral to the orthodontist is determined based on the eruption time of permanent teeth, the possibility of delay in skeletal functional treatment timing may be a cause for concern.

Abstract citation ID: cjag070.180
SP164 DOES CHIN CUP HARMFUL FOR TEMPOROMANDIBULAR JOINT DISK POSITION AND CONFIGURATION?

Hatice Gökalp; *University of Ankara Department of Orthodonticss, Ankara, Turkey*

AIM: For decades, a prevailing belief is that chin cup forces are responsible for TMJ internal irregularities. In the literature, the position of the disc has not been directly evaluated, but it generally has been estimated based on the condyle position. The dis position is to be discuss whether any orthodontic application causes TMJ internal irregularities. The aim of this study was to investigate the effect of Chin cup on the disc position and configuration in asymptomatic Class III individuals.
MATERIAL AND METHOD: Clinically asymptomatic skeletal Class III (ANB;-2.6°, skeletal age 4.6-11 years, 10 females, 5 males) treated with the Chin cup and untreated skeletal Class I (ANB; 3.1°, skeletal age 6-10 years, 6 females, 4 males) were compared regarding TMJ disc position and configuration by using unilateral sagittal TME MRI. Informed consent forms were obtained from all parents for TMJ MRI. The MRI scans were performed by a 1.5 T superconducting MRI device (GE Medical Systems, Milwaukee, WI). A 3-inch surface coil was placed over the TME region for the examination. After axial plots were obtained, examinations were performed in the oblique sagittal plane. TR was set to 500 ms, TE to 21 ms, slice thickness to 3 mm, slice spacing to 0.5 mm, FOV to 10 cm, NEX to 4, and matrix to 256X128. The examination time was 4.20 minutes.

Statistical analysis was performed using SPSS 26. Data were compared by Wilcoxon rank-ordered sign test, differences between periods were compared by the Mann-Whitney U analysis. Statistical evaluations were made at a significance level of p<0.05.

Results The posterior disc angle increased with chin cup; the disc was located 40% in region A and 60% B. The disc configuration was 93.3% biconcave. In the control group, the posterior disc angle decreased; the disc was located 50% in region A and 50% B. The disc configuration was 100% biconcave.
CONCLUSION: Chin cup does not create an effect that causes internal irregularity on disc position and configuration.

Abstract citation ID: cjag070.181
SP165 NASAL CAVITY ALTERATIONS AFTER TRANSVERSE SKELETAL MAXILLARY EXPANSION IN ADOLESCENTS: PRELIMINARY RESULTS

Sophia Panwinkler[1], Alexander Schwärzler[2], Erwin Jonke[1]; *[1]Medical University of Vienna, University Clinic of Dentistry, Department of Orthodontics, Vienna, Austria, [2]Department of Orthodontics and Dentofacial Orthopedics, School of Dental Medicine, University of Bern, Bern, Switzerland*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: Adolescents show a progressive ossification of the palatal suture, resulting in higher palate rigidity. Therefore, a bone-borne expansion appliance is recommended for the skeletal expansion of the maxilla in adolescent patients. The patients subjective perception of improved airflow following therapy provides the rationale for investigating the alteration of the nasal cavity.
MATERIALS AND METHOD: A group of 24 patients (average age 13,6 years, 11 male and 13 females) was treated using a skeletal anchored patient individual CAD/CAM (computer-aided-design/ computer-aided manufacturing) expansion appliance, which consists of two bicortical placed miniscrews a metal framework and a hexagonal [expansion screw. On average, the expansion phase spanned 137 days. Computed-tomography (CT) scans were performed before the treatment (T0) for the virtual placement of miniscrews and after the expansion period (T1). For CT image analysis, the scans were superimposed on the cranial base.
RESULTS: This preliminary results of an ongoing study show that the average transverse expansion of the maxilla of 4,15mm (SD 1,35mm) measured in the molar region was achieved. This had a statistically significant effect ($p < 0,001$) on the nasal cavity. The transverse dimension of the nasal cavity showed an average increase of 2,91mm (SD 0,97mm) in the molar region and 3,84mm (SD 1,56 mm) in the first premolar region. The results demonstrate that an increase of the alveolar width is strongly associated with an enlargement of the nasal cavity. The very high correlations between the respective difference values ($r = 0.935$ for alveolar width and nasal cavity width at the molar region; $r = 0.776$ for the premolar region) indicate that maxillary expansion leads to a nearly proportional increase in nasal cavity transverse.
CONCLUSIONS: In adolescents with transverse maxillary deficiency, the progressive ossification of the midpalatal suture supports the indication for the use of skeletally anchored expansion appliances. This expansion also produces measurable changes in the nasal cavity These findings may indicate improvement in the nasal airway and could serve as a basis for further clinical investigations.

Furthermore, potential effects on the surrounding soft tissues remain insufficiently understood and should be addressed in future research.

Abstract citation ID: cjag070.182
SP166 DIRECT-PRINTED ALIGNERS: EVALUATION OF BIOCOMPATIBILITY BASED ON CLINICAL OBSERVED HYPERSENSITIVITY

Vanessa Knode[1], Claudia Welte-Jzyk[1], Maximilian Bleilöb Julia Bulski[1], Björn Ludwig[2], Christina Erbe[1]; [1]*University Medical Center of the Johannes Gutenberg-University, Mainz, Germany,* [2]*Private Practice, Traben Trarbach, Germany*

AIM: This study aimed to evaluate the biocompatibility of Tera Harz TC-85 (Graphy Inc., Seoul, South Korea) used for directly printed aligners by investigating the effects of reduced, interrupted, and prolonged post-curing times as well as increased material thickness on the viability of human gingival fibroblasts (HGFs). A clinically worn aligner from a patient with hypersensitivity was also evaluated to identify potential cytotoxic effects.
MATERIALS AND METHODS: Standardized circular specimens with thicknesses ranging from 0.5 to 6 mm were digitally designed and printed using a validated manufacturing workflow incorporating centrifugal resin removal, nitrogen-assisted UV post-curing, and boiling-water rinsing. To assess the impact of curing variations, specimens underwent reduced, interrupted, or prolonged post-curing procedures. All samples were incubated for 24 hours in culture medium at 37 °C to obtain conditioned extracts. A clinically worn aligner was sectioned into standardized pieces and evaluated using the same protocol. HGFs were exposed to these extracts, while untreated cells served as controls. Cell viability was quantified after 48–72 hours using the AlamarBlue assay, and proliferation was monitored by live-cell imaging. According to ISO 10993-5, a viability reduction >30% was defined as cytotoxic. Statistical analysis was performed using unpaired t-tests or one-way ANOVA ($p < 0.05$).
RESULTS: Uncured liquid TC-85 resin showed clear cytotoxicity. In contrast, printed and fully post-cured specimens demonstrated no reduction in HGF viability compared with the control ($p > 0.05$). Increased specimen thickness led to a slight decrease in metabolic activity (<10%). Variations in post-curing - whether reduced, interrupted, or prolonged - did not yield significant differences in cell viability ($p > 0.05$). The worn aligner exhibited no cytotoxic effects; instead, HGFs showed increased metabolic activity relative to the control.
CONCLUSIONS: TC-85 showed reliable biocompatibility under all tested conditions - including variations in post-curing and increased material thickness. The clinically reported hypersensitivity reactions may reflect individual responses upon material contact. Maintaining appropriate and consistent post-processing procedures remains important to ensure optimal polymerization and predictable biocompatibility.

Abstract citation ID: cjag070.183
SP168 CANINE LATERALISATION - ARE PATIENTS FULLY INFORMED?

Billie-Jean Rainey, Emer Byrne, Rowan Campbell, Saarah Juman; *Western trust, Derry, United Kingdom*

AIM: Canine lateralisation is a technique commonly used to address the absence of lateral incisors or where there is planned removal of these teeth. This approach often involves mesialising the canine teeth to take the place of the lateral incisors, followed by recontouring to closely resemble the natural teeth they are replacing. This study aims to assess patient understanding and expectations of canine lateralisation, in the hope of improving these and ultimately the patient consent process.
MATERIALS (OR SUBJECTS) AND METHOD: A piloted questionnaire was distributed to all patients who were due to have or had been offered treatment with the aim of canine lateralisation over a three-month period from March to June 2025 at one hospital orthodontic department. We measured expectations for the proposed treatment as well as the awareness of both the advantages and disadvantages of this treatment. Using this feedback, we created a patient information leaflet (PIL) as well as an audio-visual aid (AVA). A second cycle to assess the effectiveness of these aids in the decision-making process was undertaken.
RESULTS: Cycle 1 – 10 patients/parents completed the questionnaire. Only 40% had good-excellent understanding of this treatment option, with 60% reporting they did not fully understand. The majority (80%) felt that the orthodontic phase of treatment was adequately explained, however 80% were unsure of the restorative treatment options long-term. 60% would like more information and felt they would benefit from images of treatment outcomes and the associated cost implications.
CONCLUSIONS: We identified the need for an improvement of information provided to this group of patients to allow for a greater understanding of the treatment plans when masking canines as lateral incisors. The introduction of PIL and AVA has ultimately enhanced shared decision making and overall patient outcomes within the orthodontic department.

Abstract citation ID: cjag070.184
SP169 EVALUATING DIRECT AND INDIRECT BONDING TECHNIQUES: A COMPARATIVE APPROACH TO ORTHODONTIC PRACTICE

ilnaz Miri Soleiman and Christiane Keil; *Duisburg-Essen, Münster, Germany*

AIM: This study provides a comparative analysis of direct bonding (DB), indirect bonding (IB), and CAD/CAM techniques, focusing on chairside time, treatment efficacy, bond failure rates, bracket placement accuracy, periodontal parameters, and white spot lesions (WSLs). The objective is to offer evidence-based guidance for clinical practice through a review of recent in vivo and in vitro studies.
METHODS: A manual and electronic search was conducted in PubMed, Google Scholar, and the Cochrane Library between December 2024 and January 2025 using keywords such as “direct bonding,” “indirect bonding,” “CAD/CAM,” and “orthodontics.” After applying specific inclusion and exclusion criteria, 21 studies were selected: 16 in vivo, 4 in vitro, and 1 combined. These studies compared bonding techniques regarding time efficiency, accuracy, bond failure, treatment efficacy, periodontal outcomes, and white spot lesions.
RESULTS: The reviewed studies revealed no consistent superiority among bonding techniques concerning bond failure rates or shear bond strength. Indirect bonding generally demonstrated greater accuracy in bracket placement and modest advantages in treatment duration and oral hygiene outcomes, including fewer WSLs. While overall treatment efficiency appeared comparable, IB and CAD/CAM techniques showed potential clinical benefits.
CONCLUSION: All bonding techniques demonstrate comparable overall effectiveness, with no clear advantage in bond strength or failure rates. Indirect bonding and CAD/CAM methods may provide slight clinical benefits in accuracy and oral hygiene, especially in complex cases.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.185
SP170 ‡‡‡ THREE-DIMENSIONAL FACIAL ASYMMETRY: QUANTIFICATION AND COMPARISON OF SOFT TISSUE SURFACE REGISTRATION METHODS

Luisa Gigante[1], Alice Gervasoni[2], Riccardo Solazzo[3], Gianluca Tartaglia[4], Chiarella Sforza[3]; [1]*Department of Biomedical,Surgical and Dental Sciences, University of Milan, Milan, Italy,* [2]*Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milan, Italy,* [3]*LAFAS, Laboratory of Functional Anatomy of the Stomatognathic System, Department of Biomedical Science for Health, University of Milan, Milan, Italy,* [4]*Fondazione IRCCS Cà Granda, Ospedale Maggiore Policlinico, Milan, Italy*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: Facial asymmetry is increasingly recognized as a key diagnostic parameter in orthodontics, maxillofacial surgery, and clinical dentistry. Several three-dimensional (3D) surface-based methods have been proposed for its evaluation; however, methodological variations may lead to inconsistent and non-interchangeable results. This study aimed to compare and quantify the asymmetry using three surface registration-based approaches to assess their reproducibility, agreement and clinical applicability in evaluating facial asymmetry in healthy subjects.
MATERIALS AND METHODS: 3D stereophotogrammetric images of 134 Italian subjects (67 male and 67 female; aged between 5 and 80 years) without a diagnosis of facial dysmorphism were analyzed. The tested protocols were used to select differently the face and the facial thirds (upper, middle, lower): (1) Codari et al. described the trigeminal subdivision in hemifaces and thirds; (2) Cassi et al. proposed the trigeminal subdivision in thirds; and (3) Primozic et al. developed an orthodontic method based on horizontal reference planes. The Root Mean Square (RMS) distance was calculated through a mirroring surface-based registration approach to quantify the asymmetry. Operator reliability was assessed through Intraclass Correlation Coefficients (ICC), while method equivalence was tested by two-way repeated measures ANOVA, Bland–Altman plots, and similarity percentage models.
RESULTS: All methods demonstrated excellent intra- and inter-operator reliability (ICC > 0.96). The mean facial asymmetry across the sample was 0.65 ± 0.18 mm. ANOVA revealed significant differences among methods ($p < 0.001$), but Bland–Altman proved clinically acceptable agreement (< 0.50 mm) between the two trigeminal-based protocols for all facial regions. Contrarily, the agreement between both trigeminal methods and the orthodontic one was acceptable only for the whole face and the upper third exceeding the threshold of 0.50 mm in the middle and lower thirds. The similarity percentage model confirmed the equivalence between the two trigeminal-based approaches, but not with the orthodontic one, although the fastest.
CONCLUSIONS: Trigeminal-based protocols yielded reproducible and interchangeable results, unlike the faster orthodontic method. The quantitative assessment of the reference population provided a clinically meaningful asymmetry benchmark, and the choice of methodology should be driven by diagnostic goals and time constraints rather than assumed interchangeability.

Abstract citation ID: cjag070.186
SP171 PERIODONTAL HEALTH IN COMBINED ORTHODONTIC THERAPIES: A COMPARISON BETWEEN ALIGNERS AND FIXED APPLIANCES

Nour Abou Merhi, Gina Rosario Alvinco Medina, Alessandro Antonuccio, Cinzia Maspero, Alberto Caprioglio; *University of Milan, Milan, Italy*

AIM: This study aims to evaluate and compare, within the same group of patients, the effects of orthodontic treatment with clear aligners in the maxillary arch and fixed appliances in the mandibular arch on oral hygiene levels and periodontal health parameters.
MATERIALS AND METHOD: The sample included 90 patients (43 females, 47 males; mean age: 26 years) presenting with mild-to-moderate dental crowding. All subjects were simultaneously treated with clear aligners in the upper arch and fixed appliances in the lower arch. Individuals with risk factors for periodontitis (smoking, diabetes, obesity, HIV infection, hormonal alterations, positive family history or medications affecting periodontal status) were excluded. Periodontal assessment was conducted at four time points (T0–T3) through clinical indices and microbiological analysis of subgingival plaque. Data were analysed using paired t-tests, with statistical significance set at $p < 0.05$.
RESULTS: Arches treated with aligners showed a significant reduction in plaque index shortly after initial oral hygiene instructions, along with a decrease in cocci and bacilli, with these improvements remaining stable over time. In contrast, arches treated with fixed appliances exhibited a progressive increase in plaque accumulation (approximately +10% at T1, T2, and T3) and a higher prevalence of *Streptococcus mutans* and *Lactobacilli* (up to 40% of subjects at T2). Moreover, a greater concentration of Gram-negative bacteria associated with periodontal disease was detected. Among patients with poor baseline oral hygiene, the maxillary arch treated with aligners, maintained conditions comparable to initial values, whereas the mandibular arch treated with fixed appliances showed marked clinical deterioration, including increased plaque deposition and signs of gingival inflammation.
CONCLUSIONS: Clear aligners proved more effective in controlling biofilm accumulation and preventing gingival inflammation, resulting in a more favourable periodontal profile compared with fixed appliances. Nevertheless, patient compliance remains crucial. From a periodontal perspective, clear aligners represent the preferred option for cooperative adult patients or those with high aesthetic demands, while individuals wearing fixed appliances require reinforced hygiene protocols and closer clinical monitoring.

Abstract citation ID: cjag070.187
SP172 THE REVERSE SYSTEM: A NEW CONCEPT IN PALATAL ANCHORAGE

Alessandro Scuderi[1], Aldo Giancotti[2], Simone Altilia[1], Vincenzo Quinzi[3], Gianluca Mampieri[4]; *[1]Post-graduate student Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy, [2]Associate Professor, Director Postgraduate Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy, [3]Associate Professor, Department of Life Science, Health, and Health Professions, Link Campus University, Rome, Italy, [4]Associate Professor, Director Postgraduate Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Rome, Italy*

AIM: To describe, analyze, and clinically contextualize the REVERSE system, a new palatal skeletal anchorage approach designed to integrate the advantages of both direct and indirect mini-screw–supported techniques while reducing their limitations. The objective is to assess its structural features, digital workflow, and clinical applicability in comparison with established skeletal anchorage systems.
MATERIALS AND METHODS: The REVERSE system includes titanium palatal mini-screws, temporary guide sleeves for insertion, and a locking cap secured to the orthodontic appliance via a micro-screw, allowing complete reversibility without removing the TADs. The appliance is produced through a fully digital CAD/CAM workflow. REVERSE TADs feature a direct-insertion method and an integrated guide incorporated within the appliance itself, removing the need for external surgical stents and simplifying clinical execution. An RME Hyrax-type appliance was fabricated using the REVERSE protocol to evaluate its structural configuration, workflow efficiency, and clinical performance compared with the BENEFIT and DIVA systems.
RESULTS: The REVERSE system showed high procedural simplicity, enabling direct guided insertion of mini-screws through the appliance without additional guides. The locking-cap design ensured stable anchorage while allowing appliance removal or replacement without TAD explantation. Digital planning facilitated precise screw placement parallel to the midpalatal suture, maintaining safe distances from neurovascular structures. The integrated bushings and predetermined insertion planes minimized deviation in axial positioning and reduced mucosal irritation. Clinically, the system achieved effective skeletal expansion, evidenced by midpalatal suture separation, diastema formation, and correction of mandibular laterodeviation. Compared with BENEFIT and DIVA, REVERSE streamlined the fixation phase, reduced component complexity, and enhanced modularity while retaining biomechanical versatility.
CONCLUSIONS: The REVERSE system represents a meaningful evolution in palatal skeletal anchorage, merging the simplicity of direct systems with the reversibility typical of indirect approaches. Its guided yet detachable fixation improves clinical efficiency, reduces chairside errors, and supports diverse orthodontic appliances functioning across all spatial planes. Initial clinical observations confirm its stability, versatility, and suitability for modern digitally driven orthodontics, providing clinicians with a reliable and adaptable tool for complex therapeutic demands.

Abstract citation ID: cjag070.188
SP173 INTRINSIC TONGUE MUSCLES IN A DUCHENNE MUSCULAR DYSTROPHY MOUSE MODEL SHOW FIBRE HYPERTROPHY AND REGENERATION

Emira Koshi, Stavros Kiliaridis, Aouatef Ait-Lounis, Gregory Antonarakis; *University of Geneva, Genève, Switzerland*

AIM: To assess muscle fibre size and regeneration in intrinsic tongue muscles across different ages in a mouse model of Duchenne muscular dystrophy.
MATERIALS AND METHODS: Tongue samples from *mdx*^{5Cv} dystrophic mice and wild-type mice were dissected and analysed at 3, 6 and 12 months of age (n=6 per phenotype per time point). Samples were fresh frozen, cross-sectioned at 10µm, and stained with haematoxylin and eosin for morphometric analysis. Standardised regions of interest were placed dorsally in the Superior Longitudinal (SL) and ventrally in the Inferior Longitudinal (IL) muscle. Muscle fibre count was calculated and used as an indirect indicator of fibre size. Automated fibre detection and normal/regenerated fibre classification were performed in QuPath using central-nuclei identification, with all outputs manually verified. Measurements were extracted for each animal, and group differences across age, phenotype (*mdx*^{5Cv} vs. wild-type) and muscle region (SL vs. IL) were evaluated using multiple regression analysis.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: Age, phenotype and muscle region significantly affected muscle fibre size. Fibres were larger in older mice (p=0.042), in the IL muscle (p<0.001), and in the dystrophic mice (p=0.012). The muscle-specific difference in fibre size was more pronounced in dystrophic mice (phenotype × muscle, p=0.026), whereas wild-type mice showed minimal differences in fibre size between SL and IL muscles. Regeneration also differed strongly by phenotype and muscle region. Dystrophic mice showed substantially higher regeneration than wild-type mice (p<0.001), with IL showing higher values than SL in both groups (dystrophic: ∼5.8% vs. 3.2%; wild-type: ∼1.0% vs. 0.8%). This IL predominance in regenerated fibres was especially marked in dystrophic mice (phenotype × muscle, p<0.001). Regeneration increased slightly in older mice, but without reaching statistical significance.
CONCLUSION: Dystrophic mice representing a phenotype of Duchenne muscular dystrophy show alterations in tongue muscle structure, including increased fibre size (indicating compensatory hypertrophy in surviving fibres due to continuous muscle fibre loss) and markedly increased regeneration (indicating ongoing cycles of muscle damage and attempted repair), with distinct regional differences that highlight characteristic patterns of tongue pathology.

Abstract citation ID: cjag070.189
SP174 INFLUENCE OF CHIN AND LOWER LIP PROTRUSION IN THE PERCEIVED ATTRACTIVENESS OF CLASS III FACIAL PROFILES

Jennie Guevara[1], Rita Oliveira[2], Rui Pereira[3], Joana Godinho[3], Luis Jardim[4]; *[1]Alumni, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal, [2]Postgraduate student, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal, [3]Assistant Professor, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal, [4]Full Professor, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisbon, Portugal*

AIM: To determine the influence of chin protrusion (CP), lower lip protrusion (LLP), and sex of both the evaluated and evaluator subjects on the perceived attractiveness and esthetics of Class III facial profiles.
MATERIAL AND METHODS: Facial profile images of 4 young adults with ideal soft-tissue profile proportions, according to previously established and widespread soft tissue cephalometric norms, were digitally altered to progressively increase CP or LLP protrusion from 1mm up to 9 mm. Forty evaluators, 20 males and 20 females, rated facial attractiveness using a 0–10 visual analogue scale. A repeated measures ANOVA evaluated the effect of chin and lip protrusion and the evaluated and evaluator's sex on the facial esthetics ratings. The significance level was set at 0.05.
RESULTS: Perceived esthetics of the evaluated profiles were significantly affected by CP ($p < 0.001$), LLP ($p < 0.001$), and the sex of the evaluated subjects ($p < 0.001$). Evaluators sex did not have a significant effect on CP ratings ($p = 0.9977$); however, it affected the evaluation of LLP ($p = 0.0038$), with the later not being considered clinically significant. The highest aesthetic ratings were given to profiles with an increased chin protrusion of 2mm in males and 1mm in females and an increased lower lip protrusion of 1mm in both males and females. A significant deterioration in facial attractiveness was observed, with increases in chin protrusion greater than 3 mm in both males ($p = 0.0288$) and females ($p = 0.0120$), and in the lower lip starting at 2 mm in males ($p < 0.001$), and 1 mm in females ($p = 0.0403$).
CONCLUSION: Both CP and LLP play significant roles in how facial esthetic is perceived. The evaluators showed greater sensitivity in perceiving facial disharmony due to lip protrusion than to chin projection. A slightly more prominent chin is generally preferred in male profiles.

Abstract citation ID: cjag070.190
SP175 COMPUTED TOMOGRAPHY ANALYSIS OF MASSETER MUSCLE IN JAPANESE PATIENTS WITH CLEIDOCRANIAL DYSPLASIA

Chia-Yu Hung, Michiko Tsuji, Hidekazu Matsumoto, Keiji Moriyama; *Department of Maxillofacial Orthognathics, Graduate School of Medical and Dental Sciences, Institute of Science Tokyo, Tokyo, Japan*

AIM: Cleidocranial dysplasia (CCD) is a rare autosomal dominant disorder associated with distinctive skeletal and dental abnormalities. In our previous study, we demonstrated that individuals with CCD exhibit characteristic craniofacial morphological features, including hypoplastic or discontinuous zygomatic arches, parallel-sided mandibular rami, rounded mandibular angles, and mandibular prognathism. Because the masseter muscle originates from the zygomatic arch and inserts into the mandibular ramus and angle, such skeletal deviations may influence its morphology and occlusal function. However, the characteristics of the masseter muscle in individuals with CCD remain unclear. This study aimed to comprehensively investigate masseter muscle morphology in CCD and examine its relationship with craniofacial skeletal features using three-dimensional computed tomography (CT) imaging.
MATERIALS AND METHOD: Ten individuals diagnosed with CCD (five males, five females; mean age 21.7 years) and ten age- and sex-matched controls with skeletal Class III morphology (five males, five females; mean age 24.2 years) were included. CT scans of craniofacial area were converted into Digital Imaging and Communications in Medicine (DICOM) datasets and segmented using Materialise Interactive Medical Image Control System (MIMICS) software to create three-dimensional reconstructions of craniofacial bones and bilateral masseter muscles. Quantitative measurements including maximal cross-sectional area (CSA), masseter muscle angle, length, thickness, and volume were performed using 3D Slicer software. Group differences were analyzed with the Mann–Whitney U test.
RESULTS: Among male subjects, all variables demonstrated significant differences between the two groups ($p < 0.05$). Individuals with CCD showed smaller maximal CSA, length, thickness, and volume but larger masseter muscle angles compared with controls. Among female subjects, maximal CSA and length were significantly smaller and muscle angle significantly larger in CCD ($p < 0.05$), whereas thickness and volume showed no significant differences.
CONCLUSIONS: This study provides a comprehensive three-dimensional assessment of the masseter muscle in individuals with CCD. Characteristic craniofacial features, such as hypoplastic or discontinuous zygomatic arches, may be related to variations in masseter morphology. Reduced CSA could indicate lower muscle force, and altered orientation may reflect adaptations to characteristic skeletal features in individuals with CCD. These findings improve understanding of the masticatory system in CCD.

Abstract citation ID: cjag070.191
SP176 ‡‡‡ THREE-DIMENSIONAL CHARACTERISTICS OF CRANIOFACIAL FEATURES IN JAPANESE PATIENTS WITH CLEIDOCRANIAL DYSPLASIA

Keiji Moriyama[1], Chia-Yu Hung[2], Hidekazu Matsumoto[3], Yuki Niki[1], Michiko Tsuji[1]; *[1]Institute of Science Tokyo, Tokyo, Japan, [2]institute of Science Tokyo, Tokyo, Japan, [3]nstitute of Science Tokyo, Tokyo, Japan*

AIM: Cleidocranial dysplasia (CCD) is a rare congenital skeletal dysplasia associated with *RUNX2* mutations. Patients typically present with hypoplastic clavicles, short stature, delayed cranial suture closure, characteristic craniofacial appearance including mandibular prognathism, and various dental anomalies such as retained primary teeth, delayed permanent tooth eruption, supernumerary teeth, and multiple impacted teeth. Although previous studies have described craniofacial traits in CCD using traditional two-dimensional cephalograms, detailed assessments using three-dimensional imaging remain limited. This study aimed to investigate three-dimensional characteristics of craniofacial morphology in CCD using computed tomography (CT).
SUBJECTS AND METHOD: Eleven patients with CCD (6 male and 5 female; mean age, 19.3 years) were included. Craniofacial data were obtained from cephalograms and CT scans acquired for treatment planning. Digital Imaging and Communications in Medicine (DICOM) files were imported into MIMICS for segmentation, and three-dimensional craniofacial models were reconstructed. Morphological characteristics were qualitatively evaluated in three regions: the cranium, the nasomaxillary complex, and the mandible.
RESULTS: Cranium: Wormian bones (100%), hypoplastic mastoid processes (100%), aplasia or hypoplasia of the styloid process (100%), persistent metopic suture (90.9%), and an open anterior fontanelle (90.9%) were observed. Nasomaxillary complex:Hypoplastic zygomatic and maxillary bones (90.9%), hypoplastic nasal bones (90.9%), atypical piriform aperture shape (90.9%), thin orbital wall (81.8%), low orbital floor position (81.8%), flat articular eminence (81.8%), downward bending of the zygomatic arch (72.7%), and discontinuity of the zygomatic arch (63.6%) were recorded. Mandible:Atypical morphology of the sigmoid notch (72.7%) and coronoid process (72.7%), near-parallel borders of the mandibular ramus (45.5%), and a rounded mandibular angle (18.2%) were identified.
CONCLUSIONS: Numerous characteristic craniofacial morphological features were identified in patients with CCD. CT imaging provides valuable insight into three-dimensional craniofacial morphology, supporting clinical diagnosis, orthodontic treatment planning, and surgical decision-making. Further quantitative analyses of these morphological traits and their relationships with the masticatory system are needed to better understand craniofacial morphology and occlusal function in CCD.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.192
SP177 CROSS-CULTURAL ADAPTATION AND CONTENT VALIDATION OF THE MALOCCLUSION IMPACT QUESTIONNAIRE (MIQ) FOR BRAZILIAN ADOLESCENTS

Tiina Ikävalko[1], Anna Luiza Rodrigues[2], Carolina Menezes[2], Lucas Campos[1]; [1]University of Eastern Finland, Kuopio, Finland, [2]São Paulo State University, Araraquara, Brazil

AIM: To translate and culturally adapt the Malocclusion Impact Questionnaire (MIQ) into Brazilian Portuguese for use among adolescents, and to examine its content validity.
SUBJECTIVES AND METHODS: The MIQ, originally developed in English to assess the perceived impact of malocclusion on adolescents' lives, was translated and culturally adapted following international guidelines. Three independent translators (native Portuguese speakers) produced forward translations, which were synthesized and reviewed by experts in orthodontics and psychometrics to create a preliminary Portuguese version (MIQ-Pt). A bilingual professional performed back-translation. Original, translated, and back-translated versions were compared by a second expert panel to ensure conceptual, semantic, idiomatic, and cultural equivalence. Content validity was assessed by eight experts using the Content Validity Index (CVI) for language clarity, practical pertinence, and theoretical relevance. A pilot study with Brazilian orthodontic patients aged 10–17 years evaluated item comprehension and clarity, and the incomprehension index (II) was calculated.
RESULTS: The expert panel considered the preliminary MIQ-Pt conceptually, semantically, idiomatically, and culturally equivalent to the original, establishing it as the final version. All items achieved CVI $\geq$ 0.80 for clarity, pertinence, and relevance, and the overall CVI for these domains was $\geq$ 0.95, indicating excellent content validity. In the pilot study, 27 Brazilian orthodontic patients (66.7% female; mean age: 12.6 $\pm$ 1.8 years) participated. The incomprehension index (II) for all items was 0%, confirming adequate comprehension and supporting the content validity of MIQ-Pt.
CONCLUSIONS: MIQ-Pt proved to be conceptually and culturally adequate. The adaptation process and expert evaluation ensured good content validity, and the pilot study confirmed comprehension among Brazilian adolescents. Despite the need for future research on its applicability and psychometric properties, MIQ-Pt is a practical and promising tool for clinical and research use, enabling standardized assessment of patient-reported outcomes in orthodontics for Brazilian populations.

Abstract citation ID: cjag070.193
SP178 ‡‡‡ ASYMMETRIC GINGIVAL MARGINS OF MAXILLARY CENTRAL INCISORS, DOES IT MATTER TO LAY PERSONS AND PROFESSIONALS?

Jadbinder Seehra[1], Laura Cockerham[2], Spyridon N. Papageorgiou[3], Jonathon T. Newton[1], Martyn T. Cobourne[1]; [1]Kings College London, London, United Kingdom, [2]Kings College Hospital NHS Foundation Trust, London, United Kingdom, [3]University of Zurich, Zurich, Switzerland

AIM: The aim of this study was to assess the aesthetic judgements made by lay people and professionals relating to an asymmetric maxillary central incisors gingival margin position.
MATERIALS AND METHOD: Multi-center institutional study. A high quality intra-oral photograph of a previously treated case was manipulated (six images). Parents of children undergoing conventional orthodontic treatment (PCT), parents of children undergoing combined surgical-orthodontic treatment for a unilateral impacted maxillary central incisor (PI) and professionals (dental and orthodontic specialists) were asked to evaluate and rank the images in terms of aesthetics and provide free-text responses to support their rankings (least and most attractive). All data was analysed statistically with regressions at 5% and a thematic analysis of the free-text responses was performed.
RESULTS: The responses from 120 participants (mean age 42.2 years; Standard Deviation [SD] 8.6 years; 62.2% female) were analysed (30 / group). Image E (symmetrical gingival margins with the lateral incisor gingival margins 0.5-1.0 mm below both the gingival margin of maxillary canine and central incisor which are at the same level in relation to each other) was ranked the most attractive (60.8%). The presence of an asymmetric gingival margin between the maxillary central incisors was rated the least attractive (image D and F; 30.9 and 39.2%, respectively). The highest and lowest mean ranking scores (adjusted for gender) were image E (5.12 points; 95% CI: 4.76-5.48 points) and F (1.83 points; 95% CI: 1.57-2.10 points) A similar trend was evident within groups. PCT group scored image D the lowest (2.17 points; 95% CI: 1.72-2.62 points). Gender influenced the ranking of the images. Themes to support the ranking of the most attractive image were related to the importance of overall symmetry. Themes to support the ranking of the least attractive image were based on overall asymmetrical (uneven) appearance (n=117).
CONCLUSIONS: An asymmetric gingival margin position between the maxillary central incisors negatively influences the rating/perception of attractiveness by lay persons and professionals.

Abstract citation ID: cjag070.194
SP179 ‡‡‡ THE EFFECT OF FIXED ORTHODONTIC APPLIANCES ON THE GINGIVAL AESTHETICS OF THE ANTERIOR MAXILLARY DENTITION

Jadbinder Seehra[1], Andrew T. DiBiase[2], Spyridon N. Papageorgiou[3], Jonathon T. Newton[1], Martyn T. Cobourne[1]; [1]Kings College London, London, United Kingdom, [2]East Kent Hospitals University NHS Foundation Trust, Kent, United Kingdom, [3]University of Zurich, Zurich, Switzerland

AIM: Quantification of the effect of orthodontic treatment on the gingival mircroaesthetics is lacking. The aim of this exploratory investigation was to investigate the effect of fixed orthodontic appliance therapy on gingival aesthetics of the anterior maxillary dentition.
MATERIALS AND METHOD: A bespoke gingival aesthetic criterion was used to assess 150 sets of pre- and post-treatment intra-oral photographs from a consecutively treated patient sample who had completed fixed appliance therapy. Five assessors rated the images assigning a score per criterion. Reliability of the method was assessed with Concordance Correlation Coefficient (CCC) and Bland-Altman limits of agreement (LOA). Differences by timepoint, assessors, and treatment characteristics were assessed with statistical tests or generalised linear models at α=5%.
RESULTS: In the sample of 150 cases, the most common pre-treatment incisor classification was Class III (n=57) followed by Class II Div 1 (n=52). The majority of cases were treated on a non-extraction basis (n=95) and involved orthodontic appliances only (n=134). The CCC and LOA values for the aesthetic gingival criterion ranged from good-excellent. Average aesthetic summary scores differed from before pre-treatment (median=33.9; Interquartile Range [IQR]=24.5-45.2) and post-treatment (median=75.8; IQR=65.2-75.3) to a significant degree (mean difference=38.5; Standard Deviation [SD]=17.8; p<0.001). No difference in aesthetic criterion points score was evident for treatment plan (non-extraction vs extraction) (p=1.00) and treatment type (orthodontic only or orthognathic) (p=0.52). Considerable variation in summary scores among assessors with different specialty / grades was seen (p<0.001).
CONCLUSIONS: Orthodontic treatment with fixed appliances has a positive effect on the gingival margin, gingival zenith, gingival embrasure, connector area and overall rating of gingival symmetry of the anterior maxillary teeth. However, aesthetic ratings depend on the assessor.

Abstract citation ID: cjag070.195
SP181 THE REPORTING QUALITY OF DENTAL PATIENT-REPORTED OUTCOMES IN ORTHODONTIC TRIALS: A METHODOLOGICAL STUDY

Feiyang Guo[1], Qi Wang[2], Tingting Zhao[1], Hong He[1], Fang Hua[2]; [1]Department of Orthodontics, School & Hospital of Stomatology, Wuhan University, Wuhan, China, [2]Center for Orthodontics and Pediatric Dentistry at Optics Valley Branch, School & Hospital of Stomatology, Wuhan University, Wuhan, China

AIM: To access the reporting quality of dental patient-reported outcomes (dPROs) in randomized controlled trials (RCTs) published in leading orthodontic journals during the past decade, and to identify factors associated with dPRO reporting.
MATERIALS AND METHODS: A manual search was conducted with the online archives of 5 selected journals, to identify orthodontic RCTs that used dPROs as primary outcomes, published between 2015 and 2024. The overall reporting quality (ORQ) and dPRO-specific reporting quality (PRQ) of the included RCTs were assessed using a modified 33-item CONSORT 2010 checklist and a modified 13-item CONSORT PRO checklist, respectively. The adequate reporting proportion (ARP) was calculated for each checklist item. Univariable and multivariable linear regression analyses were performed to identify factors associated with ORQ and PRQ.
RESULTS: A total of 47 eligible RCTs were included. The mean (standard deviation) ORQ and PRQ scores were 20.1 (5.4) and 7.0 (2.3), respectively. Items including the "background", "eligibility criteria", "intervention", and "interpretation" (from the modified CONSORT 2010 checklist), as well as the "background and rationale of PROs" (from the modified CONSORT PRO checklist), were adequately described in all included RCTs. However, reporting was particularly inadequate for several CONSORT PRO items, including the "validity and reliability of PROMs" (ARP, 19.1%) and "sample size calculation" (31.9%). Regression analyses suggested that more recent publication year was significantly associated with higher scores in both ORQ (P = 0.004, 95% CI: 0.251, 1.264) and PRQ (P < 0.001, 95% CI: 0.219, 0.643), whereas mentioning of CONSORT showed a significant association with higher ORQ scores (P = 0.018, 95% CI: 0.766, 6.202).

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

CONCLUSIONS: Among orthodontic RCTs that use dPROs as primary outcomes, the dPRO-specific reporting quality is suboptimal. Collaborative efforts from authors, editors, peer reviewers, and other stakeholders are essential to improve the completeness, transparency, and accuracy of outcome reporting, and thereby facilitate shared decision-making and evidence-based orthodontic practice, strengthen the validity and reliability of evidence synthesis, and ultimately maximize the scientific and clinical value of orthodontic trials.

Abstract citation ID: cjag070.196
SP183 MACHINE LEARNING FOR THE AUTOMATIC DETECTION OF ADENOID HYPERTROPHY BASED ON LATERAL CEPHALOGRAMS

Yanqi Yang[1], Guang Chu[2], Qixiang Zhang[3], Kwan Lok Tse[1], Xiaomeng Li[3]; *[1]Division of Paediatric Dentistry and Orthodontics, Faculty of Dentistry, The University of Hong Kong, Hong Kong SAR, China, [2]1. Division of Paediatric Dentistry and Orthodontics, Faculty of Dentistry, The University of Hong Kong; 2. Department of Stomatology, the First Affiliated Hospital, Zhejiang University School of Medicine, 1. Hong Kong SAR; 2. Hangzhou, China, [3]Department of Electronic and Computer Engineering, The Hong Kong University of Science and Technology, Hong Kong SAR, China*

AIM: To develop and validate a fully automatic artificial intelligence (AI) system for diagnosing adenoid hypertrophy (AH) in children using lateral cephalograms (LCs).
MATERIALS AND METHOD: A total of 679 LCs from 12-year-old children (582 Chinese, 97 Caucasian) were randomly divided into a training set (n = 459) for model development, a validation set (n = 100) for parameter optimization, and a test set (n = 120) for performance evaluation. A five-fold cross-validation approach was applied to assess accuracy. A category-based relation consistency mean teacher network (CRC-MT) was trained to automatically diagnose AH. Model performance was evaluated using accuracy, recall, precision, and F1 score. Diagnostic outcomes from the AI system were compared against manual assessments. Additionally, the impact of blocking specific anatomical regions—adenoid, airway, and jaw—on diagnostic accuracy was analyzed for both AI and human evaluators.
RESULTS: The AI model achieved accuracy and recall ranges of 80.5%–85.6% and 69.5%–79.5%, respectively, with precision and F1 scores ranging from 67.7%–75.7% and 66.0%–85.9%. Chi-square tests indicated that the AI-driven model significantly outperformed manual diagnosis across all metrics. When anatomical regions were obscured, AI maintained accuracies of 0.820, 0.883, and 0.892 for the blocked adenoid, airway, and jaw regions, respectively, whereas human performance declined significantly under the same conditions.
CONCLUSIONS: A fully automatic AI-driven system was successfully developed and validated for accurate diagnosis of adenoid hypertrophy in children using lateral cephalograms, demonstrating superior performance over manual assessment, particularly in cases with obscured anatomical regions.

Abstract citation ID: cjag070.197
SP184 EVALUATION OF SURFACE ROUGHNESS VARIABILITY AMONG ORTHODONTIC MINI-IMPLANTS FROM DIFFERENT MANUFACTURERS

Till Augustinowitz[1], Alessandro Antonelli[2], Giulia Brunello[3], Kathrin Becker[1]; *[1]Department of Orthodontics and Dentofacial Orthopedics, Charité Universitätsmedizin, Berlin, Germany, [2]School of Dentistry, Health Sciences Department, Magna Graecia University of Catanzaro, Catanzaro, Italy, [3]Department of Oral Surgery, University Hospital Düsseldorf, Düsseldorf, Germany*

AIM: In recent years, a growing variety of orthodontic mini-implants (OMIs) from different manufacturers have entered the market. However, positional variability in OMI surface topography has not been systematically evaluated, despite its potential influence on clinical outcomes. This study aimed to compare positional variability in surface roughness across OMIs from seven manufacturers.
MATERIALS AND METHODS: OMIs from seven different manufacturers (AbsoAnchor, American Orthodontics, Dentaurum, DualTop, OBS, Forestadent, TigerDental; n = 5 per manufacturer) were examined using confocal laser scanning microscopy. At four defined locations per OMI (Apex, Mid, Top, Neck), surface roughness parameters were quantified using Sa and Sz, Sdr, Str, and Spc. Linear mixed-effects models analyzed manufacturer and location as fixed effects with OMI as random intercept. Results were summarized with Type III ANOVA, estimated marginal means (95% CIs) and Tukey-adjusted pairwise contrasts.
RESULTS: Manufacturer, location and their interaction significantly affected all surface parameters ($p < 0.0001$). Dentaurum exhibited the highest mean roughness values, particularly at the Neck: Sa ≈ 0.81 µm compared to 0.20 - 0.39 µm for others, Sz ≈ 9.5 µm (others 2–3 µm) and Sdr ≈ 6–7% (others ≤ 2%). The mean Spc at the Neck reached ≈ 65,000 1/mm for Dentaurum, while, for instance, OBS showed markedly lower mean values (<10,000 1/mm). Ortholox Plus (TigerDental) showed moderate increases at the Neck, while OBS presented the smoothest surfaces, particularly at the Neck. Str revealed manufacturer-specific isotropy patterns: American Orthodontics and Forestadent demonstrated higher Str values (≈0.7–1.0) at the Top and Neck, whereas AbsoAnchor, Dentaurum, DualTop, OBS and TigerDental displayed lower values.
CONCLUSION: OMI surface roughness varies significantly by manufacturer and position, with the Neck showing the greatest inter-system differences. These site-specific patterns may influence tissue response, inflammation risk and therefore long-term stability. Further translational and *in vivo* research should explore how topographical variability relates to biological and clinical performance.

Abstract citation ID: cjag070.198
SP185 ANALYSIS OF THE BIOCOMPATIBILITY OF PREFABRICATED FUNCTIONAL ORTHODONTIC APPLIANCES

Julia Camilla Bulski, Jule Körner, Claudia Welte-Jzyk, Vanessa Knode, Christina Erbe; *University Medical Center of the Johannes Gutenberg University Mainz, Department of Orofacial Orthopedics & Orthodontics, Mainz, Germany*

AIM: Functional orthodontic appliances, which include prefabricated silicone-based devices (eruption guidance appliances = EGA), are used in clinical practice to correct and prevent anomalies during the growth phase. Personal clinical experience showed an unpleasant taste and odor in some cases. The study investigates whether 3D-printed devices made of light-curing resin represent an alternative to silicone-based EGAs. In addition it aims to examine whether cytotoxic effects of both silicone-based EGAs and directly printed appliances on mucosal cells can be ruled out.
MATERIALS AND METHOD: The silicone-based EGAs LM Activator™ 2 Low Short Narrow Reinforced 55 (LM-Dental™), OrthoPreventAligner DB-W (Dr. Hinz Dental mbH & Co. KG), and EF T Pro (Orthoplus®) were examined, as well as directly printed devices made from the light-curing, polyurethane-based Tera Resin TE-151 (Graphy Inc., Seoul, Korea), which correspond to the shape of the manufacturer products of the mentioned companies. All devices to be tested were incubated in medium for 24 hours each. Subsequently, human gingival fibroblasts were exposed to the conditioned medium for 48 hours. Then, the biocompatibility was determined colorimetrically in accordance with EN ISO 10993-5.
RESULTS: Functional orthodontic appliances made of light-curing resin could be manufactured using 3D printing to match the shape and quality of silicone-based EGAs. There was no significant decrease in cell viability of gingival fibroblasts after contact with the conditioned medium, so the material can be considered non-cytotoxic based on EN ISO 10993-5.
CONCLUSIONS: The EGAs LM Activator™ 2 Low Short Narrow Reinforced 55 (LM-Dental™), OrthoPreventAligner DB-W (Dr. Hinz Dental mbH & Co. KG) and EF T Pro (Orthoplus®) as well as directly printed devices made of Tera Resin TE-151 provide sufficient biocompatibility and patient safety.

Abstract citation ID: cjag070.199
SP186 AUTOMATED MEASUREMENT OF LITTLE'S IRREGULARITY INDEX FROM INTRAORAL PHOTOGRAPHS USING A CONVOLUTIONAL NEURAL NETWORK

Moritz Kanemeier, Tuna Ergün, Thomas Stamm, Claudius Middelberg, Jonas Q. Schmid; *University of Münster, Münster, Germany*

AIM: The automated remote assessment of tooth irregularities on intraoral photographs could facilitate monitoring of treatment progress and enable the early detection of unwanted tooth movement with fixed retainers. This study therefore evaluated a deep-learning model for automating the measurement of Little's Irregularity Index (LII) on intraoral photographs.
MATERIALS AND METHOD: A dataset of 281 intraoral occlusal photographs from 100 patients, annotated with the contact points 33 mesial to 43 mesial, was used to train a deep learning model. Individual tooth displacements and LII were computed from these contact points. Bland–Altman analysis was performed to evaluate the agreement between the measurements derived from the deep learning model's predictions and the annotations in the dataset. An a priori power analysis was performed to determine the required validation sample size to ensure adequate power for evaluating the agreement based on a predefined equivalence threshold of 2 mm.
RESULTS: According to the power analysis, the required sample size for the Bland–Altman analysis was 56 images. The remaining 225 images were used for model training. The model achieved precise localisation of contact points with a mean radial error of 0.58 ± 0.52 mm. Tooth displacement and LII were predicted with mean absolute errors of 0.38 ± 0.29 mm and 1.03 ± 0.82 mm, respectively. The Bland-Altman analysis revealed no significant bias, with limits of agreement ranging

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

from -0.91 mm to 0.97 mm for tooth displacement and from -2.42 mm to 2.73 mm for LII.
CONCLUSIONS: The neural network can automatically detect mandibular anterior landmarks with high accuracy from intraoral photographs. Tooth displacement measurements were largely equivalent to manual assessments, whereas Little's Irregularity Indices showed limits of agreement that were slightly wider than the predefined equivalence threshold of 2 mm. Therefore, this model can currently only be recommended as a complementary tool.

Abstract citation ID: cjag070.200
SP187 ‡‡‡ UPPER INCISOR INCLINATION AND CONDYLAR GUIDANCE: AN ORTHODONTIC PERSPECTIVE

Joana Silva[1], Eugenio Martins[2], Alberto Canabez[3], Domingo Martin[4], Conchita Martin[1]; *[1]Universidad Complutense de Madrid, Madrid, Spain, [2]Universidade do Porto, Porto, Portugal, [3]No affiliation, Barcelona, Spain, [4]No affiliation, San Sebastian, Spain*

AIM: This study aimed to analyse the relationship between vertical occlusal determinants using dynamic jaw-tracking records. A secondary objective was to evaluate whether these determinants influence mandibular function and the prevalence of temporomandibular disorders (TMD), with particular emphasis on the role of maxillary incisor inclination.
MATERIALS AND METHOD: A cross-sectional, observational, monocentric study was conducted following STROBE guidelines. Consecutive patients presenting complete initial orthodontic records—including photographs, panoramic and lateral radiographs, digital dental scans, Modjaw® jaw-tracking recordings, and DC/TMD questionnaires—were included. Exclusion criteria comprised previous orthodontic or splint therapy, maxillofacial trauma or surgery, systemic conditions affecting the orofacial region, overjet >8 mm, complete mandibular incisor coverage, and imprecise Modjaw® readings. Mandibular movements were recorded using Modjaw®, which calculated the hinge axis and sagittal condylar guidance. Cephalometric analyses were performed to determine skeletal classification, maxillary incisor inclination, interincisal angle, and mandibular plane angle. Statistical analysis was performed with SPSS v29. Normality was assessed using the Kolmogorov–Smirnov test. One-way ANOVA evaluated differences in anterior and condylar guidance across skeletal patterns. t-tests compared patients with and without TMD signs/symptoms. Correlations were analysed using Pearson coefficients, interpreted as small (≥0.30), moderate (≥0.50), or strong (≥0.60). Significance was set at $p < 0.05$.
RESULTS: Correlations between sagittal condylar guidance and incisor inclination were weak and not clinically meaningful (R values close to 0; $p > 0.05$), with slightly more evident negative correlations in Class I and Class II subjects. No significant differences were found between patients with and without TMD signs/symptoms for any variable in the total sample or in the sub-sample with positive overjet and overbite ($p > 0.05$).
CONCLUSIONS: Vertical occlusal determinants vary across skeletal patterns; however, maxillary incisor inclination does not meaningfully influence sagittal condylar guidance. Although some associations reached statistical significance, all were below the threshold for small clinical relevance ($r < 0.30$). No significant relationship was identified between TMD prevalence and skeletal or dental classifications. These findings suggest that incisor inclination should be considered as a contextual factor within a multifactorial functional assessment rather than a determinant of condylar guidance.

Abstract citation ID: cjag070.201
SP188 CRANIOFACIAL MORPHOLOGY AND GROWTH IN INDIVIDUALS WITH CLEFT LIP AND UNILATERAL CLEFT LIP AND PALATE: A CEPHALOMETRIC COMPARATIVE STUDY

Mónica Amorim[1], Matilde Jardim[1], Paul Caruso[2], Jeffrey Arigo[2], Joana Godinho[1]; *[1]Faculdade de Medicina Dentária, Universidade de Lisboa, Lisboa, Portugal, [2]Eastman Institute for Oral Health, University of Rochester School of Medicine and Dentistry, Rochester, United States*

AIM: To compare craniofacial morphology and growth patterns between individuals with cleft lip (CL), unilateral cleft lip and palate (UCLP), and individuals without craniofacial anomalies.
MATERIALS AND METHODS: Lateral cephalometric radiographs were obtained before (T1) and after (T2) the pubertal growth spurt. The sample comprised 71 individuals (mean age 7.9 ± 2.4 years at T1; 16.9 ± 3.4 years at T2): 29 (40.8%) with UCLP, 13 (18.3%) with CL, and 29 (40.8%) non-cleft controls. Controls were matched for sex and age. Cephalometric analysis included graphical visualization of standardized mean values and between-group comparisons using ANOVA, Kruskal-Wallis tests, and appropriate post-hoc tests.
RESULTS: Before the pubertal growth spurt, significant between-group differences were found in maxillary (SNA; p=0.004) and mandibular (SNB; p<0.001) sagittal dimensions, mandibular vertical dimension (MP-SN; p<0.001), and mandibular morphology (Gonial angle; p=0.014). *Post-hoc* analysis showed that individuals with UCLP presented significantly lower SNA values (77.9 ± 3.59° vs. 80.67 ± 3.40°), SNB (73.21 ± 3.09° vs. 76.84° ± 3.82°) and higher MP-SN (37.47 ± 6.52° vs. 31.6 ± 4.74°) and Gonial angle (128.43 ± 8.32° vs. 123.38 ± 5.20°) than controls. Individuals with cleft lip exhibited the greatest sagittal discrepancy, with significantly higher ANB values (7.15 ± 3.27°) compared with the UCLP group (4.69 ± 3.52°) and controls (3.83 ± 2.04°). Regarding growth changes, non-cleft individuals demonstrated significant maxillary sagittal advancement, with an average ANS change of +1.41 ± 2.83° vs. -2.2 ± 2.79° in the UCLP group and -1.31 ± 2.35° in the CL group. Significant group differences were also detected in the mandibular notch angle: the control group showed an average increase of +2.4 ± 6.51°, while the ULCP group exhibited a decrease of -3.62 ± 7.26°.
CONCLUSIONS: Individuals with unilateral cleft lip and palate and those with cleft lip display distinct craniofacial morphology and altered maxillary and mandibular growth patterns compared with non-cleft individuals. These differences should be carefully considered in orthodontic diagnosis, growth prediction, and treatment planning for cleft patients.

Abstract citation ID: cjag070.202
SP189 *** EFFECT OF MINERAL TRIOXIDE AGGREGATE ROOT CANAL FILLING ON ROOT RESORPTION VOLUME IN ADULT ORTHODONTIC PATIENTS

Takahiro Hiranuma, Junichi Watahiki, Aki Shinozuka, Yuji Takahashi, Haruhisa Nakano; *Department of Orthodontics, Showa Medical University School of Dentistry, Tokyo, Japan*

AIM: Adult orthodontic treatment often involves teeth requiring root canal retreatment, yet the influence of obturation materials on orthodontically induced root resorption remains unclear. This study compared changes in root resorption volume after tooth movement between teeth obturated with gutta-percha/zinc oxide eugenol–based sealer and those filled with mineral trioxide aggregate (MTA), to identify a preferable endodontic option for teeth scheduled for orthodontic treatment.
MATERIALS AND METHOD: Forty adult patients (20–56 years; mean age 39.9 years) undergoing orthodontic treatment with premolar extraction were included, and 47 endodontically treated teeth with periapical radiolucency on pre-treatment cone-beam CT and requiring retreatment were analyzed. Teeth were allocated to two groups according to obturation material: Group 1, lateral condensation of gutta-percha with zinc oxide eugenol–based sealer (20 teeth); Group 2, obturation with mineral trioxide aggregate alone (27 teeth). Cone-beam CT images obtained before orthodontic treatment and at completion were imported into Mimics software (Materialise) for segmentation and calculation of root volume. Extrusion of obturation material beyond the apex and the effect of treatment duration were also evaluated. Statistical analysis was performed using the Mann–Whitney U test and correlation analyses.
RESULTS: The mean decrease in root volume was 48.84 mm^3 (17.11%) in the control group and 17.22 mm^3 (6.10%) in the mineral trioxide aggregate group, with a significant difference between groups ($p < 0.001$). Greater dispersion of resorption values was observed in the control group, whereas the mineral trioxide aggregate group clustered at lower resorption values. Extrusion of obturation material at the end of orthodontic treatment was observed only in the control group. No relevant correlations were found between root volume loss and initial volume, post-treatment volume, or treatment duration.
CONCLUSIONS: Teeth obturated with mineral trioxide aggregate showed less root resorption volume during orthodontic treatment than those filled with gutta-percha and a zinc oxide eugenol–based sealer. These findings suggest that the choice of obturation material may influence root resorption in adult orthodontic patients and that mineral trioxide aggregate root canal filling may represent a useful option for teeth undergoing orthodontic treatment.

Abstract citation ID: cjag070.203
SP191 FACIAL ATTRACTIVENESS ASSESSMENT: DIFFERENCES BETWEEN TWO-DIMENSIONAL PHOTOGRAPHS AND THREE-DIMENSIONAL FACIAL SCANS

Carolina Sa[1], Danitza Barreda[2], Joana Godinho[3], Rui Pereira[3], Luis Jardim[4]; *[1]Alumni, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisboa, Portugal, [2]Postgraduate student, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisboa, Portugal, [3]Assistant Professor, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisboa, Portugal, [4]Full Professor, Division of Orthodontics, Faculdade de Medicina Dentária, Universidade de Lisboa, Lisboa, Portugal*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIMS: With the development of three-dimensional (3D) facial scanning technology, it has become increasingly important to compare these systems with conventional two-dimensional (2D) photographic analysis. This study aimed to determine whether facial attractiveness is perceived differently when evaluated in 2D versus 3D, to identify differences in perception between orthodontists and laypeople, and to examine the correlation between facial attractiveness and facial morphometric measurements.
MATERIAL AND METHOD: The sample consisted of 20 dental students (9 men and 11 women). For each participant, three standardized 2D photographs (frontal, profile, and three-quarter profile) were obtained using a digital camera, along with a 3D facial scan acquired using the Bellus3D Face Camera Pro. A panel of 42 evaluators (16 orthodontists and 26 laypeople) assessed facial attractiveness in two separate sessions, 15 days apart: one dedicated to 2D photographs and the other to 3D images. Morphometric measurements were taken on frontal and profile photographs as well as on 3D scans. Statistical analyses included descriptive statistics, paired *t*-tests, Pearson correlation coefficients, and linear and quadratic regression models.
RESULTS: Comparative analysis revealed that 3D images received significantly lower attractiveness scores. In the laypeople group, 3D images were rated lower than frontal ($p = 0.006$) and three-quarter photographs ($p = 0.020$); among orthodontists, 3D images were rated lower than three-quarter photographs ($p = 0.020$).

When comparing evaluator groups, orthodontists assigned significantly lower attractiveness scores than laypeople for frontal photographs ($p = 0.001$), three-quarter photographs ($p < 0.001$), and 3D images ($p < 0.001$).

Facial attractiveness showed significant correlations with specific morphometric variables, particularly vertical facial dimensions ($p < 0.001$; $r < 0.50$) and the gonial angle ($p < 0.001$; $r = 0.70$).
CONCLUSIONS: Perceptions of facial attractiveness differed between 2D and 3D formats, with 3D images receiving significantly lower ratings. Orthodontists consistently assigned lower attractiveness scores than laypeople. More hyperdivergent facial patterns, reflected in increased vertical dimensions and larger gonial angles, were associated with reduced facial attractiveness.

Abstract citation ID: cjag070.204
SP192 ASSESSMENT OF LOWER INCISOR INCLINATION AFTER TREATMENT WITH CLASS II FUNCTIONAL APPLIANCES: COMPARISON BETWEEN SANDER BITE JUMPING APPLIANCE VS HERBST APPLIANCE WITH OCCLUSAL SPLINT: A SYSTEMATIC REVIEW

Sofia Hu, Claudia Vicente Martí, Martha Cecilia Torres Carvajal, Meritxell Sánchez Molins, Nuno Gustavo Correia d'Oliveira; *Universitat de Barcelona, Barcelona, Spain*

AIM: Class II malocclusion in growing patients can be treated by using functional appliances, such as the Herbst appliance with occlusal splint (HBO) or Sander Bite Jumping Appliance. Although several studies have described these devices, there is still no consensus on which one exerts a more unfavorable impact on the inclination of the mandibular incisors, which are important for both aesthetics and function in the buccal cavity. Therefore, the aim of this review was to identify, analyze and synthesize the available evidence on the effects of these appliances on mandibular incisor proclination. However, due to the limited literature on HBO, the review focused on the Herbst appliance.
MATERIALS AND METHOD: A systematic review of the literature was conducted, prioritizing the inclusion of clinical studies that evaluated the dentoalveolar and skeletal changes induced by these appliances. The literature search was carried out in the Pubmed, Scopus and Web of Science databases, applying specific inclusion and exclusion criteria.
RESULTS: Eight studies that met the selection criteria were included, and all of them were retrospective cohort studies. Overall, the authors described an increase in mandibular incisor inclination after treatment with both the Herbst and Sander Bite Jumping appliances, although the Herbst appliance was associated with a greater degree of proclination.
CONCLUSIONS: Both the Herbst and Sander Bite Jumping appliances led to labial inclination of the mandibular incisors, which was more pronounced in patients treated with the Herbst appliance, although the evidence was limited.

Abstract citation ID: cjag070.205
SP193 MONITORING AND IMPROVEMENT OF PATIENT COMPLIANCE DURING THE USE OF ORTHODONTIC REMOVABLE APPLIANCES: A SYSTEMATIC REVIEW

Paula Müller-Crespán, Andrea Peiró-Aubalat, Martha Torres-Carvajal, Meritxell Sánchez-Molins, Nuno Gustavo d'Oliveira; *Department of Orthodontics-Faculty of Medicine and Health Sciences, University of Barcelona, Barcelona, Spain*

AIM: The aim of the present study was to evaluate the objective wear time of removable orthodontic appliances measured by the TheraMon® microsensor and to compare the recorded wear durations with those prescribed by the clinician and reported by the patient. Additionally, it assessed the influence of gender, age, type of appliance, and patient awareness of being monitored on treatment compliance.
MATERIAL AND METHODS: A systematic review was conducted following the PRISMA guidelines. The literature search was carried out between July and August 2025 across electronic databases including PubMed-Medline, Scopus and Web of Science without language restrictions. Observational studies and clinical trials published from 2015 to 2025 involving pediatric and adolescent patients treated with removable appliances monitored with the TheraMon® microsensor were included. Studies focusing on obstructive sleep apnea, retention or whitening splints, or exclusively on extraoral devices were excluded. The risk of bias was assessed using the Newcastle-Ottawa Scale for cohort studies and the ROB 2.0 tool for randomized clinical trials.
RESULTS: The database search initially identified 82 studies from which 11 met the inclusion criteria (nine prospective cohorts and two randomized clinical trials). Participants were mainly children and adolescents, with prescribed daily wear ranging from 12 to 24 hours and follow-up periods between 3 and 13 months. Risk-of-bias assessment indicated generally low risk. Objectively recorded wear times were significantly lower than both clinician-prescribed and self-reported durations. Compliance tended to decline after five to six months and was generally higher among females and younger patients. Results regarding appliance type were heterogeneous. No significant associations were found between compliance and monitoring awareness.
CONCLUSIONS:

1. The mean objective wear time recorded with the TheraMon® microsensor was significantly lower than the time prescribed by the professional and the patient-reported wear time, indicating a tendency among patients to overestimate their actual usage.
2. The review found no statistically significant relationship between patient compliance and factors such as gender, age, type of appliance, or awareness of being monitored.
3. The variability of results obtained in the present review indicates the need for future research.

Abstract citation ID: cjag070.206
SP194 INFANTILE SWALLOWING PATTERN, ANTERIOR OPEN BITE AND THEIR ASSOCIATION IN CHILDREN AGED 7 TO 9 YEARS

Sandra Riemekasten[1], Till Köhne[1], Christian Hirsch[2]; [1]*Department of Orthodontics, Leipzig, Germany,* [2]*Department of Pediatric Dentistry, Leipzig, Germany*

AIM: The infantile swallowing pattern is characterised by the tongue being positioned anteriorly against or between the incisors. This exerts pressure against or between the dental arches, predominantly in the anterior region, and is accompanied by increased activity of the lip and mentalis muscles. Ideally, the transition to a somatic, physiological swallowing pattern should occur spontaneously by the age of four. In the LIFE Child study in Leipzig, the association between an anterior open bite, an infantile swallowing pattern, age and sex was investigated in primary school children.
MATERIALS AND METHOD: Within the population-based LIFE Child cohort, 525 children aged seven to nine years were clinically examined for the presence of an infantile swallowing pattern, and for an anterior open bite. Additionally, the association between open bite and infantile swallowing pattern was analysed and evaluated separately by sex. Complete data for these variables was available for a total of 370 children. Swallowing was assessed visually. An anterior open bite was defined as an absence of vertical overlap of the anterior teeth. Age and sex were recorded as confounding covariates.
RESULTS: Of the 525 children examined, an infantile swallowing pattern was observed in 68 of 148 seven year olds (45.9%), 58 of 184 eight year olds (31.5%), and 43 of 193 nine year olds (22.8%). This age-dependent decrease was highly significant. The prevalence of an anterior open bite was low, with three cases (3.0%) among 99 seven-year-old children, six cases (4.7%) among 127 eight-year-old children, and eight cases (5.6%) among 144 nine-year-old children. Nevertheless, analyses of the correlation between infantile swallowing patterns and anterior open bites revealed a pronounced association, which was statistically significant in boys ($p = 0.005$).

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

CONCLUSIONS: The infantile swallowing pattern persists even after the eruption of the front teeth. For the age range of 7 to 9 years, a correlation was demonstrated between the infantile swallowing pattern and an anterior open bite. This association was significantly more pronounced in males. This highlights the importance of identifying and treating dysfunctional swallowing patterns early on to prevent orthodontic malocclusions and reduce recurrences.

Abstract citation ID: cjag070.207
SP195 STABILITY AND FAILURE OF DIGITALLY CUSTOMIZED NICKEL-TITANIUM VERSUS CONVENTIONAL STAINLESS-STEEL FIXED RETAINERS: A SYSTEMATIC REVIEW

Laia Borén Baiget, Lara Díaz González, Anna Monill González, Meritxell Sánchez Molins, Nuno Gustavo d'Oliveira; *Universitat de Barcelona, Barcelona, Spain*

AIM: To assess whether digitally customized CAD/CAM Nickel-Titanium (NiTi) retainers offer improved fit, passive adaptation, and manufacturing accuracy derived from intraoral scanning, compared with conventional stainless-steel retainers, in terms of post-treatment stability, failure rates, and periodontal response.
MATERIALS AND METHODS: This systematic review was performed following PRISMA 2020 guidelines and the PECOS framework. Searches were conducted in PubMed and Web of Science for studies published between 2020 and 2025. Randomized controlled trials and in vitro studies with a minimum follow-up of six months were included. Methodological quality was assessed using the RoB2 tool for clinical trials and the QUIN tool for in vitro studies.
RESULTS: The initial search identified 475 records, of which 8 studies met the inclusion criteria. Post-treatment stability, assessed through Little's Irregularity Index, intercanine width, and arch length, was similar for both CAD/CAM NiTi and conventional stainless-steel retainers, with no clinically significant differences. Failure rates ranged from 15% to 25%, showing comparable outcomes between the two types of retention devices.
CONCLUSION: CAD/CAM NiTi and conventional stainless-steel retainers provide comparable post-treatment stability and clinical durability. The digital design of NiTi retainers may offer slight advantages in precision, fit, and potentially reduced plaque retention due to surface homogeneity. However, current evidence remains limited. Further randomized clinical trials with longer follow-up and standardized protocols are needed to confirm these findings.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.208
SP196 INFLUENCE OF NON-ALTERNATING UNILATERAL MASTICATION ON CRANIOFACIAL DEVELOPMENT: A SCOPING REVIEW

Beatriz de Salvador, Blanca Felipe, Anna Monill, Meritxell Sanchez, Nuno Gustavo d'Oliveira; *Universitat de Barcelona, Barcelona, Spain*

INTRODUCTIÓN: Mastication constitutes an essential functional stimulus for the harmonious development of the stomatognathic system. When this process is performed unilaterally and without alternation, an imbalance in the stimulation of orofacial structures occurs, which may lead to craniofacial asymmetries, mandibular and maxillary alterations, as well as articular dysfunctions.
AIM: The main objective of this study is to identify and analyse current scientific evidence regarding the influence of non-alternating unilateral mastication on the development of craniofacial structures, aiming to deepen the understanding of its morphological, functional, and clinical implications.
MATERIALS AND METHODS: This study was designed as a *scoping review* conducted in accordance with the PRISMA-ScR guidelines. Cross-sectional observational studies involving human participants, published within the last ten years, were included provided they assessed morphological and functional effects at the craniofacial level. The electronic literature search was performed in PubMed, Scopus, and The Cochrane Library databases between June and August 2025.

After applying predefined inclusion and exclusion criteria, seven studies were selected for qualitative analysis and synthesis. The methodological quality and risk of bias of the included studies were assessed using the tool developed by the Joanna Briggs Institute (JBI).
RESULTS: The reviewed studies indicate that non-alternating unilateral mastication leads to chin deviation towards the working side, morphological alterations in the temporomandibular joint, structural differences in the mandible and maxilla, as well as dental and postural repercussions. These findings are consistent with the principles of Neuro-Occlusal Rehabilitation (NOR) developed by Dr Pedro Planas, which emphasise the importance of a balanced masticatory function to achieve symmetrical and physiological development.
CONCLUSIONS: Current evidence suggests that non-alternating unilateral mastication is associated with structural and functional alterations within the stomatognathic system. However, the limited number of available studies and their methodological constraints highlight the need for future longitudinal research employing more precise diagnostic tolos such as kinesiography to objectively evaluate masticatory function.

Abstract citation ID: cjag070.209
SP197 THE RELATIONSHIP BETWEEN MALOCCLUSIONS AND GAIT AND POSTURAL ALTERATIONS IN PEDIATRIC PATIENTS: A SYSTEMATIC REVIEW

Goretti Salom Moyà, Meritxell Sánchez Molins, Anna Monill González, Nuno Gustavo d'Oliveira; *Universitat de Barcelona, Barcelona, Spain*

AIM: Dental malocclusions and postural alterations are common in growing children and adolescents. It has been suggested that these conditions may influence body stability and gait parameters, while postural and podiatric alterations could, in turn, contribute to the development of malocclusions. However, the available evidence remains limited and heterogeneous. The aim of this study is to evaluate the possible association between dental malocclusions, body posture, and podiatric parameters in pediatric populations.
MATERIALS AND METHODS: A systematic review was conducted in accordance with the PRISMA statement. Searches were performed in PubMed, Scopus, Cochrane Library, and Web of Science for studies published between 2015 and 2025, with no language restrictions. Observational studies including populations ≤16 years were considered. Methodological quality and risk of bias were assessed using the JBI tool for cross-sectional studies.
RESULTS: Seven studies met the inclusion criteria, with sample sizes ranging from 37 to 409 participants aged 6 to 16 years. The studies reported associations between malocclusions and alterations in body posture, the podiatric system, and gait. Class II and Class III malocclusions were associated with shifts in the center of gravity, while posterior crossbite was linked to changes in cranio-cervical angulation. Faster gait cycles and shorter steps were also observed in children with malocclusion, as well as differences in foot type. Nevertheless, the findings were inconsistent due to methodological heterogeneity, small sample sizes, and the predominance of cross-sectional designs.
CONCLUSIONS: The reviewed literature suggests a relationship between dental malocclusion and postural and podiatric alterations in pediatric populations. However, the lack of longitudinal studies and standardized protocols prevents definitive conclusions. Future research adopting a multidisciplinary approach involving both orthodontics and podiatry is needed to improve understanding and clinical management.

Abstract citation ID: cjag070.210
SP198 THE ACCURACY OF INDIRECT BONDING GUIDES FOR THE POSITIONING OF FIXED ORTHODONTIC RETAINERS: A SCOPING REVIEW

Júlia Ribas-Sabartés, Anna Monill-González, Martha Torres-Carvajal, Meritxell Sánchez-Molins, Nuno Gustavo d'Oliveira; *Department of Orthodontics - Faculty of Medicine and Health Science, University of Barcelona, Barcelona, Spain*

AIM: Retention is an essential phase in orthodontics, as teeth tend to relapse after active treatment. Fixed retainers, widely used for their effectiveness and discretion, require precise placement, with the direct technique being the most common, but with significant limitations. In this context, digitally assisted indirect bonding has emerged as a promising alternative, improving accuracy and reducing clinical variability. The main objective is to evaluate the accuracy of the indirect bonding technique and to determine whether digitalization of this technique has the potential to improve the results of conventional methods.
MATERIAL AND METHODS: An electronic literature search was conducted in PubMed-MEDLINE, Scopus, Cochrane, and Web of Science, complemented by a manual cluster search. Studies analyzing the accuracy of the indirect technique for cementing retentions in humans, published between 2010 and 2015, were included. Articles without availability of full text, as well as those written in any language other than English or Spanish, were excluded. The risk of bias in non-randomized experimental and/or comparative studies was assessed using the Risk of Bias in Non-Randomized Interventional Studies (ROBINS-I) tool, while a tool adapted to these studies was used for in vitro and pilot studies.
RESULTS: Of 168 initial references, 5 studies met the inclusion criteria (3 non-randomized experimental and/or comparative articles, and 2 preclinical in vitro and pilot studies). Three were moderate risk and two were high risk. The results showed that the accuracy of the silicone key transfer was superior to the indirect technique with Essix in terms of angular transfer error, tilt, and rotation. The

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

custom-cut retainer showed a lower positioning error (0.59 +/- 0.25 mm) compared to manual fabrication, especially in the maxilla and interproximal area. Computer-assisted planning improved the quality of positioning in the vertical plane (Y-axis), especially with braided stainless steel retainers.
CONCLUSIONS: Indirect bonding is more accurate than direct techniques, particularly along the vertical axis and interproximal space. Even so, the results currently offered by digital guides for planning this type of cementation are not always the most reliable option. The use of digital technologies allows for greater efficiency and reliability of retention treatment.

Abstract citation ID: cjag070.211
SP199 PREDICTABILITY OF DENTOALVEOLAR EXAPANSION WITH CLEAR ALIGNERS: A SYSTEMATIC REVIEW

Ingrid Calduch Isaksen[1], Montserrat Puigpinós Saronellas[1], Nuno Gustavo d'Oliveira[2], Meritxell Sánchez Molins[1], Anna Monill González[1]; *[1]Universitat de Barcelona, Barcelona, Spain, [2]Universitat de Bacelona, Barcelona, Spain*

AIM: Transverse dentoalveolar expansion is a key orthodontic movement to correct non-skeletal narrow arches and improve masticatory function. Clear aligners are a growing aesthetic alternative, although their predictability, particularly in posterior sectors and translational movements, remains limited, leading to discrepancies between planned and clinical outcomes. To evaluate the predictability of dentoalveolar expansion with clear aligners and analyse biomechanical, anatomical, and technical factors that may influence it.
MATERIALS AND METHOD: This review followed the PRISMA guidelines and was registered in PROSPERO. A search was conducted in MEDLINE, Scopus, Cochrane Library, and Web of Science, complemented by manual searching, up to July 2025. Studies published in the last 10 years, in English or Spanish, including patients in permanent dentition treated with aligners and reporting outcomes on dentoalveolar expansion predictability were considered. Two reviewers independently performed study selection and data extraction. The risk of bias was assessed using the Newcastle-Ottawa scale.
RESULTS: A total of 220 references were identified, of which 15 met the inclusion criteria. The included studies comprised prospective and retrospective cohorts studies, with 20–120 patients aged 14 to 48 years. Most studies used Invisalign® and assessed expansion using digital STL models, whereas a subset of studies relied on CBCT-based measurements.

Predictability was below 100%, with higher values in premolars, intermediate in canines, and lower in molars. It was greater in the mandibular arch, and expansion was mainly achieved through buccal crown tipping. Most studies showed a moderate risk of bias.
CONCLUSIONS: Clear aligners achieve dentoalveolar expansion in mild to moderate malocclusions, although predictability remains limited. Expansion occurs mainly through crown tipping, with better results in premolars than in canines and molars, with better outcomes in the mandibular than in the maxillary arch. Further studies are needed to explore the biological, biomechanical, and technological factors behind such discrepancies, as well as to refine protocols and materials in order to optimize the efficacy and stability of expansion with aligners.

Abstract citation ID: cjag070.212
SP201 EVALUATING PERCEIVED ATTRACTION OF TOTAL VERMILION LIP HEIGHT BASED UPON CAUCASIAN THREE DIMENSIONAL (3D) DYNAMIC IMAGES

Malaaika Al-Koky and Balvinder Khambay; *Birmingham Dental Hospital, Birmingham, United Kingdom*

AIM: To identify the most attractive Total Vermilion Height (TVH) for male and female 3D facial images and determine the thresholds at which clinicians and laypeople would seek lip reduction or enhancement.
MATERIAL AND METHODS: A cross-sectional study was conducted at the Birmingham Dental Hospital & School, University of Birmingham, involving 50 clinicians and 70 lay participants. Ethical approval was obtained, and a priori power calculation conducted. Customised 3D avatars were developed using iClone 8 and Character Creator 4, with TVH systematically varied in 2 mm increments from 8mm-36mm, generating 15 images per avatar. Each smiling animation was embedded into PowerPoint slides and displayed for 30 seconds, followed by a 10-second non-facial "washout" slide. Five slides were duplicated to assess intra-rater reliability, resulting in 20 slides per avatar. Participants rated each image using a 100mm visual analogue scale (VAS) and indicated whether they would seek lip enhancement, reduction, or no treatment. Non-parametric analyses were performed, reporting medians and interquartile ranges. Intra-rater reliability was assessed using intra-class correlation coefficients (ICC). Within-group comparisons the Friedman test with Bonferroni correction was used; between-group differences were analysed using Mann–Whitney U tests.
RESULTS: ICC values ranged from 0.84–0.88 for clinicians and 0.74–0.90 for laypeople, indicating good reliability. Both groups identified a 20mm TVH as most attractive for male (median VAS 86.7 clinicians; 84.0 laypeople) and female images (80.2 clinicians; 81.5 laypeople). Attractiveness declined at extreme TVHs (≤12mm and ≥28mm). Clinicians preferred reduced TVH (8–16mm) in females more than laypeople, whereas laypeople favoured increased TVH (26–36mm). Laypeople demonstrated a stronger preference for increased female TVH, particularly beyond 24mm. Treatment interest was low within the attractive ranges (18–26mm females; 14–26mm males). In both groups, TVH≤12mm prompted interest in fillers, whereas ≥28mm prompted lip reduction.
CONCLUSION: Given Western media's emphasis on fuller lips, determining perceived attractive TVH by patients and clinicians is essential. Findings support 20mm TVH as an optimal aesthetic target, with relevance to cleft lip revision and orthognathic surgical planning. Differences between clinician and lay preferences highlight the need for thorough counselling to align expectations and improve postoperative satisfaction.

Abstract citation ID: cjag070.213
SP202 PERCEIVED RADIOGRAPHIC PREDICTORS OF IMPACTED MAXILLARY CANINE ALIGNMENT: QUESTIONNAIRE VALIDATION AND PILOT FINDINGS

Mohd Amir Mukhsin Zurin Adnan, Nik Ruzanna Nik Azmin, Nik Mukhriz Nik Mustapha; *Universiti Teknologi Mara (UiTM), Selangor, Malaysia*

AIM: Panoramic radiographs remain a baseline imaging tool in assessing impacted maxillary canines, yet clinicians may weigh individual radiographic features differently when judging alignment prognosis. This study aims to identify which panoramic parameters orthodontists consider most important when judging the likely ease of aligning impacted maxillary canines
MATERIAL AND METHODS: A cross-sectional web survey was developed to capture orthodontists' ratings (5-point Likert scale) for eight literature-derived parameters. Items underwent expert content validation using the Lawshe Content Validity Ratio (CVR), retaining items that met/exceeded the critical value for the panel size. Face validity was ensured through target user-informed wording refinements. The survey was then piloted to orthodontists practising in Malaysia. Descriptive statistics (mean/standard deviation) were used to rank parameters.
RESULTS: Fifty-two orthodontists completed the survey. All eight items met the CVR retention criterion; minor wording changes were made to improve clarity before fielding. The top three perceived predictors were: (1) sector position (mean 4.52; SD 0.58), (2) canine angulation to the midline (mean 4.52; SD 0.61), and (3) vertical position of the canine cusp tip relative to the lateral incisor root (mean 4.35; SD 0.68). Remaining items (distance to midline, angulation to the lateral incisor and first premolar, vertical height to the occlusal plane, palatal/buccal position) received lower mean ratings.
CONCLUSION: In this pilot, orthodontists prioritised sector position, midline angulation, and the canine cusp-tip's vertical relation to the lateral incisor root when estimating alignment ease on panoramic radiographs. The study also resulted in an eight-item, content- and face-validated questionnaire that captures these perceived priorities and linkage to clinical outcomes is planned.

Abstract citation ID: cjag070.214
SP204 THE ROLE OF HEME AND HEME OXYGENASE ACTIVITY IN PLACENTAL INFLAMMATORY AND CYTOPROTECTIVE PATHWAYS

Rihswin Lachman, Frank Wagener, Maarten Suttorp; *RADBOUD UMC, Nijmegen, Netherlands*

AIM: Intrauterine bleeding during early pregnancy can release free heme, which activates inflammatory or cytoprotective pathways, potentially impacting placental pathology and congenital anomalies such as clefting. This study examines whether increased heme levels and reduced heme-degrading activity by heme oxygenase (HO) influence inflammatory pathways in mouse placentas during palatogenesis. We hypothesize that elevated heme levels trigger TLR4 binding, thereby promoting NF-kappaB signaling and activation of the inflammatory gene iNOS. Conversely, low heme levels may form complexes with the heme scavenger hemopexin, bind to LRP1, and promote Nrf2 signaling, leading to activation of cytoprotective genes HO-1 and peroxiredoxin. We also assess heme's effect on vascular markers VEGF and CD31.
MATERIALS AND METHODS: Placental tissue was collected from mice treated with SnMP (an HO-activity inhibitor) and heme at varying doses (30, 75, or 150 µmol/kg body weight). Immunohistochemical staining targeted NF-κB, Nrf2, iNOS,

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

PRDX1, CD31, and VEGF. Placental sections were imaged with a Zeiss microscope and marker expression in placental tissue was quantified using FIJI/ImageJ software. ANOVA was used for statistical analyses of treatment group differences. A significance threshold of $p < .05$ was applied. Intra-observer reliability was assessed using repeated measurements on a subset of samples
RESULTS: Heme treatment led to dose-dependent increases in NF-κB, Nrf2, and VEGF expression, most pronounced at 75 μmol/kg (Heme-75). SnMP reduced CD31 expression, which was restored with co-administration of 30 μmol/kg (Heme-30). iNOS expression increased in all treatment groups without a clear dose-response. Peroxiredoxin levels did not change significantly among groups.
CONCLUSION: Lower heme doses (30 μmol/kg) enhance the cytoprotective Nrf2 pathway and VEGF, while higher doses (75 μmol/kg) increase inflammation (NF-κB, iNOS). HO-activity inhibition with SnMP intensifies inflammation at higher heme levels. This dose-dependent effect of heme and cytoprotective effect of HO-activity on placental inflammation suggest a detrimental role for intrauterine bleeding on placental function, and trigger embryonic maldevelopment or resorption at higher heme levels.

Abstract citation ID: cjag070.215
SP205 IMPACT OF SURGICALLY ASSISTED RAPID PALATAL EXPANSION ON MUSCULAR ACTIVITY: A PROSPECTIVE OBSERVATIONAL STUDY

Rachele Elli, Giorgia Pasqual, Piera Mastrogiuseppe, Cinzia Maspero, Alberto Caprioglio; *University of Milan, Milan, Italy*

AIM: The purpose of this prospective observational study is to evaluate how temporalis and masseter muscle activity changes in adult patients undergoing Surgically Assisted Rapid Palatal Expansion (SARPE), using electromyographic and electrokinesographic recordings taken pre- and post-treatment.
MATERIALS AND METHODS: Twenty-four adult patients (14 men, 10 women; mean age 30 ± 6 years) were enrolled in this study. The inclusion criteria were: right posterior crossbite, transverse discrepancy ≥ 5 mm, complete ossification of the midpalatal suture and a mesofacial growth pattern with a skeletal Class I. Muscle activity was recorded at two points: before surgery (T0) and 8 months after surgery (T1). The expansion was performed with a Hyrax expander. Electromyographic measurements involved the masseter and anterior temporalis muscles bilaterally, both at rest, during maximal voluntary contractions (MVC), and after transcutaneous electrical nerve stimulation (TENS). Data were analyzed using Student's t-test ($p < 0.05$) in SPSS statistical software.
RESULTS: After surgery, a significant decrease was observed in the activity of the right masseter muscle (from 67.1± 48.5 to 48.4 ± 31.4) ($p = 0.03$) and right temporalis (from 71.4 ± 47.4 to 56.3 ± 21.3) ($p = 0.02$) during clenching. A significant increase was observed on the right masseter at rest (from 2.0 ±0.6 to 3.1 ± 1.4) ($p = 0.03$), as well as a bilateral increase in masseter activity at rest after TENS from T0 to T1(right: from 1.8 ± 0.6 to 3.4 ± 1.6; left: from 3.0 ± 0.5 to 4.2 to 1.7) ($pr = 0.04$, $pl = 0.04$).

Conversely, no statistically significant differences were observed in the left-side muscles during clenching or in the measurements taken during MVC. Finally, maximum mouth opening increased from 38.4 ± 1 mm to 40.9 ± 1.5 mm. Overall, muscle activity on the side where the cross-bite was treated exhibited significant changes after SARPE, both at rest and during clenching.
CONCLUSIONS: The increase in electromyographic activity of the temporalis and masseter muscles on the side of the treated cross-bite highlights how occlusal normalization can result in improved neuromuscular function.

Abstract citation ID: cjag070.216
SP206 EFFECTIVENESS OF A 3D-PRINTED CUSTOM BITAINER APPLIANCE FOR SKELETAL CLASS II CORRECTION IN GROWING PATIENTS

Babak Sayahpou[1], Maike Gehring[1], Aleksandra Majdani[2], Sara Eslamishahrbabaki[1]; *[1]Department of Orthodontics, Goethe University Frankfurt, Frankfurt am Main, Germany, [2]Private orthodontic practice, Hannover, Germany*

AIM: This study aimed to assess the skeletal and dental effects of a fully customized 3D-printed Bitainer appliance combined with a multibracket system for the treatment of skeletal Class II malocclusion due to mandibular retrusion. A key objective was to evaluate treatment success using the individualized ANB angle to determine the degree of normalization of the sagittal jaw relationship. Additional outcome measures included changes in the PAR index and tooth movements assessed through 3D model superimposition.
MATERIALS AND METHODS: A retrospective cohort of 27 growing patients (CS3–CS4) was analyzed. After leveling and alignment (T0–T1), patients received a 3D-printed cobalt-chromium Bitainer attached to the first (and in some cases second) permanent molars in combination with a multibracket appliance (T1–T2), followed by a settling phase (T2–T3). Lateral cephalograms were collected at T0, T1 (89%), and T3. The individualized ANB angle, serving as each patient's normative sagittal reference, was calculated and compared to the measured ANB at each time point. PAR scoring and 3D dental model superimpositions were performed. Statistical significance was set at $p < 0.05$.
RESULTS: The PAR index improved markedly, decreasing from 23.4 to 4.8, with 77.8% of patients demonstrating a ≥70% reduction. During the Bitainer–multibracket phase, significant skeletal changes were observed, including an increase in SNB and a substantial reduction of the measured–target ANB discrepancy. At T2, the individualized ANB averaged 2.59°, the measured ANB 2.96°, resulting in a minimal deviation of 0.37°, indicating near-complete sagittal normalization relative to the individualized target. Overjet and overbite reduced to 3.35 mm and 2.67 mm, respectively, while upper incisor inclination remained stable. Premolar extrusion occurred during the functional phase, consistent with occlusal settling.
CONCLUSIONS: The customized 3D-printed Bitainer demonstrated high effectiveness in correcting skeletal Class II malocclusion in growing patients. The use of the individualized ANB angle allowed precise assessment of true skeletal correction and confirmed normalization of sagittal jaw relation with minimal dental side effects. These findings support digitally designed, patient-specific 3D-printed fixed functional appliances as a valuable and efficient option for mandibular advancement therapy.

Abstract citation ID: cjag070.217
SP207 DENTAL STUDENTS' AND YOUNG DENTISTS' PERSPECTIVES ON UNDERGRADUATE ORTHODONTIC EDUCATION

Hadeel Al-Najafi[1] and Noor Abdulla[2]; *[1]Guy's and St Thomas' Hospital, London, United Kingdom, [2]Queen Mary University, London, United Kingdom*

AIM: To evaluate UK dental students' and young dentists' perceptions of undergraduate orthodontic education, assess their confidence in providing simple orthodontic and clear aligner treatments, and identify recommended curriculum improvements to better prepare graduates for clinical practice.
MATERIALS AND METHOD: A cross-sectional online survey was distributed to final-year dental students and young dentists within five years of graduation across UK dental schools. The questionnaire, administered via Google Forms, collected demographic data and responses relating to satisfaction with orthodontic teaching, perceived preparedness for simple orthodontic and aligner-based treatments, and suggested curriculum enhancements. Data were analysed descriptively, with frequencies and percentages reported. Free-text responses were thematically reviewed to identify common recommendations for improving undergraduate orthodontic training.
RESULTS: Sixty-four participants completed the survey (61.0% dental students; 39.1% young dentists). Only 23.5% rated their orthodontic education as satisfactory. While 75.0% reported a desire to offer clear aligner treatments in future practice, 82.8% stated that their undergraduate curriculum did not prepare them sufficiently to provide such services. Confidence in managing simple orthodontic cases was low, with 70.0% indicating a need for more hands-on clinical training. Participants expressed strong support for curriculum changes, including dedicated clear aligner modules (85.0%), increased supervised clinical exposure (68.0%), and collaboration with aligner companies to provide practical training opportunities (76.5%). Thematic analysis highlighted a need for structured case-based learning, enhanced exposure to digital orthodontic workflows, and clearer guidance on clinical indications and limitations of aligner therapy.
CONCLUSIONS: A clear gap exists between the orthodontic aspirations of dental students and young dentists and the level of preparedness provided by current UK undergraduate programmes. Participants felt that more could be done to prepare them for clinical practice, reflecting widespread concern regarding the adequacy of present teaching and a strong demand for enhanced, aligner-focused, hands-on training. Incorporating aligner-focused modules, increasing clinical exposure, and fostering partnerships with industry may better equip new graduates to meet rising patient expectations. Re-evaluating undergraduate orthodontic curricula is essential to ensure future dentists enter practice with the competence and confidence required to deliver contemporary orthodontic care.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.218
SP208 OPEN EXPOSURE OF PALATAL CANINES: A PROSPECTIVE AUDIT OF PATIENT RECOVERY AND POST-OPERATIVE OUTCOMES

Gabrielle Thompson, Anna Dargue, Bethany Wright, Julie Williams; *University Hospitals Bristol and Weston, Bristol, United Kingdom*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: To assess patient recovery and early postoperative outcomes following open exposure of palatally impacted maxillary canines, and to identify opportunities to optimise perioperative care and postoperative guidance.
SUBJECTS AND METHOD: This prospective two-cycle audit included all patients undergoing open exposure of palatal canines: Cycle 1 (2021-2022, 50 cases) and Cycle 2 (2024-2025, 52 cases). Each exposure, including bilateral cases, was recorded using a structured proforma completed at surgery and at postoperative review. Performance was assessed at postoperative review against five standards, each with a target of 100%: (1) Returned to school or normal activity (2) Resumption of normal eating, (3) Absence of pain (4) Surgical dressing retained, and (5) Absence of postoperative complications. Data from both cycles were analysed and compared.
RESULTS: A total of 102 exposures were assessed (Cycle 1: 50; Cycle 2: 52). Compliance with the five standards was as follows:

1. Return to normal activity: 98% in both cycles
2. Eating normally: 86% (Cycle 1) vs 79% (Cycle 2)
3. No pain at review: 62% vs 83%
4. Coe-pak in situ: 88% vs 85%
5. No postoperative complications: 98% vs 100%

Additional analysis showed similar demographic profiles between cycles (mean age 15.3 vs 14.5 years). General anaesthetic use decreased in Cycle 2 (56% to 46%), with a corresponding rise in local anaesthetic cases. Full-thickness flap techniques predominated across both cycles, although bone removal was more frequent in Cycle 1 (94% vs 80%). Crown visibility improved in Cycle 2 (62% from 48%). Pain scores were lower in Cycle 2, with higher pain scores associated with earlier reviews. Removable healing plate provision decreased (38% to 17%) but remained well tolerated. Indications for these plates shifted between cycles. In Cycle 1, 69% were prescribed solely for healing, while 31% served as dual function for overbite reduction and healing. In Cycle 2, 85% of plates were prescribed for dual function.
CONCLUSIONS: Open exposure of palatal canines demonstrated high return-to-function outcomes and minimal complications. Pain outcomes improved in Cycle 2, and healing plates may support coe-pak stability with appropriate guidance. Continued follow-up is recommended to assess longer-term success.

Abstract citation ID: cjag070.219
SP209 ASSOCIATION BETWEEN OCCLUSAL CHARACTERISTICS AND TREATMENT MODALITIES OF CONGENITALLY MISSING AND PEG-SHAPED MAXILLARY LATERAL INCISORS: FINDINGS FROM THE NORTHERN FINLAND BIRTH COHORT 1966

Marleena Ojala-Alasuutari, Ritva Näpänkangas, Virpi Harila; *Research unit of Population health, Faculty of Medicine, University of Oulu, Oulu, Finland*

AIM: The aim of this study was to examine the association between occlusal characteristics and the treatment modalities of congenitally missing or peg-shaped maxillary lateral incisors in an adult population, based on data from the Northern Finland Birth Cohort 1966 (NFBC1966).
MATERIALS AND METHOD: The study utilized data from the NFBC1966. A clinical oral examination was conducted at the 46-year follow-up (N = 1964), including occlusion assessment, intraoral 3D scanning, and dental panoramic tomography (DPT). Missing and peg-shaped maxillary lateral incisors, as well as the treatment approach, were identified from DPT images. The study groups included canine substitution, peg-shaped teeth, and prosthetic replacement or gap and control group (complete dentition, no missing teeth). Occlusal variables included overjet, overbite, anterior and lateral crossbite, scissors bite, and midline shift. Descriptive statistics and Fisher's exact test ($p < 0.05$) were applied in the analyses.
RESULTS: Midline symmetry was highest in the peg-shaped group. Posterior crossbite was significantly more common in canine substitution (25.9%) and peg-shaped groups (22.7%) than in controls (13.3%) ($p = 0.031$). Scissors bite occurred most frequently in the prosthetic replacement group (33.3%) and canine substitution group (18.5%), and the association was highly significant among females ($p = 0.015$), but not among males. Overjet distribution was similar in all treatment groups ($p > 0.05$), while deep overbite (>4 mm) was most prevalent in the prosthetic replacement group (33.3%).
CONCLUSIONS: The method chosen to replace missing maxillary lateral incisors significantly influenced occlusal characteristics. Prosthetic replacement increased transverse discrepancies and deep bite. Peg-shaped lateral incisors maintained a more balanced occlusion, whereas canine substitution was associated with midline deviations. These findings highlight the need for individualized treatment planning to optimize functional and esthetic outcomes.

Abstract citation ID: cjag070.220
SP210 COMPARATIVE MICROSCOPIC ANALYSIS OF THE THICKNESS REDUCTION OF THERMOFORMED FOILS FOR ALIGNER FABRICATION

Mihaela Pernishka-Bahneva[1], Vladimir Petrunov[1], Valentin Dikov[2]; [1]*Medical University Sofia,Faculty of Dental Medicine, Department of Orthodontics, Sofia, Bulgaria,* [2]*Medical University Sofia,Faculty of Dental Medicine, Sofia, Bulgaria*

AIM: The aim of this study was to evaluate the changes occurring during thermoforming of three commonly used foils for in office aligner fabrication. The main focus of this study is the reduction in the thickness of the materials during thermoforming in different groups of teeth and different segments of the dental crown.
MATERIALS AND METHOD: Three aligner materials were compared – Clear Aligner 0.75mm(multilayer|, Zendura Flx(ZenduraDental) 0.76mm(multilayer) and Duran(Scheu Dental) 0.75(single layer). The foils were molded using a Ministar S thermoforming machine, according to the manufacturer's recommendations for heating and cooling time.

The aligners are fabricated through thermoforming on previously prepared models through 3D printing of the same patient in upper and lower jaw – with mild to moderate crowding of frontal teeth and the presence of single attachments.

Samples were cut from the manufactured aligners in the area of the central incisor, canine and molar and included in resin. The prepared samples were observed under a microscope with a magnification of x8 and x20. We compared the thickness of the aligners on vestibular and lingual surface of each tooth, and in the case of molars - the tip of the vestibular and lingual cusps. The acquired data is then presented in a table and graphical form.
RESULTS: We found that the thickness reduction of the foil on the vestibular surface of the teeth is greater than on the lingual surface. Greater thinning is observed in incisors and canines. In the distal segment - the thickness reduction of the aligner is less significant. The thickness reduction of the Zendura Flx is greater than that of the three-layer Scheu Dental CA foil. It's also observed that the thickness reduction is greater in the area under the attachment.
CONCLUSIONS: Microscopic analysis demonstrates a relationship between the type of tooth and the degree of thickness reduction of the aligner - the thinning is greater in the frontal area, both in the three-layer and in the studied single-layer foil, which may explain the lag of tooth movements in the frontal area from the digital planning.

Abstract citation ID: cjag070.221
SP213 MEASUREMENT OF THE EFFECTS OF MAXILLARY EXPANSION ON PALATAL VAULT VOLUME USING DIGITAL DENTAL MODELS

Ayberk Kara, Aybuke Ensarioglu, Kerem Aras; *Istanbul Okan University, Istanbul, Turkey*

AIM: This study aims to evaluate the effect of rapid maxillary expansion on palatal vault volume and dimensions using digital dental model datasets. Apart from solely observing the volumetric changes, the study focuses on whether the changes correlate with intermolar width and palatal height. The findings are intended to provide a more transparent understanding of how maxillary expansion alters the structures that are clinically observable.
MATERIALS AND METHODS: Patients who have undergone rapid maxillary expansion treatment with pre-treatment and post-treatment intraoral scanner records constitute the universe of our study. Patients with craniofacial anomalies affecting maxillary tissues, previous orthodontic treatment history, and distorted or incomplete intraoral scan files were excluded. Based on the criteria, 19 patients' data were suitable to include in the analysis.

The digital models were analysed with Materialise 3-matic software. Predefined landmarks and reference planes on the palatal tissue were marked. Based on those markings, palatal volume, area, length, depth, vault index, and intermolar width measurements were recorded. Pre-treatment and post-treatment values were compared to assess dimensional and morphological changes that occurred during maxillary expansion.
RESULTS: While the average pre-treatment palatal vault volume was 5065.48 $\pm$939.74 mm^3, the average post-treatment value was 5634.12$\pm$1292.28 mm^3. Post-treatment values for palatal vault volume ($p < 0.05$), palatal area ($p < 0.001$), and palatal length ($p < 0.05$) were significantly higher than their initial values. The intermolar distance and palatal height value change was not significant ($p > 0.05$). Spearman correlations demonstrated that the change in palatal vault volume was strongly related to the change in palatal area ($r= 0.654$, $p= 0.002$). The change in palatal vault volume showed moderate to strong correlations with both intermolar width ($r = 0.621$, $p = 0.005$) and palatal height ($r = 0.654$, $p = 0.002$).
CONCLUSIONS: The results show that palatal volume increased significantly following maxillary expansion treatment. Furthermore, intermolar distance reflects

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

transverse changes less sensitively than volumetric and surface-area measurements. The volumetric expansion of the palatal vault is closely associated with both the transverse and vertical modifications of the palate.

Abstract citation ID: cjag070.222
SP214 CORRELATION BETWEEN SPACE CONDITION AND DEGREE OF MAXILLARY CANINE IMPACTIONS

Jasna Petrovska[1], Stojan Petrovski[2], Dragan Petrovski[3]; *[1]UKIM Faculty of Dentistry in Skopje, Skopje, North Macedonia, [2]PHO Petrovski Dental Office, Skopje, North Macedonia, [3]University Dental Clinic Sv.Pantelejmon, Skopje, North Macedonia*

AIM: Maxillary canine impaction occurs frequently because of the long eruption pathway that the tooth has to follow from the site of the tooth bud to the final eruption site. Aim of this study was to compare some aspects, such as distance, mesio-distal space and anomalous laterals with the degree of impaction in cases of impacted maxillary canines and their influence on treatment outcome.
MATERIAL AND METHOD: The material consisted of OPGs form 59 patients with canine impaction, uni- and bilateral. The average age of this group was 14.69 years. From the OPGs the following parameters were obtained: d- distance, space condition and anomalous lateral incisor. They were compared with the degree of impaction (mild, moderate and severe). D-distance was measured from the cusp of the impacted canine to the occlusal plane. Space condition was measured from the distal side of the lateral incisor to the mesial side of the first premolar. Presence of anomalous lateral incisor or its absence was detected.
RESULTS: There was a significant correlation between d-distance values and the degree of impaction. D-distance larger than 14mm was detected in 57.69% of teeth with mild impaction degree, 42.86% of teeth with moderate, and 84% of teeth with severe impaction degree. Between mesiodistal measurements of space condition and the degree of impaction, we did not found any significance. In teeth with mild impaction degree we found 60% lack of space, 62.96% in teeth with moderate impaction degree, and 56% in teeth with severe impaction degree. Anomalous lateral incisors were present in 7.69% in teeth with mild impaction degree, 28.57% in moderate, and 16% in severe impaction degree.
CONCLUSIONS: The distance of an impacted canine to the occlusal plane is a key prognostic factor for treatment duration. Space condition has also a positive correlation with treatment duration.

Abstract citation ID: cjag070.223
SP215 VERTICAL DISCREPANCIES ASSOCIATED WITH TEMPOROMANDIBULAR DISORDERS

Eva Štular, Nika Korelc, Jasmina Primožič; *Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia*

AIM: The aim of this study was to determine the association between temporomandibular disorders (TMD) and vertical discrepancies at various stages of dental development. The study examined how the prevalence of TMD symptoms and signs changes throughout different stages of dental development, how these correlate with vertical discrepancies, and which discrepancies are associated with an increased risk of TMD at each developmental stage.
MATERIALS (OR SUBJECTS) AND METHOD: This retrospective cross-sectional study included 418 subjects (210 women, 208 men) who underwent their first orthodontic examination between 2020 and 2023. Participants were divided into six groups according to their stage of dental development: deciduous, early mixed, mixed, late mixed, permanent without, and permanent with all erupted second permanent molars. The prevalence of various TMD symptoms and signs was documented within each group, and the chi-square test was applied to assess differences in distribution. Logistic regression models were used to evaluate the associations between vertical discrepancies and specific TMD symptoms and signs.
RESULTS: Vertical discrepancies were present in 7.1% of all subjects. The values of normal overbite differed statistically significantly between dentition stages ($p=0.005$). The values for open bite ($p=0.461$) and deep bite ($p=0.842$) did not differ statistically significantly across dental developmental stages. A pairwise comparison using the Bonferroni correction revealed that normal overbite differed statistically significantly only between the early mixed dentition and the permanent dentition without all second permanent molars erupted ($p=0.022$). In the early mixed dentition, the mean normal overbite was 1.8 ± 0.7 mm, whereas in the permanent dentition without all second permanent molars erupted it measured 2.4 ± 0.7 mm.

In the primary to late mixed dentition, difficulties with chewing were statistically significantly associated with unilateral open bite in the trans-canine sector (TCS) ($p<0.001$), and difficulties in the TMJ area were statistically significantly associated with open bite in the inter-canine sector (ICS) ($p=0.039$). Limited mouth opening in the permanent dentition was statistically significantly associated with increased overbite ($p=0.013$).
CONCLUSIONS: Open bite and increased overbite influence the occurrence of TMD symptoms and signs; however, since TMD are multifactorial, we cannot conclude that vertical discrepancies alone are responsible for their development.

Abstract citation ID: cjag070.224
SP216 CORRECTION OF POST OSTEOTOMY OCCLUSAL PLANE CANT WITH BRACKET REPOSITIONING AND SECTIONAL MECHANICS: A CASE REPORT

Krupesh Patel and Mhairi Walker; *Glasgow Dental Hospital and School, Glasgow, United Kingdom*

AIM: To present an orthodontic method to correct post-operative cants post-surgery using bracket repositioning and sectional mechanics to apply intrusive/ extrusive forces on targeted segments.
SUBJECT: Orthognathic surgery is frequently used to correct skeletal discrepancies and dentofacial deformities. Post-operative complications, although not common, can occur, a small number of complications may require further surgery or extended orthodontic treatment to correct. The Surgery First technique of orthognathic surgery reduces overall treatment time by limiting orthodontic treatment to the post-surgical phase and allowing any post operative orthodontic revision to be completed without increasing overall treatment time.

A cant is a postoperative complication that may require invasive surgical correction. Less invasive options include orthodontic revisions using TADs for precise tooth movement, specialized archwires, or bracket repositioning with sectional mechanics. These approaches provide targeted correction while reducing risks and improving overall treatment outcomes.

This patient presented to clinic following Surgery First bimaxillary surgery with a maxillary cant. After discussing available options, the patient declined further surgery. We explored orthodontic management of the cant whilst simultaneously completing the orthodontic phase of planned orthognathic treatment.
METHODS: We repositioned brackets and apply intrusive/and extrusive mechanics on targeted segments.

The brackets were repositioned 13 12 11 21 22 23 with a gradient of placement. Initial alignment was achieved with Nickel-Titanium archwires. Stainless steel archwire were placed and sectioned distal to 23. Intermaxillary elastic traction was used to extrude the upper left posterior segment.
RESULTS: Using the Surgery First technique ensured this could be corrected orthodontically without a significant increase in post operative orthodontic treatment time and without the reduction in motivation associated with prolonged treatment times.

Overall treatment time was under 12 months.
CONCLUSION: This case demonstrates that presentation of mild to moderate canting post-bimaxillary osteotomy may be effectively addressed orthodontically with targeted bracket repositioning, applying both intrusive and extrusive mechanics in different segments. This approach offers a minimally invasive alternative to revision surgery in selected cases. This minimally invasive technique provides excellent aesthetic improvement without affecting posterior occlusion and maintains the reduced treatment time of the Surgery First approach in select cases.

Abstract citation ID: cjag070.225
SP217 THE EFFICACY OF PLANNED MODERATE TO SEVERE ROTATION CHANGES IN MAXILLARY CANINES WITH THE INVISALIGN APPLIANCE

Hannah Chong, Tony Weir, Maurice Meade; *The University of Adelaide, Adelaide, Australia*

AIM: This retrospective study aimed to assess the efficacy of planned moderate to severe rotation changes of $\geq5°$ in maxillary canines with the Invisalign (Align Technology, Santa Clara, Calif) appliance. The secondary aim of this study was to evaluate the influence of the planned direction of rotation on efficacy.
MATERIALS AND METHOD: Digital models representing the initial malocclusion and the planned and achieved occlusions following wear of an initial series of aligners by adult patients meeting selection criteria were measured using metrology software. A method to define and categorise rotation directions was formulated. Based on this method, the sample was further divided into 5 categories based on rotation type: mesial-in, mesial-out, distal-in, distal-out and combination rotations. Categorisation into these groups enabled subsequent analyses to determine whether the planned rotation directions were met and whether rotation direction influenced the efficacy of movement.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: A total of 114 maxillary canines from 75 patients satisfied inclusion criteria and were evaluated. Rotation of the maxillary canines was under-expressed, with an overall mean accuracy of planned rotation of 63.99%. The direction of rotation had no statistically significant influence on the efficacy of rotation of maxillary canines. Planned rotation directions were achieved in 77% of cases. Combination rotations demonstrated the greatest variability in achieving their planned direction, with 51% rotating in a direction other than that planned. A 1° increase in rotational velocity per aligner was associated with an additional 5.6° shortfall in accuracy of this rotation ($P > 0.05$).
CONCLUSIONS: The achieved rotation of maxillary canines following wear of an initial series of Invisalign aligners differed from the planned movements in both magnitude and type of rotation in patients where ≥5° rotation was planned. A defined and reproducible method of classifying rotation types was developed, which may facilitate further investigations evaluating the efficacy of the Invisalign appliance to guide clinicians and optimise treatment outcomes.

Abstract citation ID: cjag070.226
SP218 VARIATION IN THE LEVEL OF MMP-13 BIOLOGICAL MARKER OF ORTHODONTIC TOOTH MOVEMENT USING TWO DIFFERENT CLEAR PLASTIC APPLIANCES

KRISHNASWAMY Rengarajan; *RagasDental Collage and Hospital, Chennai, India*

AIM: This study aimed to investigate the clinical relevance of MMP-13 (matrix metalloproteinase-13) as a biological marker involved in orthodontic tooth movement, specifically focusing on the remodelling of the periodontal ligament and alveolar bone, using two distinct types of clear plastic appliances.
MATERIALS AND METHOD: This prospective study was carried out involving 8 patients aged 18 to 40 years, all of whom sought orthodontic treatment. The patients were randomly divided into two groups, Group 1 (Control) received thermoformed aligners, while Group 2 received direct-printed aligners. Gingival crevicular fluid (GCF) and unstimulated whole saliva (UWS) samples were collected at specific time intervals: 7 days, 14 days, 21 days, 28 days, and 42 days. The concentration of MMP-13 was determined using the ELISA method.
RESULTS: This study evaluated MMP-13 expression in GCF and saliva over six weeks in patients undergoing orthodontic treatment with either direct-printed or thermoformed aligners. While within-group changes over time were not statistically significant in most cases, the direct-printed aligner group consistently showed higher MMP-13 levels in both GCF and saliva compared to the thermoformed group. Between-group comparisons revealed statistically significant differences in MMP-13 concentrations across all sample types ($p \leq 0.001$), with the direct-printed group exhibiting overall higher biomarker levels. Additionally, tooth movement was more pronounced in the direct-printed group, with a maximum displacement of 2.25 mm by Week 6, suggesting a possible association between increased MMP-13 activity and enhanced orthodontic tooth movement.
CONCLUSION: This study found that MMP-13 levels peaked during the active phase of orthodontic tooth movement and were significantly higher and earlier with direct 3D-printed aligners compared to thermoformed aligners, indicating a stronger biological response.

Abstract citation ID: cjag070.227
SP220 RELATIONSHIP BETWEEN HORIZONTAL SYMMETRY OF THE LIP-CLOSING FORCE AND FACIAL SURFACE MORPHOLOGY

Yuichiro Watanabe[1], Kishio Sabashi[2], Yuki Okumura[1], Wakako Tome[1], Noriyuki Kitai[1]; *[1]Asahi University, Gifu, Japan, [2]Sabashi Orthodontics, Gifu, Japan*

AIM: This study aimed to evaluate the relationship between the horizontal symmetry of the lip-closing force (LCF) and facial surface morphology.
MATERIALS AND METHODS: Twenty-two women (mean age, 25 years; range, 19–38 years) were included in this study. The LCF was measured in eight directions: upper, upper left, left, lower left, lower, lower right, right, and upper right. To evaluate the horizontal symmetry of the LCF, data from the upper right, upper left, lower right, and lower left sides were used for the analysis. The Horizontal LCF have been reported to have relatively poor reliability, and therefore, the right and left LCF data were excluded from analysis in this report. The absolute difference in LCF divided by the sum of the right and left values was defined as the LCF horizontal symmetry index (LCF-SI). Three-dimensional facial images were captured at rest using a VECTRA H1 system (Canfield, USA). The root-mean-square deviation (RMSD) between the actual and mirrored facial images was calculated as the face horizontal symmetry index (Face-SI) for the entire face and three subregions: the upper face, midface, and lower face. The correlation between LCF-SI and Face-SI was then analyzed for the entire face and the three subregions.
RESULTS: The LCF-SI correlated positively with the Face-SI in the lower face region. No significant correlations were found between the LCF-SI and the Face-SI in the upper or midface regions.
CONCLUSION: Symmetry of the lip-closing force was associated with symmetry of the lower facial surface. These findings highlight the role of LCF symmetry in maintaining facial balance, with implications for clinical and aesthetic applications.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.228
SP221 THREE-DIMENSIONAL ANALYSIS OF LIP MORPHOLOGY FOLLOWING ORTHODONTIC TREATMENT WITH PREMOLAR EXTRACTION

Akihiro Ohyama, Wakako Tome, Noriyuki Kitai; *Asahi University, Gifu, Japan*

AIM: This study aimed to investigate three-dimensional lip morphological changes following orthodontic treatment involving premolar extraction.
MATERIALS AND METHODS: The study included 12 Japanese patients (male, n=1; female, n=11; mean age, 20 years and 5 months) who were diagnosed as requiring orthodontic treatment with tooth extraction because of improvement in crowding and anterior teeth protrusion. Orthodontic treatment was performed using pre-adjusted edgewise appliances with premolar extraction. Three-dimensional images of the face at rest were recorded for each patient using a 3D surface imaging device (3dMDcranial System, 3dMD, USA) before and after the active phase of treatment (pre- and post-treatment). The images were superimposed on the forehead, and the midsagittal, axial, and frontal planes were defined using an image processing software program (3D-Rugle, Medic Engineering, Japan) based on several reference points. The subnasale (*sn*) and labiomentale (*labm*) were identified. The plane passing through the *sn* and *labm*, perpendicular to the midsagittal plane, was defined as the lip base plane. The lip surface area and volume anterior to the lip base plane were calculated. Significant differences in pre- and post-treatment measurements were identified using paired t-tests. Pearson's correlation coefficients between the upper and lower lip measurements were also calculated. Statistical significance was set at $P < 0.05$.
RESULTS: The upper lip surface area and volume and lower lip surface volume decreased significantly after treatment ($p<0.05$). Meanwhile, there was no significant difference in the pre- and post-treatment lower lip surface area. The upper lip surface area was correlated with that of the lower lip. Similarly, the upper lip volume was correlated with that of the lower lip.
CONCLUSIONS: Three-dimensional images of the face revealed a decrease in the upper lip surface area and volume as well as a decrease in the lower lip volume following orthodontic treatment with premolar extraction.

Abstract citation ID: cjag070.229
SP222 COMPARATIVE STUDY OF AESTHETIC PREFERENCES FOR LIP PROMINENCE BETWEEN KOREAN ORTHODONTIC PATIENTS AND ORTHODONTISTS

Sang June Lee and Ji Yeon Lee; *Department of Orthodontics, National Health Insurance Service Ilsan Hospital, Goyang, Republic of Korea*

AIM: This study compared aesthetic preferences for lip prominence relative to the Ricketts' aesthetic line (E-line) between Korean orthodontic patients and orthodontists, investigating whether sex, age, and malocclusion type influence patients' preferred profiles.
METHOD: Seven silhouette images were generated by adjusting the lips of an average profile (Korean female, 20s) from –6 to +6 mm relative to the E-line in 2-mm increments. Participants included 128 patients (aged 21–50) undergoing or having completed orthodontic treatment at the National Health Insurance Service Ilsan Hospital and 76 orthodontists with more than 5 years of clinical experience. Patients were stratified by age group, sex, and skeletal malocclusion. Participants ranked the three profiles they considered most aesthetic, and responses were quantified using the Borda count method. Group differences were analysed using the Kruskal–Wallis test, and differences in variance were examined using the Brown–Forsythe test.
RESULTS: All groups preferred profiles with lips positioned slightly posterior to the E-line. When comparing orthodontists and patients, patients showed a statistically significant preference for more protrusive lips ($p = 0.045$), and the variance in preferences was also greater among patients. Male and female patients showed similar preferences. Although older patients tended to prefer slightly more protrusive profiles, the difference was not statistically significant. Compared with Class I patients, Class II patients tended to prefer slightly more retrusive lips, and Class III patients slightly more protrusive lips, but these differences were also not statistically significant.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

CONCLUSION: Unlike previous literature suggesting that individuals tend to prefer profiles similar to their own, patients in this study tended to select profiles in the opposite direction of their actual facial characteristics, potentially reflecting a desire for improvement associated with their orthodontic treatment experience. Also, patients showed more varied aesthetic standards than orthodontists. Therefore, orthodontists should consider patients' individual expectations and avoid excessive lip retraction based solely on the E-line when making treatment plans. Future studies with larger, more diverse groups are necessary to more precisely evaluate the factors that influence individual profile preferences.

Abstract citation ID: cjag070.230
SP223 PREVENTION, EARLY DIAGNOSIS AND TIMING IN ORTHODONTICS

Jorida Jubani[1], Francesca Perella[1], Alfredo Altieri[2]; [1]*Univerista l'Aquila, Roma, Italy,* [2]*Universita l'Aquila, Roma, Italy*

AIM: To analyse the role of prevention, early diagnosis, and treatment timing in orthodontics, with a focus on preventive orthodontic treatment in the growing patient.
MATERIALS AND METHODS: A narrative literature review was performed, combined with clinical evidence. Diagnostic criteria in deciduous and mixed dentition, evaluation of occlusal indicators, oral habits, and radiographic and photographic records were analysed. Literature sources included PubMed, Scopus, and EJPD publications on prevention, early orthodontics, interceptive treatment, and treatment timing.
RESULTS: Early identification of malocclusion patterns such as cross-bites, increased overjet, and skeletal Class III discrepancies is essential for targeted interventions. Evidence demonstrates benefits in reducing traumatic risk, improving psychosocial outcomes, and simplifying future orthodontic treatment. Up to 15% of malocclusions can be completely corrected and nearly 50% improved with interceptive measures in mixed dentition. The correct timing of intervention represents a pivotal clinical variable: decisions must be based on growth status, risk evaluation, and evidence of effectiveness and predictability.
CONCLUSIONS: Prevention, early diagnosis, and treatment timing are key factors in paediatric orthodontics. Timely preventive orthodontic treatment can correct skeletal and dental discrepancies, reduce trauma risk, and improve quality of life. Clinical decisions must be evidence-based and personalised, avoiding unnecessary overtreatment. Therapeutic methods must be effective and efficient in achieving the treatment goals and, above all, must not interfere with the health of growing patients.

Abstract citation ID: cjag070.231
SP224 INTRAORAL ORTHOPEDIC MANAGEMENT OF CLASS III MALOCCLUSION: EARLY CLINICAL OUTCOMES OF THE ERTTY-GAP III APPLIANCE

Hilal Algul and Ayse Tuba Altug; *Ankara University Faculty of Dentistry, Ankara, Turkey*

AIM: The aim of this study was to evaluate the short-term skeletal and dentoalveolar effects of the intraoral ERTTY-Gap III functional orthopedic appliance in growing individuals with skeletal Class III malocclusion due to maxillary retrognathia. The appliance was designed as an alternative to extraoral facemask therapy by reducing cooperation requirements through its fully intraoral design.
MATERIALS AND METHODS: The study sample consisted of 20 individuals (12 males, 7 females; mean age 9.75 ± 0.73 years) in the early mixed dentition period. Active treatment duration is 11.6 months. Lateral cephalometric radiographs were obtained before treatment (T0) and after treatment (T1). All cephalometric variables were digitized and analyzed. Normality of distributions was assessed using the Shapiro–Wilk test. Paired t-tests were applied for normally distributed variables, and the Wilcoxon signed-rank test was used for non-normally distributed variables. Effect sizes were calculated using Cohen's d and statistical significance was set at $p<0.05$.
RESULTS: Significant skeletal and dentoalveolar changes were observed following treatment. Maxillary advancement increased significantly, as demonstrated by the rise in SNA (+2.03°, $p<0.001$). SNB decreased (–1.17°, $p=0.002$), resulting in a substantial improvement in ANB (+3.18°, $p<0.001$). The occlusal plane angle relative to SN decreased (–2.24°, $p<0.01$), while GoGn/SN showed a mild but significant increase (+1.18°, $p<0.05$). The gonial angle also decreased significantly (–1.85°, $p<0.01$). At the dentoalveolar level, maxillary incisors exhibited significant proclination (1-NA distance: +1.43 mm; angle: +3.25°, $p<0.01$). Mandibular incisors showed mild but significant proclination as well (1-NB distance: +0.87 mm; angle: +1.78°, $p<0.05$). The interincisal angle decreased markedly (–8.15°, $p<0.001$). The most pronounced occlusal improvement was the increase in overjet (+4.16 mm, $p<0.001$), accompanied by a significant reduction in overbite (–2.18 mm, $p<0.01$).
CONCLUSIONS: The ERTTY-Gap III appliance produced effective sagittal correction at skeletal and dentoalveolar levels in growing Class III patients. By enhancing maxillary advancement, improving sagittal relationships, and normalizing incisor and occlusal characteristics, it demonstrated strong orthopedic effectiveness. Its intraoral design, which reduces cooperation challenges associated with facemask therapy, positions ERTTY-Gap III as a clinically advantageous option for early orthopedic management of Class III malocclusion.

Abstract citation ID: cjag070.232
SP225 ‡‡‡ EVALUATION OF PATIENT REPORTED OUTCOMES MEASURES FOR CLEFT-LIP-PALATE PATIENTS IN ORTHODONTIC RETENTION

Balraj Gill, Shree Patel, Preeti Jauhar; *Royal London Dental Hospital, London, United Kingdom*

AIM: To evaluate patient understanding of retention, as well as outcomes post orthodontic treatment, which can be used to develop resources accordingly.
METHODS: This cross-sectional study was registered with the trust governance department. Cases were identified from the department cleft database. A questionnaire was devised which explored patient experience of treatment, with a focus on understanding and compliance of retainers. Patients were invited to complete the questionnaire via text message or a phone-call and all responses were collated into a data capture spreadsheet.
RESULTS: The sample consisted mainly of patients with cleft palate or combination of cleft-lip-and-palate, with a mean age of 32 years old. All had some form of active orthodontic treatment, with 42% of cases undergoing surgical intervention, typically with LeFort 1 maxillary advancement. Over half were not aware that retainers are lifelong, with 50% of these responses from those who had treatment completed less than 5 years ago. Despite this, only 4 respondents felt they had not received sufficient information about retainers prior to discharge.
CONCLUSION: There is a lack of understanding amongst cleft lip/palate patients regarding lifelong retention, which necessitates information to be tailored accordingly. It is suggested that the retention phase should be regularly audited as it crucial for patients to maintain a stable occlusion in the long-term.

Abstract citation ID: cjag070.233
SP226 CEPHALOMETRIC EVALUATION OF INCISOR INCLINATION FOLLOWING FIRST PERMANENT MOLAR EXTRACTION IN THE GROWING PATIENTS

Adnan Hajdarević[1] and Emina Čirgić[2]; [1]*Department of Pediatric Dentistry, Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden,* [2]*Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden*

AIM: This study aimed to assess changes in maxillary and mandibular incisor inclination from pre- to post-treatment in growing patients and to evaluate whether extraction of first permanent molars (FPMs) influences these changes
MATERIALS AND METHODS: This prospective study included children aged 6–9 years who had one or more FPMs extracted due to severe molar–incisor hypomineralisation (MIH). Lateral cephalometric radiographs were obtained before any extractions (T0) and repeated at follow-up (T2), when the patients were 15 years old. The inclination of the maxillary incisors (Ils/NL) and mandibular incisors (Ili/ML) was measured in degrees at both time points, and the change in inclination between T0 and T2 was calculated. Paired *t*-tests assessed longitudinal changes within individuals, while Kruskal–Wallis tests examined associations between the amount of change in incisor inclination and the number of extracted FPMs in each jaw (0, 1, or 2). Statistical significance was set at $p<0.05$
RESULTS: Fifty-three patients (19 boys, 34 girls; mean age at baseline = 9.4±0.6 years) were included. Overall, maxillary incisor inclination showed no significant change from T0 to T2 (mean=110.8° → 111.5°, $p=0.34$). In contrast, mandibular incisors exhibited a significant retroclination over time (mean=96.6° → 94.6°, $p=0.007$). No significant associations were found between the number of extracted FPMs and the change in incisor inclination. In the maxilla, the mean change was +0.7°, +0.8°, and +0.4° for patients with zero, one, and two extractions, respectively ($p=0.95$). In the mandible, the corresponding mean changes were −1.6°, −3.4°, and −1.5° ($p=0.49$). These findings indicate that neither unilateral nor bilateral FPM extraction had a measurable effect on longitudinal changes in incisor inclination
CONCLUSIONS: Mandibular incisors exhibit significant retroclination during growth, particularly in cases where first permanent molars have been extracted, while maxillary incisor inclination remains largely unchanged. Extraction of first permanent molars does not appear to influence long-term maxillary incisor position but is associated with increased retroclination of the mandibular incisors. These findings indicate that anterior dental compensation in the mandible following FPM loss is

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

evident, whereas its contribution to overall sagittal adaptation in mixed dentition is limited.

Abstract citation ID: cjag070.234
SP227 MINIMUM DAILY WEAR THRESHOLD FOR EFFECTIVE TWIN BLOCK APPLIANCE THERAPY: A PROSPECTIVE EVALUATION

Natasha Lemasney[1], Angus Burns[1], Mary Kate Kearney[2], Simon Wolstencroft[3], Padhraig Fleming[1]; [1]Dublin Dental University Hospital, Dublin, Ireland, [2]Loughlinstown Orthodontic Unit, Dublin, Ireland, [3]Tallaght Orthodontic Unit, Dublin, Ireland

BACKGROUND: The Twin Block appliance is an established treatment for Class II Division 1 malocclusion in growing patients. Although traditionally prescribed for full-time wear, emerging evidence suggests that part-time wear may achieve comparable outcomes. There is, however, uncertainty regarding the minimum daily wear threshold required for successful occlusal correction.
AIM: To determine the minimum daily hours of Twin Block wear required to achieve overjet reduction.
METHODS: Participants were recruited from a pool of patients undergoing treatment with a Twin Block appliance in two public orthodontic clinics. Participants were instructed to wear the appliance full-time (22 hours per day). Wear time was objectively recorded using embedded TheraMon™ sensors. Participants were categorised into four wear time groups based on mean daily wear over the first six months, and treatment success was graded according to the percentage overjet reduction.
RESULTS: Fifty-eight participants with mean age of 12.46 years completed the study. The mean baseline overjet was 10.35 mm with mean overjet reduction of 5.89 mm observed at six months. A strong positive correlation was found between wear time and treatment outcome. Complete success (>70% overjet reduction or final overjet ≤3.5 mm) was achieved only in participants who wore the appliance ≥12 hours/day. The proportion of unsuccessful outcomes increased with decreasing wear time. Mean overjet reduction was greatest in the highest wear group (7.1 mm) and lowest in the poorest wear group (3.6 mm). Mean daily wear time at four weeks was also found to be a good predictor of future wear.
CONCLUSIONS: A minimum of approximately 12 hours of daily wear appears necessary to reliably achieve a successful treatment outcome within the first six months of treatment. Initial adherence to appliance wear protocols appears to be a good predictor of future compliance.

Abstract citation ID: cjag070.235
SP228 TRANSPLANT AND TRIUMPH: ORTHODONTIC HARMONY THROUGH AUTOTRANSPLANTATION

Aliya Hasan[1] and Clara Gibson[2]; [1]The Royal London Hospital, London, United Kingdom, [2]Coden Specialists, Singapore, Singapore

AIM: The aim of this case series was to evaluate the clinical and radiographic outcomes of autotransplantation of teeth performed in conjunction with comprehensive orthodontic treatment. The report highlights the multidisciplinary approach required for successful management of space loss and how autotransplantation can be a viable solution for missing teeth, both in growing and non-growing patients.
SUBJECTS: Two patients were treated at the Department of Orthodontics and Oral Surgery.

- Case 1: An 13 year old male presented with early loss of the left maxillary central incisor following trauma (avulsion). A developing mandibular second premolar with complete root formation was selected as the donor tooth. The tooth was atraumatically extracted and transplanted into the recipient site, followed by endodontic treatment and orthodontic alignment to establish proper occlusion.
- Case 2: A 40-year-old male was undergoing orthodontic treatment in preparation for a mandibular advancement osteotomy. Extractions of two lower premolars were planned to create an increased overjet pre-surgery. A lower first premolar was transplanted into an edentulous upper left second premolar site. Elective endodontic treatment was carried out directly after transplantation. The tooth was stabilised and kept out of occlusion for four weeks. Orthodontic preparation for orthognathic surgery continued without complication.

RESULTS: Both cases demonstrated initial progressive healing of the autotransplanted tooth. However in Case 1, there was some evidence of external root resorption over a 3 year follow-up period during orthodontic treatment. This indicated a guarded prognosis for the long-term viability of the transplanted tooth. On the other hand, Case 2 had no complications following the elective endodontic treatment and normal orthodontic movement continued with no negative sequelae.
CONCLUSION: Autotransplantation represents a biologically sound and cost-effective treatment alternative for young patients requiring tooth replacement. Autotransplantation can also be a successful viable option for non-growing patients, if teeth are due to be electively extracted. When combined with precise surgical handling, appropriate case selection, and interdisciplinary orthodontic management, autotransplantation can achieve predictable long-term success and maintain alveolar bone volume.

Abstract citation ID: cjag070.236
SP229 EARLY TREATMENT OF CLASS III MALOCCLUSION WITH RAPID MAXILLARY EXPANSION AND FACEMASK: A LONG-TERM STUDY

Franceska Vinjolli[1], Keisi Brahimaj[2], Eleni Toma[1]; [1]Catholic University Our lady of Good Counsel, Tirana, Albania, [2]Private practice, Genova, Italy

AIM: The objective of this study was to evaluate the long-term effectiveness of early orthopedic treatment in growing patients with skeletal Class III malocclusion, using rapid maxillary expansion (RME) combined with facemask therapy and to find a possible cephalometric predictor for good responders.
METHODOLOGY: In this retrospective study were enrolled 20 growing patients with skeletal Class III malocclusion and treated according to the RME + facemask protocol. Cephalometric radiographs were analyzed at three time points: T0 (pretreatment), T1 (post-treatment), and T2 (long-term follow-up). The interval between T1 and T2 was five years. Treatment success was defined as an increase in the ANB angle from T0 to T1 and T2, accompanied by minimal dental compensation. The Student t-test was used for statistical analysis to compare cephalometric parameters over time, and linear regression was used to find clinical success predictors.
RESULTS: The findings demonstrated statistically significant improvements in SNA, ANB, and Wits appraisal, with long-term maintenance of treatment outcomes at T2. The SN^GoGn angle measured at T0 showed a strong statistical correlation with the final result. In particular, patients with an initial value lower than 33.5° were more likely to benefit from treatment, suggesting that the vertical growth pattern is a key element in predicting stable orthopedic outcomes.
CONCLUSION: The combined RME + facemask protocol for the orthopedic treatment of growing patients with skeletal Class III malocclusion is effective and stable over time. The SN^GoGn angle measured at baseline (T0) emerges as an important predictive indicator of long-term success. Patients with a less pronounced vertical growth pattern exhibit a more favorable response to treatment, leading to stable functional and aesthetic results.

Abstract citation ID: cjag070.237
SP230 ‡‡‡ METAL ARTIFACT MIMICKING EXTERNAL ROOT RESORPTION IN CONE BEAM COMPUTED TOMOGRTAPHY IMAGES: A CASE REPORT

ZEYNEP AKPINAR and NESLİHAN EBRU ŞENIŞIK; SULEYMAN DEMIREL UNIVERSITY, ISPARTA, Turkey

PURPOSE: Cone Beam Computed Tomography (CBCT) technology provides significant advances in detailed examination in dentistry, particularly in orthodontics. However, orthodontic attachments as metal brackets, wires and mini screws can cause artefacts in the image, limiting diagnostic accuracy. This case presentation aims to examine the accuracy of the diagnosis of external root resorption based on an image characterised by radiolucency in the tooth root in CBCT image.
METHOD: A 25-year-old male patient presented to our orthodontic clinic complaining of a retruded mandible. The examinations revealed inferior micrognathia. Intraoral examinations revealed crowding in the lower jaw along with 5 incisors, and it was determined that the lower incisors were protruding and extruded. It was decided to advance the mandible with orthognathic surgery, extract two incisors to correct the crowding, deep Spee, and increased incisor extrusion and intrusion, and levelling of the teeth. The severe extrusion and protrusion of the lower incisors was corrected with intrusion and retrusion movements. During treatment, it was observed that the patient had pain in tooth #31. The CBCT slices taken revealed radiolucency in the lingual coronal third of the root, consistent with external root resorption. The patient was referred to endodontics. The endodontist examined the tooth but couldn't determine any signs of external root resorption and therefore suspected a radiological artefact. Subsequently, brackets of #42, #41, #31 and #33 were removed, the field of view (FOV) area was narrowed, and CBCT was retaken with metal distractor programme. It was concluded that the

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

radiolucency extending in the CBCT in the lingual root mesial third of the incisor was a metal artefact associated with the bracket on the relevant tooth.
CONCLUSION: Metal brackets and wires used in orthodontic treatment can cause beam hardening and scattering in CBCT images, creating radiolucent areas(artifacts) that mimic external root resorption in healthy tooth roots. Pathologies detected in radiological images must be confirmed by clinical examination. In cases of diagnostic uncertainty, removing the brackets, narrowing the FOV area, and using Metal Artifact Reduction algorithms improves image quality and facilitates accurate diagnosis. To avoid unnecessary endodontic treatments, radiological data should be evaluated carefully.

Abstract citation ID: cjag070.238
SP231 ASSESSMENT OF THE GONIAL ANGLE AS A PREDICTOR OF MANDIBULAR RESPONSE IN CLASS II MALOCCLUSION TREATED WITH FUNCTIONAL APPLIANCES

FRANCESKA VINJOLLI; *CATHOLIC UNIVERSITY OUR LADY OF GOOD COUNSEL, TIRANA, Albania*

AIM: Identify cephalometric predictors of Functional Therapy response in Class II mandibular retrusion
MATERIALS AND METHODS: Twenty-two subjects were divided into two groups based on their Co-Go-Me angle at T0: Group “Low angle” (angles < 125°) and Group “High angle (angles > 125°). Inclusion criteria included an overjet greater than 5 mm, complete Class II malocclusion and an ANB angle > 4°. All subjects underwent lateral radiographic imaging at T0 and T1. Both groups initially presented similar values of the skeletal sagittal relationship. To assess whether there is a significant difference between the groups, a t- test was performed
RESULTS: Statistically significant differences were found, with the low-angle group showing more favorable results: an increase in SNB (P = 0.01), an increase in SNPg (P = 0.02), and a decrease in ANB (P = 0.00). The low-angle group exhibited more significant skeletal changes, while both groups experienced improvements in overjet. In the high- angle group, a greater compensatory inclination of the lower incisors was noted (P = 0.02.
CONCLUSIONS: Lower pretreatment values of the Co-Go-Me angle correlate with more substantial improvements in the skeletal relationships of Class II malocclusion

Abstract citation ID: cjag070.239
SP232 ANALYSIS OF DENTAL ARCH MORPHOLOGY: RELATIONSHIP WITH SKELETAL AND DENTAL PARAMETERS AND ITS ADECUACY WITH PREFORMED ARCHWIRES

Celia López Sevilla, Martín Romero Maroto, Marta Olmos Valverde, María Pérez Chicharro, Azahara Ortiz Peñas; *Universidad Rey Juan Carlos, Madrid, Spain*

AIM: The influence of dental arch form is key in orthodontic planning, affecting overall treatment stability and success. Although various classifications exist to categorize arch morphology, reported variations depend on the population and methodology used. The aim of this study is to determine the prevalence of dental arch forms in patients from the Rey Juan Carlos University Clinic and to analyze their association with different factors. Additionally, the present study aims to evaluate the concordance between the most prevalent arch forms and the most commonly used preformed archwires in the University Clinic.
MATERIALS AND METHODS: A cross-sectional descriptive observational study was conducted using dental models from a sample of 61 participants with a mean age of 20.4 years. Arch forms were classified using OrthoForm templates and Ricketts’ pentamorphic classification. Data collected included age, sex, facial pattern, skeletal class, Angle’s molar class, and transverse discrepancies. Statistical analysis was performed using SPSS, including the chi-square test, ANOVA, and the Kolmogorov–Smirnov test for assessment of normality.
RESULTS: According to the OrthoForm classification, the most prevalent arch form in the upper arch was triangular (49.2%). For Ricketts’ pentamorphic classification, it was conical (34.4%). For the lower arch, the most prevalent form was triangular (45.9%) according to OrthoForm, whereas narrow conical (44.3%) was for Ricketts’ pentamorphic classification. No significant associations were found with age or sex. However, lower arch form showed a significant association with skeletal class, where triangular forms were related to Class II and ovoid forms to Class III. Transverse discrepancies showed statistically significant differences in palatal depth according to facial pattern, with greater widths found in dolichofacial patients. The preformed archwires used in the University Clinic did not match the most common arch forms found in the sample.
CONCLUSIONS: Significant results were identified between archform and skeletal class and palatal depth to facial pattern. Interesting relationships were identified between sex and facial pattern even though they were not statistically significant. A mismatch was observed between the most used preformed archwires and the most prevalent arch forms in the University Clinic, suggesting the need to personalize archwire selection to optimize orthodontic outcomes.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.240
SP233 PSYCHOSOCIAL FACTORS, CENTRAL SENSITIZATION AND CRANIOFACIAL MORPHOLOGY: A PILOT STUDY WITH SUBGROUP ANALYSIS IN WOMEN

Rieko Oyama[1], Junichi Watahiki[2], Takeshi Sakakibara[3], Akira Toyohuku[4], Haruhisa Nakano[5]; *[1]Department of Orthodontics, SHOWA Medical University, Interdisciplinary Orthodontics Research Center, Tokyo Nihombashi AQUA Dental and Orthodontic Clinic, Jiyugaoka Dental and Orthodontic Clinic, Tokyo, Japan, [2]Department of Orthodontics, SHOWA Medical University, Interdisciplinary Orthodontics Research Center, Tokyo Nihombashi AQUA Dental and Orthodontic Clinic, Tokyo, Japan, [3]Department of Orthodontics, SHOWA Medical University, Interdisciplinary Orthodontics Research Center, Jiyugaoka Dental and Orthodontic Clinic, Tokyo, Japan, [4]Institute of Science Tokyo, Interdiscipnary Orthodontics Research Center, Tokyo, Japan, [5]Department of Orthodontics, SHOWA Medical University, Interdisciplinary Orthodontics Research Center, Tokyo, Japan*

AIM: Psychological stress, personality traits and central sensitization (CS) may influence craniofacial morphology, but studies integrating cephalometric and psychosocial measures are scarce. This study examined associations among CS, personality traits and craniofacial morphology in adult dental patients, focusing on sex differences and on young women.
MATERIALS AND METHOD: In this cross-sectional study, 70 patients (≥18 years) without previous orthodontic treatment or major prosthodontic work were recruited from a dental clinic (48 women, 22 men). Central sensitization, personality traits and psychological stress were assessed using the Central Sensitization Inventory (CSI), the Ten Item Personality Inventory–Japanese version and the 23-item Brief stress Scores. Standard lateral cephalograms were obtained and skeletal measurements including SNA, SNB and ANB were recorded. Associations between CSI scores, personality traits and cephalometric variables were examined using Spearman correlation and simple linear regression in the total sample, in women and in a subgroup of women in their twenties.
RESULTS: In the total sample (n = 70), higher CSI scores showed positive trends with SNA and SNB and were significantly associated with higher neuroticism and lower extraversion, whereas stress scores were not related to the main cephalometric variables. In women (n = 48), associations were more pronounced: CSI correlated positively with SNA ($\rho = 0.34$, $p = 0.018$), with a similar trend for SNB, and regression analysis showed that each 1-point increase in CSI was associated with a mean 0.11° increase in SNA ($\beta = 0.11$, $p = 0.020$). In the young female subgroup (n = 22), CSI showed a moderate correlation with SNA ($\rho = 0.45$, $p = 0.020$), with concordant but weaker trends for SNB and ANB, suggesting higher CS scores with maxillary protrusion.
CONCLUSIONS: In this adult cohort, particularly among women and young women, higher CSI scores were associated with maxillary protrusion and a tendency toward mild mandibular protrusion. CSI was positively related to neuroticism and negatively to extraversion, suggesting that psychosocial traits and central sensitization covary with craniofacial morphology. These findings support integrated models linking psychosocial factors, CS and skeletal morphology and highlight the need for larger stratified studies to confirm these associations.

Abstract citation ID: cjag070.241
SP234 EFFECTIVENESS AND SATISFACTION DURING TREATMENT: LINGUAL BRACES VERSUS ALIGNERS IN CASES WITH SEVERE CROWDING AND CLASS II MALOCCLUSION

Valeria Rostirolla; *Clinica Rostirolla, Madrid, Spain*

AIM: To evaluate the effectiveness and patient satisfaction of two orthodontic approaches, lingual braces, and aligners, in treating complex cases with severe crowding and class II malocclusion. The focus is on how these treatments impact patients lifestyles and perceptions throughout their orthodontic journey.
MATERIALS AND METHODS: Two female patients, aged 35 and 25, with high aesthetic demands, were treated. Case 1 involved lingual orthodontics while Case 2 employed aligners. In the case of aligners, sequential distalization and class II elastics were used. In the lingual braces where utilized a combination of coils, elastics, and chains. In both cases, microscrews were not used because the patients did not want to have them placed. Fixed retainers were placed post-treatment, along with nighttime splints.
RESULTS: Case 1, treated with lingual orthodontics for three years and nine months, reported high satisfaction due to the invisibility of the braces, allowing her to maintain her lifestyle without aesthetic concerns. The crowding, crossbites, midlines,

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

and malocclusion were corrected satisfactorily. Case 2, treated with aligners for three years and eight months after the first year of placement, caused anxiety and frustration throughout the process. However, her perception improved significantly because due to work he was able to space out his appointments without delaying his treatment. This underscores the need for orthodontists to consider not only clinical outcomes but also patients emotional well-being during treatment. Throughout the treatment, multiple radiographs including lateral cephalometric, orthopantomography, and temporomandibular joint were taken to monitor progress and ensure that no marked skeletal changes, pathological conditions, or bone loss occurred when comparing initial and final assessments.
CONCLUSION: The choice of orthodontic appliance should align with patient comfort and lifestyle preferences. As aesthetic values become increasingly universal, orthodontists must adapt to meet the growing demand for invisible treatments while ensuring effective clinical outcomes. At the same time, facing a demotivated patient is a problem to the doctor, the clinical team and the reputation of the kind of device we used.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.242
SP235 SOFT-TISSUE SIMULATION IN ORTHOGNATHIC SURGERY: A SCOPING REVIEW OF CURRENT APPLICATIONS AND EVIDENCE

Ellen Schoone[1], Josh Yang[2], Annemieke Bos[1], Tom van Riet[2], Alfred Becking[2]; *[1]ACTA, Amsterdam, Netherlands, [2]Amsterdam UMC, Amsterdam, Netherlands*

AIM: Soft-tissue simulation is used frequently in orthognathic treatment planning, having evolved from traditional 2D prediction methods to modern 3D simulation tools. Despite its widespread use, the clinical application and supporting evidence remain fragmented. This scoping review examines how soft-tissue simulation programs are currently used and highlights gaps in accuracy, clinical relevance and user perspectives.
MATERIALS & METHODS: A scoping review was conducted following PRISMA guidelines. PubMed, Embase and Web of Science were searched for studies reporting the use of soft-tissue simulation programs in orthognathic surgery. Two reviewers independently screened titles, abstracts and full texts using predefined inclusion criteria, disagreements at any stage were resolved through discussion or consultation with a third reviewer. Data were extracted on simulation methods, clinical application, study design and outcome measures.
RESULTS: A total of 50 studies met the inclusion criteria. Most articles focused on the accuracy of soft-tissue prediction by comparing simulated outcomes with postoperative results, using both heterogeneous methods and outcome measures. Only a limited number of studies addressed patient or clinician perspectives, and very few described how soft-tissue simulation is integrated into clinical workflows. Evidence on its impact on clinical decision-making or patient communication was therefore scarce.
CONCLUSION: Soft-tissue simulation is frequently used in orthognathic treatment planning, current literature focuses mainly on accuracy assessments using heterogeneous methods. Evidence on how these programs are implemented in clinical workflows, support decision-making, or contribute to patient communication is limited. This review identifies a substantial knowledge gap in these domains and underscores the need for research that evaluates the impact of soft-tissue simulation.

Abstract citation ID: cjag070.243
SP236 THE IMPLEMENTATION OF EPA-BASED ASSESSMENT IN ORTHODONTIC POSTGRADUATE TRAINING IN FINLAND: A CROSS-SECTIONAL SURVEY

Anu Kiukkonen[1] and Leila Niemi-Murola[2]; *[1]Helsinki University Hospital, Helsinki, Finland, [2]University of Helsinki, Helsinki, Finland*

AIM: Entrustable Professional Activities (EPAs) are defined as key professional tasks that can be entrusted to a trainee once sufficient competence has been reached. The aim of this study was to evaluate the implementation of competency-based postgraduate dental education (CBDE) assessments in Finnish orthodontic postgraduate training and explore students' experiences regarding their use, related as useful, and challenges.
MATERIALS AND METHOD: The study was conducted as an electronic survey (REDCap) among all orthodontic postgraduate students in Finland (n = 56). The questionnaire included items on the frequency of EPA use, related as useful for learning and feedback culture, and barriers to implementation. Data were analyzed using SPSS (version 29.0.0.0) with Pearson correlation and ANOVA to examine associations between EPA use and feedback-related outcomes.
RESULTS: EPA-based assessments (n=6) were widely known and generally related as useful. Their use was significantly associated ($p < 0.001–0.005$) with constructive suggestions for improvement, coaching and feedback discussions that enhance learning, and opportunities for students to provide feedback to supervisors. However, some students reported stress related to assessments, and variability in implementation across training programs was observed.
CONCLUSIONS: EPAs support feedback culture and learning in orthodontic postgraduate education but require further development of assessment structures, matrices, and supervisor calibration. Emphasis on student-centered supervision and psychological safety is essential for successful implementation.

Abstract citation ID: cjag070.244
SP238 ‡‡‡ SLEEP-DISORDERED BREATHING IN CLASS II AND LARGE OVERJET TREATED WITH REMOVABLE FUNCTIONAL APPLIANCE – A CASE-CONTROL STUDY

Camilla Hansen[1], Agneta Markström[2], Merete Bakke[3], Liselotte Sonnesen[1]; *[1]Discipline of Orthodontics, Postgraduate Programme in Orthodontics and Dental Sleep Clinic, Department of Odontology, University of Copenhagen, Copenhagen, Denmark, [2]Department of Women's and Children's Health, The Karolinska Institute, Stockholm, Sweden, [3]Discipline of Clinical Oral Physiology, Department of Odontology, University of Copenhagen, Copenhagen, Denmark*

AIMS: The aim was to examine sleep-disordered breathing (SDB, including snoring) in children aged 9-14 years with class II and large overjet ≥6 mm (study group) before (T0), during (T1) and after treatment (T2) with removable functional appliance during the pubertal growth spurt compared to a control group with neutral occlusion.
METHODS: At T0 the study group included 37 children (19 boys; 18 girls; median age 12.3 years) and the control group included 32 children (16 boys; 16 girls; median age 12.2 years). Exclusion criteria for both groups were diseases, syndromes, known sleep disorders, allergies, asthma, mouth breathing, adenoid vegetations, and hypertrophied tonsils. SDB was assessed by respiratory polygraphy and manually scored for all examinations (T0, T1, T2). Comparing changes in SDB parameters between the groups were tested using general linear model adjusted for gender, treatment time, and body mass index (BMI).
RESULTS: No difference in age, gender, treatment time between the groups. Significant higher numerical BMI was found in the control group ($p<0.001$) at T0, T1 and T2. Mean±SD total treatment time for the study group was 1,5±0.4 y and 1,4±0.1 for the corresponding registrations in the controls. Dropouts from T0-T2 in the study group were 13.5 % and 6 % in the control group.

At T0, no significant difference in SDB was found between the groups, although 8.6% of the children in the study group had SDB and none in the control group. None were diagnosed with SDB at T1 or T2. No significant difference in changes of SDB measurements was found but snore index was almost significantly higher in the study group ($p=0.051$) at T0. No significant differences in SDB parameters were observed from T0-T1, T1-T2, T0-T2 between the groups adjusted for gender, treatment time and BMI.
CONCLUSIONS: 8.6 % of the children in the study group had SDB at T0 but none at T1 or T2. No difference in SDB was found besides that snore index tended to be higher in the study group at T0. No significant difference in changes in SDB parameters over time were found between the groups.

Abstract citation ID: cjag070.245
SP239 MANAGEMENT OF IMPACTED MAXILLARY INCISORS CAUSED BY SUPERNUMERARY TEETH USING RAPID PALATAL EXPANSION AND CLOSED - ERUPTION TECHNIQUE: A CASE REPORT

Karin Singh, Josef Kucera, Alzbeta Tryskova; *1st Faculty Charles University, Prague, Czechia*

AIM: To present the interdisciplinary management of bilateral impaction of maxillary central incisors caused by supernumerary teeth and transverse maxillary deficiency, using rapid palatal expansion and a staged closed-eruption protocol.
MATERIALS AND METHOD: A 10-year-old male presented with failure of eruption of upper central incisors caused by two supernumerary incisors and transverse maxillary deficiency. Clinical examination and cone-beam computed tomography (CBCT) assessed the position of supernumerary teeth and quantified the amount of transverse expansion required to create adequate anterior space. Rapid maxillary expansion was performed using Hyrax appliance, followed by a 3-month retention phase. Upper fixed appliance with transpalatal arch with extension arms for both upper incisors was bonded to initiate alignment and space opening. Following

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

surgical removal of the supernumerary teeth, a closed-eruption surgical exposure protocol was performed for both impacted upper central incisors.
RESULTS: Rapid maxillary expansion successfully restored transverse dimension and created sufficient anterior space. Tooth 11 erupted approximately 6 months after the initiation of active traction. Tooth 21 erupted after approximately 10 months. Both incisors were successfully aligned without notable periodontal or root complication.
CONCLUSIONS: CBCT-assisted diagnosis and staged treatment approach facilitated predictable eruption, preserved periodontal health, and allowed successful integration of both incisors into the dental arch, representing an effective strategy for complex anterior tooth impactions.

Abstract citation ID: cjag070.246
SP240 COMPARISON OF HUMAN THIRD MOLAR DEVELOPMENT IN 18 COUNRY-SPECIFIC POPULATIONS

Emily Van Damme[1], Guy Willems[1], Maria Cadenas de Llano-Pérula[1], Steffen Fieuws[2], Patrick Thevissen[3]; [1]Department of Oral Health Sciences – Orthodontics KU Leuven, Leuven, Belgium, [2]Centre of Biostatistics, Katholieke Universiteit Leuven, Leuven, Belgium, [3]Imaging and Pathology – Forensic Odontology, Leuven, Belgium

INTRODUCTION: Third molar development offers insight into late dental maturation. In orthodontics, this is particularly interesting for evaluating eruption potential, impaction risk, arch-space considerations, and the availability of these teeth during extraction-based treatment planning. However, existing third molar developmental reference data are often limited by small or unrepresentative samples, heterogeneous staging methods, and inconsistent findings regarding population differences. This study examines third molar development across 18 countries using a standardized approach to assess sex- and country-specific patterns in maturation.
MATERIALS AND METHODS: The dataset included 12,412 subjects from 18 countries (5620 males; 6792 females) aged 16–22 years. All present third molars were staged using the modified Gleiser & Hunt (GH) method. Developmental Scores (DS) were estimated using a generalized linear mixed model to summarize overall maturation, with age-adjusted comparisons and tests for country–age interaction. A transition analysis estimated median ages for progression between GH-stages using maximum likelihood (ML) estimates within a Bayesian framework, generating age-specific developmental timelines per country.
RESULTS: Clear sex- and country-related differences in third molar maturation were identified. Males exhibited faster and more variable development than females. Age-corrected comparisons revealed numerous significant differences between countries, and country–age interactions showed that these differences changed with age. Transition analysis showed limited variation at early GH-stages but considerably greater divergence at later stages, with age gaps of up to six years between the earliest and latest transitions.
DISCUSSION: Third molar development varies substantially between countries and between men and women, without following a uniform geographical pattern. DS and ML analyses provide complementary insights, showing increasing divergence at later stages but comparatively limited differences near the legal age of majority, which in most countries is set at 18 years-old.
CONCLUSION: Sex- and population-specific patterns in third molar maturation highlight the need for appropriate reference data to support more accurate age estimation in forensic contexts and clinical assessment in orthodontic or maxillofacial contexts.

Abstract citation ID: cjag070.247
SP241 RETROSPECTIVE STUDY OF ORTHODONTIC ASSESSMENT IN PAEDIATRIC MANDIBULAR FRACTURES: REFERRAL PRACTICES OF ORAL AND MAXILLOFACIAL SURGEONS

Sanna Uggeldahl, Lotta Veistinen, Leena Kannari, Johanna Snäll, Anu Kiukkonen; Helsinki University Hospital, Helsinki, Finland

AIM: The aim of the study was to examine how often and based on which criteria oral and maxillofacial surgeons refer paediatric mandibular fracture patients to an orthodontist for evaluation. A further aim was to examine the duration of orthodontic follow-up of these patients.
SUBJECTS AND METHOD: This was a retrospective study that included patients under 13 years of age with a recent mandibular fracture treated in Helsinki University Hospital in 2013-2018. Trauma-related patient records were assessed. The statistical methods used included Fisher's exact test and logistic regression.
RESULTS: A total of 44 patients (27 males, 17 females, mean age 8.65 years, with a range of 0.46–12.96 years) were included in the study, of whom 32 had a condylar fracture. In total, 15 of all fracture patients were referred to an orthodontist for consultation. These patients were followed by an orthodontist for an average of 6.8 months, with a follow-up duration ranging from 0.3 to 20.3 months. Intermaxillary fixation with fixed appliances and elastics were applied to five patients following the fracture. There was no identifiable predictor, clinical or fracture-related, that influenced the surgeon's decision to refer the patient to an orthodontist.
CONCLUSIONS: Clear guidelines are needed to determine when patients with mandibular fractures should be referred to an orthodontist. In addition, a protocol should be established to monitor and confirm optimal craniofacial growth as well as developing occlusion in these growing patients.

Abstract citation ID: cjag070.248
SP242 SMARTER BRUSHING: MODIFIED ELECTRIC BRUSH HEADS FOR IMPROVED HYGIENE IN ORTHODONTIC PATIENTS

Irene Artioli[1], Katarina Miladinovic[2], Adriano Giacomo Crismani[1], Ines Kapferer-Seebacher[2]; [1]University Hospital of Orthodotics, Medical University of Innsbruck, Innsbruck, Austria, [2]University Hospital for Conservative Dentistry and Periodontology, Medical University of Innsbruck, Innsbruck, Austria

AIM: The aim of this study was to analyze whether shortening the central bristles of a CrossAction brush head (Oral-B®) results in greater plaque reduction on buccal brackets compared with an iO brush head (Oral-B®) and a conventional, unmodified CrossAction brush head (Oral-B®).
MATERIALS AND METHOD: This in vitro study investigated the cleaning performance of modified electric brush heads on orthodontic brackets. Plastic models with buccal brackets (Bio Quick, Forestadent) were used to compare three brush head designs: a conventional CrossAction brush head, an iO brush head, and a customized CrossAction brush head with the central bristles shortened by 2.5–3 mm. Brushing was simulated on the models, with occlusion spray serving as artificial plaque. Cleaning time was standardized at 3 seconds per buccal surface and 2 seconds per occlusal and lingual/palatal surface, for a total brushing duration of 3 minutes and 16 seconds. After each brushing cycle, plaque removal was quantified using the Rustogi Modified Navy Plaque Index (RMNPI). Each brush head was tested in 10 runs, performed three times. Statistical analysis (Kruskal–Wallis and Mann–Whitney U tests) was used to assess differences in plaque reduction between brush head types.
RESULTS: The modified CrossAction brush head achieved the greatest overall plaque reduction, demonstrating both superior cleaning performance and the lowest variability across runs. The iO brush head ranked second, followed by the conventional CrossAction brush head. Mean plaque indices were 7.24% (range: 4.76–10.32%) for the modified CrossAction brush head, 9.72% (range: 6.15–14.48%) for the iO brush head, and 11.41% (range: 8.13–17.86%) for the conventional CrossAction brush head ($p < 0.001$).
CONCLUSIONS: The iO brush head achieved a statistically greater plaque reduction than the conventional CrossAction brush head. Further improvement was observed when the central bristles of the CrossAction head were shortened, resulting in a significantly enhanced cleaning effect. Simple brush head modifications can markedly improve home oral hygiene in patients with buccal brackets.

Abstract citation ID: cjag070.249
SP243 THALASSEMIA PATIENTS AND THE EVALUATION OF MANDIBULAR ASYMMETRY USING KJELLBERG ANALYSIS

Niyazi Yüksel[1], Özgenur Aksoy[1], Ayça Koca Yozgat[2], Ayse Tuba Altug[1], Namık Yaşar Özbek[2]; [1]Ankara University, Ankara, Turkey, [2]Ankara Bilkent City Hospital, Ankara, Turkey

OBJECTIVE: In thalassemia patients, markedly increased hematopoietic activity within the bone marrow leads to notable morphological alterations in maxillary-mandibular growth and development. These changes may particularly affect the structural and functional characteristics of the temporomandibular joint region. Thus, individuals with condylar asymmetry may exhibit accompanying various craniofacial anomalies. The objective of this study is to assess mandibular condylar symmetry in thalassemia patients using the Kjellberg Analysis on panoramic radiographs.
SUBJECT AND METHOD: This retrospective study evaluated panoramic radiographs of 31 thalassemia patients admitted to the Hematology Department of Bilkent City Hospital who were receiving regular blood transfusions. All participants were in permanent dentition period, with a mean age of 17.97 years. The sample consisted of 11 males, 20 females. Mandibular condylar symmetry was assessed using the Kjellberg Analysis performed on panoramic radiographs through AutoCAD software in accordance with established literature. The RH (Co–Go) line extending from the

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

condylar center to the gonion was defined, and the projection of the Mn point—representing the mandibular incisura—onto this line was identified. Based on these landmarks, condylar height ratios were calculated. Data were analyzed using SPSS 22. The Shapiro–Wilk test was applied to assess normality, while independent samples t-tests were used for group comparisons. The chi-square test evaluated associations between categorical variables. The significance level was set at 0.05.
RESULTS: Condylar asymmetry was identified in 58.1% of the sample. The higher prevalence of asymmetry relative to symmetry indicates substantial morphological variation in the mandibular condylar region of thalassemia patients. This suggests that condylar structural differences may represent a common characteristic within this population. Although the number of female participants exceeded males, no significant association was found between gender and asymmetry. Furthermore, no statistically significant difference was detected regarding whether the asymmetry originated from the right or left condyle.
CONCLUSION: This study demonstrates that condylar asymmetry is relatively common in thalassemia patients. While no gender-related differences were observed, studies with larger sample sizes are needed to further clarify the impact of thalassemia on mandibular condylar morphology.

Note: Hilal Algul, DDS and Leyla Sezgin, DDS also contributed to this work.

Abstract citation ID: cjag070.250
SP244 PARENT PERCEPTIONS OF CLASS II MALOCCLUSIONS

Sinead Brosnan[1], Declan Millett[1], Mairead Harding[2], Rhian Fitzgerald[1], Michael Cronin[3]; *[1]Orthodontic Unit, Cork University Dental School and Hospital, University College Cork, Cork, Ireland, [2]Oral Health Services Research Centre, Cork University Dental School and Hospital, University College Cork, Cork, Ireland, [3]School of Mathematical Sciences, University College Cork, Cork, Ireland*

AIMS: To investigate if parent perception of their child's Oral Health Related Quality of Life (OHRQoL), self-esteem, family impact and orthodontic aesthetic treatment need differ in parents of children/adolescents with Class II division 1 malocclusion (II/1M) compared to Class II division 2 malocclusion (II/2M).
MATERIALS AND METHODS: Following ethical approval and consent, 120 parents of children/adolescents awaiting orthodontic treatment and aged 10-16-years (60 with II/1M, 60 with II/2M) completed questionnaires to assess parent perception of their child's OHRQoL (Parent COHIP), their child's self-esteem (Parent CHQ-SE), family impact (FIS) and perception of their child's orthodontic aesthetic treatment need (IOTN-AC). Demographic and clinical variables were also recorded for each child including age, gender of parent and child, socioeconomic status (SES), caries (dentinal caries), dental trauma, overjet, overbite, severity of crowding, as well as IOTN both dental health and aesthetic components. One trained, calibrated assessor undertook recordings

ANOVA was used to investigate associations of OHRQoL, self-esteem and FIS between II/1M and II/2M groups. Perceived IOTN-AC was compared between II/1M and II/2M groups using ordinal logistic regression models.
RESULTS: Parent-reported OHRQoL, self-esteem, family impact and perception of IOTN-AC did not differ significantly between II/1M and II/2M groups (COHIP p=0.2361; CHQ-SE p=0.9161; FIS p=0.3480; IOTN-AC p=0.3191).

Female parent gender and higher SES negatively impacted parent-reported OHRQoL (p=0.0014, p=0.045, respectively), with the gender effect more pronounced for II/1M than II/2M (p=0.0330). Lower SES negatively impacted parent-reported self-esteem (p=0.0125), while caries experience negatively affected family impact (p = 0.0295).

No variables influenced parent-reported IOTN-AC (p>0.05). Parents reported lower IOTN-AC compared to clinician-reported in both II/1M and II/2M groups (p<0.0001 and p=0.0078, respectively). Mean COHIP scores in the II/2M group were lower (indicating worse perceived OHRQoL of their child) for parents who perceived a definite IOTN-AC relative to those who perceived no IOTN-AC.
CONCLUSIONS: There was no significant difference between II/1M and II/2M in relation to parent-reported OHRQoL, self-esteem, family impact or perception of IOTN-AC of their child. Other variables, however, were found to impact perceptions, such as parent gender, SES and dentinal caries.

Abstract citation ID: cjag070.251
SP245 DIGITAL INNOVATION IN ORTHOGNATHIC SURGERY: ENHANCED PRECISION USING CLEAR ALIGNER ORTHODONTICS AND TOOTH BONDED SURGICAL ARCH BAR

Pamela Sze Tai Ching and Paul Lau; *Private, HKSAR, Hong Kong*

AIM: The aim of this presentation is to describe and evaluate a fully digital, wafer-less protocol for managing patients with severe skeletal discrepancies requiring orthognathic surgery, using clear aligner orthodontics in combination with tooth-bonded surgical arch bars. Specifically, the objective is to demonstrate how an integrated digital workflow—from diagnosis and virtual treatment planning to execution of orthodontic and surgical phases—can achieve ≤0.5 mm between simulated and actual post-surgical outcomes. A further aim is to highlight how this protocol enhances occlusal predictability, post-surgical stability, and interdisciplinary communication while maintaining or improving overall treatment efficiency in complex orthognathic cases.
MATERIALS: The protocol begins with comprehensive digital data acquisition, including intraoral scanning and three-dimensional imaging, to generate accurate virtual models for diagnosis and treatment planning. Virtual surgical planning is integrated with clear aligner simulation platforms to coordinate pre-surgical decompensation, skeletal movements, and post-surgical finishing within a digital environment. Tooth-bonded surgical arch bars are designed and positioned to provide stable intraoperative control of occlusion and segment positioning, thereby eliminating the need for conventional occlusal wafers. Throughout the workflow, computer-aided design is used to streamline appliance fabrication, while iterative digital review supports continuous communication between orthodontists, oral and maxillofacial surgeons, and patients, ensuring alignment of expectations and planned outcomes.
RESULTS: Clinical implementation of this digital workflow has demonstrated close agreement between planned and achieved skeletal and dental positions, with deviations maintained within approximately 0.5 mm. The elimination of the traditional wafer, supported by tooth-bonded surgical arch bars, has resulted in highly predictable intraoperative occlusal guidance and stable post-surgical intercuspation. In addition, the integration of clear aligner therapy with virtual planning has facilitated more efficient appliance sequencing, reduced chairside adjustments, and improved coordination of pre- and post-surgical orthodontic phases.
CONCLUSION: A fully integrated digital workflow that combines intraoral scanning, virtual surgical planning, clear aligner orthodontics, and tooth-bonded surgical arch bars can deliver highly precise, reproducible outcomes in orthognathic surgery without the use of occlusal wafers. This approach enhances diagnostic accuracy, treatment customization and interdisciplinary communication, while improving efficiency and patient engagement.

Abstract citation ID: cjag070.252
SP246 APERT SYNDROME: A CASE REPORT ON THE COMBINED SURGICAL AND ORTHODONTIC MANAGEMENT, INCLUDING THE USE OF FACIAL BIPARTITION WITH RIGID EXTERNAL DISTRACTION FRAME

Zinab Kassir, Rosheen Fatima, Lorna Hirst, Suhaym Mubeen; *Great Ormond Street Hospital, London, United Kingdom*

Apert syndrome (OMIM: 101200) is a congenital autosomal dominant condition characterised by the premature fusion of one or more of the cranial sutures (craniosynostosis), facial abnormalities and syndactyly. It has a reported incidence of 1:100,000.

The craniofacial features include turribrachycephaly, hypertelorism, exorbitism, midface hypoplasia, short zygomatic arches and facial asymmetry. Functional issues include raised intracranial pressure, airway obstruction, risk of exposure keratitis or globe subluxation. Patients may require an early tracheostomy for breathing problems. Oro-dental features include narrow, high arched or cleft palate, severe dental crowding, a class III malocclusion, crossbite and anterior open bite.

Aims of surgical management is to improve skull shape, protect the orbits, and to improve airway and nasal space. Improvement in the facial appearance may be achieved through Le Fort III, or monobloc midface distraction osteogenesis, or facial bipartition with rigid external distractor frame attachment.
AIM: We describe the multidisciplinary management of a patient with Apert syndrome, highlighting the role of the orthodontist in the management of facial asymmetries due to Apert syndrome, by covering 3 key stages of their treatment. 1) Facial bipartition surgery with RED frame, 2) anterior bone graft and pre-orthognathic surgery orthodontics, and 3) orthognathic surgery.
SUBJECT: We present a case of an 16-year-old male, diagnosed with Apert syndrome, severe obstructive sleep apnoea and hydrocephalus with ventriculoperitoneal shunt. There were intra-oral findings of significant reverse overjet of 11mm, severe crowding of the upper arch and a severe anterior open bite.
RESULTS: At age 16, the patient underwent midfacial bipartition surgery and RED frame attachment to correct his midface hypoplasia. Prior to the surgery, the patient was orthodontically reviewed to confirm root separation. Orthodontic treatment commenced at age 17, along with alveolar bone grafting surgery to correct his centre-line shift in the upper arch. Orthodontic treatment included the management of multiple palatally displaced teeth. The patient is currently undergoing pre-orthognathic surgery orthodontics, with a surgical plan in place.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

CONCLUSIONS: The clinical features associated with Apert Syndrome have significant impact on a patient's function and psychological health. Management is lifelong, complicated and requires careful multi-disciplinary care.

Abstract citation ID: cjag070.253
SP247 EVALUATION OF THE RELIABILITY OF AN AI-BASED AUTOMATED CEPHALOMETRIC ANALYSIS SOFTWARE COMPARED TO THE MANUAL METHOD

Eliott Delplancq, Maria Jose Gonzalez-Olmo, Thomas Mourgues, Carolina Nieto-Moraleda, Martin Romero; *Rey Juan Carlos University, Alcorcón, Spain*

AIM: To evaluate the reliability and accuracy of an AI-based automated cephalometric analysis software (WebCeph) by comparing its diagnostic outputs with those obtained through manual analysis, used as the reference standard.
MATERIALS AND METHOD: Ninety pre-treatment lateral cephalometric radiographs (T0) were collected and divided into three age groups: children (<13 years, n = 33), adolescents (13–18 years, n = 30), and adults (>18 years, n = 27). All cephalograms met the inclusion criteria of high-quality digital imaging, complete dentition (excluding third molars), and absence of craniofacial anomalies or prior orthognathic surgery. Each radiograph was analyzed using two methods:

1. Manual Ricketts Analysis, performed in Nemotec by one calibrated and blinded orthodontist.
2. AI-Based Automated Ricketts Analysis, performed using WebCeph, which automatically generates the same parameters.

Twelve cephalometric variables—linear, angular, and ratio-based—were extracted for comparison. Statistical analyses included paired t-tests, Intraclass Correlation Coefficient (ICC) to assess reliability, and Pearson correlation to evaluate linear associations. Bland–Altman plots were used to assess agreement and detect systematic bias. A two-factor repeated-measures ANOVA examined the effects of method (manual vs AI) and age group, as well as potential interactions.
RESULTS: All variables showed statistically significant differences between manual and AI measurements ($p < 0.05$), with effect sizes ranging from moderate to large ($\eta^2 = 0.06–0.54$). ICC values ranged from 0.612 to 0.935, indicating generally good reliability, although certain variables (e.g., maxillary depth) showed lower concordance. Pearson correlations were high for most measurements ($r > 0.90$). No significant interaction between method and age group was found, indicating consistent discrepancies across age categories. For the orbit point specifically, the AI-traced landmark demonstrated a vertical deviation of 1.314 ± 1.128 mm and a horizontal deviation of 2.016 ± 1.870 mm relative to the manually traced reference. These deviations affect the construction of the Frankfurt plane, and consequently propagate error into several Ricketts measurements dependent on this reference, reducing diagnostic precision.
CONCLUSIONS: AI-based cephalometric tracing shows strong correlation with manual tracing but presents systematic and clinically relevant differences. Manual and AI methods cannot be considered interchangeable without adjustment, and AI outputs should be interpreted cautiously in diagnostic decision-making.

Abstract citation ID: cjag070.254
SP248 PREVALENCE OF DENTAL ANOMALIES IN PATIENTS WITH CLEFT LIP AND PALATE AND ORTHODONTIC TREATMENT IN CASE OF AGENESIS OF THE MAXILLARY LATERAL INCISOR

Ann Kathrin Binger, Sophia Victoria Josuhn, Adriano Giacomo Crismani; *Department of Orthodontics, Medical University of Innsbruck, Innsbruck, Austria*

AIM: Aim of this study was to evaluate the prevalence of dental anomalies in patients with cleft lip and palate at the Department of Orthodontics and Oral and Maxillofacial Surgery of the Medical University of Innsbruck and compare it to a group of randomly selected patients with a dental anomaly without cleft lip and palate or syndrome. Furthermore the cleft patients were assessed regarding the orthodontic treatment in case of agenesis of the maxillary lateral incisor.
MATERIAL AND METHOD: In this retrospective study 74 cleft patients in the age of $11,1 \pm 3,6$ years treated at the Department of Orthodontics and Oral and Maxillofacial Surgery of the Medical University of Innsbruck during the period from 2003 to 2025 were assessed. Orthopantomograms, intraoral and extraoral photographs, medical records and three-dimensional imaging, if available, were assessed. All analyses were performed using IBM SPSS Statistics and Microsoft Excel.
RESULTS: The study showed a highly significant correlation between sex and cleft type ($p = 0.001$). Male patients predominate in total as well as in the group of unilateral cleft lip and palate on the left side and bilateral clefts. Female patients are more frequently affected by a cleft palate. In the group of dental anomalies agenesis highly significantly predominates ($p < 0,0001$). Tooth 22 is more frequently affected by unilateral cleft lip and palate on the left side and by bilateral clefts, tooth 12 by unilateral cleft lip and palate on the right side. In 81,0 % of cases, patients underwent orthodontic space closure, either with canine substitution or in the case of a persisting lateral incisor of the deciduous dentition if applicable composite restoration; in 10,6 % of these cases also space opening in the posterior region to relocate a subsequent implant restoration was performed.
CONCLUSIONS: The frequency of agenesis of the lateral incisor is significantly dependent on the cleft type. Due to the still ongoing vertical development an implant restoration in the anterior maxillary region in adolescent patients is not possible. Therefore orthodontic space closure and if necessary space opening in posterior region to relocate a subsequent implant restoration is to be sought.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.255
SP249 DIGITAL INTEGRATION FOR MULTIDISCIPLINARY TREATMENT OF HYPODONTIA: CLINICAL CASE SERIES

Pamela Ching and Kieran Tsang; *The University of Hong Kong, HKSAR, Hong Kong*

AIM: The aim of this case series is to demonstrate how an integrated digital workflow can enhance the management of hypodontia cases requiring space redistribution and multidisciplinary care. The primary objective is to show how digital technologies enable precise diagnosis, individualized treatment planning, and coordinated execution across orthodontics, oral surgery, and prosthodontics. A further aim is to illustrate how digital visualization of proposed outcomes improves patient understanding, engagement, and acceptance of complex treatment plans in hypodontia management.
METHODS: Three hypodontia cases requiring space redistribution and prosthetic rehabilitation were managed using a comprehensive digital workflow. Each case began with detailed intraoral scanning and three-dimensional imaging to generate accurate digital records for diagnosis and analysis. Virtual treatment planning and outcome simulation were performed across software platforms to coordinate orthodontic tooth movement, space management, and definitive prosthetic replacement. Digital wax-ups were created to visualize final tooth positions and restorative designs, guiding both fixed appliance and clear aligner therapy where indicated. Shared digital records and simulations facilitated communication and joint decision-making among orthodontists, oral surgeons, and prosthodontists, as well as structured discussions with patients.
RESULTS: Across the three cases, the digital workflow allowed precise simulation of dental and prosthetic outcomes before clinical execution, resulting in controlled space redistribution and improved readiness for prosthetic rehabilitation. Digital planning supported accurate positioning of teeth for implant- or tooth-borne restorations and reduced the need for mid-treatment modification of plans. Multidisciplinary coordination was enhanced through common access to digital models, wax-ups, and simulations, which streamlined sequencing between orthodontic, surgical, and prosthodontic phases. Patients demonstrated better comprehension of treatment objectives and anticipated outcomes due to visual representations, contributing to improved engagement and adherence.
CONCLUSION: A digital approach that incorporates intraoral scanning, computer-aided design, and virtual planning can improve the precision, efficiency, and predictability of hypodontia management. By enabling detailed outcome simulation and shared digital planning, this workflow strengthens interdisciplinary collaboration and optimizes space redistribution for prosthetic replacement. The experience from this case series supports broader adoption of integrated digital workflows as a standard of care in complex hypodontia cases requiring coordinated orthodontic and restorative treatment.

Abstract citation ID: cjag070.256
SP253 POLY-ETHER-ETHER-KETONE (PEEK) AS A MATERIAL FOR FIXED ORTHODONTIC RETAINERS: A SYSTEMATIC SCOPING REVIEW

Claudia Ribeiro[1], Ralph de Vries[2], Burcu Aydin[1]; [1]*Academisch Centrum Tandheelkunde Amsterdam, Amsterdam, Netherlands,* [2]*Vrije Universiteit, Amsterdam, Netherlands*

AIM: Poly-ether-ether-ketone (PEEK), a member of the polyaryletherketone (PAEK) family, has gained attention as a biocompatible, high-performance polymer and a potential alternative to stainless steel wires for fixed orthodontic retention. However, the existing evidence regarding the use of PEEK as an orthodontic retainer material remains scattered, and a clear overview for clinicians and researchers is lacking. This scoping review summarizes the available literature on the use and performance of PEEK for fixed orthodontic retainers and identifies knowledge gaps to guide future research.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

MATERIALS AND METHODS: A systematic search of Ovid MEDLINE, Embase, Web of Science, and Scopus was conducted up to October 15, 2025, in collaboration with a medical information specialist. Studies reporting original data evaluating fixed orthodontic retainers fabricated from PEEK or related PAEK polymers were eligible, including clinical studies, in vitro experiments, animal studies, and finite element analyses. Literature reviews and expert opinions were excluded, but reference lists were screened for gray literature. Two reviewers independently screened studies, with disagreements resolved by consensus. This review is reported according to PRISMA-ScR guidelines.
RESULTS: Of 1149 identified records, 14 studies were included. These comprised 2 randomized controlled trials, 4 clinical reports, and a range of in vitro and finite element analysis studies. Considerable variability was observed in retainer design (with round 0.8-mm PEEK most frequently tested), PEEK materials (DD-PEEK-MED most used), fabrication modes (milled PEEK most frequently applied), surface treatments (mechanical roughening or air abrasion), bonding protocols and outcome measures. Short-term clinical studies suggested acceptable stability up to the longest reported follow-up of 6 months and reduced plaque accumulation compared with stainless steel retainers, although evidence was limited.
CONCLUSIONS: Substantial heterogeneity exists across available studies regarding testing protocols, retainer dimensions, surface treatments, bonding procedures, and outcome measures. Current evidence provides insufficient consensus on optimal PEEK retainer design, recommended surface treatment, or long-term clinical performance. Although results from the first randomized clinical trials are promising, additional prospective clinical studies with extended follow-up are required. Development of standardized testing protocols for orthodontic fixed retainers, similar to ISO standards, would facilitate comparability across in vitro studies and support evaluation of emerging polymer-based materials.

Abstract citation ID: cjag070.257
SP254 COMPARISON OF ARNETT AESTHETIC CEPHALOMETRIC PARAMETERS WITH CURRENT BEAUTY PREFERENCES

Kenza Khair, Alberto de Lucas Martínez, María José Martínez Lozano, Elsa Conde Disla, Martín Romero Maroto; *Rey Juan Carlos University, Alcorcón, Spain*

AUTHORS: K. Khair, A. de Lucas Martínez, M.J. Martínez-Lozano, E. Conde-Disla, M. Romero Rey Juan Carlos University, Madrid, Spain
TITLE: COMPARISON OF ARNETT AESTHETIC CEPHALOMETRIC PARAMETERS WITH CURRENT BEAUTY PREFERENCES
AIM: To analyse the preferred facial profile aesthetics in a general Caucasian Spanish population and compare these preferences with Arnett's soft tissue cephalometric norms, in order to improve orthodontic treatment planning focused on facial balance and attractiveness.
MATERIALS AND METHODS: A digital survey was created using Microsoft Forms including standardized profile photographs of real patients. Modified images were produced to simulate different facial biotypes (mesofacial, dolichofacial and brachyfacial) combined with skeletal Class I, II and III patterns. Respondents were asked to select the most attractive option for male and female profiles. Preferences were compared with published normative values of Arnett and Bergman (1993). Statistical analysis was performed for sex-related differences using chi-square tests with a significance level of $p < 0.05$.
RESULTS: In female profiles, skeletal Class I was preferred across all facial biotypes (≈90%), followed by Class II. In male profiles, Class I was also most preferred, although acceptance of Class III was higher than in females. The mesofacial biotype received the highest aesthetic score in both sexes, while the dolichofacial pattern was additionally valued in males, particularly in Class II and III simulations. No statistically significant differences were found between male and female respondents ($p > 0.05$). Compared with Arnett's cephalometric standards, survey results showed agreement regarding preference for greater lower facial height and increased chin projection in males, reflecting a tendency towards slightly dolichofacial and more prominent mandibular profiles. For female profiles, preferences aligned predominantly with Class I mesofacial harmony.
CONCLUSIONS: The general population prefers straight profiles, mildly convex in females and slightly concave in males. Mesofacial patterns are most valued, followed by dolichofacial—especially for male facial aesthetics—and skeletal Class I is strongly preferred. Current aesthetic preferences are broadly consistent with Arnett's norms, supporting their relevance in modern orthodontic planning focused on enhancing soft-tissue balance and facial attractiveness.

Abstract citation ID: cjag070.258
SP255 AN AUDIT TO EVALUATE CONE BEAM COMPUTED TOMOGRPAHY TAKEN FOR THE DENTOALVEOLAR JOINT CLINIC

Yit Shern Ho and Sirisha Ponduri; *Portsmouth Hospital University NHS Trust, Portsmouth, United Kingdom*

BACKGROUND: Cone Beam Computed Tomography (CBCT) provides high-resolution 3D imaging of teeth, jaws, and surrounding structures, offering superior diagnostic accuracy over traditional 2D radiographs. While highly beneficial for orthodontic assessment and surgical planning, CBCT involves higher radiation exposure and should be used judiciously, following evidence-based guidelines.
AIMS: 1. To assess the adherence to CBCT selection criteria 2. To evaluate the formal radiographic report of CBCT
MATERIALS AND METHOD: A two-cycle retrospective audit carried out from 1/6/2024 to 31/8/2024 and 1/2/2025- 30/4/2025 respectively in Orthodontic-Oral Surgery Joint Clinic at Queen Alexandra Hospital.
Gold standards:

1. 100% adherence to BOS CBCT Selection Criteria: unerupted canines, dilacerated teeth, surgical planning of unerupted teeth and assessment of cleft palate
2. 100% formal CBCT report completed by the oral surgeons (specialist/consultant)

Data for patients referred for CBCT in the joint clinic was retrieved from the database using the designated clinical code. A total of 33 samples and 21 samples were included in the respective 1st and 2nd cycles of the audit. The data was accumulated on a digital proforma with protection of patient's confidentiality.
RESULTS: 1st cycle

1. Adherence to CBCT selection criteria- 100%
2. Formal radiographic report of CBCT- 24%

2nd cycle

1. Adherence to CBCT selection criteria- 100%
2. Formal radiographic report of CBCT- 95%

CONCLUSIONS: In the 1st cycle, the audit demonstrated 100% adherence to CBCT selection criteria guideline while formal CBCT report did not meet the standard. Findings were discussed at the clinical governance meeting and a standardised CBCT report template was introduced. It showed a tremendous positive impact in the 2nd cycle.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.259
SP256 EFFECTIVENESS OF THE QUADHELIX MAXILLARY EXPANDER VERSUS OTHER APPLIANCES IN GROWING PATIENTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Andrea Pinilla, Gregory S Antonarakis, Alexandra K Papadopoulou; *University of Geneva, Geneva, Switzerland*

BACKGROUND: Maxillary constriction is common in primary and early mixed dentitions with maxillary expansion being the conventional treatment approach using various appliance designs.
AIM: To evaluate the effectiveness of the quadhelix maxillary expander (QH) versus other expanders in growing patients with maxillary constriction.
MATERIALS AND METHODS: Ten databases were searched up to August 2025 for randomized and nonrandomized comparative studies on growing patients needing maxillary expansion. Intervention: expansion with QH. Comparators: other expanders, including rapid maxillary expanders (RME) or removable plates. Outcomes: crossbite correction, treatment duration, maxillary and mandibular interdental transverse widths, patient reported outcomes, and long-term stability/relapse. The random-effects meta-analysis model was used for data synthesis. Risk of bias was assessed using appropriate per-study design tools (RoB2 for RCTs and ROBINS-I V2 for non-RCTs).
RESULTS: Twenty-eight studies (31 publications) were included while data from 19 publications on 1028 participants, were meta-analysed. Insignificant differences were found between QH and tooth-borne RME in the maxillary intercanine and intermolar widths measured at the cusps and fossa. Contrary to this, on the long-term, QH showed greater relapse on the molars over tooth-borne RME (MD: 0.6mm, 95%CIs: 1.08-0.11). Regarding QH versus removable plates, the former significantly outperformed the latter for intermolar widths measured at the buccal cusps, central fossa and gingival crest (MD:0.97mm, 95%CIs:0.13-1.82; MD:1.13mm, 95%CIs:0.49-1.76; MD: 1.19mm, 95%CIs:0.48-1.89). Differences in the induced mandibular changes, crossbite correction and relapse of the crossbite

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

were not statistically significant across groups. Nevertheless, the risk of bias for most of the included articles was considered moderate to high while any differences should be considered also from the point of clinical significance and relevance.
CONCLUSION: In growing patients with maxillary constriction, QH achieves greater results than removable plates while treatment effects are equal to those of tooth-borne RME. Due to heterogeneous study designs, methods used, and risk of bias, patient-reported benefits, harms, and cost-effectiveness remain uncertain. Appliance selection depends on dentoalveolar and skeletal goals, patient preferences, compliance, and relapse potential. Future well-designed studies with long-term follow-up are required to address the remaining knowledge gaps.

Abstract citation ID: cjag070.260
SP257 ‡‡‡ SURFACE ROUGHNESS OF SIX DIFFERENT ORTHODONTIC BRACKET SLOTS: A COMPARATIVE ANALYSIS

Christianna Iris Papadopoulou, Lisa Josefine Langer, Kathrin Becker; *Department of Orthodontics and Dentofacial Orthopedics, Center for Oral Health Sciences CC3, Charité—Universitätsmedizin Berlin, Berlin, Germany*

AIM: The aim of this study was to compare the surface roughness of bracket slots across six different orthodontic bracket types. Increased surface roughness may affect frictional resistance and, consequently, treatment efficiency.
MATERIALS AND METHOD: The surface roughness of the bracket slots (measured as Sa and Ra values) was evaluated for the following orthodontic bracket types from GC Orthodontics and 3M™ Solventum: Experience Metal Rhodium SL, Experience Ceramic SL, Chic Mini Ceramic, Legend Mini, Mini Uni-Twin, and Victory. For each bracket type, measurements were performed on the upper left central incisor, upper left canine, and upper left second premolar (UL1, UL3, UL5). Three measurements were taken per bracket slot (mesial, center, distal), and each measurement was repeated three times to ensure reliability. All analyses were conducted using a 3D laser scanning microscope (Keyence, VK-X3000 series) at 20,000x magnification. Statistical analysis was performed using mixed linear models to evaluate the effects of bracket type and slot region on surface roughness.
RESULTS: Overall, the Chic Mini Ceramic and Legend Mini brackets showed the highest surface roughness values, particularly at the distal and center slot regions. In contrast, the Experience Metal Rhodium and Victory brackets showed the lowest surface roughness levels. Distal slot regions consistently had the highest Ra and Sa values, in contrast to the center regions, which tended to show lower roughness levels. For both Ra and Sa measurements, the interaction between bracket type and slot region was statistically significant ($p < 0.001$).
CONCLUSION: The results show significant differences in surface roughness among the evaluated bracket types. Further studies are needed to determine whether these differences have a clinically relevant impact on frictional resistance, tooth movement, and overall orthodontic treatment efficiency.

Abstract citation ID: cjag070.261
SP260 TRANSVERSE DIAGNOSTIC METHODS IN ORTHODONTICS: A SCOPING REVIEW

Tomás Wiberg-Cabrera, Marta Orriols-Galve, Anna Monill-González, Meritxell Sánchez-Molins, Nuno Gustavo d'Oliveira; *University of Barcelona, Barcelona, Spain*

AIM: Accurate diagnosis of transverse discrepancies is essential in modern orthodontics, as it directly affects treatment planning and long-term stability. To identify and describe diagnostic methods reported in recent literature (2020–2025) for evaluating the transverse dimension, analysing their clinical foundations, advantages, limitations and applicability.
MATERIALS AND METHODS: Scoping review following PRISMA-ScR guideline. Searched PubMed, Scopus, Web of Science and Cochrane Library for cross-sectional observational studies and reviews published 2020-2025. Selection and data extraction performed in duplicate. Risk of bias assessed using JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies and SANRA tools. No meta-analysis due to heterogeneity.
RESULTS: 18 studies included: 17 cross-sectional (mean sample 230; age 5.5–60 years; 44% male) and 1 narrative review. Methods: classic indices (Pont's index), cephalometric analyses, visual assessments, and CBCT-based techniques (UPenn, Yonsei, Andrews Element III, Boston University, and 4 novel proposals). CBCT methods demonstrated high intra- and inter-examiner reliability (ICC >0.85–0.98) and superior accuracy for basal bone measurements vs. classic indices, but limited by cost and radiation. Classic indices showed low external validity and ethnic dependence (e.g., Pont's index inapplicable in non-Caucasians). No direct comparative studies across methods found; heterogeneity in criteria noted. Risk of bias: low (6), medium (8), high (3); narrative review high quality (SANRA 10/12).
CONCLUSIONS: Transverse diagnostic methods differ in references (skeletal vs. dentoalveolar) and supports (models, frontal cephalometrics, standardized visual evaluations, CBCT). Modern CBCT-based methods offer greater precision and reproducibility, while classic methods have limitations in validity and applicability. Among CBCT techniques, Yonsei shows superior reliability in Class III; UPenn recommended for Class I/II, as Yonsei lacks evidence in non-Asians. Evidence limited and heterogeneous; multicenter studies with standardized criteria needed to unify practice and improve comparability.

Abstract citation ID: cjag070.262
SP262 IS CLEFT-Q CONSISTENT IN ASSESSING THE ORAL HEALTH-RELATED QUALITY OF LIFE OF PATIENTS WITHOUT ORAL CLEFTS? A CASE-CONTROL STUDY

Marie Stroo, Guy Willems, Pieter-Jan Verhelst, An Verdonck, Maria Cadenas de Llano Perula; *KU Leuven, Leuven, Belgium*

BACKGROUND: Cleft-Q is a tool for Oral Health-related Quality of Life (OHRQoL) assessment in patients with oral clefts, proposed in 2017. Although Cleft-Q norm values are available for non-cleft patients, the consistency of Clef-Q in these patients is a subject of debate, since some subdomains seem to perform insufficiently.
AIMS: To compare Cleft-Q scores of patients with and without oral clefts measured at (1) and between (2) ages 8 and 11 and (3) to investigate the internal consistency of Cleft-Q in a non-cleft population.
MATERIALS AND METHOD: All 8 and 11 year-old patients seeking treatment at our Department of Orthodontics were invited to participate. The population was divided into patients with non-syndromic uni- or bilateral cleft lip and palate, cleft lip and alveolus or cleft palate and the non-cleft group. The Dutch translation of Cleft-Q was filled in by all included patients before the start of orthodontic treatment. Group comparisons on subscale scores were performed using the Mann-Whitney U test. The internal consistency of the subscales was quantified with Mcdonalds Omega(h).
RESULTS: 25 (11 female) and 172 (98 female) patients were included in the cleft and non-cleft group respectively. No significant differences in total nor domain-dependent Clef-Q scores were found between groups at any of the ages, nor was there a difference between ages, except for 'Eating and drinking' who achieved a significantly higher mean score in 11 year-old compared to 8 year-old non-cleft patients (p=0.015). For Aim (3), while the Cleft-Q domains 'Appearance of the Face' and 'Appearance of the Teeth' showed high internal consistency (0.738 and 0.898) in 8 year-olds, domains 'Social Function' and 'Eating and Drinking' did not (0.570 and 0.572). In non-cleft 11 year-olds, the internal consistency of domains 'Appearance of the Face', 'Jaws', 'Teeth','Psychological function' and 'School function' showed high internal consistency (0.817,0.916,0.867,0.794 and 0.794) while 'Eating and Drinking', 'Speech distress' and 'Speech function' did not (0.468,0.535 and 0.657).
CONCLUSIONS: The internal consistency of several Cleft-Q domains is insufficient in non-cleft patients, particularly 'Eating and Drinking'. This domain should be either excluded in future studies or formally adapted into a properly-performing true scale.

Abstract citation ID: cjag070.263
SP263 *** PREDICTING TRANSVERSAL ARCH EXPANSION OUTCOMES WITH INVISALIGN ALIGNERS IN PERMANENT DENTITION: A SYSTEMATIC REVIEW AND META-ANALYSIS

Marta Adele Calo', Elisa Boccalari, Marco Serafin, Alberto Caprioglio; *Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milan, Italy*

AIM: This review aimed to determine how accurately Invisalign aligners achieve transverse expansion in permanent dentition and to identify clinical or methodological variables that may influence expansion performance.
MATERIALS AND METHOD: A structured search of PubMed, Embase, Scopus, and WOS (up to November 2025) retrieved clinical studies reporting both prescribed and obtained transverse expansion. Predictability, expressed as the achieved/planned expansion ratio, was analyzed using random-effects meta-analyses with logit-transformed proportions. Separate pooled estimates were generated for each tooth group within the upper and lower arches. To evaluate potential modifiers of accuracy, meta-regressions, non-parametric correlations, and linear as well as multivariable regression models were applied, considering publication year, age, arch, tooth type, material, aligner-change frequency, and magnitude of planned/achieved movement. Risk of bias was evaluated via ROBINS-I and certainty of evidence with GRADE.
RESULTS: Twenty-three studies involving 1391 patients were included; 21 contributed data to meta-analysis. Mean predictability reached 75.5% in the maxilla and

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

80.6% in the mandible. Mandibular second premolars showed the greatest accuracy (88%), whereas lower second molars were least predictable (73%). In studies reporting both reference levels, gingival-margin accuracy was consistently lower than cusp-level values. Prediction intervals were wide, indicating substantial variability. Meta-regression identified small but significant decreases in predictability in more recent studies (p=0.01) and with increasing age (p=0.016). The association between achieved expansion and predictability was positive but limited. In multivariable models, younger age (p=0.001), SmartTrack material (p<0.001), and mandibular sites (p=0.001) independently predicted higher accuracy. Publication bias was evident, and overall certainty of evidence was very low.
CONCLUSIONS: Invisalign aligners demonstrate moderate-to-high reliability for dentoalveolar transverse expansion in permanent dentition, with especially favorable results in premolar areas and in the mandible. Expansion primarily reflects buccal crown tipping. Age, material, and arch position exert modest effects on performance, underscoring the importance of realistic digital planning, selective overcorrection, and prudent case selection.

Abstract citation ID: cjag070.264
SP264 VALIDATION OF THE CAMPER-WITS METHOD FOR SAGITTAL MAXILLOMANDIBULAR DISCREPANCY ASSESSMENT USING CBCT DATA

Giuliano Zanotti[1], Valeria Giulia Borzi[1], Yana Shumska[1], Marco Serafin[1], Alberto Caprioglio[2]; *[1]Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milan, Italy, [2]Department of Biomedical, Surgical and Dental Sciences, University of Milan, and IRCCS Fondazione Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy*

AIM: To evaluate a sagittal skeletal measurement based on projecting points A and B onto the Camper plane, and to compare its diagnostic performance with ANB and the traditional Wits appraisal using three-dimensional CBCT data. Additional attention was given to the behaviour of the three measurements in situations where the occlusal plane may not offer a stable reference.
MATERIALS AND METHOD: A retrospective sample of 249 CBCT scans was reviewed. Three-dimensional skeletal, dental, and soft-tissue landmarks were identified using a standardized protocol intended to reduce operator variability. Camper-Wits, ANB, and Wits values were computed for each subject. Statistical analysis included Pearson and Spearman correlations, ordinary least-squares regressions, agreement statistics for both three-class and binary classification. Bland–Altman plots were also used to check for any systematic differences among the measurements. A conservative Class I interval for Camper-Wits was established through a Theil–Sen regression applied to subjects who exhibited concordant Class I skeletal characteristics (ANB 0–4°, Wits −2 to +2 mm).
RESULTS: Camper-Wits demonstrated the strongest correlation with ANB ($r = 0.875$, $p < 0.001$) and provided higher three-class agreement with ANB (73.9%) compared with Wits (35.3%). The calibrated Class I range for Camper-Wits extended from −2.736 to +0.683 mm. Wits values were affected by occlusal-plane inclination, resulting in weak concordance with ANB ($\kappa = 0.058$) and a consistent positive bias relative to Camper-Wits (mean difference +3.12 mm). Camper-Wits remained stable despite changes in the occlusal plane, cranial-base variability, or dental compromise.
CONCLUSIONS: Compared with ANB and the traditional Wits appraisal, Camper-Wits offered a more consistent representation of sagittal maxillomandibular relationships, especially when the occlusal plane was variable or not clearly identifiable. Regression mapping suggested diagnostic thresholds for Camper-Wits of: Class III < −3.9 mm, Class I −3.9 to +1.2 mm, and Class II > +1.2 mm. This approach can be integrated into low-dose diagnostic workflows through facial-scan and reduced-FOV CBCT registration. Additional studies would be useful to assess the consistency of landmark identification and confirm applicability across different clinical settings.

Abstract citation ID: cjag070.265
SP266 EFFECTS OF PERIODONTAL LIGAMENT MYOFIBROBLAST ON RELAPSE AFTER ORTHODONTIC TOOTH MOVEMENT

Yoko Hikida, Mami Shimizu, Ryota Nakajima, Reika Taniguchi, Shinichi Negishi; *Nihon Univercity School of Dentistry at Matsudo, Chiba, Japan*

AIM: In orthodontic practice, relapse of the dentition frequently occurs even after the retention phase. This relapse is considered to result from the retraction force exerted by periodontal ligament fibres that were stretched by orthodontic forces, as they attempt to return to their original state. Recent studies suggest that orthodontic forces induces the expression of Transforming Growth Factor β1 (TGF-β1), leading to the differentiation of fibroblasts into myofibroblasts, which possess strong contractile forces. This process is thought to be related to post-treatment relapse. Therefore, this study aimed to clarify the relationship between relapse following orthodontic treatment and myofibroblasts.
MATERIALS AND METHOD: *In vitro*: Human Periodontal Ligament Fibroblasts (HPLF cells) were treated with TGF-β1 at concentrations of 0, 5, 10, and 20 ng/ml to examine concentration-dependent effects. Next, to reproduce relapse, HPLF cells were subjected to 10% tensile force and treated with 0, 5, and 10 ng/ml TGF-β1 for 36 hours. Following removal, RT-PCR was used to examine the gene expression levels of α-Smooth Muscle Actin (α-SMA) and Tenascin-C.

In vivo: Wistar female rats (n=36) were performed experimental tooth movement for 14 days. These were divided into three groups: a retention group, a non-retention group, and a control group that no movement. The amount of relapse was measured using micro-CT at days 0, 14, 28, and 42 after the start of the experiment. Immunohistochemical staining was also performed to examine α-SMA.
RESULTS: *In vitro*: In the TGF-β1 concentration experiment, both α-SMA and Tenascin-C gene expression levels increased in a concentration-dependent manner compared to the control group. Furthermore, in the relapse reproduction experiment, even after removing the effects of 5, 10 ng/ml, both α-SMA and Tenascin-C gene expression peaked at 48 hours.

In vivo: On day 0, α-SMA-positive cells were present in all three groups. By day 14, α-SMA-positive cells further increased in the experimental groups. By day 42, a decrease in the number of positive cells was observed in the non-retained group.
CONCLUSIONS: It is conceivable that TGF-β1, expressed during orthodontic tooth movement, induces differentiation from fibroblasts to myofibroblasts, potentially contributing to relapse after treatment.

Abstract citation ID: cjag070.266
SP267 CYTOGENETIC BIOMONITORING OF RADIOGRAPHIC AND CONE-BEAM COMPUTED TOMOGRAPHIC EXPOSURES IN ORTHODONTIC TRAETMENT PLANNING

Bora Ismail Biren, Merve Kurnaz, Kubilay Gocucu, Sirin Funda Eren, Sibel Biren; *Kent University, Istanbul, Turkey*

AIM: This study aimed to investigate nuclear alterations in exfoliated buccal mucosa cells of patients who underwent orthodontic imaging with lateral cephalometric and panoramic radiographs or cone-beam computed tomography (CBCT), and to compare these findings with those of a control group.
METHODS: The study included 20 control participants, 20 individuals whose orthodontic records were obtained using lateral cephalometric and panoramic radiographs, and 20 individuals imaged with CBCT. Buccal mucosa cells were collected 10 days after imaging in the study groups, while samples from the control group were obtained during the first visit. Exfoliated cells were scraped from the inner cheek and spread onto slides using a moistened spatula. To evaluate micronucleus activity and nuclear abnormalities, Feulgen staining and Papanicolaou (PAP) staining were applied. Feulgen was selected for its specificity in demonstrating nuclear characteristics, whereas PAP allowed visualization of both nuclear and cytoplasmic structures. Micronuclei were defined as round or oval bodies within the cytoplasm, measuring approximately one-fifth to one-third of the main nucleus and exhibiting similar staining characteristics. For each participant, 1,000 cells were examined, and nuclear anomalies were recorded. Statistical analyses were performed using Student's t-test, Friedman test, Kolmogorov–Smirnov test, Mann–Whitney U test, Wilcoxon test, Fisher's exact test, and Tukey test, with significance set at $p<0.05$.
RESULTS: No statistically significant differences were found between the groups in either staining method ($p>0.05$), largely due to high intergroup variability. However, comparison of the two techniques revealed notable discrepancies, especially in karyorrhexis counts, which showed significant differences across all groups ($p<0.05$). In addition, micronucleus counts in the radiograph group and budding findings in the CBCT group varied between PAP and Feulgen staining. PAP staining detected anomalies in 2 control subjects, 5 subjects in the radiograph group, and 6 subjects in the CBCT group, while Feulgen staining identified abnormalities in 6, 10, and 10 subjects, respectively.
CONCLUSION: Despite marked sensitivity differences between staining techniques, neither method revealed significant group-to-group variation. Feulgen staining exhibited greater sensitivity in detecting nuclear damage, particularly karyorrhexis. Overall findings suggest that dental radiographic procedures cause minimal biological effects, underscoring the importance of standardized cytological evaluation protocols.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.267
SP269 ORTHODONTIC TREATMENT-INDUCED CHANGES IN GINGIVAL PHENOTYPE AND KERATINIZED GINGIVAL WIDTH

Seher KARACA[1], Emel Tugba ATAMAN DURUEL[2], Hande GORUCU COSKUNER[1]; [1]Department of Orthodontics, Faculty of Dentistry, Hacettepe University, Ankara, Turkey, [2]Department of Periodontology, Faculty of Dentistry, Hacettepe University, Ankara, Turkey

AIM: To evaluate the changes in keratinized gingival width (KGW) and gingival phenotype (GP) of mandibular central incisors from the pre-treatment period to the sixth month of orthodontic treatment, and to determine the relationship of these changes with lower incisor inclination and symphysis dimensions.
MATERIAL AND METHODS: This clinical study included 59 orthodontic patients (46 female, 13 male, mean age=15,9±2,6 years). Individuals with poor oral hygiene, gingivitis, or fibrous gingival overgrowth were excluded. Periodontal examinations and cephalometric radiographs were performed before treatment (T0) and at 6 months after the initiation of orthodontic treatment (T1). IMPA, symphysis length (Ido-Me distance) and alveolar symphysis width (B-B' distance) were evaluated with ImageJ program (Version 1.54i). KGW and GP were assessed using a periodontal probe and a Colorvue Biotype Probe (CBP; Hu-Friedy, Chicago, IL), respectively.

Statistical analyses were performed using IBM SPSS version 23. Multiple linear regression analysis was used to evaluate the contribution of lower incisor inclination and symphysis dimensions to KGW variation. Additionally, ordinal logistic regression was conducted to investigate variables predicting the three categories of GP change (decreasing–unchanged–increasing) during orthodontic treatment.
RESULTS: Among the 59 orthodontic patients, KGW increased in 23 patients (1.32 ±0.71 mm), remained unchanged in 24 patients (0.05±0.29 mm), and decreased in 12 patients (–1.03±0.45 mm). Regarding GP, gingival thickness increased in 12 individuals, remained unchanged in 28 individuals, and decreased in 19 individuals. Based on the regression coefficients, only Ido-Me distance had a statistically significant effect on KGW of the mandibular central incisors (β=0.277, t=2.152, p=0.036). The overall regression model explained approximately 12% of the variance. In the ordinal logistic regression model, baseline Ido–Me distance was the only significant predictor of GP changes.
CONCLUSIONS: Symphysis length was found to play a determining role in both GP and KGW changes during orthodontic treatment. Individuals with a greater symphysis length at baseline may have a higher risk of decrease in GP. In contrast, an increase in the Ido–Me distance during treatment, reflecting greater vertical dentoalveolar development, was associated with a significant increase in KGW.

Abstract citation ID: cjag070.268
SP270 COMPARATIVE EFFECTS OF D-BAR ANCHORAGE ON THE FIRST PREMOLAR VERSUS THE CANINE: A CLINICAL AND BIOMECHANICAL EVALUATION

Carla Clemente[1], Gianluca Mampieri[2], Giulia Campanella[1], Lorenzo Nespoli[1], Aldo Giancotti[2]; [1]Post-graduate Student Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy, [2]Associate Professor, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy

AIM: The aim of this study was to assess the distalizing efficiency and dental side effects of the D-bar appliance in Class II treatment, comparing designs in which the mesial end contacts either the first premolar or the canine, and evaluating their effects on molar distalization, tipping patterns and anchorage loss.
MATERIALS AND METHOD: A total of 36 adolescents (mean age 12.4 ± 1.3 years) with a Class II molar relationship were enrolled and randomly assigned to two groups: Group P (n = 18), with the mesial portion of the D-bar contacting the first premolar, and Group C (n = 18), with the mesial end contacting the canine. All subjects followed identical activation protocols. At baseline (T0) and after completion of distalization (T1), cephalograms and digital dental models were examined. Measurements included: first molar distal movement (mm), premolar and canine positional changes and modifications in overjet and molar relationship. Statistical analysis was performed using paired T-tests for intragroup comparisons and independent T-tests for intergroup differences, with significance set at $p < 0.05$.
RESULTS: Mean molar distalization was similar (Group P: 2.8 ± 0.6 mm; Group C: 2.6 ± 0.7 mm; p = 0.09). However, side effects varied significantly according to the mesial contact. Premolar-anchored appliances produced greater premolar mesial tipping (3.1° ± 1.0° vs. 1.5° ± 0.8°; $p < 0.001$), whereas canine-anchored appliances exhibited higher canine rotation (2.7° ± 1.2° vs. 1.3° ± 0.7°; $p < 0.01$). Anchorage loss was greater in Group P in which premolars showed mesial movement of 1 ± 0.3 mm, while canines in Group C moved mesially only 0.4 ± 0.2 mm ($p < 0.001$). Overjet reduction was comparable (Group P: 2.2 ± 0.5 mm; Group C: 2.0 ± 0.4 mm; p = 0.18). No significant differences were observed in molar tipping or treatment duration.
CONCLUSIONS: Both D-bar configurations achieved effective maxillary distalization; however, the mesial contact point modulated side effects: first-premolar contact resulted in greater distal tipping and anchorage loss, whereas canine contact yielded better control and anchorage preservation despite increased canine rotation. Therefore, anchorage selection should align with specific biomechanical goals and patient's characteristics.

Abstract citation ID: cjag070.269
SP273 AUTO3DCEPH: OPEN SOURCE CT AND CBCT CEPHALOMETRIC LANDMARKING VIA DEEP LEARNING

Gauthier Dot[1], Laurent Gajny[2], Hicham Benyahia[3], Thomas Schouman[4], Akhilanand Chaurasia[5]; [1]Université Paris Cité and Sorbonne Paris Nord, UMR1333 INSERM Santé Orale, Paris, France, [2]Institut de Biomecanique Humaine Georges Charpak, Arts et Metiers Institute of Technology, Paris, France, [3]Mohammed V University, Rabat, Morocco, [4]Service de Chirurgie maxillo-faciale, Sorbonne Université, AP-HP, Hôpital Pitié Salpêtrière, Paris, France, [5]Department of Oral Medicine and Radiology, Faculty of Dental Sciences, King George Medical University, Lucknow, India

AIM: This research aimed to develop and evaluate a new open-source tool called Auto3DCeph for automatic cephalometric landmarking of CT and CBCT scans.
MATERIALS AND METHOD: A retrospective sample of 300 CT and CBCT scans from several institutions was used as a training/validation set of a custom deep learning pipeline for three-dimensional (3D) landmarking. The reference data consisted of 33 landmarks, manually localized by trained operators. The performance and generalizability of the tool was evaluated by comparing annotations provided by experts and automatic landmarking; the outcome set included localization accuracy and 23 cephalometric measurements. Two hold-out test datasets were used: an internal dataset of 50 CT and CBCT scans acquired before orthognathic surgery and an external dataset of 50 CBCT scans acquired for orthodontic purposes in another institution.
RESULTS: On the internal test set ($n = 50$), the mean localization error for all landmarks was 1.2mm ± 1.2mm and success detection rates for 2.0, 2.5, and 3.0mm precision ranges were 86.7%, 92.2% and 95%, respectively. On the external test set ($n = 50$), the mean localization error for all landmarks was 1.6mm ± 1.3mm and success detection rates for 2.0, 2.5, and 3.0mm precision ranges were 78.2%, 86.9% and 91.6%, respectively. On both test sets, mean differences between the reference and predicted 3D cephalometric measurements were 0.1 ± 2.5° for angular observations and 0.1 ± 2.4mm for linear observations. To encourage the clinical deployment of Auto3DCeph, the pre-trained model will be made publicly available and integrated to a novel 3D cephalometry extension for the 3D Slicer software.
CONCLUSIONS: The overall results demonstrate that Auto3DCeph can provide clinically acceptable automatic 3D cephalometric analysis of a highly diverse and challenging test dataset comprising 100 CT and CBCT scans. The difference in performance between the internal and external test sets indicates that the model's generalizability could be improved. In a clinical context, cephalometric annotations should always be checked and corrected by an expert if necessary. The Auto3DCeph open-source 3D Slicer extension will provide a free, easy-to-use platform for performing and correcting automatic 3D cephalometric analyses.

Abstract citation ID: cjag070.270
SP274 CROSS-SECTIONAL ANALYSIS OF SELF-PERCEPTION REGARDING DENTOFACIAL ASYMMETRY

EDUARD RADU CERNEI, ALEXANDRA- NINA BOTEZATU, BOTEZATU VALENTINA ALINA, GEORGETA ZEGAN; Faculty of Dental Medicine, "Grigore T. Popa" University of Medicine and Pharmacy Iasi, Iasi, Romania

AIM: Facial symmetry is a crucial aspect of beauty and attractiveness. However, perfect symmetry is uncommon, and slight natural asymmetries are prevalent, contributing to the uniqueness of individual faces. Perceptions of facial asymmetry differ among individuals and may be influenced by various factors. This study aims to examine the self-perception of dentofacial asymmetry in a sample of Romanian individuals, focusing on their awareness, the degree of discomfort it causes, and their interest in correction.
MATERIALS (OR SUBJECTS) AND METHOD: A cross-sectional analytical study was conducted with 283 Romanian participants between January and February 2024. Participants completed a questionnaire assessing their self-perception of facial asymmetry and socio-demographic characteristics, which included 10 questions on self-perception and 8 questions on socio-demographic data. Statistical analysis

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

was conducted using SPSS 26.0, employing the Pearson Chi-square test for comparative analysis.
RESULTS: The sample consisted mostly of females (75.3%) with an average age of 32.24 years. A majority were from urban areas (80.6%) and held university degrees (58.7%). Approximately 28.7% of participants reported noticing facial asymmetry, with dental asymmetry being the most frequently mentioned, followed by asymmetries in the eyebrows and eyelids. The right side of the face was more commonly perceived as asymmetric. While 24.4% of participants were bothered by their asymmetry, 39.2% expressed a desire for correction.
CONCLUSIONS: About one-third of participants recognized dentofacial asymmetry, particularly dental asymmetry. A notable proportion expressed a desire for correction, emphasizing the significance of understanding self-perception in regards to facial aesthetics.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.271
SP275 FINNISH SOCIAL WELFARE AND HEALTH CARE REFORM AND MAPPING OF PUBLIC ORTHODONTIC SERVICES IN WELLBEING SERVICES COUNTY OF SOUTHWEST FINLAND

Leeni Misin[1], Päivi Jääsaari[2], Janna Waltimo-Sirén[1]; [1]*Wellbeing Services County of Southwest Finland, and Department of Pediatric Dentistry and Orthodontics, Institute of Dentistry, University of Turku, Turku, Finland,* [2]*Department of Oral and Maxillofacial Diseases, Turku University Hospital, Turku, Finland*

AIM: A total reorganization of public health care and social services in Finland in 2023 led to a division of the country into 21 wellbeing services counties, responsible for arranging and providing these services for the entire population. As one of them, the newly formed Wellbeing Services County of Southwest Finland covers the area of 27 municipalities. Since the reform aims at harmonization of health care services within larger geographic areas, it became necessary to initiate a process towards harmonization of orthodontic care as well. The present paper is a description of that process.
MATERIALS AND METHODS: The first step was to map out how orthodontic care was organized before, by the 27 distinct municipalities. A survey was conducted to evaluate the practices year before the reform, in 2022. The chief dentists and orthodontists were surveyed about the amount of work force dedicated for orthodontics. The data were compared with the population count in different areas. As a theoretical framework, one orthodontist per 30.000 inhabitants has been generally deemed enough to provide the necessary services in Finland.
RESULTS: Population counts in the surveyed 27 municipalities varied between 1.000 and 200.000. In line with this variation, the ways to organize orthodontic services were diverse. In many areas, an orthodontic team, comprised of an orthodontist, general dentist, dental hygienist and dental nurse oriented in orthodontics, provided the necessary services. In some areas, an orthodontist only made the treatment planning and was merely occasionally available for consultation, meaning that the treatments were executed by other team members. Altogether the inhabitants in Wellbeing Services County of Southwest Finland numbered 490.500, indicating a required number of full-time orthodontists of 16.35, but turned out to be only 12.87. Moreover, the orthodontists were unevenly distributed.
CONCLUSIONS: In many municipalities forming the Wellbeing Services County of Southwest Finland, the quantity of orthodontists has been significantly lower than the suggested 1/30.000, mainly due to the small number of specialized orthodontists available. There has been marked inequality in availability of orthodontic services between the municipalities, which the formation of the wellbeing counties is expected to alleviate.

Abstract citation ID: cjag070.272
SP277 ASSOCIATION BETWEEN ANTERIOR OPEN BITE AND MOLAR DAMAGE IN ADULT PATIENTS: A PANORAMIC RADIOGRAPHIC STUDY

Kasei Aoyagi[1], Chiho Kato[1], Yuki Yoshizaki[2], Yura Kim[2], Takashi Ono[1]; [1]*1.Department of Orthodontic Science, Graduate School of Medical and Dental Sciences, Institute of Science Tokyo, Tokyo, Japan,* [2]*2.School of Dentistry, Institute of Science Tokyo, Tokyo, Japan*

AIM: Anterior open bite may concentrate occlusal forces on posterior teeth, but its association with molar damage remains unclear. This study aimed to investigate whether anterior open bite is associated with damage to the adult molars.
MATERIALS AND METHOD: This retrospective study included patients who visited the orthodontic clinic of a university dental hospital, seeking orthodontic treatment between 2015 and 2018. They were aged ≥18 years and had panoramic radiographs and overbite (OB) measurements. Patients with a history of previous orthodontic treatment were excluded. For each tooth, a damage score was assigned: 0 = sound, caries or congenitally missing; 1 = restored; 2 = crowned or root-filled; 3 = missing or residual root. The primary outcome was the summed damage score of all the first and second molars in the four quadrants. The main exposure was anterior open bite, defined as OB < 0 mm. Background damage was quantified as the summed score of all the anterior and premolar teeth. Associations between anterior open bite and molar score were evaluated using multivariable linear regression with age entered as a continuous variable and with an adjustment for anterior/premolar score. A subgroup analysis was performed in young adults aged 18–24 years to assess early effects before substantial age-related damage accumulates.
RESULTS: A total of 612 adults met the inclusion criteria, of whom 114 (18.6%) had anterior open bite. In the fully adjusted model, anterior open bite was independently associated with greater molar damage (regression coefficient: +1.09; 95% CI: 0.48–1.70; p = 0.0005). In the young adult subgroup (n = 282), open bite remained an independent predictor of higher molar scores (regression coefficient: +1.11; 95% CI: 0.47–1.74; p = 0.001).
CONCLUSIONS: Anterior open bite was independently associated with greater damage to first and second molars, even after accounting for age and damage to anterior and premolar teeth, and this association was evident in young adults. These findings suggest that molars in patients with anterior open bite may be at risk of early and disproportionate deterioration and prove the necessity of early diagnosis and treatment of open bite.

Abstract citation ID: cjag070.273
SP278 AN EVALUATION OF THE USE OF AUGMENTED INTELLIGENCE IN 3D FACIAL LANDMARKING- AN APPROACH TO FACIAL ANALYSIS AND CRANIOFACIAL ANOMALIES DETECTION

Shane Kau[1] and Chung Kau[2]; [1]*University of Debrecen, Debrecen, United States,* [2]*University of Alabama at Birmingham, Birmingham, United States*

BACKGROUND: Accurate 3D facial landmarking is essential for craniofacial analysis, but manual identification is time-consuming and subject to variability. Automated systems offer a solution but require robust validation and calibration. This study aims to validate a previously described automated augmented intelligence (AI) platform for 3D facial landmarking in a Caucasian population.
METHODS: Thirty-seven 3D facial scans from a single cohort of Caucasian adults aged 18-40 years were used. Twenty-one landmarks were manually identified on each 3D face with texture overlay. The same landmarks were automatically plotted by the AI platform (https://3dmedx.nl) using geometric data only (texture removed). Ten linear distances and angles were derived from the landmarks. Paired t-tests were used to compare manual and AI-derived measurements.
RESULTS: The mean error across all linear distances was 1.30+/-0.89mm and for angles was 1.14+/- 0.76 degrees, representing a mean percentage error of less than 2.5%. The percentage of landmarks within 2mm, 3mm, and 4mm was 75.1%, 89.8%, and 96.7%, respectively. Statistically significant differences ($p<0.05$) were found for landmarks ExR-ExL, which was notably in the periocular region.
CONCLUSIONS: The evaluated AI platform demonstrated good accuracy for 3D facial landmarking in a Caucasian cohort, with errors comparable to reported inter-observer variability. It shows promise as a time-saving tool for initial assessment and research, and as the technology evolves can be used in things like diagnostic facial imaging and precise surgical planning.

Abstract citation ID: cjag070.274
SP279 ADULT PATIENTS SURVEY: STUDY OF THEIR PROFILE, EXPECTATIONS AND SOCIO-DEMOGRAPHIC CHARACTERISTICS

Constance Vallier; *University of Strasbourg, Strasbourg, France*

AIM: Aim of this study was to determine the general profile of adult patients undergoing orthodontic treatment, their motivations, expectations, needs and the treatment impact on their quality of life.

Secondary objective was to undertake two comparisons: first by comparing patients with or without a history of orthodontic treatment, second by comparing patients according to gender.
MATERIALS AND METHOD: Survey was conceived as an online SurveyMonkey® questionnaire which was sent to 144 adult patients of the Dentofacial Orthopedics Department of the Strasbourg University Hospitals. Survey included questions about the patients' general profile, their previous orthodontic treatment if applicable, their expectations, motivations and the difficulties they encountered during their current treatment.
RESULTS: A total of 100 patients took part in the survey, resulting in a response rate of 69.4%. Respondents were mostly women (64%; n = 64), and average patient age was 33.9 years.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

56% were employed, of whom 42.9% were managers or held a higher intellectual profession. 25% were students.

44% (n = 44) had previously undergone orthodontic treatment in the past. Initial treatment was rendered with buccal metallic brackets in 81.2%, with ceramic brackets in 13,6% and with aligners in 4.5% of the cases. Quite surprisingly 31.8% (n = 30) had not benefited of any kind of retention following this initial treatment.

Regarding the current treatment, 84% (n = 84) consulted on their own initiative. Main reason for consultation was of aesthetic nature (60%). Age at treatment start was 32.3 years. Treatment was rendered this time with metallic brackets for 54%, ceramic brackets for 32%, lingual appliance for 11%, aligners for 27% of the patients. Patients with an orthodontic past history were more susceptible to opt for aligners. Aligners were chosen more often by women than men. Women experienced more discomfort with their appliance.

Main treatment encountered difficulties were duration, pain, dental hygiene, and appliance appearance.

CONCLUSIONS: An increasing proportion of adults are undergoing orthodontic treatment.

Majority were women and average age in our sample was 33.9 years.

A noteworthy finding of this study is that 44% of these adult patients had already undergone a previous orthodontic treatment.

Abstract citation ID: cjag070.275

SP280 THE ASSOCIATION OF TEMPOROMANDIBULAR DISORDERS AND ORAL HEALTH-RELATED QUALITY OF LIFE IN THE NORTHERN FINLAND BIRTH COHORT 1986

Elisa Tervahauta[1], Ambra Michelotti[2], Ritva Näpänkangas[1], Anna-Sofia Silvola[1], Kirsi Sipilä[1]; [1]University of Oulu, Oulu, Finland, [2]University of Naples Federico II, Naples, Italy

AIM: The aim of this study was to provide knowledge of the relation of temporomandibular disorders (TMD) with oral health-related quality of life (OHRQoL) by gender in a young adult population.

SUBJECTS AND METHOD: The data is part of the Northern Finland Birth Cohort 1986 (NFBC1986) and included 1,769 subjects (females n = 1,059, males = 710), who participated in a clinical examination in the at the age of 33-35. The diagnoses of TMD were assessed using a protocol of the Diagnostic Criteria for TMD (DC/TMD) and validated questionnaires. In statistical analyses TMD were categorized into three subgroups: pain-related TMD diagnoses, joint-related TMD diagnoses and combined TMD diagnoses including both pain-related and joint-related TMD diagnoses. OHRQoL was measured using the Oral Health Impact Profile (OHIP-14). Associations of TMD and OHRQoL were evaluated with χ^2-test and Fisher's exact test.

RESULTS: In females, pain-related and combined TMD diagnoses associated significantly with prevalence of OHIP total and all dimensions, whereas in joint-related TMD, physical pain showed the strongest association. Males with pain-related or combined TMD, the most impaired dimensions were physical pain, psychological discomfort, and physical disability.

CONCLUSIONS: When pain is associated with TMD, it appears that regardless of gender OHRQoL is lower than with joint-related TMD.

Abstract citation ID: cjag070.276

SP282 VARIATION OF THREE- DIMENSIONAL DENTAL ARCH SHAPE IN ADULTS WITH NO HISTORY OF ORTHODONTIC TREATMENT AND A FULL PERMANENT DENTITION

Lydia Kakali[1], Anna-Sofia Silvola[1], Pauliina Kulman[1], Gerogios Kanavakis[2]; [1]University of Oulu, Oulu, Finland, [2]School of Dentistry, NKUA, Athens, Greece

AIM: To investigate variation and sexual dimorphism in 3D dental arch form in a non-orthodontic adult population.

MATERIALS AND METHOD: The sample consisted of 587 adults (324 females, 263 males) from the Northern Finland Birth Cohort 1966, who met the study inclusion criteria. Maxillary and mandibular study models were scanned with an intraoral scanner (iTero, Align Technology). Models were imported into Viewbox 4.1 software (DHAL software, Kifissia, Greece) and digitized using a pre-determined template with 22 maxillary and 24 mandibular landmarks, corresponding to the cusps and incised edges. Maxillary and mandibular landmark configurations described the three-dimensional shape of the maxillary and mandibular dental arches, respectively. Landmark space coordinates were transformed into shape coordinates with Procrustes Superimposition, performed separately for the maxilla and mandible. The resulting shape coordinates were then used as variables of dental arch shape and were reduced into Principal Components (PCs) of shape using Principal Component Analysis for better interpretation. Method error was assessed by repeating digitization for 10% of the sample. Sex differences in arch shape were studied with permutation tests and variation in arch shape was assessed quantitatively and qualitatively through evaluation of the magnitude and direction of shape variation explained by the strongest shape PCs.

RESULTS: There was significant sexual dimorphism in maxillary and mandibular arch shape (maxilla: Procrustes distance: 0.009, P=0.007 ; mandible: 0.015, p<0.001). The first 8 PCs, explained approximately 65% of total variance, represented clinically recognizable shape patterns. PC1 described width-length discrepancies in both arches and sexes. In the maxilla, PC2 reflected overjet changes and anterior transverse variation in both sexes. Mandibular PC2 in females showed premolar-region rotations and crowding, whereas in males it reflected anterior crowding.

CONCLUSIONS: This is the first study to explore 3D dental arch shape in a large, homogenous adult population without history of orthodontic treatment. Significant sexual dimorphism was observed in both arches. Sex differences were related to differences in anterior crowding as well as molar and premolar transverse position. Maxillary arch variation was primarily linked to arch length, width and anterior tooth proclination, while mandibular variation involved premolar-region crowding as well as arch length and width.

Abstract citation ID: cjag070.277

SP283 REMINERALIZATION POTENTIAL OF SILVER-DIAMINE-FLUORIDEVERSUS CASEIN PHOSPHOPEPTIDE AMORPHOUS-CALCIUMPHOSPHATE ON WHITE SPOT LESIONS : AN IN-VITROCOMPARATIVE STUDY

HAWA Sophie EL[1], Cléa YEYE[1], Claire-Adeline DANTAGNAN[2], Julia BOSCO[2]; [1]Université Paris Cité, Montrouge, France, [2]Université Paris Cité,INSERM, Oral Health UMR-S 1333,, Montrouge, France

AIM: White Spot Lesions (WSLs) are common side-effects of orthodontic treatment, they compromise enamel aesthetics and mechanical resistance. Fluoride varnish was the gold standard for primary and secondary prevention, however they carry risks such as local reactions, reduced brackets adhesion and potential toxicity. Alternative remineralizaing agents had therefore been developed,. This study aimed to compare the effects of Silver Diamine Fluoride (SDF), and Casein Phosphopeptide Amorphous-Calcium Phosphate (CPP-ACPF) on the remineralization of in-vitro-induced WSLs.

MATERIALS AND METHOD: Fifteen sound human teeth were collected in accordance with the French ethical guidelines (n°DC- 2009-927, Bioethic cell, DGRI/A5, Paris, France). The teeth were embedded in resin, then demineralized in a pH 3.5 solution at 37°C for 3 weeks and randomly assigned to the three groups : CPP-ACPF (MI Paste Plus®), SDF (Riva Star Aqua®), Control, n=5 each. In the control group, artificial saliva was applied using a microbrush. After application of the remineralizing agents, specimens were stored for one week in artificial saliva at 37°C before analysis (t2). Vickers Micro-hardness (six measures per specimen), Scanning Electron Microscope (SEM) imaging (15x, 500x, 1500x, 3000x) and Raman Spectrocopy were performed at baseline (t0), after demineralization (t1), and after remineralization (t2) by blinded operators. Statistical analysis was conducted using a one-way ANOVA with Tukey post-hoc tests.

RESULTS: Microhardness increased significantly from t1 to t2 for both CPP-ACPF (+35.2%) and SDF (+30.0%) compared to the control group (+8.75%) (p<0.05). No significant difference was found between CPP-ACPF and SDF. SEM images suggested partial recovery of the enamel in both treatment groups and a reorganization of the prisms in the control group. Raman Spectroscopy showed no detectable differences between t0, t1 and t2 for any group.

CONCLUSION: CPP-ACPF and SDF both significantly improved enamel microhardness compared with the control, without statistical difference between the two agents. The micro-hardness recovery was partial for both group. The SEM analysis supported partial structural recovery for both treatments. Further studies with larger sample sizes are required to strengthen these findings.

Abstract citation ID: cjag070.278

SP284 THREE-DIMENSIONAL PALATAL MORPHOLOGY IN ORTHODONTIC PATIENTS WITH OBSTRUCTIVE SLEEP APNEA RISK

Martina Zigante[1], Lidia Gavic[2], Nika Simenc Zaja[3], Alexei Zhurov[4], Marina Lapter Varga[5]; [1]Department of Orthodontics, Dental Medicine Clinic, Clinical Hospital Center Rijeka; Department of Orthodontics, Faculty of Dental Medicine, University of Rijeka, Rijeka, Croatia, [2]Department of Restorative Dental Medicine and Endodontics, Study of Dental Medicine, School of Medicine, University of Split, Split, Croatia, [3]Dental Polyclinic Zagreb, Zagreb, Croatia, [4]Ishlinsky Institute for Problems in Mechanics, Russian Academy of Sciences, Moscow, Russia, [5]Department of Orthodontics, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: This research aimed to investigate palatal morphology in orthodontic patients at risk for obstructive sleep apnea (OSA).
SUBJECTS AND METHODS: We included 130 consecutive subjects (67% male) aged 8–16 years starting orthodontic treatment. Standardised orthodontic diagnostic records were obtained, including a three-dimensional dental scan (iTero Element 2, Align Technology, San Jose, CA, USA), and the Paediatric Sleep Questionnaire (PSQ) was administered to parents. Measurements included palatal surface (mm^2), palatal projection (mm^2), and palatal volume (mm^3). PSQ score ≥7 was used to indicate a possible risk for obstructive sleep apnea (OSA). Patients were divided into two age groups, 8–12 and 13–16 years, for statistical analysis. All continuous variables were presented as mean ± standard deviation (SD). Normality of data distribution was assessed using the Kolmogorov–Smirnov test. Differences between groups were evaluated using an independent-samples t-test, with a significance level set at $p < 0.05$.
RESULTS: A total of 27% of participants (N=35) scored 7 or higher on the PSQ. In both age groups, children and adolescents at higher risk of OSA consistently exhibited smaller palatal dimensions than subjects at low risk of OSA. In the younger group, they showed reduced palatal surface (1382.45 ± 133.19 mm^2 vs. 1152.87 ± 217.52 mm^2; $p \leq 0.001$), projection area (955.25 ± 122.13 mm^2 vs. 813.15 ± 145.86 mm^2; $p = 0.001$), palatal volume (6509.78 ± 1132.39 mm^3 vs. 4813.97 ± 1509.33 mm^3; $p \leq 0.001$), and a lower projection-to-volume ratio (0.15 ± 0.02 vs. 0.18 ± 0.04; $p \leq 0.001$). Similarly, in the older group, adolescents at higher risk also demonstrated significantly smaller palatal surface (1433.02 ± 120.42 mm^2 vs. 1130.89 ± 138.68 mm^2; $p \leq 0.001$), projection area (934.34 ± 81.59 mm^2 vs. 766.75 ± 117.67 mm^2; $p \leq 0.001$), palatal volume (7351.22 ± 1022.10 mm^3 vs. 5063.95 ±1184.25 mm^3; $p \leq 0.001$), along with a significantly reduced projection-to-volume ratio (0.65 ± 0.05 vs. 0.68 ± 0.07; ≤ 0.001).
CONCLUSIONS: Decreased palatal surface, projection area, and palatal volume may indicate a higher risk of obstructive sleep apnea. Therefore, palatal morphology could serve as a useful parameter for assessing OSA risk in the orthodontic population.

Abstract citation ID: cjag070.279
SP285 DENTAL ARCH AND APICAL BASE MORPHOLOGY

Karl-Friedrich Krey; *University Medicine, Greifswald, Germany*

AIM: To assess size and shape characteristics of the dental arch and apical base across different sagittal malocclusion groups using geometric morphometrics.
SUBJECTS AND METHODS: Dental casts of 242 adults (139 females, mean age 25.4 years; 103 males, 25.7 years) were retrospectively selected based on the following criteria: no extractions, no prosthodontic treatment, and complete visibility of all landmarks on high-quality casts. Using a Microscribe 3DX Digitizer (Immersion Corp., San Jose, CA, USA), xyz coordinates of 68 upper and 73 lower jaw landmarks were recorded. These included dental landmarks and, in each jaw, 14 points located 5 mm apical to the gingival margin representing the apical base, following Rees' definition. Subjects were assigned to four groups based on first molar sagittal relationship, overbite, and overjet: Class I (n = 139), Class II/1 (n = 54), Class II/2 (n = 25), and Class III (n = 24). Geometric morphometric methods were applied to evaluate group- and gender-related variation in size and shape. Procrustes transformation was used to analyse shape in tangent space, while centroid size served as the size metric.
RESULTS: Males exhibited significantly larger centroid sizes in all groups. The upper-to-lower arch size ratio was significantly lower in Class III subjects and showed the greatest variability. No statistically significant shape differences were found between males and females. Significant shape differences ($p < 0.05$, NPMANOVA) were detected among all groups for the upper arch, but not for the lower. When only apical base landmarks were analysed, this pattern reversed: the upper arch showed no group differences, whereas the lower arch did—except between Class II/2 and Class I, which were similar. Class II/1 demonstrated a notably compressed shape. Canonical variate analysis identified incisor- and canine-related landmarks as the most influential contributors to intergroup differences. Dental-only landmarks showed significant shape differences across all groups in both arches.
CONCLUSION: The applied morphometric approach appears well-suited for describing dentoalveolar size and shape. While males and females differ mainly in size, not in shape, the substantial morphological variability observed highlights the importance of individualized diagnosis.

Abstract citation ID: cjag070.280
SP286 OVERJET AS A PREDICTOR OF EARLY SKELETAL CLASS II MALOCCLUSION CORRECTION WITH MANNI TELESCOPIC HERBST APPLIANCE: A RETROSPECTIVE STUDY

Andrea Boggio, Antonio Manni, Emma Gotti, Giorgio Gastaldi, Mauro Cozzani; *Vita-Salute San Raffaele University, Milan, Italy*

AIM: Class II Division 1 malocclusion is associated with an increased overjet, generally considered a negative predictor of treatment outcomes, aesthetic perception and long-term stability. This study investigated the link between the initial magnitude of overjet and the degree of skeletal correction, in early treated growing skeletal class II patients.
MATERIALS AND METHOD: This retrospective study analyzed 109 patients (59 males, 50 females; mean age 9.22 years) consecutively treated with Manni Telescopic Herbst Appliance. Once permanent dentition was complete, all patients underwent a multibracket phase. Lateral cephalograms were taken at the beginning of treatment (T0), immediately after removing the Herbst appliance (T1) and at the end of multibracket treatment (T2). Cephalometric analysis was performed at T0, T1 and T2 to assess changes in skeletal and dental parameters. Three Rank-Based Estimation Regression Models were constructed, with the ANB difference (T1-T0) and Wits difference (T1-T0) as the dependent variables and the initial overjet as the regressor. In the second and third models initial skeletal divergence and initial mandibular length were added as regressors. T2 evaluation was performed to confirm stability of skeletal results.
RESULTS: A significant direct correlation was found between an initially increased overjet and improvement in the ANB angle (p=0.01), with the correction primarily attributed to an increase in the SNB angle. A similar trend was observed for the correction of the WITS index ($p < 0.01$). Specifically, for every 1 mm increase in initial overjet, there was an average reduction of 0.41 mm in the WITS index and a decrease of 0.15 degrees in the ANB angle. This correlation became even more significant when the initial overjet exceeded 8.0 mm. The results were not influenced by the vertical dimension and the initial length of the mandible, and they were stable over time.
CONCLUSIONS: In specific conditions, such as in cases of bullying or increased risk of trauma, it might be advisable to initiate treatment early when the initial overjet exceeds the threshold of 8 mm. In such instances the amount of skeletal correction appears clinically significant (ANB reduction -2.10° and Wits reduction -4 mm) and stable over time.

Abstract citation ID: cjag070.281
SP287 COMPOUND RELEASE FROM THREE ORTHODONTIC BAND ADHESIVES USED AS BITE RAMPS DURING SIMULATED CHEWING: TARGETED QUANTIFICATION AND UNTARGETED LIQUID CHROMATOGRAPHY-HIGH RESOLUTION MASS SPECTROMETRY PROFILING

Nouf Alsuayri[1], Silvio Uhlig[2], Lene Aiko Grutle[2], Agneta Karsten[1]; [1]*Karolinska Institutet, Stockholm, Sweden,* [2]*Nordic Institute of Dental Materials (NIOM), Oslo, Norway*

AIM: To characterize compound release from three orthodontic band adhesives used as bite ramps during simulated chewing by targeted and untargeted LC-HRMS.
MATERIALS AND METHOD: Ultra Band Lok (UBL), BracePaste® Band and Build LC (BP), and Transbond™ Plus Light Cure Band Adhesive (TB) were tested in triplicate in a chewing simulator using water as the medium. UBL and BP were loaded at 110 N, while TB was tested at 70 N due to specimen fracture at higher loads. After 12,600 cycles, extracts were analyzed by targeted and untargeted LC-HRMS with a process blank.

Targeted results were reported as mean ± SD, values for UBL and BP were compared using Welch's t-test ($p < 0.05$).

Untargeted features were retained at $p \leq 0.001$ for UBL and BP and $p \leq 0.01$ for TB, with $\log_2 FC \geq 5$, relative to the blank.

To assess force reduction, one additional UBL and BP sample was tested at 70 N, and targeted peak areas were compared to their 110 N replicates using percent and fold change.
RESULTS: Targeted LC-HRMS detected 8 leachables from UBL and 11 from BP. Bis-GMA and its hydrolysis products, parbenate, and benzoresorcinol were released from both materials, with parbenate and benzoresorcinol significantly higher in UBL ($p < 0.05$).

UBL additionally released TEGDMA (2161.81 ± 834 ng/mL) and its hydrolysis product, with HEMA (1350 ± 59.3 ng/mL).

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

BP uniquely released diphenyliodonium hexafluorophosphate (499.5 ± 32.5 ng/mL), UDMA (496.4 ± 190 ng/mL) and its hydrolysis products, butanediol dimethacrylate (421 ± 123 ng/mL), and TPO (24.082 ± 3.9 ng/mL).

TB released 5 compounds: GMA (53,720 ± 25,596 ng/mL), diphenyliodonium hexafluorophosphate (1588.5 ± 602 ng/mL), parbenate (311 ± 147 ng/mL), and TEGDMA (106 ± 52 ng/mL) with its hydrolysis product.

Untargeted LC-HRMS detected 32 compounds from UBL, 48 from BP, and 13 from TB meeting statistical thresholds.

Reducing chewing force for UBL and BP generally lowered release, although some compounds remained unchanged or increased.

CONCLUSION: LC-HRMS analyses provided a comprehensive assessment of chemical behavior during simulated chewing. The materials revealed distinct release patterns, with BP exhibiting the greatest chemical diversity. Reduced chewing force decreased release overall, though several compounds appeared force-independent.

PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.282

SP290 INVESTIGATION OF THE STRESS AND DISPLACEMENT OBSERVED IN THE SKELETAL ANCHORAGE DEVICES AND SURROUNDING BONE CAUSED BY FORCES APPLIED TO THREE DIFFERENT SKELETAL ANCHORAGE DEVICES FOR MAXILLARY POSTERIOR INTRUSION

BURCAK KAYA[1] and MEHMET DENIZ ERTUZ[2]; [1]Baskent University, Ankara, Turkey, [2]Private practice, Izmir, Turkey

AIM: To evaluate the stress distribution in three different skeletal anchorage devices and the bone surrounding them, and the displacement of the devices, due to forces applied for intrusion of maxillary posterior teeth, using FEM analysis.

MATERIALS AND METHOD: CT data of an adult male was reconstructed to create the 3D maxillary study models. Maxillary teeth, cortical bone, trabecular bone, periodontal ligament and anchorage devices were modeled using ALTAIR Evolve software. Stainless Steel Infrazygomatic Crest Screw (2x12mm), Titanium Interradicular Screw (1.5x8mm), Stainless Steel Zygomatic Plate (3-hole I-plate, titanium screws 2x7mm) were used as skeletal anchorage devices. The infrazygomatic crest screw was placed below the zygomatic crest at a 60° angle to the occlusal plane; the interradicular screw was placed at the mucogingival junction between the upper first and second molars at a 90° angle to the bone; and the zygomatic plate was placed in the zygomatic buttress region. Intrusion forces of 250, 350, and 450 grams were applied on the skeletal anchorage devices perpendicular to the occlusal plane.

RESULTS: The highest stress and displacement were observed with the infrazygomatic crest screw, while the lowest stress and displacement were observed with the zygomatic plate. The highest stress and displacement in the zygomatic plate occurred in the screw closest to the plate's hook. While the lowest stress in the cortical bone was measured with the zygomatic plate, higher stresses were measured with the infrazygomatic crest screw and the interradicular screw. In all skeletal anchorage devices, the stress levels were measured below the critical values at which the materials would deform. The stresses in the cortical bone surrounding the zygomatic plate (-2.47Mpa) were measured within safe limits. However, it was measured that the high stresses created by 450 grams force applied to the infrazygomatic crest screw (-28.49MPa) and the interradicular screw (-28.35MPa) carry a risk of resorption in the cortical bone.

CONCLUSIONS: Zygomatic plates should be preferred as anchorage sources when 450 grams or higher force is needed for maxillary posterior intrusion, while less invasive infrazygomatic crest screws or interradicular screws can be preferred when lighter force is needed.

Abstract citation ID: cjag070.283

SP291 AESTHETIC EVALUATION OF SURGICAL EXPOSURE AND ORTHODONTIC ALIGNMENT OF PREVIOUSLY IMPACTED MAXILLARY CENTRAL INCISORS - A PILOT STUDY AT ABERDEEN DENTAL HOSPITAL & THE INSTITUTE OF DENTISTRY

Vlad Costin Iliescu[1] and Khaled Khalaf[2]; [1]NHS Grampian, Aberdeen, United Kingdom, [2]University of Aberdeen, Aberdeen, United Kingdom

AIM: Following surgical and orthodontic management of impacted maxillary central incisors, subtle residual clinical features may persist and influence long-term management. This quality improvement project aimed to assess the aesthetic outcome of previously impacted and orthodontically aligned maxillary central incisors by multidisciplinary staff teams using six aesthetic domains.

MATERIALS AND METHOD: Fourteen potential eligible patients were screened, and five patients with a completed treatment course for impacted maxillary central incisors were included. Aetiologies comprised dentigerous cyst, supernumerary teeth, ectopic eruption, trauma-related dilaceration, and horizontal impaction. All patients had undergone surgical exposure followed by orthodontic alignment. Post-treatment clinical photographs were assessed by twenty multidisciplinary staff members including consultants, registrars, dental core trainees, nurses, laboratory technicians, and administrative staff. Six aesthetic domains were evaluated: colour and translucency, shape and size symmetry, gingival tissue appearance, alignment and position, overall aesthetic outcome, and the need for further recommendations. Responses were recorded using Likert scales and categorical measures.

RESULTS: Correct identification of the previously impacted incisor ranged from 68.18% to 81.81%, with incorrect identification between 4.54% and 22.72%. For colour and translucency, combined agreement ranged from 65% to 85%. For shape and size symmetry, agreement ranged from 70% to 85%. For gingival tissue appearance, combined agreement ranged from 40% to 75%, with higher disagreement in cases associated with soft tissue scarring. For alignment and position, positive agreement ranged from 75% to 85%. Overall aesthetic outcome was rated as excellent in 15-50% and good in 45-75%, with fair or average outcomes in 5-30%. No cases were rated as poor or very poor. Further recommendations were considered unnecessary in 55-65% of cases.

CONCLUSIONS: Surgical exposure followed by orthodontic alignment of impacted maxillary central incisors of various aetiologies produces several favourable aesthetic outcomes. Alignment and crown form achieved the highest satisfaction, while gingival aesthetics showed greater variability. These findings may help inform patients during the consent process regarding management options for this complex condition.

Abstract citation ID: cjag070.284

SP292 FIXED ORTHODONTIC RETENTION AS A LONG-TERM STRATEGY FOR MANDIBULAR ANTERIOR STABILITY

Ernesto Buonanno[1], Alfredo Altieri[1], Jorida Jubani[1], Federica Santori[1], Vincenzo Quinzi[2]; [1]University of L'Aquila, L'Aquila, Italy, [2]Link University, Roma, Italy

AIM: The purpose of this study was to assess the long-term positional stability of mandibular anterior teeth in patients wearing a fixed canine-to-canine retainer. Specifically, the study evaluated angular and linear changes of the canines, lateral incisors and central incisors between the end of active orthodontic treatment (T0) and follow-up (T1).

MATERIALS AND METHOD: Thirty patients aged 19–60 years were initially enrolled; twenty-six satisfied all inclusion criteria, including ideal mandibular incisor angulation, stable occlusion at debonding, intact fixed retention, absence of periodontal or systemic disease and regular 6-month follow-up. Each patient had two panoramic radiographs: one at debonding (T0) and one at follow-up (T1). The mean T0–T1 interval was 708 days (23.2 months).

On each radiograph, landmarks were traced for the mandibular first molars, canines, lateral incisors and central incisors. Tooth axes were constructed, and T0–T1 superimpositions were generated. Using a Cartesian coordinate system with the molar furcation as the fixed reference point, linear displacement along the X and Y axes was calculated for each tooth. Statistical analysis included the Cramer–von Mises test to compare T0 and T1 distributions and the Kruskal–Wallis one-way ANOVA to test for differences in median tooth displacement across groups ($\alpha = 0.05$).

RESULTS: The Cramer–von Mises test demonstrated no significant differences between T0 and T1 distributions across all evaluated parameters, confirming that both datasets originated from the same population. The Kruskal–Wallis analysis showed no statistically significant differences among median displacements of the mandibular canines and incisors. Mean rank values were comparable, and no clinically relevant positional changes were detected. The null hypothesis—that teeth retained with a fixed mandibular retainer remain stable over time—was supported, while the alternative hypothesis suggesting instability or inadequate retention was rejected.

CONCLUSIONS: Fixed canine-to-canine mandibular retention proved effective in maintaining long-term stability of the anterior dentition. Minor differences observed between T0 and T1 appear to reflect natural occlusal settling rather than relapse. Consistent recall visits and prompt management of retainer failures remain essential to prevent unwanted tooth movement. Fixed retention represents a reliable option for preserving anterior alignment after orthodontic treatment.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.285
SP294 OPTIMIZATION OF A MACROPHAGE DIFFERENTIATION PROTOCOL AND REFERENCE GENE SELECTION FOR QUANTITATIVE POLYMERASE CHAIN REACTION

Leiting Yang, Andrea Wichelhaus, Uwe Baumert; *Department of Orthodontics and Dentofacial Orthopedics, LMU Hospital, Munich, Germany*

AIM: Macrophages located in periodontal ligaments and alveolar bone tissue present extensive plasticity to chemical and physical stimuli. They can be differentiated into multiple phenotypes and regulate bone homeostasis through cytokine secretion during orthodontic tooth movement (OTM). To elucidate the function of macrophage, a standard protocol to differentiate THP-1 cells into macrophage phenotypes was established and suitable reference genes (RG) were identified for qPCR analysis focusing on macrophage differentiation.
MATERIALS AND METHOD: THP-1 cells were differentiated into M0 macrophage using different concentrations of phorbol-12-myristat-13-acetat (PMA; 5, 10, 50, 100ng/ml) for 24h and rested without PMA for 24, 48 and 72h. Differentiation efficiency was determined by adherent cell number. M1 or M2 phenotypes were induced using 100ng/ml LPS or 20ng/ml IL4/IL13, respectively. All three phenotypes were characterized by flow cytometry, immunofluorescence, western blot and qPCR. For the latter, an RG panel of 14 candidate genes was composed from relevant publications. After RG primer validation, qPCR was done with total RNA collected from M0, M1, and M2 macrophages. The RefFinder platform was applied for RG selection.
RESULTS: 24h PMA (50ng/ml) stimulation followed by 24h without PMA was the most favorable condition for M0 differentiation, combining differentiation efficiency and M0 nativeness. CD68 was highly expressed on M0, M1 and M2. According to flow cytometry, immunofluorescence, and western blot results, CD86 and CD206 were specially detected on M1 and M2. RefFinder evaluated *ARPC3* was the most stable RG during macrophage differentiation (M0, M1 and M2) while *B2M* was the most unstable one. The two most frequently used RGs, *GAPDH* and *ACTB*, only ranked 8th and 9th of 14 candidate RGs. qPCR analysis showed the mRNA level of the M1 (*TNF-α*, *CCL2*) and M2 markers (*CD206*, *TGM2*) were highly upregulated in M1 or M2 macrophages.
CONCLUSIONS: 50ng/ml PMA for 24h followed by 24h without PMA can efficiently induce M0 macrophage, holding robust differentiation ability to M1 or M2 macrophages. *ARPC3* is a potential RG for qPCR normalization during macrophage differentiation while *GAPDH* and *ACTB* showed insufficient stability to cover the analyzed experimental conditions and could thus induce bias for quantification.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.286
SP296 ‡‡‡ EFFECTIVENESS OF MYOFUNCTIONAL APPLIANCE CLASS II/1 TREATMENT IN THE IN PREPUBERTAL PATIENTS IN COMPARISON TO THE ACTIVE PLATE AND FRANKEL APPLIANCE

Tina Pajević, Nemanja Marinković, Jovana Juloski, Zorana Stamenković, Nenad Nedeljković; *University of Belgrade, School of Dental Medicine, Department of Orthodontics, Belgrade, Serbia*

The aim of this study was to compare the effectiveness of myofunctional appliance, removable active plate and Frankel appliance type I in the early treatment of Class II division 1 before the pubertal growth spurt.
MATERIALS AND METHOD: In this retrospective study 52 patients with diagnosed Class II/1, aged 8.37±1.16 years were included. The patients were divided into the three groups based on the treatment conducted. First group consisted of 17 patients treated with myofunctional appliance, the LM activator for Class II treatment. Second group comprised 15 patients treated with removable active plates for upper arch expansion. In the third group there were 20 patients who underwent treatment with Frankel appliance type I. Changes inside and between groups were evaluated on the pretreatment and posttreatment cephalometric radiographs manually and using a computer assisted method of cephalometric analysis. Paired sample T test was used to investigate differences inside groups and one-way ANOVA to test differences between groups.
RESULTS: Before treatment there were no statistically significant differences between skeletal and dental parameters. After treatment, In the group 1 and 3, there was improvement in the sagittal skeletal parameters: SNB angle (74.12±3.53 to 75.75±4), and (74.7±2.56 to 77.65±2.45), ANB angle (6.42±2.37 to 4.93±2.54) and (6.6±1.35 to 3.6±1.23), respectively. Comparison between groups did not show significant difference in sagittal skeletal parameters after the treatment. In the vertical plane, there was a significant increase of SN/SpP angle in the group 3 in comparison to the group 1 (p=.032). Significantly greater retroclination of the upper incisors (I/SpP angle) was detected in the group 1 in comparison to the group 2 (p=.033).
CONCLUSION: Myofunctional appliances could be as equally effective in the early correction of the sagittal skeletal and dentoalveolar parameters as functional appliances. Comprehensive diagnosis and careful patient selection for the treatment and after treatment monitoring should be performed.

Abstract citation ID: cjag070.287
SP297 TRANSVERSE DISCREPANCY BETWEEN PLASTER MODELS AND CONE BEAM COMPUTED TOMOGRAPHY

ANDRADA NEDOV and PEDRO Colino- Gallardo; *UCAM, MURCIA, Spain*

AIM: To quantify the differences in transverse width and molar angulation between plaster model STL measurements and Cone Beam Computed Tomography measurements in patients with suspected maxillary transverse deficiency.
MATERIALS AND METHOD: A cross-sectional observational study was conducted on 50 subjects assessed with Cone Beam Computed Tomography and digital STL files from plaster dental models. Linear measurements of upper and lower first molars were collected to determine transverse width discrepancies. Three variables were calculated: Dif_CBCT, Dif_STL, and Dif_Total. Normality was tested with the Shapiro–Wilk test. Measurement differences were compared using a paired Student's t-test ($p < 0.05$). Effect sizes were calculated using Cohen's d and Hedges' g.
RESULTS: Cone Beam Computed Tomography showed consistently greater transverse discrepancies than STL measurements. Mean upper–lower molar differences were −5.94 mm (SD 3.85) for Cone Beam Computed Tomography and −3.40 mm (SD 2.87) for STL, resulting in a mean method difference of −2.54 mm (SD 4.08). Data were normally distributed ($p = 0.110$). Paired t-testing confirmed a statistically significant difference ($t(49) = -4.394$, $p < 0.001$). Effect size was moderate (Cohen's $d = -0.62$).
CONCLUSIONS: Cone Beam Computed Tomography consistently yields smaller transvers measurements than plaster model STL files. This statistically significant discrepancy is clinically meaningful, indicating that reliance on plaster models alone may lead to underestimation of skeletal transverse deficiencies

Abstract citation ID: cjag070.288
SP300 ARAB AND GERMAN PHENOTYPIC VARIATIONS OF SKELETAL CLASS II MALOCCLUSION – A CROSS-SECTIONAL MULTI-CENTER STUDY

Kareem Midlej[1], Peter Proff[2], Nezar Watted[3], Fuad A. Iraqi[1]; [1]*Department of Clinical Microbiology and Immunology, Gray Faculty of Medical and Health Sciences, Tel Aviv University, Tel Aviv, Israel,* [2]*Department of Orthodontics, University Hospital of Regensburg, Regensburg, Germany,* [3]*Center for Dentistry Research and Aesthetics, Jatt, Jatt, Israel*

AIMS: The prevalence of skeletal class II malocclusion varies from country to country and among different ethnicities. Additionally, patients from different ethnic groups may vary in their diagnosis and treatment values due to differences in skeletal patterns. Therefore, the main aim of this study was to reveal novel information about the differences between Arab and German patients, which can prevent misdiagnosis and an inaccurate treatment process.
MATERIALS AND METHODS: This study included Arab skeletal class II orthodontic patients (n=322), and German skeletal class II orthodontic patients (n=352). We examined the effect of age and gender between the two populations. Besides, we applied machine-learning models to classify the patient's origin. Finally, we performed a hierarchical clustering analysis to identify unique patterns within each population.
RESULTS: The analysis of the cephalometric values revealed significant differences between the two populations, which can be attributed to differences in ethnic groups, gender, and age. For example, among patients up to 13 years old, the Arab patients showed more severe divergence of the jaw bases as presented in the NL/ML angle ($P<0.01$). Another significant difference ($P<0.05$) was shown in the SNA angle values that were higher among Arab populations, which means that the maxilla is positioned more anteriorly, and a more severe skeletal class II, as presented by the anteroposterior position of the maxilla to the mandible (ANB angle) ($P<0.05$). These differences were also reflected in the Hierarchical clustering, which showed 7 unique clusters that varied in growth pattern and severity of skeletal class II. The results showed that clusters 1,2, and 4 were dominant with Arab patients, while clusters 3,5,6, and 7 were dominant with German patients. Finally, the results demonstrated the ability of the random forest model to accurately classify the patients' origin based on the cephalometric profile with 97% accuracy.
CONCLUSIONS: The results revealed distinct clusters that varied significantly across most of the vertical, sagittal, and dental variables. This study demonstrated the complexity of skeletal malocclusion and the need to consider the variations that

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

can be referred to different ethnic groups, gender, and age, while diagnosing and treating skeletal class II patients.

Abstract citation ID: cjag070.289
SP304 DIMENSIONAL ACCURACY OF SMARTPHONE-BASED 3D DENTAL CASTS: A COMPARISON WITH PLASTER MODELS

Mohd Amir Mukhsin Zurin Adnan, Nursyafika Abdul Khalim, Siti Nor Hafizah Salehun; *Universiti Teknologi MARA (UiTM), Selangor, Malaysia*

AIM: Digital study models offer practical advantages over plaster casts, but smartphone 3D scanning requires validation. This study evaluates the dimensional accuracy of smartphone-derived digital casts versus plaster casts for mesiodistal tooth-widths and determines whether this low-cost approach can yield measurements comparable to those obtained using traditional high-precision methods.
MATERIALS AND METHODS: Thirty orthodontic dental casts (15 maxillary, 15 mandibular) were analysed. Mesiodistal widths of 24 permanent teeth (16-26 and 36-46) were measured using a digital calliper on plaster models and digitally on 3D models generated with Polycam application. Mesial and distal contact points on each tooth were marked with an indelible pencil to aid consistent identification of the widest mesiodistal dimension during both manual and digital measurements. Each cast was digitised with an iPhone using the Polycam photogrammetry application. A 10-mm reference scale bar was attached during image acquisition and used in MeshLab to calibrate dimensional accuracy before digital measurements. The same 24 teeth were then measured in MeshLab on the calibrated digital models. Manual and digital measurements were compared using paired t-tests ($\alpha = 0.05$), and mean differences, standard deviations and 95% confidence intervals were calculated across all 360 paired measurements.
RESULTS: Mean paired differences between manual and digital measurements ranged from -0.097 mm to +0.008 mm, indicating that Polycam-derived values were consistently within about one-tenth of a millimetre of plaster model measurements. Nineteen of 24 teeth showed no statistically significant difference between methods ($p > 0.05$). Five teeth (11, 13, 23, 32 and 33) demonstrated statistically significant differences ($p < 0.05$), although absolute mean discrepancies remained ≤0.10 mm, with digital measurements tending to be slightly larger than manual values.
CONCLUSION: iPhone-based Polycam photogrammetry produced digital dental models that yielded mesiodistal tooth-width measurements highly comparable to those obtained on physical plaster casts. This study introduced a low-cost and widely accessible workflow for digitising orthodontic study models using consumer smartphones rather than dedicated 3D scanners, offering a practical option for clinics, teaching institutions and resource-limited settings to convert existing plaster archives into accurate digital records for tooth-size and space analysis, as well as for reducing physical storage.

Abstract citation ID: cjag070.290
SP305 LONG-TERM STABILITY AFTER ORTHODONTIC VERSUS ORTHOGNATHIC TREATMENT IN PATIENTS WITH NON-REDUCING DISK DISPLACEMENT

SANG-WON SONG[1], SUG-JOON AHN[2], WON-JIN YI[3]; *[1]Department of Orthodontics, Seoul National University Dental Hospital, SEOUL, Republic of Korea, [2]Dental Research Institute and Department of Orthodontics School of Dentistry Seoul National University, SEOUL, Republic of Korea, [3]Dental Research Institute and Department of Oral and Maxillofacial Radiology School of Dentistry Seoul National University, SEOUL, Republic of Korea*

AIM: This retrospective study aimed to compare long-term stability of orthodontic camouflage treatment and surgical–orthodontic treatment in adult patients with temporomandibular joint (TMJ) disk displacement without reduction (DDNR).
MATERIALS AND METHODS: Thirty-seven adult patients diagnosed with bilateral DDNR on TMJ magnetic resonance imaging were included. Participants were classified into an orthodontic camouflage group (OCG, n = 18; 24.79 ± 4.88 years) or a surgical–orthodontic group (SOG, n = 19; 25.09 ± 4.65 years). The OCG received camouflage treatment using 0.022-in preadjusted edgewise appliances, whereas the SOG underwent combined surgical and orthodontic treatment using the same system. Twenty-two cephalometric landmarks were digitized, and 14 variables were measured at pretreatment (T0), posttreatment (T1), and at least 3 years posttreatment (T2). Intragroup changes were analyzed using the Wilcoxon signed-rank test, and intergroup comparisons were evaluated using the Mann–Whitney U test. Statistical significance was set at $P < 0.05$.
RESULTS: At T0, both groups exhibited retrognathic mandibles and hyperdivergent skeletal patterns, although SOG showed a more pronounced pattern with a larger FH–mandibular plane angle (FMA) (OCG, 35.93 ± 4.29; SOG, 41.12 ± 7.21) and smaller nasion perpendicular to pogonion (OCG, -11.13 ± 4.98; SOG, -16.92 ± 11.46) than OCG. Between T0 and T1, SOG demonstrated greater increases in SNB angle (OCG, -0.25 ± 1.40; SOG, 1.56 ± 3.47) and nasion perpendicular to pogonion (OCG, -0.34 ± 2.77; SOG, 8.29 ± 7.52), along with a greater decrease in ANB angle (OCG, 0.19 ± 1.28; SOG, -1.65 ± 3.01), indicating more substantial sagittal mandibular advancement. From T1 to T2, SOG showed a greater increase in FMA (OCG, 0.79 ± 1.52; SOG, 3.11 ± 3.21), and a greater decrease in overbite (OCG, -0.06 ± 0.96; SOG, -1.27 ± 2.01) and nasion perpendicular to pogonion (OCG, -1.25 ± 1.79; SOG, -3.67 ± 3.52), suggesting more marked dentofacial changes during long-term follow-up.
CONCLUSIONS: In adult patients with bilateral DDNR, orthodontic camouflage treatment provides more favorable long-term dentofacial stability but offers limited skeletal improvement. Surgical–orthodontic treatment produces greater skeletal enhancement during treatment but may be more susceptible to dentofacial relapse during long-term follow-up.

Abstract citation ID: cjag070.291
SP306 THERMOPHYSICAL AND SPECTROSCOPIC CHANGES IN ORTHODONTIC ALIGNERS AFTER EXPOSURE TO BEVERAGES AND CLEANING

Thomas Ethell[1], René Macquart[2], Elizabeth A Carter[3], Mehmet Ali Darendeliler[1], Narayan Gandedkar[1]; *[1]Discipline of Orthodontics, School of Dentistry, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW, Australia, Sydney, Australia, [2]Thermophysical Properties Facility School of Chemistry, University of Sydney, NSW, 2006, Australia, Sydney, Australia, [3]Vibrational Spectroscopy Facility, Sydney Analytical Madsen building, University of Sydney, NSW, 2006, Australia, Sydney, Australia*

AIM: To evaluate how exposure to everyday beverages and routine cleaning affects the thermal and molecular stability of clear orthodontic aligners, with emphasis on patient-relevant material performance and safety.
MATERIALS AND METHOD: New Invisalign®, Spark™, and Angel™ aligners were analysed using thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), Fourier-transform infrared spectroscopy (FTIR), and Raman spectroscopy. Aligners were immersed for 7 days at 37 °C in red wine, coffee, or artificial saliva to simulate common patient behaviours. One specimen per condition was subsequently cleaned using effervescent tablets for 3 minutes. New (T0), stained (T1), and cleaned (T2) aligners were compared. A general linear model with a significance level of $\alpha = 0.05$ evaluated brand and condition effects.
RESULTS: TGA demonstrated significant thermal differences between brands ($p<0.001$). Angel™ decomposed in a single step with 95.8-98.2% mass loss, while Invisalign® and Spark™ exhibited two-step decomposition, with the major step accounting for 85-93%. Onset temperatures for the primary decomposition ranged from 329-334 °C (Angel™) to 360-378 °C (Invisalign®/Spark™), indicating large safety margins far above any intraoral temperature exposure.

DSC confirmed brand-specific glass transition patterns, reflecting mechanical behaviour: Angel™ at ∼65-80 °C, Spark™ at ∼70 °C and ∼110 °C, and Invisalign® near ∼100 °C, with additional relaxation events at 103-117 °C appearing after staining. These values indicate preserved flexibility and stiffness within patient-relevant temperature ranges.

FTIR identified no structural degradation after exposure or cleaning, except in saliva-immersed samples, which showed a 32-48% increase in N-H stretching absorbance near 3300 cm^{-1}, representing superficial interaction rather than polymer breakdown.

Raman spectroscopy mapping confirmed material layering differences: Angel™ was a single polyurethane system, whereas Invisalign® and Spark™ were multilaminate constructions combining polyurethane and copolyester. Crucially, no Raman-detectable molecular changes occurred after beverage exposure or cleaning, highlighting material resilience during daily patient use.
CONCLUSIONS: Across three major clear aligner systems, exposure to red wine, coffee, and common cleaning agents produced minimal thermal or molecular alteration, with only saliva causing minor surface-level changes. These findings support that clear aligners maintain structural integrity, safety, and predictable clinical performance under simulated patient conditions.

Abstract citation ID: cjag070.292
SP309 MANAGING REGIONAL CHAIR-USAGE RESTRICTIONS IN AN ORTHODONTIC SERVICE DURING COVID-19: A QUALITY IMPROVEMENT APPROACH

Sarah Fligelstone, Kristian Davies, Jacob Curtis, Charlotte Eckhardt; *Swansea Bay University Health Board, Swansea, United Kingdom*

AIM: Following COVID-19 restrictions, the department operated below capacity at one day per week, risking delayed treatment and reduced care quality for a regional population. This project aimed to safely restore orthodontic clinical

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

activity from 50% to full 60-session weekly provision.

SUBJECTS AND METHOD (per SQUIRE Guidelines): Restricted clinical activity, even at full occupancy, hindered timely service provision. The SMART aim was to increase orthodontic chair availability from 50% to 100%. Prospective twice-daily data were collected from September 2020 to 2024 and summarised monthly on run charts, including percentage change in allocated weekly sessions (outcome), mean weekly sessions utilised (process) and patient attendance (balancing). Three Plan-Do-Study-Act (PDSA) cycles were undertaken: baseline data were presented with supporting literature to the directorate; stakeholder updates included metrics and waiting list figures; and a 60-session timetable was proposed with adequate staffing.

RESULTS: Capacity improved by 37% (22 sessions), reaching 87% of the target (52 sessions) after PDSA 3. Run chart analysis demonstrated three shifts, indicating a non-random signal of sustained improvement. Higher patient attendance suggested shorter interappointment intervals, consistent with the aim. These gains benefitted a census population of 8,508 patients. Although data collection ended early as stakeholders resumed clinical duties, the findings aided recovery of the remaining eight sessions in November.

CONCLUSIONS: Integrating longitudinal chair-usage data with evidence on delayed treatment risks supported effective regional change during service volatility. In the absence of prescriptive guidance, proactive advocacy remains essential to minimise disruption.

Abstract citation ID: cjag070.293
SP313 CHARACTERIZATION OF RIGHT–LEFT SYMMETRY IN MAXILLARY BONE MICROARCHITECTURE USING FRACTAL ANALYSIS

Hilal Algul, Gozde Haksayar, Tulin Ufuk Toygar Memikoglu, Ayse Tuba Altug; *Ankara University Faculty of Dentistry, Ankara, Turkey*

AIM: The objective of this study was to evaluate the regional symmetry of maxillary trabecular bone microarchitecture in adult individuals without dental, skeletal, or orofacial anomalies by comparing right and left fractal dimension values using fractal analysis. Additionally, the study aimed to explore whether microstructural characteristics of the maxillary bone may be associated with the higher prevalence of orofacial anomalies reported on the left side in the literature.

MATERIALS AND METHODS: Panoramic radiographs of a total of 88 individuals were retrospectively included in the study (45 females, 43 males; mean age 22.85±5.28 years). Fractal analysis was performed using ImageJ software (ImageJ 1.53e, NIH, Bethesda, MD, USA). Polygonal regions of interest (ROIs) representing the largest anatomically confined areas between the lateral incisor and canine were selected bilaterally, and fractal dimension values were calculated using the box-counting method. The distribution of right–left fractal dimension values was assessed with the Kolmogorov–Smirnov test. Paired t-tests were used for normally distributed data, and Wilcoxon signed-rank tests for non-normal data. Statistical significance was set at $p<0.05$.

RESULTS: Fractal analysis revealed measurable differences between the right and left maxillary regions. Comparison of maxillary fractal dimension values revealed significantly higher fractal dimensions, indicating a more complex trabecular organization, on the left side ($t = -2.29$, $p = 0.024$).

CONCLUSION: This study demonstrated a significant right–left difference in maxillary trabecular bone microarchitecture, with higher fractal dimensions on the left side. These findings suggest that the maxilla may not exhibit complete bilateral microstructural symmetry, and that the left side may present a more complex trabecular organization. The results align with previous reports of left-sided predominance of certain orofacial anomalies and support the utility of fractal analysis as a sensitive method for detecting regional variations in maxillary bone structure.

Abstract citation ID: cjag070.294
SP314 ‡‡‡ IMPACT OF POST-PRINT PROCESSING ON THE CYTOTOXICITY OF 3D-PRINTED ALIGNER MATERIALS

Ružica Badić, Ivna Vuković Kekez, Gordana Paić Karega, Danijela Kalibović Govorko; *Department of Orthodontics, University of Split School of Medicine, Split, Croatia*

AIM: To determine the effect of post-print processing on the cytotoxicity of a 3D-printed aligner material.

MATERIALS AND METHODS: 3D-printed samples of Tera Harz TC-85 DAC were processed using the manufacturer's protocol and different modified post-print procedures involving different resin-removal methods (centrifugation, 97% ethanol, 96% isopropanol), polymerization conditions (air or water), and immersing in an ultrasonic bath at 80 °C for two minutes. All samples were cut into 2 × 2 cm pieces and incubated in artificial saliva (0.1 g/mL; ISO 10993-12) at 37 °C for fourteen days. Extracts were diluted to four test concentrations (c1=10%, c2=20%, c3=30% and c4=50 %). Cytotoxicity was assessed on human oral fibroblasts using the CCK-8 assay after 4 h, 24 h, 48 h, and 72 h of exposure. Cell viability was calculated according to ISO 10993-5. The cytotoxicity trend was assessed graphically, and group comparisons were performed using the Kruskal–Wallis test with Dunn post hoc analysis.

RESULTS: After fourteen-day incubation of Tera Harz TC-85 DAC in artificial saliva, a clear concentration-dependent cytotoxicity pattern was observed, with reduced metabolic activity particularly at higher concentrations. The percentage of metabolically active cells frequently fell below the 70% cytotoxicity threshold at 24 h, 48 h, and 72 h when resin was removed by centrifugation, whereas other processing methods generally showed a similar and mostly non-cytotoxic pattern.

Statistically significant differences between concentrations were identified in multiple processing conditions (Pholm < 0.05), most notably between c1 and c2, c1 and c3, c1 and c4, as well as between c2 and c4. Comparison of incubation times also revealed significant differences in specific processing modes and concentrations (Pholm < 0.05), especially between 4 h and 48 h, 4 h and 72 h, and 48 h and 72 h.

CONCLUSIONS: Cytotoxicity of the 3D-printed aligner material varied with extract concentration, incubation time, and post-print processing method. Centrifugation resulted in the most pronounced reduction in cell viability, frequently falling below the cytotoxicity threshold, while other processing protocols produced largely non-cytotoxic patterns. These findings emphasize the need to optimize post-processing workflows to minimize cytotoxic effects and ensure the biocompatibility of 3D-printed orthodontic materials.

Abstract citation ID: cjag070.295
SP315 ANGEL ATTACCHMENTS WITH DIFFERENT TEMPLATE AND COMPOSITE

ILENIA CORTESE[1], RICCARDO PROVARONI[2], CARLA CLEMENTE[1], SUSANNA FLAVIA FEDRIZZI[1], ROBERTA CONDO'[3]; *[1]Post-graduate student Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy, [2]PRIVATE PRACTICE, Rome, Italy, [3]Assistant Professor, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy*

AIM: This study compares the accuracy, surface morphology, and clinical handling of ANGEL® attachments placed using two template types—Soft Template (upper arch) and Hard Template (lower arch)—combined with two composite resins: 3M™ Clarity™ and GC Aligner Connect. The aim is to determine the influence of template rigidity and composite formulation on attachment fidelity and workflow efficiency.

MATERIALS AND METHOD: *A split-arch design was planned on 21 patients undergoing clear aligner therapy* • Upper arch (Soft Template): – Quadrant I: 3M Clarity – Quadrant II: GC Aligner Connect • Lower arch (Hard Template): – Quadrant III: 3M Clarity – Quadrant IV: GC Aligner Connect

Attachments followed standardized ANGEL® geometries. Pre- and post-bonding intraoral scans were superimposed to measure deviations in height, width, and volume. Digital microscopy was used to evaluate surface texture and marginal adaptation. Clinical parameters—including working time, excess removal, and post-curing integrity—were recorded. Patient comfort was assessed using a visual analog scale.

RESULTS: Hard Templates produced higher dimensional accuracy and less volumetric distortion than Soft Templates. Attachments made with 3M Clarity demonstrated the most consistent morphology, particularly in the lower arch, likely due to the resin's high filler load and sculptability. GC Aligner Connect showed good flow and adaptation but led to slightly increased over-contouring in Soft Templates. The fastest clinical workflow occurred with Hard Template + 3M Clarity. Patient comfort scores were similar across all quadrants.

CONCLUSIONS: Attachment precision depends on both template rigidity and composite composition. Hard Templates paired with a highly filled composite such as 3M Clarity provide the most predictable and accurate ANGEL® attachment reproduction. Soft Templates may require more flowable composites but show minor dimensional variability. Matching template and composite selection is therefore key to optimizing attachment performance in aligner therapy.

Abstract citation ID: cjag070.296
SP316 USING MACHINE LEARNING TO PREDICT RELAPSE FOLLOWING ORTHODONTIC CLASS II TREATMENT

Stratos Vassis[1], Jason Liu[1], Thomas Klit Pedersen[1], Ruben Pauwels[2], Peter Stoustrup[1]; *[1]Section of Orthodontics, Aarhus University, Aarhus, Denmark, [2]Department of Dentistry and Oral Health, Aarhus University, Aarhus, Denmark*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: Relapse after Class II malocclusion correction is a clinical challenge, but its prediction remains difficult. This study aims to develop a machine learning model for predicting Class II relapse to improve long-term stability.
MATERIALS AND METHOD: This retrospective study included 300 treated Class II patients. Data included cephalometric variables (Björk analysis), overjet/overbite, and molar/canine relationships, and treatment-modality at baseline, debond, and 2-year follow-up. For model development, feature selection was combined with frequency-based ranking, top-K XGBoost screening, and randomized forward selection. Machine learning models (XGBoost and LightGBM) were trained and integrated into weighted-ensemble and stacked architectures. Explainability was assessed using SHAP values, permutation importance, and univariate logistic regression.
RESULTS: Feature selection identified overjet at debond, canine-relation ratios, ANB angle, overbite change, and alveolar prognathism measures as the most informative predictors. The models achieved 70% accuracy (AUC ≈ 0.70). Across all approaches, ANB angle, overjet at debond, and overbite change consistently demonstrated the strongest predictive influence.
CONCLUSIONS: The developed machine-learning models showed moderate predictive ability, with ANB angle, overjet at debond, and overbite change emerging as the key indicators of sagittal relapse after Class II treatment.

Abstract citation ID: cjag070.297
SP318 AUTOMATED UPPER AIRWAY SEGMENTATION ON CBCT USING A MONAI LABEL–BASED 3-DIMENSIONAL U-NET FRAMEWORK

Tingting Zhou[1], Yuchao Shi[2], Yuhao Yi[3], Jie Feng[1], Xianglong Han[1]; *[1]State Key Laboratory of Oral Diseases & National Center for Stomatology & National Clinical Research Center for Oral Diseases & Department of Orthodontics, West China Hospital of Stomatology, Sichuan University, Chengdu 610041, Sichuan, China, [2]State Key Laboratory of Oral Diseases & National Center for Stomatology & National Clinical Research Center for Oral Diseases & Department of Oral Radiology, West China Hospital of Stomatology, Sichuan University, Chengdu 610041, Sichuan, China, [3]Department of Pathology, West China Hospital, Sichuan University, Chengdu 610041, Sichuan, China*

AIM: This study aimed to develop and validate a MONAI Label–driven 3D U-Net framework for fully automated upper airway segmentation on CBCT to support objective airway assessment in orthodontic patients.
MATERIALS AND METHODS: A total of 50 CBCT scans were retrospectively collected, comprising 30 for model training, 10 for validation, and 10 for independent testing. Ground-truth airway masks were generated through interactive annotation using a MONAI Label pipeline embedded in 3D Slicer, enabling incremental training and real-time inference. A 3D U-Net architecture was trained under a supervised learning strategy with data augmentation and patch-based sampling. Model performance was evaluated on the test set using the Dice similarity coefficient, 95% Hausdorff distance, and volumetric deviation. Paired statistical analyses were performed to compare automated and manual airway volume measurements, with significance set at $p < 0.05$.
RESULTS: On the independent test set ($n = 10$), the 3D U-Net achieved a mean Dice similarity coefficient of 0.88 ± 0.03, with a median 95% Hausdorff distance of 2.9 mm. The mean volumetric deviation between automatic and manual annotations was $5.2 \pm 3.0\%$. Paired comparisons revealed no significant differences in airway volume measurements between the two methods ($p = 0.27$). The average inference time per CBCT scan was 7.4 ± 1.1 seconds, demonstrating the feasibility of real-time clinical deployment.
CONCLUSION: The proposed MONAI Label–based 3D U-Net system provides a reliable and efficient approach for automated upper airway segmentation on CBCT, offering a clinically feasible tool for objective airway evaluation in orthodontic practice.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.298
SP319 ORAL HEALTH-RELATED QUALITY OF LIFE IN INDIVIDUALS WITH CLEFT LIP AND PALATE : A SYSTEMATIC REVIEW

Aswani Abdul Rashid[1], Syed Bazli Alwi Syed Bakhtiar Ariffin[1], Aida Nur Ashikin Abd Rahman[1], Kazi Ahsan Jamil[2]; *[1]Centre of Paediatric Dentistry & Orthodontic Studies, Faculty of Dentistry Universiti Teknologi MARA, Selangor, Malaysia, [2]Centre of Preclinical Science Studies, Faculty of Dentistry Universiti Teknologi MARA, Selangor, Malaysia*

AIM: Oral health–related quality of life (OHRQoL) has emerged as a critical patient-centered outcome in cleft lip and palate (CLP) research, because the condition disrupts oral function, facial appearance, and psychosocial wellbeing. The aim of this review was to systematically synthesize and critically appraise contemporary evidence (2021–2025) on oral health–related quality of life (OHRQoL) in individuals with cleft lip and palate, with particular emphasis on patient-reported outcomes, the influence of clinical and multidisciplinary care pathways, and the validity and application of OHRQoL measurement instruments. METHODOLOGY:

This systematic review followed PRISMA guidelines, and two major scientific databases (Web of Science and Scopus) were searched using the advanced controlled keyword string “oral AND quality AND cleft.” The search was restricted to 2021–2025 English journal articles. After applying eligibility criteria, removing duplications, and conducting quality appraisal, 30 primary studies (n=30) were included for synthesis.
RESULT: Evidence synthesis generated three dominant themes: (1) Patient-reported outcomes demonstrated consistently lower OHRQoL across age groups, with psychosocial impact frequently persisting after surgery; (2) Clinical and orthodontic interventions, especially those aligned with structured multidisciplinary cleft team pathways, improved some functional and esthetic outcomes, but disparities in access and service delivery still limited results; and (3) Validated PROM instruments (e.g., COHIP, OHIP-14, CLEFT-Q) showed acceptable psychometric performance, but cross-cultural translation and comparability remain incomplete.
CONCLUSION: Overall, contemporary evidence reveals that OHRQoL in CLP is multifactorial and remains suboptimal despite advances in surgical and orthodontic care, emphasizing the need to integrate psychosocial support, equitable service access, robust PROMs, and routine multidisciplinary follow-up. Future research should focus on culturally sensitive standardization of outcome measures, improve service delivery models, and prioritize patient-reported outcomes as core indicators of treatment success.

Abstract citation ID: cjag070.299
SP321 SUCCESS RATE OF GUIDED- VERSUS FREEHAND-PLACED INTERRADICULAR MANDIBULAR MINISCREWS IN ORTHODONTIC PATIENTS: A PROSPECTIVE CLINICAL TRIAL

Tarek Abasseri, Paolo Cattaneo, Denice Loo, Paul Schneider, Marie Cornelis; *University of Melbourne, Melbourne, Australia*

AIM: Miniscrews are commonly used in orthodontics for anchorage augmentation, yet their stability can be compromised in growing patients due to ongoing alveolar bone remodelling. The aim of this study is to evaluate the success rate in terms of stability of a guided technique for interradicular mandibular miniscrew placement in growing patients, compared with traditional freehand insertion.
METHOD: Consecutive growing patients were enrolled in the trial. The inclusion criteria were: (1) age 11–15 years, (2) a skeletal Class III malocclusion, (3) and the presence of an erupted mandibular canine and first premolar, or an erupted first and second premolar in both quadrants. In the guided placement group, patients received intraoral digital scans and cone beam computed tomography (CBCT) imaging. Optimal interradicular sites between the mandibular canine and first premolar, or first and second premolar regions, were identified. CBCT and miniscrew stereolithography (STL) datasets were superimposed to plan the insertion trajectory, and an acrylic customised surgical guide was designed and fabricated for guided placement. In the freehand group, interradicular sites between the mandibular canine and first premolar, or first and second premolar regions, were defined using clinical examination, and panoramic radiography alone. The primary outcome was miniscrew stability across at least 6 weeks. Nominal variables were analysed using Chi-square tests.
RESULTS: Twenty-two patients (average age 12.5 yrs ±1.2 yrs, 44 miniscrews) were recruited into the guided placement group, compared with fourteen patients (average age 11.7 yrs ±0.7 yrs, 28 miniscrews,) in the freehand placement group. Guided placement demonstrated a significantly higher miniscrew success rate than freehand insertion (40/44 vs. 17/28), corresponding to 90.9% and 60.7%, respectively ($P \leq 0.05$).
CONCLUSION: Guided mandibular interradicular miniscrew placement significantly increases success rate compared with freehand techniques in growing patients, with respect to stability. Surgical guides may enhance predictability and provide more reliable miniscrew anchorage in orthodontic treatment in growing patients with developing bony morphology.

Abstract citation ID: cjag070.300
SP323 TEMPOROMANDIBULAR JOINT DISORDER SYMPTOM RELIEF AND CLASS II CORRECTION WITH A MODIFIED STABILIZATION SPLINT : A CASE REPORT

DUYGU ISCAN[1], AMIRHOSSEIN KHALILZADEH[1], Arda Tabancalı[2]; *[1]ISTANBUL AYDIN UNIVERSITY FACULTY OF DENTISTRY DEPARTMENT OF ORTHODONTICS, ISTANBUL,*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Turkey, [2]Aydın University Faculty of Dentistry Department of Orthodontics, ISTANBUL, Turkey

AIM: The aim of this case report is to highlight the importance of functional-oriented orthodontic examination and to present the effects of temporomandibular disorder (TMD) management using a modified stabilization splint in a patient with Class II Division 2 malocclusion, despite ongoing debate regarding the relationship between TMD and malocclusion.
SUBJECTS AND METHOD: A 14-year-old patient was referred to the orthodontic clinic for treatment of Class II Division 2 malocclusion. The initial functional examination revealed a restricted functional mandibular position and signs of TMD. Detailed history indicated temporomandibular joint (TMJ) pain, joint clicking, headaches, upper back pain, dizziness, and tinnitus.

A modified stabilization splint incorporating a three-way expansion screw was fabricated to correct the inclination of the maxillary arch and eliminate occlusal restriction on the mandible. The screw was activated weekly for 6 months, and splint therapy continued with adaptational grinding until the predefined objectives were achieved.
RESULTS: Following splint therapy, all TMD symptoms resolved, with complete elimination of TMJ pain, joint sounds, headaches, upper back pain, dizziness, and tinnitus. The patient's TMJ pain intensity decreased from 9/10 to 0/10 on the visual analog scale. Intraoral findings demonstrated maxillary incisor proclination and reduced crowding. Maxillary incisor proclination was evidenced by an increase in U1–SN from 88.4° to 97.7° and in U1–NA from 0.6 mm to 4.1 mm, findings confirmed by local cephalometric superimpositions. Forward mandibular repositioning occurred, correcting the Class II molar and canine relationships. Cephalometric total superimpositions revealed anterior mandibular displacement, with ANB decreasing from 3.4° to 1.3° and Wits appraisal from 5.6 mm to 0.4 mm, indicating a transition from Class II to Class I skeletal relationship. Pog–N-Perp (FH) improved from −6.5 mm to −3.8 mm, returning to normal limits.
CONCLUSION: Functional evaluation is an indispensable component of accurate orthodontic diagnosis and treatment planning. Identifying underlying functional alterations can modify treatment strategies, shorten treatment duration, and enable simultaneous correction of multiple problems. The modified stabilization splint used in this case proved to be a practical and effective appliance for alleviating TMD symptoms and contributing to the correction of Class II Division 2 malocclusion.

Abstract citation ID: cjag070.301
SP324 DISPLACEMENT AND STRESS DISTRIBUTION EVALUATION OF CONTROLLED ASYMMETRIC MARPE IN YOUNG ADULTS: A THREE DIMENSIONAL FINITE ELEMENT STUDY

Francesca Zara[1], Marco Serafin[1], Salvatore Bocchieri[2], Elisa Boccalari[1], Alberto Caprioglio[1]; [1]University of Milan, Milan, Italy, [2]university of Messina, Messina, Italy

AIM: The aim of the present study was to biomechanical evaluate the skeletal effects of MARPE (miniscrew assisted rapid palatal expansion) through FEM(finite element method analysis).Different symmetrical and asymmetrical numbers and placements of TADs(temporary anchorage devices) were tested in order to ponder a potential selective movement of basal and alveolar bones.
MATERIALS AND METHODS: A full-cranium perfectly specular model was used for a biomechanical evaluation of MARPE. The mesh was mechanically characterized and tested by FEM across eight different configurations, including symmetrical and asymmetrical designs. A viscoelastic model with a 250mm/12-hours activation protocol was simulated until 10mm of expansion was reached. Von Mises stress distribution was analyzed, and patterns displacements as Euclidean distances were quantified along the anterior nasal spine (ANS) and posterior nasal spine (PNS).To characterize the model, a 1mm external shell was defined as cortical bone while the rest of the file was considered as continuous cancellous bone. Also, cortical and alveolar bones were assumed to be homogenous and isotropic. The midpalatal suture was simulated by spitting the maxilla along the anterior and posterior nasal spines and considering a 0.2mm of virtual space between the maxillary halves.
RESULTS: When symmetric expansion was performed using interalveolar and posteriorly placed TADs, the largest observed opening were along the ANS (10.78mm) and the PNS (8.02mm). Designs with asymmetry, due to the number of TADs, resulted in the most pronounced asymmetrical displacement of the PNS between sides (1.46mm). Conversely, asymmetry based solely on positional differences, affected the total displacement of the PNS (10.27mm) and the asymmetry in ANS displacement between sides (0.51mm).Conclusions: FEM analysis revealed how MARPE design might change the clinical outcome in terms of anterior and posterior expansion. Symmetric configurations with two paramedian anterior and two paramedian posterior TADs demonstrated significant greater skeletal expansion at ANS and PNS, making them suitable for cases requiring substantial and uniform maxillary widening, i.e., bilateral posterior crossbite and anterior crowing. On the contrary, symmetric paramedian TADs positioned anteriorly emphasizes more the opening of suture in the ANS area, being indicated for intercanine crowding in absence of significant posterior transversal deficiency.

Abstract citation ID: cjag070.302
SP325 MAPPING SEX DIFFERENCES IN ADULT TMJ ARTHRITIC CHANGES VIA CBCT IMAGING

Meyra Durmaz, Mehmet Alp Eriş, Merve Berika Kadıoğlu, Mehmet Emre Yurttutan; Ankara University, ankara, Turkey

AIM: Bone changes observed in temporomandibular joint (TMJ) structures may indicate adaptive remodeling or degenerative processes in adults. Therefore, determining the distribution of these morphological changes according to gender may contribute to more accurate clinical evaluations. The aim of this study is to examine the prevalence of basic osseous changes in the TMJ in adult patients and to determine whether there are any significant differences between genders.
MATERIALS AND METHOD: *This retrospective study includes 103 adults (36 males, 67 females) who underwent cone beam computed tomography (CBCT) for clinical evaluation. The presence of erosion, flattening, osteophytes, sclerosis, and subchondral bone cysts in each temporomandibular joint was assessed as "present/absent" according to criteria based on the literature. Differences between genders were analyzed using the chi-square test; the significance level was set at $p < 0.05$.*
RESULTS: *According to the findings, erosion was observed in 11.1% of men and 10.4% of women, with no significant difference ($p = 0.883$). Flattening was recorded in 26.4% of men and 31.3% of women; however, this difference was not statistically significant ($p = 0.458$). Osteophyte formation was detected in 6.9% of men and 9% of women, with no significant difference ($p = 0.617$). Sclerosis was observed in approximately 11% of both genders, with no significant difference between genders ($p = 0.956$). Subchondral bone cysts was the change with the lowest prevalence in the adult sample, observed in 2.8% of men and 5.2% of women; however, this difference was also not significant ($p = 0.413$). Overall, although there was a tendency for bone changes to be observed at higher rates in female individuals, no parameter showed a statistically significant difference based on sex.*
CONCLUSIONS: *In conclusion, the prevalence of basic osseous changes associated with TME in this sample of adults does not show a significant difference between genders. The findings reveal that adaptive and degenerative processes in TME cannot be explained solely by the sex factor.*
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.303
SP326 THE EFFECT OF ORTHODONTIC ANOMALIES ON THE ORAL HEALTH-RELATED QUALITY OF LIFE IN ADOLESCENTS IN NORTHEAST GERMANY: A CROSS-SECTIONAL EPIDEMIOLOGICAL ANALYSIS

Ahmad Al Masri[1], Christiane Pink[2], Karl-Friedrich Krey[3], Christian H. Splieth[4], Mhd. Said Mourad[1]; [1]Department of Orthodontics, department of Pediatric Dentistry, Greifswald University Medicine, Greifswald, Germany, [2]Department of Restorative Dentistry, Periodontology and Endodontology, Greifswald University Medicine, Greifswald, Germany, [3]Department of Orthodontics, Greifswald University Medicine, Greifswald, Germany, [4]Department of Pediatric Dentistry, Greifswald University Medicine, Greifswald, Germany

AIM: Oral Health-related Quality of Life (OHQoL) is an essential aspect to consider in dentistry. This study investigated the effect of orthodontic anomalies on the OHQoL of adolescents.
MATERIALS AND METHODS: Cross-sectional data were collected from 2021 to 2023 alongside the compulsory dental school examinations in the district of XXX, XXX Germany (ethical approval: reg. no.BB 129/20/XXX University). A detailed orthodontic examination was performed by two experienced and calibrated examiners using a dental mirror and an overbite-ruler. OHQoL was collected independently using the German version of the COHIP-19 questionnaire, only with signed written consent from parents/guardians. The findings were documented in Excel and exported to Stata for statistical analysis. Regression coefficients with 95%-confidence intervals were obtained from adjusted multi-level models. The relevance of predictors was calculated as the Wald χ^2 statistic minus the corresponding degrees of freedom.
RESULTS: A total of 5,888 adolescents (48.6% females) aged between 10-18 years had a dental and orthodontic examination (mean age 14.5 ±2). Among them, 2,144 had consent for the COHIP-19 (14 ±2 years, 50.5% females). In this group, 32.8% had an orthodontic anomaly and treatment need according to the German

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

health insurance system (KIG≥3). Active orthodontic treatment was documented by 15.2% while 18.2% had an earlier orthodontic treatment. The mean score of COHIP-19 was 62.8 ±8.2. Regression analyses confirmed the presence of at least one orthodontic anomaly (KIG≥3) as a significant risk factor for reduced COHIP-19 with B= -1.8 [-2.6; -1.1]. Individual statistically significant orthodontic risk factors were missing teeth (-2,6 [-4,9; -0,2]), overjet >6mm (-1,9 [-3,2; -0,6]), frontal crowding >3mm (-1,3 [-2,5; -0,2]), and spacing (-2,7 [-3,9; -1,5] for the front and -4,5 [-6,9; -2,0] for the back teeth).
CONCLUSION: This cross-sectional epidemiological study confirms that orthodontic anomalies have a negative effect on self-reported Oral Health-related Quality of Life (OHQoL), reflected by lower scores of COHIP-19. Prospective longitudinal studies are recommended to confirm beneficial effects of orthodontic treatment on OHQoL.
FUNDING: This study is part of the XXX project, which was funded by the German Federal Joint Committee (G-BA; XXX).

Abstract citation ID: cjag070.304
SP327 ‡‡‡ FROM TRADITIONAL POLYMERS TO NEW MATERIALS FOR CLEAR ALIGNERS: A SYSTEMATIC REVIEW

Isabella Parziale, Stefania Santaniello, Beatrice Simone, Niccolò Cenzato, Alberto Caprioglio; *University of Milan, Milan, Italy*

AIM: The aim of this work was to study clear aligners materials and their main functional characteristics in order to evaluate how these materials influence clinical outcomes and to have an overview on new solutions available on material choice, in response to the increasing demand for orthodontic treatments with clear aligners.
MATERIALS AND METHODS: The literature review was conducted across major medical databases as Pubmed, Medline, Cochrane Library, Scopus and Embase, only studies published from 2014 onward were included, using keywords as *orthodontic appliance*, *clear aligners*, *thermoplastic polymers*, *simulated oral environment*, *mechanical properties*, *physical properties*, *chemical properties*. A total of 11 studies were selected, allowing a comparison of the properties of 17 different polymers.
RESULTS: The literature analysis revealed that the materials used in the fabrication of clear aligners fall into three main categories. PETG is among the most widely used due to its high optical clarity, good mechanical strength and ability to deform without fracturing. TPU, characterized by their marked elasticity and their capacity to deliver lighter and more consistent forces to the teeth. Additional polymers as polycarbonate, polypropylene and copolyesters, are often incorporated into multilayer structures or hybrid combinations to achieve more balanced performance. The studies evaluated mechanical parameters, physicochemical properties, optical features and surface qualities. The impact of the thermoforming process was also assessed, as this critical phase often alters and diminishes the mechanical performance of the materials.
CONCLUSIONS: PETG-based materials offer a favorable balance of transparency and elasticity, however, they experience a noticeable reduction in mechanical strength after thermoforming and following prolonged exposure to oral fluids. TPU materials, on the other hand, provide greater elasticity and improved long-term stability, contributing to more predictable tooth movements. Despite these advantages, they tend to be more prone to fracture and generally exhibit lower resistance to sliding. Multilayer or hybrid solutions, created by combining different polymers, allow for a more balanced optimization of rigidity, aesthetics and patient comfort, although their performance can vary depending on the specific formulation. Thermoforming substantially alters the properties of both PETG and TPU, there is a clear need for the development of more advanced polymers.

Abstract citation ID: cjag070.305
SP329 WIDENING THE PICTURE: A FIVE-YEAR REVIEW OF RAPID MAXILLARY EXPANSION AT BIRMINGHAM DENTAL HOSPITAL

Amardeep Dhadwal, Mohammed Lone, Shane Higgins, Sheena Kotecha; *Birmingham Dental Hospital, Birmingham Community Healthcare NHS Foundation Trust, Birmingham, United Kingdom*

AIM: To evaluate the use and outcomes of rapid maxillary expansion (RME) in the orthodontic department over a five-year period, reviewing indications, appliance design, treatment progression, complications, and overall success to identify areas for improving patient care.
MATERIALS AND METHOD: A retrospective service evaluation was undertaken at Birmingham Dental Hospital, assessing records of all patients (n= 49) prescribed an RME appliance from 2019 to 2024. Data were captured using a customised proforma which included demographics, initial crossbite, clinical indication, appliance design, activation protocol, review frequency, complications, unscheduled visits, transition management, relapse and next phase of treatment. Outcomes were assessed in terms of successful expansion, appliance breakages, compliance, and need for further expansion. Data were compared with locally agreed criteria and descriptive statistics were used where appropriate.
RESULTS: Forty-nine records met the inclusion criteria,18 male and 31 female with a mean age of 14 years (range: 9-20 years). Most cases (90%) used banded RME appliances, predominantly hybrid designs on first molars and upper first premolars, with 76% presenting with bilateral buccal crossbites. Review intervals during the expansion phase were usually weekly, with a maximum interval of six weeks due to poor compliance. The majority of patients (92%) were advised to turn the screw twice daily. Complications were generally minor, including difficulty turning the screw, band debonding, poor fit, compliance issues, overcorrection, soft tissue irritation, transient pain/headaches and occasional eating difficulties. Eighteen percent required unscheduled review visits. The most common method for maintaining expansion was conversion to a transpalatal arch (81%). Relapse occurred in 8% of patients, further expansion was required in 29% and 4% subsequently underwent surgically assisted expansion.
CONCLUSIONS: The use of rapid maxillary expansion is generally successful with low rates of relapse or need for further expansion. Complications were mainly related to patient compliance and appliance breakage. Limitations of this service evaluation, including inconsistent record-keeping and a relatively small sample size, suggest that further prospective evaluation is warranted. This will help to refine protocols, optimise appliance use and ultimately improve patient outcomes.

Abstract citation ID: cjag070.306
SP330 AN AUDIT OF WAITING-TIME COMMUNICATION FOR ORTHOGNATHIC PATIENTS AT BIRMINGHAM DENTAL HOSPITAL

Amardeep Dhadwal, Sheena Kotecha, Shane Higgins; *Birmingham Dental Hospital, Birmingham Community Healthcare NHS Foundation Trust, Birmingham, United Kingdom*

AIM: Documenting discussions about expected waiting times at the initial new patient clinic assessment is integral to valid consent, patient-centred care and compliance with professional standards. This audit aims to determine local orthodontic departmental compliance for documenting Orthognathic Multidisciplinary Team (MDT) Clinic waiting-time discussions at new patient clinics.
MATERIALS AND METHODS: A retrospective record-keeping audit was undertaken in Birmingham Dental Hospital. A customised clinical audit proforma was used to collect data for 50 orthodontic new patients that were referred to the Orthognathic MDT Clinic for assessment, from January to December 2025. Clinical notes and clinic letters were reviewed for documented communication of expected waiting times for both the Orthognathic MDT Clinic and commencement of orthodontic treatment. The gold standard required 100% of records to document the waiting-time discussions with this information included in clinic letters to the patient and referrer.
RESULTS: Fifty records were analysed. Documentation of Orthognathic MDT Clinic waiting-time discussions was found in 14% of records with 12% specifying the expected wait time. Waiting-time information was included in clinic letters in 4% of cases. Four per cent of records documented the expected wait time for commencing orthodontic treatment. Just one record demonstrated full compliance across all audit standards. Full clinical records for orthognathic planning were taken for 56% of cases at the new patient assessment and the remainder required at least one further appointment for records or planning prior to the MDT clinic. This led to delays in adding the patients to the MDT Clinic waiting list. In at least 8% of cases, the patient contacted the department to enquire about their appointment as they were unaware of the waiting times.
CONCLUSION: Departmental compliance on communicating and documenting waiting times was below the expected standard. Contributing factors included delays in initiating the MDT referral, delays in clinical record taking for orthognathic planning and limited awareness of the need to record waiting-time discussions. Findings will be disseminated locally to increase clinician awareness. Strengthening clinicians' understanding of waiting-time documentation requirements is essential for maintaining high-quality, patient-centred care.

Abstract citation ID: cjag070.307
SP331 CONE-BEAM COMPUTED TOMOGRAPHY–BASED VALIDATION OF A THREE-DIMENSIONAL INTRAORAL SCANNING METHOD FOR ALVEOLAR CLEFT ASSESSMENT

Maria isabella Federici, Annelise Küseler, Sven Erik Nørholt, Susanna Botticelli; *University of Aarhus, Aarhus, Denmark*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: In Denmark, secondary alveolar bone grafting for patients with unilateral or bilateral clefts is performed prior to the eruption of the tooth adjacent to the cleft (the lateral incisor or permanent canine), using either mandibular symphyseal bone or iliac crest bone as donor sites. In accordance with SedentexCT radiation guidelines grounded in the ALARA and ALADA principles, cone-beam computed tomography (CBCT) is routinely obtained preoperatively but is no longer taken at a standardized 1-year follow-up. Instead, postoperative CBCT is acquired only at selected timing points when clinically indicated. Because intraoral radiographs provide solely two-dimensional information, a three-dimensional, radiation-free follow-up method is needed. Our research group previously developed a measurement protocol based on intraoral scans (IO), which demonstrated excellent intra- and inter-examiner reliability. The aim of this study was therefore to validate this IO-based method by comparing preoperative IO measurements with those obtained from preoperative CBCT.
MATERIALS AND METHODS: This retrospective pilot study included 45 non-syndromic patients with unilateral cleft lip and alveolus or palate. Intraoral scans and intraoral radiographs were available at T0 (preoperatively) and T1 (3–4 months postoperatively). Preoperative CBCT at T0 served as the reference standard. The IO protocol comprised four height and two thickness measurements describing cleft morphology. The corresponding measurements—Height A, Height B, Height C, Height D (distal), Thickness A, Thickness B, and incisor bony coverage—were obtained from CBCT using Mimics (Materialise, Leuven, Belgium). IO- and CBCT-derived values were compared, and directional trends were assessed for consistency.
RESULTS: All IO-based measurements demonstrated the same directional trends as their CBCT equivalents. This uniformity across height and thickness dimensions indicates strong agreement between the IO-derived measurements and the CBCT reference standard.
CONCLUSIONS: Intraoral scanning provides a non-invasive, radiation-free modality for three-dimensional assessment of alveolar cleft morphology and early postoperative graft outcomes. Comparison with preoperative CBCT confirmed the validity of the IO-based measurement protocol, supporting its use as a reliable alternative when postoperative CBCT is not clinically indicated.

Abstract citation ID: cjag070.308
SP332 ‡‡‡ EFFECT OF UPPER SECOND MOLAR ERUPTION STATUS ON THE EFFICIENCY OF UPPER FIRST MOLAR DISTALIZATION: A SYSTEMATIC REVIEW AND META-ANALYSIS

Alessandra Campobasso[1], Umar Hussain[2], Nikolaos Pandis[3]; [1]The University of Melbourne, Melbourne, Australia, [2]Saidu College of Dentistry, Swat, Pakistan, [3]University of Bern, Bern, Switzerland

AIMS: The aim of this systematic review was to assess the distalization, tipping, and vertical movement of the maxillary first permanent molar in patients with and without erupted maxillary second molar (MSM).
MATERIALS AND METHODS: Unrestricted literature search of six databases was conducted up to May 2024 for randomized/non-randomized clinical studies comparing distalization, tipping, and vertical movement of the maxillary first permanent molar in patients with and without erupted MSM. After duplicate study selection and data extraction, the quality assessment of the studies was conducted using the Cochrane Risk of Bias Tool (ROBINS-I). Random effects meta-analyses using standardized mean differences (SMDs) and their 95% confidence intervals (CIs) were performed, followed by meta-regressions, sensitivity analyses, and assessment of the quality of evidence using GRADE.
RESULTS: Eleven studies (8 retrospective and 3 prospective non-randomized trials) involving 562 participants (43.97% male) were included. Distalization was significantly more effective when the maxillary second molar was unerupted (9 studies; SMD = −0.41; 95% CI: −0.81–−0.004; P = .04; I^2 = 68.6%). The eruption status of MSM has no significant effect on tipping (8 studies; SMD = −0.27; 95% CI: −0.68–0.15; P = .17), and vertical movement (4 studies; SMD = 0.08; 95% CI: −0.32–0.48; P = .57) of upper first molars during distalization. Sensitivity analyses showed no significant differences based on study design, appliance type, or anchorage type, confirming the robustness of the findings. The certainty in the estimates was very low due to high risk of bias, methodological weaknesses, and small sample sizes.
CONCLUSIONS: Very low level of evidence indicates that it may be preferable to perform distalization before the eruption of the upper second molar. However, the inclusion of non-randomized, mostly retrospective studies, unmatched baseline, Class II severity, and insufficient reporting of treatment duration are key limitations.

Abstract citation ID: cjag070.309
SP333 PREDICTABILITY AND EFFECTIVENESS OF SHAPE-MEMORY ALIGNER TREATMENT ACROSS TOOTH MORPHOLOGIES

JIN BAI[1], Helen Sophie Berger[2], Farhan Bazargani[1], Anna Westerlund[1], Björn Ludwig[3]; [1]University of Gothenburg, Gothenburg, Sweden, [2]Private Practice, Traben-Trarbach, Germany, [3]University of Homburg/Saar, Traben-Trarbach, Germany

AIM: To assess the predictability and effectiveness of shape-memory aligner (SMA) treatment by comparing virtually planned and clinically achieved tooth movements across different tooth types and morphological categories.
MATERIALS AND METHOD: This retrospective study included 200 patients (preliminary results including 45 cases with 621 teeth: 211 incisors, 97 canines, 172 premolars, 141 molars) treated with SMAs. Pre-treatment (T0), post-treatment (TA), and virtual-setup (TV) STL files were superimposed using stable palatal or mandibular lingual landmarks. Crown movements were quantified in three linear axes (X: buccolingual; Y: mesiodistal; Z: vertical) and three angular domains (first-order rotation, second-order tipping, third-order torque). Deviations between actual movements (AM: T0–TA) and virtual movements (VM: T0–TV) were calculated, and achievement ratios (ARs) were derived as AM/VM. Teeth were classified by morphology (plate-shaped incisors; single-cusped canines; bi-cusped premolars; multi-cusped molars). Group differences were tested using one-way ANOVA. Findings will inform a forthcoming large-scale investigation.
RESULTS: Preliminary results regarding linear movements showed that, the proportions of off-target outcomes (including over- and undercorrection) were 21.3%, 22.2%, and 26.1% for the X-, Y-, and Z-axes, respectively. Among teeth with on-target linear movements, mean ARs were 46.2% (X), 44.8% (Y), and 44.9% (Z), with no significant differences across directions or morphological categories ($P > 0.05$).

For angular movements, off-target proportions were 10.0% (rotation), 6.1% (tipping), and 6.7% (torque). Among teeth with on-target angular movements, ARs averaged 42.8% (rotation), 40.8% (tipping), and 40.0% (torque). Plate-shaped incisors demonstrated significantly lower third-order ARs compared with single-cusped, bi-cusped, and multi-cusped teeth ($P < 0.05$). Within the plate-shaped subgroup, maxillary central incisors showed significantly lower torque ARs than maxillary lateral and mandibular incisors ($P < 0.05$), and within this tooth type, third-order ARs were also significantly lower than rotation and tipping ARs ($P < 0.01$). No additional significant subgroup differences were identified.
CONCLUSIONS: SMA treatment demonstrates moderate predictability for linear and first-/second-order angular movements (mean AR 43.9% ± 2.1%). Predictability of third-order torque is substantially lower in plate-shaped teeth, particularly maxillary central incisors, highlighting a morphology-dependent limitation of SMA biomechanics.

Abstract citation ID: cjag070.310
SP335 COMPUTER AIDED DESIGN OF ALIGNER INTEGRATED BITEBLOCKS FOR CLASS II PATIENTS WITH TEMPOROMANDIBULAR DISORDERS

Nazar Blazhkiv; Odesa National Medical University, Department of Orthopedic Dentistry and Orthodontics, Odesa, Ukraine

AIM: The aim of this case report is to present a temporomandibular joint (TMJ) guided workflow for treating an adult Class II patient with temporomandibular disorders using in-house clear aligners incorporating computer aided designed, aligner integrated biteblocks.
MATERIALS AND METHOD: A 42-year-old female presented with skeletal Class II malocclusion (Wits 4.3 mm, ANB 6.2°), dental protrusion and bilateral TMJ clicking with masticatory discomfort. The lower left first molar was missing and replaced by an implant with a premolar-shaped crown, producing an asymmetrical posterior anatomy. A TMJ-first protocol was followed. First, a therapeutic condylar position and vertical dimension were established using deprogramming and a removable splint until joint symptoms reduced and a repeatable mandibular position was obtained. Second, intraoral scans were recorded in this therapeutic position with posterior disocclusion. Third, a virtual articulator was used to close the digital models into the desired final intercuspation while maintaining the therapeutic condylar position, and a full dental setup was designed in this position. Finally, the occlusion was digitally re-opened and aligner integrated biteblocks were constructed with a predefined thickness, adjusted for the thickness of the aligner material, to maintain controlled disocclusion throughout treatment. Tooth movement included sagittal correction, space management around the implant and reduction of incisor protrusion, all performed with in-house aligners manufactured from the digital setup.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: The protocol produced bilateral Class I canine and molar relationships with normalized overjet and overbite and improved facial profile. Occlusal contacts in the final position were stable without posterior open bite or unwanted vertical changes. TMJ symptoms resolved completely: joint clicking disappeared, there was no pain on palpation of the masticatory muscles, and mandibular movements became smooth and symmetrical during function. The patient reported comfortable chewing and absence of previous headaches at the end of treatment.
CONCLUSIONS: A TMJ-guided digital workflow with in-house clear aligners and computer aided designed, aligner integrated biteblocks allowed simultaneous control of condylar position and complex tooth movement in an adult Class II patient with temporomandibular disorders. This approach may provide a practical option for integrating TMJ management into aligner treatment in daily clinical practice.

Abstract citation ID: cjag070.311
SP336 CORRELATION ANALYSIS BETWEEN CLINICAL AND ANATOMICAL FACTORS AND RELIABILITY OF THE INSERTION GUIDE FOR PALATAL TEMPORARY ANCHORAGE DEVICES (TADS)

Raffaele Buono, Giorgio Oliva, Andrea Coletta, Cristiano Segnini, Vincenzo D'Antò; *University of Naples "Federico II", Napoli, Italy*

AIM: There is a need to identify the factors that influence reliability of digital planning and to assess their impact on the discrepancy between the planned position and the clinically achieved position during the insertion of Temporary Anchorage Devices (TADs) at the palatal level using a guide.
MATERIALS AND METHOD: The sample consisted of 46 subjects who required orthodontic treatment with palatal mini-screw-supported appliances for a total of 126 TADs. For each patient, an intraoral scan and a cone-beam scan were acquired for mini-screw planning. After screw insertion, a second scan was obtained. Planned and achieved positions of the TADs were compared by evaluating the distances between the heads and tips, as well as the different inclinations of the mini-screws. These discrepancies were then correlated with clinical and biological factors, using linear-quantile mixed-effects model analysis to evaluate their influence on positioning accuracy. Finally, the accuracy of the bicortical screw planning was analyzed.
RESULTS: The analysis showed that a number of mini-screws > 4 was associated with a significant increase in the distance between the tips (+2.02 mm) and the heads (+1.62 mm). Cortical thickness had a significant effect on the axial angle, leading to an increase in distortion of 1.16° per mm. Mini-screws planned as bicortical were accurate in 93.8% of cases.
CONCLUSIONS: A number of mini-screws > 4 and increased cortical thickness were identified as factors contributing to a significant discrepancy between planned and clinically achieved TAD positions. In 93.8% of cases, the planned bicortical TADs (BI) remained bicortical in the post-surgical phase.

Abstract citation ID: cjag070.312
SP338 EARLY PERIODONTAL AND ORAL HEALTH CHANGES DURING FIXED ORTHODONTIC TREATMENT IN ADOLESCENTS: PRELIMINARY FINDINGS FROM A PROSPECTIVE COHORT STUDY

Alba Kamberi[1], Sara Ghanim[2], Adela Alushi[3], Irina Isufi[4], Enida Petro[1]; *[1]The Faculty of Dental Medicine (FDM) at the University of Medicine (UMT), Tirana, Albania, [2]Department of Orthodontics, UCL Eastman Dental Institute, University College London (UCL), London, United Kingdom, [3]G.D'ANNUNZIO CHIETI - PESCARA UNIVERSITY, Chieti, Italy, [4]ALDENT University, Tirana, Albania*

AIM: To evaluate the early impact of fixed orthodontic appliances on periodontal health and oral hygiene in adolescents, with specific assessment of plaque accumulation, gingival inflammation, periodontal parameters, caries experience, and the development of white-spot lesions.
MATERIALS AND METHODS: This prospective cohort study followed sixty adolescents aged 12–18 years, divided into a group beginning fixed orthodontic treatment (n = 30) and an untreated age-matched control group (n = 30). Periodontal and oral health assessments were performed at baseline (T0) and again after six months (T1), recording fluoride use, Plaque Index (PI), Gingival Bleeding Index (GBI), periodontal pocket depth, DMFT score and the presence of white-spot lesions (WSL). Changes were evaluated using a repeated-measures ANOVA model, facilitating analysis of within-subject changes over time and between-group variation. Statistical significance was set at $p < 0.05$. These findings represent the early phase of an ongoing prospective cohort study, with continued follow-up planned throughout the full duration of orthodontic treatment to monitor long-term periodontal outcomes.
RESULTS: After six months, the orthodontic cohort demonstrated a modest but statistically significant increase in PI and GBI compared with the control group ($p < 0.05$). Mean PI increased by 0.24 units in the orthodontic group compared with 0.04 units in controls, while GBI rose by an average of 6.1% in the orthodontic cohort versus 0.9% in the control group. Reinforcement of toothbrushing techniques and improved compliance with oral hygiene instructions contributed to partial recovery of these indices over the monitoring period. Early enamel demineralization (white-spot lesions) was observed in 15% of the orthodontic group, predominantly adjacent to metal brackets. No persistent or clinically meaningful deterioration in overall periodontal health was detected.
CONCLUSIONS: Fixed orthodontic appliances may transiently compromise oral hygiene and periodontal parameters in adolescents, particularly in the early treatment phase. However, regular monitoring and targeted oral hygiene reinforcement effectively mitigate these effects. These findings represent preliminary results from an ongoing study, with continued follow-up planned to evaluate long-term periodontal outcomes.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.313
SP339 TECHNOLOGY-ASSISTED PLAQUE DETECTION IN PATIENTS WITH FIXED ORTHODONTIC APPLIANCES: A SCOPING REVIEW

Xiu Ling Florence Kok[1], Wilson Lu[2], Ye Choung Lai[2]; *[1]Faculty of Dentistry, National University of Singapore, Singapore, Singapore, [2]National University Centre for Oral Health Singapore, Singapore, Singapore*

AIM: Differentiating dental plaque from tooth structure can be more challenging in the presence of fixed orthodontic appliances. This scoping review aimed to systematically identify and map the range of technology-assisted plaque detection tools relevant to patients with fixed appliances, and to appraise their methodological quality and suitability for use in this population.
MATERIALS AND METHOD: In line with PRISMA-ScR guidelines, a comprehensive search was conducted across six databases (PubMed, Embase, EBSCOhost, Web of Science, Scopus and Cochrane Library). Eligible studies evaluated digital or imaging-based plaque detection systems, including AI-assisted methods, used in clinical or remote settings. The requirement for inclusion of patients with fixed orthodontic appliances was applied only at the full-text screening stage to reduce the risk of omitting relevant publications. Reference lists of included studies were hand-searched for additional grey literature. No language restrictions were applied.
RESULTS: Thirteen publications met the inclusion criteria. The studies were predominantly from Europe and North America, and evaluated eight plaque detection tools. AI-based systems included a U-Net neural network and the Dental Monitoring smartphone application. Direct fluorescence imaging tools, used with or without adjunctive dyes, comprised the Quantitative Light-induced Fluorescence-Digital (QLF-D) device, the Evince device, the SOPROCARE system, an unspecified commercially available fluorescence camera, and a Digital Plaque Image Analysis (DPIA) system adapted for orthodontic patients. The eighth tool, the WhiteTeeth smartphone application, incorporated patient self-monitoring using images of plaque-disclosed teeth. Except for the smartphone-based approaches, the tools were primarily evaluated in clinical settings. Overall, the systems enabled effective detection of plaque in the presence of fixed appliances, although accuracy of plaque quantification varied across tools.
CONCLUSIONS: There are a number of technology-assisted tools that can facilitate plaque detection in patients with fixed orthodontic appliances. Usage of these tools may enhance patients' awareness of sites with plaque accumulation and support oral hygiene maintenance during treatment, although clinicians should be aware of the advantages and limitations of each method. While most systems are currently limited to clinical settings, future refinement into portable formats or application to smartphone-captured images may expand their feasibility for patient-directed use.

Abstract citation ID: cjag070.314
SP341 ADOLESCENT ORTHODONTIC PATIENTS' EXPERIENCE OF SUGAR SWEETENED BEVERAGES: A QUALITATIVE STUDY

Jennifer Li[1], Catherine Brierley[2], Samantha Watt[1], Zoe Marshman[1]; *[1]University of Sheffield, Sheffield, United Kingdom, [2]Charles Clifford Dental Hospital, Sheffield and Chesterfield Royal Hospital, Sheffield, United Kingdom*

AIM: To investigate adolescent orthodontic patients' experience of sugar sweetened beverages (SSBs), knowledge of harms and perceptions of acceptability and effectiveness of dental team dietary interventions.
MATERIALS AND METHOD: A qualitative study was conducted using semi-structured interviews with adolescent orthodontic patients, aged 11-16 years, from an orthodontic department in a UK dental hospital and orthodontic specialist practice. A purposive sampling framework was used to obtain variation in age, gender, and

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

stage of treatment (early, mid-, and post-treatment stage). A piloted topic guide was used to conduct interviews which were audio-recorded and transcribed verbatim. Transcriptions were imported into NVivo 15 and analysed using an inductive approach to thematic analysis until thematic saturation was reached.
RESULTS: A total of 10 patients (4 female and 6 male) were interviewed, with a mean age of 14 years. Five main themes were identified: experience of SSB consumption; reasons for and influences on consumption; knowledge of harmful effects; dietary interventions; and behaviour and adherence. Adolescent orthodontic patients consumed SSBs occasionally, generally purchased from local shops and consumed in social settings. Taste, low cost and enhancing energy levels were the main reasons for consumption. They were aware of the associated risks of dental caries and enamel decalcification and some had knowledge of harmful general health effects. Participants were advised to reduce their intake at the start of orthodontic treatment and felt this was helpful, whilst some perceived this to be effective at changing behaviour. Adolescents experienced changing consumption patterns due to greater freedoms and social behaviours. Those who reduced their intake were motivated by a desire to pursue improved health outcomes.
CONCLUSIONS: Orthodontic and dental team members should be aware of the large variety of SSBs consumed by adolescents. Dietary discussions should focus on explaining the harmful effects of excessive SSB consumption, reducing intake and healthier alternatives. This should be supplemented with visual aids and written information resources. Reinforcement of dietary interventions at follow-up appointments are important for sustained behaviour change. These findings will contribute to future efforts to evaluate and reduce SSB consumption in children and young people attending dental settings.

Abstract citation ID: cjag070.315
SP343 ‡‡‡ ANALYSING HOW THE AIRWAYS SPACE DIMENSION ASSOCIATES WITH CRANIOFACIAL PATTERNS IN LATERAL CEPHALOMETRIC RADIOGRAPHS: A RETROSPECTIVE STUDY

Anne-Sophie Eichhorn[1], Erika Calvano Küchler[1], Christian Kirschneck[1], Lívia Azeredo Antunes[2], Svenja Beisel-Memmert[1]; *[1]Rheinische Friedrich-Wilhelms-Universität Bonn, Bonn, Germany, [2]Federal Fluminense University, Rio de Janeiro, Brazil*

AIM: This retrospective, cross-sectional, multicentric study examined the association between airway space dimensions on lateral cephalometric radiographs and cranioskeletalpatterns.
MATERIAL AND METHOD: A total of 155 lateral cephalometric radiographs of healthy orthodontic Brazilian patients (56 male, 99 female) were analysed. The patients were grouped according to their skeletal patterns: ANB (class I n=70, class II n=69, class III n=16), SNA (retro- n=12, ortho- n=82, prognathic n=61), SNB (retro- n=23, ortho- n=89, prognathic n=43), and facial type (normo- n=76, dolicho- n=43, brachyfacial n=36). The dimensions of the nasopharynx, oropharynx, and hypopharynx were measured in cephalometric radiographs using ImageJ. The Shapiro-Wilk test was used to calculate deviation from the normal distribution within the data. The Kruskal–Wallis test was used to evaluate the association between the variables. An alpha value of 5% was established for all analyses.
RESULTS: Patients with skeletal class III showed statistically significantly larger airways in the upper (P-Pp) (p=0.0025), lower (Pe-Ppe) (p=0.0077), and area (Area 3) (p=0.0012) measurements of the hypopharynx, patients with skeletal class II showed lower measurements of the oropharyngeal area (Area 2) (p=0.0065). Patients with a prognathic mandible showed larger upper (P–Pp) (p=0.0019) and lower (Pe–Ppe) (p=0.0002) values of the hypopharynx. The SNA angle showed no statistically significant results. Dolichofacial patients had significantly lower measurements of the upper (PNS–Ad1) (p=0.0005), middle (PNS–Ad2) (p<0.0001), lower (PNS–AA) (p=0.0023) and area (Area 1) (p = 0.0079) measurement of the nasopharynx, as well as lower measurements of the Upper (P-Pp) (p= 0.0213), lower border of the hypopharynx (Pe–Ppe) (p=0.0230) and the area of the oropharynx (Area 2) (p=0.0018), when compared to brachyfacial patients.
CONCLUSION: Patients with dolichofacial profile had narrower airway measurements, while patients with skeletal class III malocclusion and prognathic mandible had larger airway space dimensions.

Abstract citation ID: cjag070.316
SP345 MANAGEMENT OF INGESTED ORTHODONTIC APPLIANCES: A CASE REPORT

Bahar Gharooni-Dowrani, Nikou Gharooni-Dowrani, Navneet Bhamra, Dominic Innes-Taylor, Golfam Khoshkhounejad; *Guy's Hospital, London, United Kingdom*

Accidental ingestion or inhalation of Orthodontic appliances while uncommon, presents a potential medical emergency that requires prompt action to ensure patient safety. Due to the nature of Orthodontic fixed appliance therapy and the use of small brackets, this matter should not be overlooked. A case within our orthodontic department highlighted the importance of staff awareness of established protocols and the need for ongoing education for all members of the team.
AIM: To review our clinical management and outcome of accidental ingestion of an orthodontic bracket and to highlight the importance of prompt assessment, monitoring and preventative measures in our Orthodontic department.
Subjects: A patient undergoing fixed orthodontic treatment attended for an emergency appointment for the repair of a bracket. In this appointment there was an accidental incident whereby the bracket was lost in the patient's oral cavity. A full medical history and clinical assessment was conducted to identify any immediate respiratory or GI symptoms. The patient was then referred for medical evaluation, including radiographic imaging, to localise the foreign body.
RESULTS: Radiographic examination in the form of an abdominal x-ray revealed that the bracket has passed into the GI tract without signs of obstruction or perforation. The patient remained asymptomatic throughout the monitoring period and conservative management was chosen with advice given on dietary intake, symptom monitoring and follow up.
CONCLUSIONS: This incident allowed us to explore whether our management of an ingested bracket was in fact in accordance with the BOS national guidelines. Following this, a local presentation was given to the whole orthodontic team on our management and what we could have done differently if this were to occur again as well as a refresher for all clinicians and nursing staff on immediate, short term and long term mangement. The case also emphasises the importance of secure appliance bonding and patient education to reduce the risk of appliance related accidents. Prompt multidisciplinary teamwork between orthodontic and medical teams is essential for optimal patient outcomes.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.317
SP346 EVALUATION OF PRECISION AND TRUENESS OF INTRAORAL SCANNERS FOR NEWBORNS WITH CLEFT LIP AND PALATE: 3D ANALYSIS OF DIGITAL MODELS

Isabelle Graf, Juliana-Theresa Schell, Teresa Kruse, Sarah Achterrath, Bert Braumann; *University Hospital of Cologne, Department of Orthodontics, Cologne, Germany*

AIM: Children born with cleft lip and palate (CLP) require intensive interdisciplinary care from birth onward. Intraoral scanners (IOS) have emerged as a promising alternative for neonatal maxillary data acquisition. This study evaluated the precision and trueness of five commonly used IOS using a standardized landmark-based methodology applied to neonatal maxillary models with increasing cleft complexity.
MATERIALS AND METHOD: Three plaster casts were digitized: (1) An edentulous maxilla without cleft morphology, (2) a unilateral cleft maxilla and (3) a maxilla with a complex bilateral cleft. STL datasets were processed for further geometric modelling: Ten pyramidal landmarks along the alveolar ridge on a standardized horizontal plane were designed for measurement purposes. These digital master models (DMM) were 3D-printed (Formlabs 2®, 25 µm- layer thickness). Each printed model was scanned ten times by the same operator using five IOS: Primescan® (Dentsply Sirona), CS3600® (Carestream Health), TRIOS 3® (3Shape A/S) iTero Element 2® (Align Technology) and Medit i500® (Medit Corp). All IOS-derived STL files were imported into Rhinoceros 3D® to quantify precision based on transversal distances between the landmarks and deviations from the DMM. Full-surface trueness was assessed in Geomagic Control 3D® using a standardized alignment protocol. Statistical analysis was performed using the Kruskal–Wallis test with Bonferroni-corrected Mann–Whitney U post-hoc tests ($p < 0.05$).
RESULTS: Precision varied between IOS and increased in variability with anatomical complexity. Primescan® demonstrated the lowest absolute linear deviations, while iTero® and Medit® exhibited slightly higher deviations, particularly in more complex cleft regions (range: 0.03-0.10mm, p<0.001). Full-surface trueness was high for all IOS: RMS deviations remained well below 0.10 mm, though localized discrepancies increased in posterior and undercut regions of model 3.
CONCLUSION: This study demonstrates that intraoral scanning is a reliable and potentially feasible method for digitizing neonatal maxillary anatomy. Although precision and trueness decreased with more complex cleft configurations, particularly in

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

the deep posterior regions of the bilateral cleft model, all IOS captured relevant morphological features. Additional in-vivo studies are needed to investigate IOS practicability within this vulnerable patient population.

Abstract citation ID: cjag070.318
SP348 TIKTOK DIY ORTHODONTIC TRENDS: A MIXED-METHODS STUDY OF CONTENT QUALITY, USER ENGAGEMENT AND PROFESSIONAL INVOLVEMENT

Isabelle Graf, Isabelle Sauerwald, Till Kaspar, Bert Braumann; *University Hospital of Cologne, Department of Orthodontics, Cologne, Germany*

AIM: Social media, particularly the video-based platform TikTok, is widely used by adolescents and young adults. In recent years, teeth-related trends featuring do-it-yourself (DIY) procedures have gained traction. These teeth- and orthodontics-related DIY trends may pose substantial health risks, yet empirical data remain limited. Therefore, this mixed-methods study aimed to assess the content of DIY orthodontics-related videos on TikTok. Furthermore, video metrics, author characteristics and user engagement were evaluated among others.
MATERIAL AND METHOD: Using a systematic search strategy, 100 TikTok videos containing DIY orthodontic-related information were included. The thematic content and perceived tone were analyzed independently by two researchers. Audience engagement and video metrics (number of views, shares, video length, number of comments) were recorded. Authors were categorized as laypersons or professionals. Video quality was rated by three individuals using the modified Global Quality Scale (GQS) and the modified DISCERN tool. Correlations were assessed using Spearman's ρ ($p < 0.05$).
RESULTS: DIY videos containing orthodontic-related information were categorized into four themes: (1) fake braces, (2) DIY gap closure, (3) DIY teeth filing and (4) DIY aligners. Professional authors produced fewer videos than lay users (13.6% vs. 86.4%) but achieved higher GQS scores (mean 3.3 vs. mean 1.1). The most viral content predominantly originated from lay users with low GQS scores. User engagement was highly skewed (1,184-8,700,000 views per video), with some videos reaching millions of views (mean 1,093,474). Video views were strongly correlated with the number of comments (ρ=0.82, $p<0.001$), indicating that higher visibility consistently generated more discussion. GQS demonstrated a moderate positive correlation with video duration (ρ=0.35, $p<0.05$), suggesting that higher-quality videos tended to be longer. Negatively perceived videos tended to elicit more comments than those with a positive tone. None of the included videos provided evidence-based information with source citations.
CONCLUSIONS: On TikTok, DIY orthodontic content is frequently of low quality. The limited amount of professional content is of higher quality but is not preferentially amplified by the platform's engagement-driven algorithms. Given the absence of evidence-based information and the potential for harm, targeted moderation and proactive dissemination of reliable professional content may be warranted.

Abstract citation ID: cjag070.319
SP349 DIAGNOSTIC ACCURACY AND CLINICAL DECISION-MAKING OF DENTAL TRAINEES IN COMMON ORTHODONTIC SCENARIOS: A CROSS-SECTIONAL STUDY

Ibrahim Ali; *Manchester Foundation Trust, Manchester, United Kingdom*

AIM: To assess how dental trainees recognise and manage common orthodontic situations and highlight areas where further teaching or clarification may be beneficial.
MATERIALS AND METHOD: An online survey was distributed to dental undergraduates and early postgraduate trainees. It included nine questions based on orthodontic scenarios commonly encountered early in clinical practice, including posterior crossbites with functional shifts, palatally displaced maxillary canines, anterior open bites, and Class II Division 2 malocclusions. Responses were scored in accordance with UK orthodontic guidance. All but one question had a single correct answer; one scenario allowed more than one acceptable option. The Index of Orthodontic Treatment Need (IOTN), the UK system for grading malocclusion severity and determining eligibility for state-funded orthodontics, was used to assess understanding of referral thresholds. Participants rated familiarity with the IOTN on a 0–5 scale. Descriptive statistics were used.
RESULTS: Twenty-eight trainees completed the survey. Performance varied by scenario. Only 39.3% recognised that a posterior crossbite with a functional mandibular shift requires early interceptive treatment, whereas 96.4% identified the need to escalate management for a severe Class II Division 2 traumatic deep bite. Understanding of treatment criteria ranged from 67.9% for early crossbite referrals to 89.3% for recognising cases with definite treatment need. 75.0% selected the correct pathway for investigating and referring an unerupted maxillary canine, and 78.6% gave appropriate monitoring and habit advice for a mild anterior open bite. Familiarity with the IOTN averaged 2.8 out of 5, indicating trainees felt able to use it only with some senior input.
CONCLUSIONS: Trainees recognised key orthodontic concepts but were less confident with early interceptive decisions, particularly posterior crossbites and referral timing. Limited confidence in applying the IOTN suggests that orthodontic teaching could be clearer and more consistent. Free-text responses noted limited orthodontic exposure and uncertainty around referral criteria. Improving early diagnostic confidence may help ensure that patients who require specialist assessment are referred at an appropriate stage, rather than after problems progress and become more complex. These findings may inform curriculum development and support more consistent referral decisions across training levels.

Abstract citation ID: cjag070.320
SP350 A NOVEL METHOD TO ASSESS MAXILLO-MANDIBULAR DISCREPANCY INDEPENDENT OF SKELETAL BITE INTERFERENCE

Laura Bencivenga, Barbara Disconzi, Marco Serafin, Elisa Boccalari, Alberto Caprioglio; *University of Milan, Milan, Italy*

AIM: This study aimed to evaluate a novel three-dimensional (3D) cephalometric approach for assessing anteroposterior maxillomandibular relationships using CBCT data: based on three skeletal landmarks, point A, point B, and condylar point (Co), the proposed method, named ABCo, was hypothesized to represent a reliable alternative parameter for sagittal skeletal evaluation
MATERIALS AND METHODS: A retrospective analysis was performed on 300 CBCT scans of orthodontic and maxillofacial patients. Exclusion criteria were severe craniofacial asymmetries, previous orthodontic or orthognathic treatment, and systemic diseases. The DICOM files of each patient were imported into dedicated software (3DSlicer) for manual identification of four midline landmarks (N, S, A, B) and one bilateral landmark (CoR, CoL), totaling six skeletal landmarks. Two sagittal parameters were calculated: the ANB angle (°) and the ABCo value (mm), defined as the difference between the orthogonal distances of points A and B from the condylar plane
RESULTS: Both ANB and ABCo showed non-normal distributions ($p < 0.001$). Strong positive correlations were found between the two variables (Spearman's $\rho = 0.665$; Pearson's $r = 0.725$; $p < 0.001$). Linear regression produced the model $ABCo = 1.326 \times ANB - 19.897$ ($R^2 = 0.526$), indicating that ANB accounted for 52.6% of ABCo variability. This study introduces and validates a new 3D cephalometric parameter designed to assess maxillo-mandibular sagittal relationships while avoiding the limitations of ANB and Wits. ABCo is less affected by vertical patterns, uses a reduced FOV, and provides complementary diagnostic information for accurate skeletal classification
CONCLUSION: The ABCo appraisal shows strong correlation with ANB and may serve as a reliable, skeletal bite - independent indicator for 3D sagittal skeletal assessment. Further research on larger and more diverse populations is recommended to validate its diagnostic applicability

Abstract citation ID: cjag070.321
SP351 ‡‡‡ *** ACCURACY AND SUSTAINABILITY OF 3D-PRINTED DENTAL MODELS USING RECYCLED KAIROS 3D PET: A CIRCULAR ECONOMY APPROACH

Antonio Spiezia[1], Mario De Rosa[2], Pasquale Nappo[1], Giorgio Oliva[1], Vincenzo D'Antò[1]; *[1]Università Federico II, Napoli, Italy, [2]Free Lence, Napoli, Italy*

The aim of this study was to evaluate the dimensional accuracy and stability of dental models produced using Kairos 3D ReCycled PET, a uniquely engineered filament sourced from recycled bottles. This process showcases the complete workflow, from digital model selection to the thermoforming of orthodontic aligners.

Patients who completed orthodontic treatment were selected for this study. For each case, final digital impressions were acquired in STL or PLY format, ensuring no artifacts were present. These files were then printed with Kairos 3D ReCycled PET filament, exclusively developed and manufactured by Kairos 3D Technology Solutions. The company expertly managed the technical aspects, covered production costs, and optimized printing parameters, such as temperature, layer height, and extrusion speed, to ensure unparalleled dimensional fidelity. Following printing, Kairos 3D Technology Solutions meticulously handled the cleaning and refinement of the models.

An initial 3D scan was conducted to capture the reference geometry. The models were then used for thermoforming orthodontic aligners using PETG or polypropylene. After cooling and finishing, a second 3D scan was performed to compare pre- and post-thermoforming geometries.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

MATERIALS AND METHODS: From the pre-thermoforming scans, only dental elements were selected to generate new analysis models. These were aligned with post-thermoforming models using an optimized algorithm for surface and normal alignment. The Root Mean Square Error (RMSE), based on Kim et al. (2017), and the maximum deviation between models were calculated. Non-normally distributed data were analyzed with descriptive statistics, such as median and interquartile range.
RESULTS: The mean RMSE was 0.092 mm, with an average maximum deviation of 0.49 mm and a peak of 0.68 mm. Dimensional discrepancies were under 0.2 mm, within clinically acceptable boundaries.

This innovative process exemplifies a breakthrough in the circular economy within dentistry, leveraging Kairos 3D ReCycled PET to lower environmental impact while upholding quality. The digital-additive workflow validates the filament's potential, calling for further research to explore its full capabilities.

Abstract citation ID: cjag070.322
SP352 COMPREHENSIVE PERFORMANCE EVALUATION OF FLOWABLE COMPOSITES FOR ORTHODONTIC ATTACHMENT SYSTEMS

Giulia Campanella[1], Marco Schirripa[2], Wanda Lelia Russomanno[1], Ernesto Buonanno[2], Roberta Condò[3]; *[1]Post-graduate student Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy, [2]Department of Health, Life and Environmental Science, University of L'Aquila, L'Aquila, Italy, [3]Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy*

AIM: Clear aligner therapy represents a major advance in orthodontics. The clinical effectiveness of this treatment largely depends on the correct design and fabrication of attachments, small resin structures bonded to the teeth to optimize force transmission and aligner stability. The intrinsic properties of these attachment materials, including their composition and mechanical behavior, play a crucial role in clinical outcomes; however, data on these aspects remain limited. This study evaluated the rheological, optical and morphological features of five widely used flowable composite resins - Aligner Flow LC, Simply Shade, SOFT ENA Flow, Tetric EvoFlow, and Venus Bulk Flow One - to determine which performs best for the fabrication of orthodontic attachments in clear aligner therapy.
MATERIALS AND METHOD: Each resin was tested following manufacturer recommendations. Square-shaped specimens were fabricated using standardized silicone molds. The resins were evaluated for their clinical suitability and their influence on aligner adaptation to the tooth surface by assessing rheological properties, UV-Vis spectroscopy profiles, and morphological characteristics (SEM/EDX).
RESULTS: Materials with higher filler content showed greater stiffness and deformation resistance. These traits favor stable force delivery and maintenance of attachment shape during repeated functional stresses, making them preferable for situations where longevity and mechanical consistency are key. Conversely, SOFT ENA Flow displayed greater flexibility, which can help with detailed modeling and adaptation but may compromise long-term shape stability. Microscopic (SEM/EDX) evaluations were largely consistent with manufacturers' specifications, despite small discrepancies in the reported inorganic filler fractions. All materials exhibited surface roughness and defects, likely due to uneven distribution of fillers within the resin matrix, an issue that affects both mechanical strength and aesthetic quality. Optical spectroscopy (UV-Vis-NIR) differentiated the materials based on their specific spectral patterns, confirming the presence of fillers like silica and ytterbium fluoride.
CONCLUSIONS: The study demonstrates that choosing the optimal composite resin for attachments should depend on the specific clinical case, rather than assuming superiority of a single option. The combination of rheological and physicochemical evaluations establishes a robust basis for selection, guiding clinicians toward the most rational and effective use of flowable composites in clear aligner orthodontics.

Abstract citation ID: cjag070.323
SP354 ‡‡‡ SKELETAL EFFECTS ON THE GLENOID FOSSA AFTER FUNCTIONAL TREATMENT WITH THE TWIN-BLOCK APPLIANCE: A CASE-CONTROL STUDY

Lucia Pozzan, Alessandro Crevatin, Luca Contardo*; University of Trieste, Trieste, Italy*

AIM: To evaluate the skeletal effects of Twin-Block functional therapy on the glenoid fossa position in growing skeletal Class II patients, focusing on horizontal and vertical changes.
MATERIALS AND METHODS: This retrospective case-control study included 86 subjects (43 treated with Twin-Block, 43 untreated controls) with skeletal Class II malocclusion due to mandibular retrusion (SNB < 78°). All were in pre-peak or peak growth stages (MPM method). Lateral cephalograms at T0 and T1 were analyzed for: horizontal F–S (glenoid fossa position), vertical F–S, and mandibular length (Co–Gn). Intergroup comparisons of treatment changes (Δ = T1–T0) were performed using Mann–Whitney tests ($p < 0.05$).
RESULTS: At baseline, groups were equivalent in all parameters. Compared to controls, the Twin-Block group showed a significant anterior shift of the glenoid fossa (Δ horizontal F–S: −0.86 ± 1.50 mm vs. +1.02 ± 1.30 mm; $p < 0.001$) and greater mandibular growth (Δ Co–Gn: +6.86 ± 3.27 mm vs. +4.50 ± 2.80 mm; $p = 0.021$). No significant difference was observed in vertical F–S ($p = 0.588$).
CONCLUSIONS: Twin-Block treatment induces anterior remodeling of the glenoid fossa and stimulates mandibular length increase, beyond changes expected from growth alone. These adaptive TMJ changes may enhance Class II correction stability, revealing a modest but relevant orthopedic effect of functional therapy on craniofacial development.

Abstract citation ID: cjag070.324
SP357 NICKEL STABILITY PROFILES OF ORTHODONTIC ARCHWIRES: A TIME-DEPENDENT COMPARISON BETWEEN NI-TI AND STAINLESS STEEL

Mirela Georgieva[1], Angelina Stoyanova-Ivanova[2], Velizar Georgiev[2], Laura Andreeva[3], Valeri Petrov[1]; *[1]Medical University of Sofia, Faculty of Dental Medicine, Department of Orthodontics., Sofia, Bulgaria, [2]G. Nadjakov Institute of Solid-State Physics, Bulgarian Academy of Sciences, Sofia, Bulgaria, [3]Medical University of Sofia, Faculty of Dental Medicine., Sofia, Bulgaria*

INTRODUCTION: Orthodontic archwires undergo continuous exposure to variable intraoral factors, including pH shifts, thermal fluctuations, and mechanical loading. These conditions can gradually influence their surface chemistry. Nickel–Titanium (Ni-Ti) alloys, characterized by phase transformations and superelasticity, often display adaptive surface changes during clinical use. Stainless steel (SS) CrNi wires, in contrast, possess a more inert, stable lattice. Understanding the different stability behaviors of these two material families is essential for treatment planning, wire sequencing, and ensuring patient safety.
AIM: The objective of this investigation is to compare the time-dependent stability of surface Nickel content in Ni-Ti archwires, analyzed collectively, with that of stainless steel CrNi wires. The comparison aims to determine which material category maintains more consistent composition during orthodontic treatment and to identify clinically relevant implications for long-term use.
METHODS: Four commercially available Ni-Ti wire types—superelastic, heat-activated, copper-enhanced, and multiforce—were grouped into a unified analytical category. Stainless steel CrNi served as a separate comparison group. All wires were examined at three intervals: unused, retrieved after up to six weeks, and retrieved after more than eight weeks. Surface composition was evaluated using SEM/EDX. Multiple measurement points per wire captured regional variability. Temporal patterns were synthesized within each group to establish generalized stability profiles.
RESULTS: Ni-Ti group: All Ni-Ti wires exhibited noticeable early variability. Initial weeks frequently showed small composition shifts, reflecting their thermally responsive structure. Over prolonged exposure, stabilization patterns diverged among subtypes, creating an overall profile of higher dynamism and reduced long-term uniformity. Stainless steel CrNi: SS wires demonstrated minimal change across all intervals. Nickel levels remained nearly constant, aside from minor declines after extended use. Their stable microstructure contributed to exceptional chemical consistency throughout treatment.
CONCLUSION: Ni-Ti alloys, evaluated as a collective group, show dynamic composition influenced by early intraoral adaptation. Stainless steel CrNi maintains markedly greater stability, supporting its reliability for extended clinical phases. Recognizing these distinct stability behaviors enhances clinical decisions regarding material selection, wire longevity, and individualized treatment planning. This information helps orthodontists optimize timing, improve outcomes, and enhance long-term patient comfort.

Abstract citation ID: cjag070.325
SP359 EVALUATION OF STABILITY OF RETENTION POST TREATMENT IN ORTHOGNATHIC PATIENTS - A RETROSPECTIVE AUDIT AT SALISBURY DISTRICT HOSPITAL

Shamaila Javaid and Annalise McNair; *Salisbury District Hospital, Salisbury, United Kingdom*

AIM: Retention is a critical and active phase of orthodontic treatment especially for Orthognathic patients where relapse can compromise not just the aesthetics but also the function. The audit was carried out in the orthodontic department at 12

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

months post debond to evaluate current standards of compliance with retainer wear instructions amongst patients who have undergone Orthognathic surgery within the service. The aim of the audit is to highlight the significance of retention advice given to Orthognathic patients at debond and if they follow the regimental approach of wearing retainers long term and understand the significance of the retainer wear.
MATERIALS AND METHODS: 22 patients were looked at retrospectively which were treated with Orthodontics followed by Orthognathic surgery. The clinical records were assessed which included the photographs, study models and radiographs. Data was analysed for prescribed retainer type, duration of wear, relapse/breakages against the gold standard which has been set in the department as there is no universally agreed retention regime and neither is an agreement on type of retainer used. Patients were assessed on the 1 year post debond at the Orthognathic follow up appointment.
RESULTS: 20 out of 22 patients attended their post operative appointment for the retainers. 17 patients followed advise regarding retainers as prescribed. 2 patients missed wearing retainers every day in the initial 3 months, the teeth had minor irregularities, new retainers were made. Relapse of vertical correction was noted in one patient which may have been due to instability of the correction and not particularly due to the lack of retainer wear.
CONCLUSION: Current compliance rate for retainer wear for Orthognathic patients in the unit is quite close to the gold standard. However, the findings do suggest that there is importance of patient education and communication for maintaining long term retention in patients who have undergone Orthognathic surgery. We also have to establish if the patients are getting recalls at a timely fashion particularly for malocclusions more prone to relapse such as anterior open bites and jaw asymmetries. This will be re-audited in the second cycle in 6 months time after implementing changes.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.326
SP361 COMPARISON OF SPONTANEOUS MOLARMOVEMENT IN RAPID AND SLOW MAXILLARYEXPANSION ANCHORED ON DECIDUOUS TEETH

Lorenzo Bernardoni[1], Ilaria Bertucci[2], Vito Malvasi[2], Alberto Caprioglio[3]; *[1]Università Milano, milano, Italy, [2]università Milano, milano, Italy, [3]Università Milano, Milano, Italy*

AIM: The objective of this study was to evaluate the difference between two different devices and two different types of expansion: rapid maxillary expansion (Haas type expander) and slow maxillary expansion (Leaf type expander), both with anchorage on deciduous second molars. The analysis focused on the spontaneous displacement of the permanent maxillary first molars, considering both transverse expansion and changes in their inclination.
MATERIALS AND METHODS: Pre and post treatments intraoral scans of 48 subjects, of which 28 treatedwith a Haas screw expander and 20 treated with a Leaf screw expander, were analyzed using Viewbox 4.0 software. The following parameters were measured: angle 1.6–2.6 (°), distance 5.5–6.5 (mm), distance 1.6–2.6 (mm), distance 5.5–1.6 (mm), and distance 6.5–2.6 (mm).
RESULTS: The statistical analysis performed did not reveal any significant differences in the measured variables between the group treated with rapid expansion and the group treated with slow expansion (p=0,372 and p=0,617, respectively). In both groups, the expansion obtained at the level of the firstpermanent molars was approximately 57% of the expansion achieved at the level of the deciduous second molars. The inclination of the first permanent molars was found to favor dentoalveolar compensation of the first permanent molars in the Haas group (-2.7°) compared to the Leaf group (+3.3°), however, this difference was not statistically significant ($p = 0.115$).
CONCLUSIONS: When comparing patients treated with rapid and slow expansion of the

maxillary arch with anchorage on the second deciduous molars, no differences were found in terms of transverse expansion or changes in the dentoalveolar inclination of the first permanent molars.

Therefore, these findings suggest that both expansion protocols lead to similar clinical results.

Abstract citation ID: cjag070.327
SP363 ARTIFICIAL INTELLIGENCE ASSISTED LATERAL CEPHALOGRAM STUDY

Liudmyla Kryvenko; *Kharkiv National Medical University, Kharkiv, Ukraine*

AIM: This study aimed to evaluate the reliability and accuracy of angular measurements obtained from artificial intelligence (AI)-assisted fully automated cephalometric analysis software compared to conventional digital cephalometric analysis upon manual landmark identification.
METHODS: This study analyzed pre-treatment lateral cephalograms from 32 patients, comparing two tools of AI-based automatic digital tracing and manual digital tracing, which served as the control group. Angular measurements were used as primary parameters, with 14 cephalometric measurements derived from 10 skeletal (SK) and 4 soft tissue (ST) landmarks.

Cephalometric parameters received from Sidexis 4, Sirona Dental X-ray Imaging System 4, including key skeletal and dental angular measurements such as SNA, SNB, ANB, FMA, IMPA and other were assessed. Intra- and inter-operator reliability and agreement were evaluated using statistical methods such as the Intraclass Correlation Coefficient, paired t-tests.
RESULTS: Several datasets containing numerical cephalometric landmark data from two different AI-assisted software were analyzed. These datasets automate landmark identification, measurement calculation, and report generation from cephalometric radiographs. They facilitated statistical analysis, outlier handling, and data scaling. The research enabled the proposal of a classification method for lateral cephalometric radiographs, along with class-forming features for comparing AI models. Descriptive statistics justified the selected features, providing insights to optimize data preprocessing for machine learning. A correlation matrix was a good tool in this situation, because it conveys both the strong and weak linear relationships among numerical variables. The Seaborn's heat map function was used to show the correlation matrix.
CONCLUSIONS: Fully automated AI-assisted cephalometric analysis is a time-saving tool for obtaining most angular measurements in orthodontic diagnosis. Although the reliability is generally high, AI analyses should be used as an assistant tool and require final clinical oversight by a skilled orthodontist to ensure diagnostic accuracy. In this study an analysis of numerical data from two artificial intelligence (AI)-assisted cephalometric software programs led to a proposed classification method for lateral cephalometric for optimizing (AI)-assisted measurements.

Abstract citation ID: cjag070.328
SP366 IMPACT OF ANKYLOGLOSSIA AND ITS SURGICAL MANAGEMENT ON OROFACIAL GROWTH: A SYSTEMATIC REVIEW

Ameirah Alyammahi[1] and Salem Alkaabi[2]; *[1]Department of Orthodontics, Fujairah Specialized Dental Centre, Emirates Health Services., Fujairah, United Arab Emirates, [2]Department of Maxillofacial Surgery, Fujairah Hospital, Emirates Health Services., Fujairah, United Arab Emirates*

AIM: To systematically evaluate the effects of ankyloglossia and its surgical management on orofacial growth and craniofacial morphology in children and adolescents.
MATERIALS AND METHOD: A systematic review was conducted according to PRISMA 2020 guidelines. Electronic searches were performed in PubMed, ScienceDirect, Google Scholar, and Cochrane Library up to June 2025. Studies included were observational and interventional, published in English, and focused on individuals with ankyloglossia, with or without surgical intervention, reporting outcomes related to orofacial growth. Two reviewers independently screened studies, extracted data, and assessed risk of bias using the ROBINS-I tool. Due to methodological heterogeneity, a qualitative synthesis was performed.
RESULTS: Nine studies met the inclusion criteria. Individuals with skeletal Class III malocclusion exhibited significantly longer median lingual frenulum lengths and greater maximum mouth opening reduction compared to Class I and II (mean difference: 2.1 mm, $p < 0.05$). Ankyloglossia was associated with narrower dental arch widths (mean difference: 1.8 mm, $p < 0.05$), maxillary constriction, incisor crowding, and open bite. Surgical intervention, particularly early frenotomy, improved tongue–palate contact and lip sealing at rest in infants (reported improvement: 85% of cases, $p < 0.01$). However, diagnostic criteria and measurement techniques varied widely across studies, and longitudinal data on structural outcomes were limited.
CONCLUSIONS: Ankyloglossia may negatively influence orofacial growth and craniofacial morphology, especially regarding dental arch development and skeletal patterns. Surgical management can improve tongue function and resting posture, but robust evidence for long-term craniofacial benefits is lacking. Standardized diagnostic protocols and further high-quality longitudinal studies are needed to clarify the role of surgical intervention in managing ankyloglossia.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.329
SP367 FROM EXTRACTION TO CRYOBANKING: WHICH CRITICAL PROCESS PARAMETERS GENUINELY IMPROVE DPSC PRODUCTION?

Tomasz Gedrange[1], Tomasz Gębarowski[2], Amelie Lupp[3], Marzena Dominiak[1]; [1]Wroclaw Medical University, Wroclaw, Poland, [2]Department of Biostructure and Animal Physiology, Wroclaw, Poland, [3]Institute of Pharmacology and Toxicology, Jena, Germany

AIM: Advanced therapy medicinal products (ATMPs) require control of critical process parameters (CPPs). The relative impact of donor biology (e.g., vitamin D levels in blood) versus technical factors remains unclear for dental pulp–derived cell products.
METHODS: Prospective observational study of 219 adults undergoing clinically indicated extraction of impacted mandibular third molars. Blood assays: 25(OH)D, parathyroid hormone, Ca, phosphate, alkaline phosphatase, cortisol, growth hormone, complete blood count. Pulp was processed under a single standard operating procedure (SOP) using scissor cutting vs mechanical tearing/pipetting and several enzyme/medium options (including type II collagenase). Primary endpoints: 25(OH)D (ng/mL) and cell yield (million); secondary: passages, cryovials. Statistics: Welch/Mann–Whitney, χ^2/Fisher, Kruskal–Wallis with Benjamini–Hochberg procedure, Spearman (primary) and Pearson (for linear relations), multivariable ordinary least squares (OLS) heteroskedasticity-consistent standard errors, method 3 (HC3); sensitivity: log10 (yield).
RESULTS: Mean 25(OH)D was 30.1 ± 14.5 ng/mL (median 27.7; range 5.3–84.0). D3 supplementation increased 25(OH)D (38.2 ± 14.0 vs 25.6 ± 12.7 ng/mL; $p<0.0001$; $d\approx0.96$) and ≥30 ng/mL prevalence (52.6% vs 22.3%; $p<0.0001$; $V\approx0.31$), but 25(OH)D was not associated with yield or passages ($\rho\approx0.14/0.07$; $p_{(FDR)}=0.168/0.406$). Passages strongly correlated with yield (Pearson $r\approx0.69$, $p<10^{-26}$; Spearman $\rho\approx0.82$, $p<10^{-44}$). Scissor cutting outperformed mechanical tearing (yield median 5.00 [3.00] vs 1.00 [0.50]; $p=3.6\times10^{-13}$; r_rb=0.82). Enzyme/medium differed overall (yield $p=6.8\times10^{-15}$), with type II collagenase highest. In OLS (HC3), passages remained the strongest predictor ($\beta\approx2.28$ million/passage, 95% CI 1.86–2.69; $p<10^{-26}$; $R^2\approx0.61$); 25(OH)D was not independent ($\beta\approx0.02$, 95% CI −0.01–0.05; $p\approx0.30$). Type II collagenase remained favorable (β=+2.04 million, 95% CI 0.24–3.83; p=0.026). Sensitivity analyses were concordant ($R^2=0.518\rightarrow0.798$).
Conclusions: In this SOP, process engineering—not donor vitamin D status—drives manufacturing efficiency. Scissor cutting + type II collagenase and controlling passages are high-impact levers for ATMP production.

Abstract citation ID: cjag070.330
SP368 MINIMUM INTERPROXIMAL SPACE DETECTION IN INTRAORAL SCANNING: AN IN-VITRO STUDY

Georgios-Alexandros Tsakiris[1] and Demetrios J. Halazonetis[2]; [1]National and Kapodistrian University of Athens, Athens, Greece, [2]National and Kapodistrian University of Athens, Department of Orthodontics, Athens, Greece

AIM: The purpose of the present study was to determine the minimum interproximal distance detectable by intraoral 3D scanners using standardised tooth models, and to evaluate the extent to which surface wetness affects this ability.
MATERIALS AND METHOD: An in-vitro model was constructed using extracted premolars mounted on a custom fixture allowing controlled adjustment of the interproximal gap from 0.00 mm to 1.00 mm in 0.05-mm steps. Scans were performed first under dry conditions and then under wet conditions to simulate an intraoral-like environment. The same procedure was carried out with a premolar–molar pair to explore whether tooth morphology influenced detection. The scans were reviewed to establish the smallest spacing at which each scanner rendered a visible gap on the digital model.
RESULTS: For the premolar–premolar setup under dry conditions, the Medit i500 failed to detect interproximal spaces smaller than 0.45 mm, while the AlliedStar AS260 detected gaps only larger than 0.35 mm. Under wet conditions, detection thresholds increased to 0.90 mm for the Medit i500 and 0.70 mm for the AlliedStar AS260. Comparable trends were observed in the premolar–molar configuration, with simulated saliva consistently increasing the detection threshold across scanners.
CONCLUSIONS: Simulated saliva consistently increased the minimum interproximal space that scanners were able to detect. Among the devices tested, the AlliedStar AS260 detected smaller gaps than the Medit i500 under both dry and wet conditions. These findings highlight important limitations in digital models used for orthodontic space assessment, tooth size estimation and restorative planning.

Abstract citation ID: cjag070.331
SP369 ‡‡‡ APPLICATION OF PLATELET-RICH FIBRIN IN EXTRACTION SOCKETS TO PREVENT GINGIVAL INVAGINATIONS AFTER ORTHODONTIC SPACE CLOSURE

Eric Kutschera[1], Tim Klünter[2], Raluca Cosgarea[3], Christian Kirschneck[1], Andreas Jäger[1]; [1]Department of Orthodontics, Center of Dento-Maxillo-Facial Medicine, University of Bonn Medical Center, Bonn, Germany, [2]Department of Oral, Maxillofacial and Plastic Surgery, Center of Dento-Maxillo-Facial Medicine, University Hospital Bonn Medical Center, Bonn, Germany, [3]Department of Periodontology, Center of Dento-Maxillo-Facial Medicine, University of Bonn Medical Center, Bonn, Germany

AIM: Platelet-rich fibrin (PRF), an autologous blood-derived product enriched with growth factors, is employed across a wide range of surgical procedures to enhance wound healing. In dentistry, it is used in periodontal regenerative surgery and for short-term alveolar ridge preservation following tooth extraction. Gingival invaginations (GI) represent a manifestation and surrogate marker of suboptimal tissue regeneration after orthodontic space closure (OSC) of extraction sites. The aim of this prospective observational study was therefore to investigate whether the application of PRF in extraction sockets provides a distinct clinical benefit by reducing the incidence and severity of GI during OSC. In addition, the study sought to document and assess the general feasibility of such a combined therapeutic approach.
MATERIALS AND METHOD: Following ethical approval, patients at our clinic with an indication for premolar extractions and orthodontic space closure (OSC) were enrolled after providing informed consent. During tooth extraction, venous blood was drawn, centrifuged for 12 minutes at 700 g (IntraSpin™; IntraLock) to produce PRF, and subsequently inserted autologously into the extraction sockets. After completion of space closure and 10 months after the onset of OSC, the incidence and severity of GI were assessed in a standardised manner using a periodontal probe, recorded vertically and horizontally (Williams 17 probe; Hu-Friedy), coded, and categorised according to severity grades 0–V. The data obtained from the current cohort (G1) were compared with those from a cohort (G2) of a previous prospective, controlled study conducted at our clinic using the same study protocol but without PRF insertion. Biometric evaluation was performed using a matching procedure
RESULTS: A total of G1 (n = 12) + G2 (n = 27) patients with 103 extraction sites were included and statistically analysed. No significant reduction in the incidence or severity of GI was observed with the use of PRF.
CONCLUSION: Within the limitations posed by the sample size, PRF—when applied as described in this study—does not appear to exert a clinically relevant reducing effect on the incidence or severity of GI following OSC.

This study was funded by the German Research Foundation (DFG), project ID KU 3027/1-1.

Abstract citation ID: cjag070.332
SP370 MORE THAN CHAIRSIDE ADVICE: THE UNTAPPED POTENTIAL OF NURSE-LED OH CLINICS IN ORTHODONTICS

Sarah Ibrahim, Favour Onwudiwe, Gavin Power; East Kent Hospitals University, Ashford, United Kingdom

AIMS: Orthodontic patients with fixed appliances are at increased risk of plaque accumulation, gingivitis, decalcification, and early caries. National guidance from the British Society of Periodontology and the British Orthodontic Society emphasises the importance of structured preventive care for patients with poor oral hygiene (OH). At the William Harvey Hospital (WHH), a monthly nurse-led OH clinic delivered by Band 5 nurses with NEBDN oral-health education qualifications provides tailor-made interventions designed to improve oral health behaviour. However, anecdotal concerns suggested the service was underutilised. This Quality Improvement Project (QIP) evaluated utilisation, appropriateness of referrals, and barriers to optimal use of the clinic. To assess the utilisation of orthodontic OH nurse-led clinics for patients with poor OH and identify barriers that limit referral and OH improvement. A secondary objective was to determine whether current management aligns with BOS/BSP preventive recommendations.
METHODS: A retrospective review of orthodontic patient records from October 2024 to August 2025 was undertaken. Data included demographics, BPE, OH advice provided, follow-up arrangements, DNA rates and recorded OH improvements. Parallel staff surveys (consultants, StRs, orthodontic therapists, and OH nurses) explored awareness of the clinic, perceived effectiveness, referral behaviours, and barriers to use. QIP methodology followed a baseline–intervention–reassessment cycle. The reassessment will be conducted in three months.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: 30 out of the 45 patients booked attended the OH clinic during the study period, giving a 33% DNA rate. Overall, 68% of the clinic possible capacity was utilised. Most referrals came from consultants (81%), and limited referrals from StRs. Although clinicians frequently encountered poor OH, they often relied on chairside-advice rather than referrals. Staff cited structural barriers (irregular scheduling, unclear pathways), patient factors (poor compliance, travel burden), and communication issues (lack of feedback loops). Despite these challenges, 90% of attending patients showed measurable improvement in OH.
CONCLUSIONS: The OH nurse-led clinic provides effective, evidence-based preventive support, but its potential is constrained by underutilisation and high DNA rates. Clearer referral pathways, improved scheduling, enhanced communication between teams, and expanded clinic sites may significantly increase effectiveness. Implementation of these interventions forms the basis of the ongoing second QIP cycle.

Abstract citation ID: cjag070.333
SP372 ESTHETIC CHALLENGES OF CLEAR ORTHODONTIC ELASTOMERIC CHAINS: THE EFFECTS OF TOOTHPASTES AND DIETARY COLORANTS

İpek Savkan, Berrak Tezulas, Yelda Parlak; *Istanbul Kent University, Istanbul, Turkey*

AIM: This study aimed to evaluate effects of different dietary staining agents on color stability of clear orthodontic elastomeric chains and to assess the influence of commonly used cleaning protocols with goal of increasing clinical awareness regarding diet-related discoloration during orthodontic treatment.
MATERIALS AND METHOD: A total of 130 clear orthodontic elastomeric chain samples were randomly divided into four staining groups:turmeric, curry, coffee, and red wine. Specimens were immersed in their respective solutions for 15 minutes and stored in artificial saliva.Each group was further subdivided and subjected to daily brushing for 2 minutes using either a whitening toothpaste or a non-whitening conventional toothpaste.Color measurements were performed using a Vita Easyshade V device based on the CIE L*a*b* color system on days 1, 3, 7, and 14.Color changes were quantified as ΔE values. Statistical analysis was performed using SPSS software and group comparisons were conducted with one-way ANOVA and Tukey HSD post-hoc tests($p < 0.05$).
RESULTS: At baseline (day 0),the highest discoloration was observed in the turmeric($\Delta E \approx 44.6 \pm 8.2$) and curry groups ($\Delta E \approx 39.3 \pm 7.9$),while lower discoloration was detected in coffee ($\Delta E \approx 13.8 \pm 4.6$) and red wine groups ($\Delta E \approx 10.1 \pm 4.2$).A significant difference was found among staining agents ($p < 0.001$),with turmeric and curry causing greater discoloration than coffee and red wine. Limited color recovery was observed in non-brushed chains; however,ΔE values remained clinically high in the turmeric and curry groups at all time points.Whitening toothpaste resulted in a significant increase in L* values and reduction in ΔE. At days 7 and 14, whitening toothpaste provided greater color recovery than both stained control and non-whitening toothpaste groups($p < 0.05$).Non-whitening toothpaste showed only partial improvement,particularly in heavily stained groups.
CONCLUSIONS: The color stability of orthodontic elastomeric chains is significantly affected by the type of staining agent and the brushing protocol applied.Although whitening toothpaste improved color recovery in some groups, discoloration could not be completely eliminated.These results highlight the vulnerability of elastomeric chains to staining during clinical use
and suggest that dietary counseling and material selection should be considered as part of esthetic risk management.

Abstract citation ID: cjag070.334
SP373 IMPACT OF ATTACHMENT INDUCED SURFACE COMPLEXITY ON COLORING AND CLEANING EFFICIENCY OF CLEAR ALIGNERS: A SPECTROPHOTOMETRIC AND DIGITAL IMAGE ANALYSIS STUDY

İpek Şavkan, Yaren Söz, Berrak Tezulaş, Gizem Altundal, Sibel Biren; *Istanbul Kent University, Istanbul, Turkey*

AIM: This study aimed to explore whether the attachment induced surface complexity on clear aligners affects coloring and how efficiently different cleaning methods can remove staining.
MATERIALS AND METHOD: Samples were produced in four attachment configurations: no attachments,single attachment, multiple attachments (2 or 3).100 samples were fabricated using TAGLUS® PU Flex 0.76 mm thermoplastic sheets and each aligner was sectioned into two halves to create standardized surface-complexity models for each attachment number.To induce staining, all aligners were immersed in tea for 24 hours under standardized conditions.Color measurements (L*,a*,b*) were taken at baseline, after staining, and after cleaning with different cleansing methods (rinsing with water, liquid soap, effervescent cleansing tablet,brushing with toothpaste, and brushing without toothpaste) using a VITA Easyshade® V spectrophotometer.Each aligner was placed on a white dental stone model to provide a consistent background for optical assessment.Also standardized photographs were taken at each stage, and digital color analysis was performed in Adobe Photoshop 2025™ (Version 27.1.0) software.
RESULTS: After 24-hour tea immersion no significant difference was observed between the 0 and 1attachment groups ($p = 0.12$), however the 2 and 3 attachment groups exhibited significantly greater color change ($p = 0.010–0.015$),with no difference between them ($p \approx 0.2$).Both VITA and Photoshop analyses confirmed that atachment induced surface complexity promotes localized pigment accumulation.Among cleaning methods, brushing with toothpaste resulted in the highest ΔE* values ($p < 0.001$), followed by brushing without toothpaste($p = 0.002–0.004$); effervescent tablets produced moderate discoloration, liquid soap yielded significantly lower values ($p = 0.01$), and water rinsing was the least effective ($p < 0.001$).Differences between the two measurement systems were not significant ($p \approx 0.08$),indicating consistent results.
CONCLUSION: This study demonstrated that increased attachment number is associated with greater aligner discoloration, likely due to reduced cleaning accessibility.Among the evaluated cleaning methods, brushing with toothpaste produced the highest color change,whereas water rinsing was the least effective.These findings emphasize that attachment design should be regarded not only as a biomechanical factor but also as a critical determinant of long-term esthetic outcomes in aligner therapy.

Abstract citation ID: cjag070.335
SP374 THE EFFECT OF OCULAR DOMINANCE ON FACIAL MIDLINE AND MENTON DEVIATION IN NATURAL HEAD POSITION : A PRELIMINARY ANALYSIS

İpek Şavkan, Selin Erginer, Gizem Altundal, Evren Öztaş; *Istanbul Kent University, Faculty of Dentistry, Department of Orthodontics, Istanbul, Turkey*

AIM: Ocular dominance is a visuomotor preference in which the brain relies more on one eye for spatial orientation.Its possible influence on craniofacial orientation has recently attracted interest in orthodontics.Because the facial midline, menton position and deviation direction are related to postural and sensorimotor control, their relationship with ocular dominance may help clarify neuromuscular factors in facial orientation.This study aimed to assess whether ocular dominance affects facial midline angular deviation (°), menton linear deviation (mm) and deviation direction (right/left) in Natural Head Position.
MATERIALS AND METHOD: Twenty-one adults were recruited following institutional ethics approval.Ocular dominance was assessed using the Miles test performed at a standardized distance of 3 meters.Frontal facial photographs were obtained in Natural Head Position with a standardized camera.After acquisition, the pupillary plane was digitally verified and corrected to horizontal when necessary.Facial midline angular deviation was measured as the angle formed by the Glabella–Subnasale–soft-tissue Pogonion line relative to the True Vertical Line (TVL).Menton linear deviation was recorded as the horizontal displacement of soft-tissue Pogonion from the TVL, and deviation direction was classified as right or left.For reliability, all measurements were repeated by a second orthodontist blinded to ocular dominance.Statistical analysis was performed using Fisher's Exact Test, and effect size was reported with the Phi coefficient (φ).
RESULTS: Thirteen participants (61.9%) had right ocular dominance and eight (38.1%) had left dominance.Facial midline angular deviation ranged from 0.67° to 2.41° (mean 1.63°). Menton deviation ranged from 0.5 to 4.0 mm (mean 2.29 mm). Deviation direction matched the dominant eye in 7 of 21 individuals (33.3%).Fisher's Exact Test showed no significant association between ocular dominance and deviation direction ($p = 0.3498$), with a small effect size ($\varphi = 0.25$). Inter-observer agreement was high.
CONCLUSIONS: This study found no significant evidence that ocular dominance affects facial midline angular deviation, menton deviation or deviation direction.The findings suggest that transverse soft-tissue asymmetry is multifactorial and not primarily driven by visuomotor preference.Studies with larger samples and three-dimensional analysis are recommended to further clarify the contribution of ocular inputs to craniofacial orientation.

Abstract citation ID: cjag070.336
SP376 ASSESSING THE DIAGNOSTIC CAPABILITY OF CHATGPT IN ORTHODONTIC TREATMENT PLANNING: A COMPARISON WITH SUPERVISED LEARNING ALGORITHMS

Hasan CAMCI, Artun YANGIN, Mehmet SOYBELLI; *Afyonkarahisar Healthy Science University, Afyonkarahisar, Turkey*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: The aim of this study was to evaluate ChatGPT's capability to distinguish between extraction and non-extraction orthodontic cases by comparing its performance with five different machine learning (ML) models (XGBoost, Random Forest, Decision Tree, Support Vector Machine [SVM], and Logistic Regression)
MATERIALS AND METHODS: A total of 550 orthodontic patient records were included in the study. The collected data consisted of intraoral and extraoral photographs, demographic information, diagnostic records, model analyses, and cephalometric measurements. In total, 23 variables were used: 13 clinical parameters, 7 cephalometric measurements, 2 types of photographs, and 1 treatment decision. ChatGPT was tested directly without prior training, whereas the machine learning algorithms were trained and then tested on the same dataset. Accuracy, sensitivity, and specificity values were calculated and comparatively evaluated.
RESULTS: Among the evaluated models, XGBoost demonstrated the highest performance across all metrics. In terms of accuracy, XGBoost achieved a performance of 78%, followed by ChatGPT (0.7576). The lowest accuracy was observed in the MLP model (0.6288). Based on accuracy values, the models were ranked as follows: XGBoost > ChatGPT > Random Forest > SVM > Logistic Regression > MLP.
Conclusion
Despite the lack of user-level training capability, GPT demonstrated reasonable clinical reasoning and achieved an acceptable level of performance in distinguishing between extraction and non-extraction treatment plans. ChatGPT may be utilized as a complementary clinical decision-support tool in orthodontic treatment planning.

Abstract citation ID: cjag070.337
SP377 PREDICTABILITY OF CLEAR ALIGNERS IN ACHIEVING PLANNED DENTAL ARCH EXPANSION DURING MIXED DENTITION: A SYSTEMATIC REVIEW AND META-ANALYSIS

Elisa Boccalari, Francesca Zara, Marco Serafin, Alberto Caprioglio; *University of Milan, Milan, Italy*

AIM: This study aimed to assess the predictability of Invisalign First in producing planned dental arch expansion during mixed dentition, addressing an existing gap in the pediatric orthodontic literature.
MATERIALS AND METHOD: According to PRISMA guidelines and a PROSPERO-registered protocol, four electronic databases (Pubmed, Scopus, Web of Science and Embase) were searched from inception to July 2025. Studies were eligible if they were clinical trials or cohort studies assessing Invisalign First for arch expansion in children with mixed dentition, reporting both planned and achieved expansion. The primary outcome was predictability, expressed as the ratio of achieved to planned expansion. Separate meta-analyses for the maxillary and mandibular arches were conducted using binomial modeling on the logit scale. Correlation tests and univariate linear regression explored the relationship between planned expansion and actual predictability overall and by arch and tooth group. Risk of bias was assessed using ROBINS-I, and publication bias was evaluated through funnel plots and Egger's and Begg's tests. Certainty of evidence was assessed using GRADE.
RESULTS: Nine studies met the inclusion criteria for the systematic review and eight were suitable for the meta-analysis. The pooled predictability of maxillary expansion was 65%, ranging from 58% at permanent first molars to 70% at deciduous canines. Mandibular expansion showed higher predictability (71%), peaking at deciduous canines (75%). Neither correlation nor regression analyses found any significant association between the amount of planned expansion and achieved predictability in any subgroup. No signs of publication bias were detected, and findings remained robust on sensitivity analysis. GRADE certainty was rated as Low for the maxilla and Moderate for the mandible.
CONCLUSIONS: Invisalign First demonstrates modest to moderate predictability for dental arch expansion in patients with mixed dentition, particularly in the mandibular arch and anterior teeth, although limitations persist in the posterior maxilla.

Abstract citation ID: cjag070.338
SP378 PROBLEMATIC SOCIAL MEDIA USE AND ITS PSYCHOSOCIAL IMPACT ON DENTAL AESTHETICS: A CROSS-CULTURAL STUDY IN BRAZIL AND FINLAND

Gil Gasparello[1], Lucas Arrais Campos[2], Linnea Närhi[1], Orlando Tanaka[3], Anna-Sofia Silvola[1]; *[1]University of Oulu, Oulu, Finland, [2]University of Eastern Finland, Kuopio, Finland, [3]Pontifícia Universidade Católica do Paraná, Curitiba, Brazil*

AIM: To evaluate the impact of problematic social media use (PSMUS) on the psychosocial impact of dental aesthetics among Brazilian and Finnish adults.
SUBJECTS AND METHOD: Cross-sectional online survey was conducted in 2024 with convenience samples of adults from Brazil and Finland. The PSMUS was assessed using the Bergen Social Media Addiction Scale (BSMAS), while the psychosocial impact of dental aesthetics was measured using the four domains of the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ): Dental Self-Consciousness (DSC), Social Impact (SI), Psychological Impact (PI), and Aesthetic Concern (AC). Structural equation modeling (SEM) was performed separately for each country. Model fit was evaluated with CFI, TLI, RMSEA, and SRMR. Standardized regression coefficients (β) and explained variance (R^2) were used to quantify the effects of problematic social media use on each PIDAQ domain.
RESULTS: A total of 777 Brazilians (mean age: 31.2 years; 69.1% female) and 640 Finns (mean age: 26.1 years; 78.6% female) participated. SEM presented adequate fit for both countries (CFI $\geq$ 0.98, TLI $\geq$ 0.98, RMSEA $\leq$ 0.06, SRMR $\leq$ 0.05). In Brazil, PSMUS had a significant impact on SI ($\beta = 0.245$, $p < 0.001$; $R^2 = 0.060$), PI ($\beta = 0.218$, $p < 0.001$; $R^2 = 0.048$), and AC ($\beta = 0.153$, $p = 0.001$; $R^2 = 0.024$), but not on DSC ($\beta = -0.050$, $p = 0.205$; $R^2 = 0.002$). In Finland, PSMUS was significantly associated with all PIDAQ domains: DSC ($\beta = -0.125$, $p = 0.004$; $R^2 = 0.016$), SI ($\beta = 0.222$, $p < 0.001$; $R^2 = 0.049$), PI ($\beta = 0.195$, $p < 0.001$; $R^2 = 0.038$), and AC ($\beta = 0.163$, $p < 0.001$; $R^2 = 0.027$).
CONCLUSIONS: Higher levels of PSMUS were associated with greater psychosocial impact and heightened concern about dental aesthetics in both Brazil and Finland. Maladaptive engagement with social media can negatively shape individuals' self-perception and mental image. Only in Finland, greater PSMUS was associated with lower dental self-confidence, suggesting that cultural context shapes how social media influences self-evaluation. Context-specific strategies to mitigate the potential effects of PSMUS on oral health–related quality of life are required.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.339
SP379 OROFACIAL CLEFTS IN SLOVENIA: INCIDENCE AND ASSOCIATED ANOMALIES (2014–2023)

Eva Veršič[1], Sindi Bažato[2], Alja Plut[2], Andreja Eberlinc[3], Martina Drevenšek[1]; *[1]Department of Orthodontics, Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia, [2]Department of Orthodontics, University Medical Center Ljubljana, Ljubljana, Slovenia, [3]Department of Maxillofacial and Oral Surgery, University Medical Center Ljubljana, Ljubljana, Slovenia*

AIM: This study aimed to examine the incidence of orofacial clefts in Slovenia (2014–2023), their distribution by cleft type and sex, and evaluated the prevalence of associated anomalies, affected organ systems, and genetic syndromes.
MATERIALS AND METHODS: A retrospective analysis was conducted of all live-born children with orofacial clefts born in Slovenia between 2014 and 2023. A total of 270 children were included. Data on cleft type, associated anomalies, and genetically confirmed disorders were extracted from medical records. Incidence rates, distribution by cleft type and sex, and the most frequently affected organ systems were evaluated. We assessed the relationship between cleft subtypes and three categories: isolated clefts (AnNo), clefts with anomalies of non-confirmed genetic background (AnNCGB), and clefts associated with syndromes or confirmed genetic mutations (AnCGB). Statistical analyses were performed using Microsoft Excel and MATLAB R2023b.
RESULTS: The mean incidence of orofacial clefts was 1.41 per 1,000 live births. Cleft palate (CP) was most prevalent (45.2%), followed by cleft lip (CL) (27.4%), cleft lip and palate (CLP) (25.9%), and atypical clefts (1.5%). CL and CLP occurred more frequently in males (58.1% and 61.4%, respectively), whereas CP was more common in females (53.3%). Isolated clefts accounted for 64.4% of cases, while 35.6% presented with at least one associated anomaly, syndrome, or genetic mutation. Among affected cases, 23.7% had anomalies in other organ systems, and 11.9% had a diagnosed syndrome or genetically confirmed mutation. The distribution of AnNo, AnNCGB, and AnCGB was 79.7%, 18.9%, and 1.4%, respectively, for CL; 78.6%, 12.9%, and 8.6% for CLP; and 46.7%, 33.6%, and 19.7% for CP. The most frequently affected organ systems were cardiovascular (40%), skeletal (11%), auditory (10.6%), ocular (4.7%), and urinary, respiratory, and gastrointestinal systems (3.6% each). Van der Woude syndrome was the most commonly diagnosed genetic condition.
CONCLUSIONS: Our findings suggest a declining incidence of orofacial clefts in Slovenia over the 2014–2023 period from rates documented in earlier time intervals. However, a substantial proportion of affected children, particularly those with CP, present with additional anomalies or genetic syndromes, underscoring the importance of early multidisciplinary evaluation and genetic counselling.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.340
SP380 EVALUATION OF PALATAL SHAPE AND DENTOALVEOLAR CHARACTERISTICS IN CHILDREN AND ADOLESCENTS WITH JUVENILE IDIOPATHIC ARTHRITIS: A CASE-CONTROL STUDY

Eleni Parcha[1], Keijo Aukusti Luukko[1], Timo Peltomaki[2], Demetrios Halazonetis[3]; *[1]Department of Clinical Dentistry, University of Bergen, Bergen, Norway, [2]Field of Dentistry, Faculty of Medicine and Health Technology, Tampere University, Tampere, Finland, [3]Dept. of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece*

AIM: to investigate the dentoalveolar characteristics and the palatal shape in children and adolescents with Juvenile Idiopathic Arthritis (JIA) compared to controls.
MATERIALS AND METHODS: Dental casts of 98 JIA patients and 115 controls (6-16 years) were selected from the Norwegian JIA study and digitized. Inclusion criteria were: children with JIA as defined by the International League of Associations for Rheumatology, controls matched for age and sex, Caucasian origin, presence of good quality dental casts. Exclusion criteria were: previous orthodontic treatment, syndromes or congenital malformations of the craniofacial complex, torus palatinus, primary dentition, history of severe dentofacial trauma. For each subject, the intercanine/intermolar distance was measured manually and the palatal shape was described with 3 curves and 239 semilandmarks. T-test was used to assess the dentoalveolar differences between the two groups. Procrustes superimposition and principal component analysis was applied for the calculation of shape variability.
RESULTS: The first 5 principal components explained approximately 80% of total palatal shape variability. The palate varied mainly in width/length ratio and height. When both groups were considered in the same shape space, no statistically significant differences were found between JIA patients and controls. Sexual dimorphism was observed, with girls showing a deeper palate anteriorly compared to boys. No statistically significant difference was observed in intercanine/intermolar distance between JIA patients and controls.
CONCLUSIONS: Children with JIA showed similar transverse dental dimensions and palatal shape compared to controls.

Abstract citation ID: cjag070.341
SP381 THE EFFECT OF CROSSBITE ON MAXILLARY SINUS AREA: EVALUATION BASED ON POSTEROANTERIOR RADIOGRAPHS

BENGÜBOZ Beyza, Özge Nur KARTAL, Mehmet Okan AKÇAM*; Ankara University Faculty of Dentistry, Department of Orthodontics, ANKARA, Turkey*

AIM: The maxillary sinus is an anatomical structure that influences maxillary volume and alveolar process development, thereby affecting tooth eruption paths and posterior segment mobility. Maxillary sinus area has been measured using different radiographic techniques in the literature, while the practicality of posteroanterior radiographs makes them suitable for clinical assessment. The aim of this study is to calculate the maxillary sinus area on posteroanterior films in crossbite and non-crossbite cases and to present a comparative assessment of differences between these two groups.
METHOD: This study included 52 patients aged 10–16 years during development, of whom 26 had crossbite and 26 were non-crossbite cases. Data were obtained from the patient archives of the Department of Orthodontics, Faculty of Dentistry, Ankara University. Maxillary sinus measurements were performed using AutoCAD LT 2026 software. Prior to statistical analysis, assumptions were evaluated using the Shapiro–Wilk test for normality and the Levene test for homogeneity of variances. Primary comparisons between groups were carried out using the independent samples t-test when assumptions were met; otherwise, the non-parametric Mann–Whitney U test was applied. All analyses were performed using SPSS version 21 software.
RESULTS: A comparative analysis of total maxillary sinus area between adults presenting with posterior crossbite and those without the condition revealed no statistically significant intergroup difference. The control group exhibited a mean total MSA of 1123.7 mm^2, whereas the posterior crossbite group demonstrated a mean value of 1043.1 mm^2. Given the violations of normality and variance homogeneity assumptions, the Mann–Whitney U test was employed, yielding a non-significant result ($U = 368.0$, $p = 0.589$). The calculated effect size (Cohen's $d = 0.29$) indicated a small magnitude of difference. Collectively, these findings suggest that posterior crossbite does not exert a measurable or clinically meaningful influence on maxillary sinus area within the studied cohort.
CONCLUSION: Posterior crossbite was not associated with a statistically significant difference in maxillary sinus area compared with controls. Although mean MSA was slightly lower in the crossbite group, the effect size remained minimal. Overall, findings indicate that posterior crossbite does not substantially influence maxillary sinus area in this sample.

Abstract citation ID: cjag070.342
SP384 COMPARATIVE EVALUATION OF EARLY CLASS III MALOCCLUSION TREATMENT APPROACHES: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

Vasileios Zymperdikas[1], Ludovica Nucci[2], Fabrizia D'Apuzzo[3], Letizia Perillo[3], Moschos Papadopoulos[1]; *[1]Department of Orthodontics, Faculty of Dentistry, School of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece, [2]Department of Mental and Physical Health and Preventive Medicine, University of Campania Luigi Vanvitelli, Naples, Italy, [3]Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania Luigi Vanvitelli, Naples, Italy*

AIM: To assess the effectiveness of various appliances used of the early treatment of Class III malocclusion, by performing a network meta-analysis.
MATERIALS AND METHODS: Only randomized (RCTs) or non-randomized controlled trials (non-RCTs) providing angular measurements on lateral cephalometric radiographs were considered eligible. A systematic search of 16 electronic databases up to September 2025, complemented by manual searches was performed. Risk of bias assessment was performed with the Cochrane Rob 2.0 and ROBINS-I tools. Mean differences (MDs) and the respective 95% confidence intervals (95% CIs) were calculated for primary outcomes. Random-effects network meta-analysis was performed according to a graph theoretical approach within a frequentist framework. The confidence on effect estimates was rated according to the GRADE approach.
RESULTS: Five RCTs and eighteen non-RCTs were included in the network meta-analysis, assessing 1149 subjects and reporting on angular cephalometric variables. According to the results of the network meta-analyses, the combination of Hybrid RME with Mentoplates was found more effective in maxillary advancement, as well as in preventing loss of anchorage of the upper and lower incisors. Furthermore, the effects of the various appliances on the vertical level were rather small and did not reach the levels of clinical significance. The overall confidence on the effect estimates for the primary outcomes ranged from low to very low.
CONCLUSIONS: According to the results of this network meta-analysis, it can be concluded that the combination of Hybrid RME with Mentoplates seems to be the most effective approach for improving the sagittal skeletal relationships, while functional appliances and facemask (with or without RME) produce significant dentoalveolar side-effects.
CONFLICTS OF INTEREST: None
FUNDING: None

Abstract citation ID: cjag070.343
SP385 ‡‡‡ THE EFFECTS OF ORTHODONTIC FORCE APPLICATION ON THE BIOLOGICAL RESPONSES OF DENTAL PULP: A SYSTEMATIC REVIEW AND META-ANALYSIS

Hannah B-Gleeson[1], Rachel Waddington[1], Damian Farnell[1], Marie Cornelis[2], Alastair Sloan[2]; *[1]Cardiff University Dental Hospital, Cardiff, United Kingdom, [2]Melbourne dental hospital, Melbourne, Australia*

Authors:
H. B-Gleeson[1], B. Egan[1], D Farnell[1], J. Galloway[1], M. Cornelis[2], A. J. Sloan[2], R. J. Waddington[1]

1. Cardiff Dental Hospital, University of Cardiff, Wales
2. Melbourne Dental School, University of Melbourne, Australia

OBJECTIVES: Orthodontic forces applied to a tooth can produce adverse reactions in the tissue, yet underpinning cellular responses are unclear. The aim of this systematic review was to identify and evaluate changes in biological mediators within the dental pulp following orthodontic tooth movement in healthy human and animal teeth.
MATERIALS AND METHODS: The review was registered on PROSPERO and followed PRISMA guidance. Electronic databases, MEDLINE, EMBASE, SCOUPUS, Web of Science, CENTRAL and Proquest were searched to identify 1365 papers. Following duplication removal and assessment against inclusion/exclusion criteria 14 papers were identified for inclusion. Risk of Bias was assessed with ROBINS-I and RoB 2.0 tools.
RESULTS: 11 human studies and 3 rat studies identified changes in 14 protein biomarkers associated with orthodontic forces, involving proteins influencing

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

angiogenesis, hypoxia, cell proliferation, apoptosis and matrix turnover. Subsequent meta-analysis identified notable increases in neuropeptides Substance P (SP), Calcitonin Gene-Related Peptide (CGRP) and methionine enkephalin (ME).
CONCLUSION: Orthodontic tooth movement results in significant changes to the highly regulated biological pathways within the dental pulp. Immediate release of SP, CGRP and ME implies orthodontic tooth movement results in neurogenic inflammation which correlates with observed changes in blood flow and subsequent inflammatory tissue responses related to hypoxia. The results provide better understanding for orthodontic pain and treatment management.

Abstract citation ID: cjag070.344
SP386 SERIAL EXTRACTIONS: NINE PROGNOSTIC CLINICAL SIGNS FOR SEVERE SPACE DEFICIT IN MIXED DENTITION

Lorenzo Nespoli[1], Jorida Jubani[2], Valeria Cantiero[1], Alessandro Scuderi[1], Aldo Giancotti[3]; *[1]Post-graduate student Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy, [2]Department of Health, Life and Environmental Science, University of L'Aquila, L'Aquila, Italy, [3]Associate Professor, Director Postgraduate Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy*

AIM: The nine prognostic clinical signs associated with severe space deficit in mixed dentition are: crowding in the deciduous dentition; eruption of two incisors in the space normally occupied by three deciduous teeth; eruption of three incisors in the space normally occupied by four deciduous teeth; early loss of one or both deciduous canines, this being the most frequent and most representative sign of severe early crowding; incisor crowding with "double-row" lateral incisors; incisor protrusion; incisor protrusion associated with a tooth showing periodontal problems; maxillary or mandibular cuspid bulging; and second molar impaction. The aim of this study is to evaluate the skeletal and dental outcomes of managing severe crowding either through serial extractions alone or through maxillary expansion followed by serial extractions during the mixed-dentition phase.
MATERIALS AND METHOD: Participants were divided according to the treatment received: serial extraction (EX) or maxillary expansion followed by extraction (EXP-EX). Cephalometric measurements assessing sagittal and vertical skeletal relationships, as well as dental parameters, were recorded at baseline and again after complete eruption of all permanent posterior teeth. Comparisons between the two treatment groups were then performed.
RESULTS: Both treatment approaches produced significant changes in vertical skeletal measurements, specifically reducing the inclination of the mandibular and occlusal planes and increasing the facial height index. A clear treatment-related effect on the gonial angle was observed, with a notable reduction in its superior portion in both extraction groups. The annual rate of change in the upper gonial angle differed significantly ($P = .036$) among the Control (-0.04 ± 0.6), EX (-0.44 ± 0.6), and EXP-EX (-0.34 ± 0.5) groups. Upper and lower incisor inclinations remained largely stable in all groups; however, at follow-up, the interincisal angle was significantly smaller in the Control group compared with both treatment groups.
CONCLUSIONS: When performed during the pre-pubertal growth period, both serial extractions alone and maxillary expansion followed by serial extractions yield comparable and meaningful skeletal effects, primarily influencing vertical cephalometric measurements.

Abstract citation ID: cjag070.345
SP387 UTILIZATION OF ARTIFICIAL INTELLIGENCE IN CONE BEAM COMPUTED TOMOGRAPHY REPORTING WITHIN THE ORTHODONTIC DEPARTMENT, GALWAY UNIVERSITY HOSPITALS

Ahmed AlMajmaie[1], Triona Fahey[2], Niamh O'Rourke[2], Lorna Dobbyn-Ross[2]; *[1]Oral and Maxillofacial Surgery Department, Galway University Hospitals, Galway, Ireland, [2]Orthodontic Department, Merlin Park University Hospital, Galway, Ireland*

AIM: A study performed to assess the quality of the cone beam computed tomography (CBCT) scan reports generated in three different ways:

1. Artificial intelligence (AI) hybrid system.
2. Reports by an Oral and Maxillofacial radiologist.
3. Reports by medical radiologists.

within the Orthodontic department, at Merlin Park University Hospital.
MATERIALS AND METHODS: A retrospective review of 30 CBCT scan reports was conducted using a validated 16-point guideline by Simon Harvey and Shanon Patel, focusing on features relevant to orthodontic interpretation. The scans were divided into 3 groups, each group consists of 10 reports randomly chosen. The first group reported by a hybrid reporting system that utilises AI as a tool assisting in the reports, the second group was reported by hospital-based consultant medical radiologists, and the third group was reported by an Oral and Maxillofacial radiologist.
RESULTS: On average, the AI assisted reports were of the highest quality with a mean score of 13.9, followed by the Oral and Maxillofacial radiologist reports which scored 10. Medical radiologists came last with mean score of 8.2. While all three groups were consistent in including administrative details such as the referrer's name, patient information, clinical details, and authorisation, other important key elements were frequently missed. For example, resorption of adjacent teeth was missed from 40% of medical radiologist reports. On the other hand, information like peripheral findings and matters that need further management, were missed from 70% of the Oral and Maxillofacial radiologist reports.
CONCLUSION: Within the limitation of this review, the AI assisted reports demonstrated the best quality across all categories and provided a standardized reporting format. The integration of AI in CBCT reporting should be considered, as it has the potential to aid the clinical decision, reduce reporting time, and decrease the workload of radiologists and orthodontists. However, a radiologist should always review AI generated reports to make sure the findings are accurate, and to confirm that the clinical question posed is answered fully.

Abstract citation ID: cjag070.346
SP388 ‡‡‡ TRANSVERSE SAGITTAL MAXILLARY EXPANDER (TSME) AND ITS VERTICAL AND SAGITTAL EFFECTS IN THREE MALOCCLUSION GROUPS

Ismahan Mohamed, Carmen Silvano, Saverio Joshua Leone, Cinzia Maspero, Alberto Caprioglio; *University of Milan, Milan, Italy*

AIM: The aim of this retrospective study is to evaluate the dental and skeletal effects of the transverse sagittal maxillary expander (TSME) used in subjects with Class I, II, and III malocclusions to correct transverse and sagittal maxillary deficiencies.
MATERIALS AND METHOD: A sample of 45 growing patients (19 males and 26 females; mean age 8.4 years), all in mixed or early permanent dentition and presenting bilateral crossbite, was selected. The sample was divided into three groups (n=15 each) based on their skeletal malocclusion. Patients with a history of previous orthodontic treatment, congenital or dental anomalies were excluded. The TSME appliance was worn for 8 to 12 months, including a 4-month passive retention phase. The activation protocol involved initial transverse expansion followed by sagittal expansion. A lateral cephalogram was obtained before treatment (T0) and again after the retention period (T1). Changes in cephalometric values were statistically analysed using a paired t-test ($p < 0.05$).
RESULTS: Cephalometric values before T0 and after T1 showed significant differences in all three groups. A significant increase in SNP-A, I^SN, and I^FH was observed across all groups, indicating forward movement of the maxillary dentoalveolar process and tipping of the incisors. In Class I patients, a slight increase in SNA and SNB was recorded, along with a downward and backward rotation of the palatal plane due to an increase in SN-SNP.SNA. In Class II patients, the increase in SNB and the statistically significant reduction in ANB improved the skeletal class due to a forward position of the mandible. In Class III patients, SNA increased while SNB decreased, resulting in an improvement of ANB. Anterior vertical dimensions showed no significant changes in all three groups, the posterior vertical dimension remained stable in class I and III and increased in class II.
CONCLUSIONS: The TSME appliance can produce skeletal changes through both transverse and sagittal forces on the maxillary alveolar process. The data suggests the TSME is an effective interceptive appliance that can be used in skeletal Class I, II, and III malocclusions to achieve good vertical and sagittal results.

Abstract citation ID: cjag070.347
SP390 COMPARISON OF A FULLY AUTOMATIC WEB-BASED AI DRIVEN CEPHALOMETRIC ANALYSIS TOOL TO A SEMI-AUTOMATED SOFTWARE PACKAGE

Jonathan Luyten, Noëmi De Roo, Liesbeth Temmerman, Guy De Pauw; *Ghent University, Ghent, Belgium*

AIM: The aim of this study was to compare the accuracy of Webceph® to the golden standard of semi-automated cephalometric analysis. Secondly, the time necessary to perform the analysis was investigated.
MATERIAL AND METHODS: fifty-one lateral head x-rays were analysed with the Webceph® tool and with a semi-automated tracing program. Steiner, McNamara and Jarabak analysis parameters were compared between the two methods using Intra Class Correlation and Two-One-Sides-Tests for the average values. Ten orthodontists were timed during the effectuation of both analysis methods.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: Correlation coefficients were excellent for SNB, GoGn-SN, U1-NA, L1-NB(mm), maxillomandibular differential, facial axis, L1-A Pg, saddle angle and upper gonial angle. When comparing the averages only SNA, U1-NA, A pt-N vertical and the cranial base length were not within the equivalence range. Automated cephalometric analysis was significantly faster than semi-automated respectively 7.25s versus 206s.
CONCLUSIONS: Webceph® is an accurate and fast cephalometric analysis tool only values using Point A should be interpreted with caution.

Abstract citation ID: cjag070.348
SP391 MYSTERIOUS FEATURES OF INTRA-ORAL SCANNING: A CASE SERIES OF MISSING AND EXTRA MANDIBULAR INCISORS

Krupali Mukeshkumar, Jessica Williams, Stuart Yeaton; *Queen Mary's Hospital, Sidcup, London, United Kingdom*

AIM: This case series aims to highlight how intraoral scanning can introduce errors and anomalies; specifically, the appearance of missing or additional mandibular incisors. The two case reports demonstrate how scan artefacts can affect orthodontic treatment through inaccurate study models and non-fitting orthodontic appliances.
MATERIALS (OR SUBJECTS) AND METHOD: Two patients were identified (one in 2022 and one in 2025) who underwent intraoral scanning with the '3 shape TRIOS 3 basic' intraoral scanner at the Gillies Unit in Queen Mary's Hospital (Sidcup). Both patients were scanned immediately following debond and prior to the fabrication of vacuum-formed retainers. In each case, intraoral scanning appeared to show the incorrect number of mandibular incisors present.
RESULTS: Calibration errors, incomplete data capture, and soft-tissue interference can affect the quality of intraoral scanning. In these cases, mandibular incisor anomalies resulted in vacuum formed retainers which did not fit. Repeated intraoral scans were required which were assessed for accuracy with a direct clinical comparison prior to fabrication of new vacuum formed retainers.
CONCLUSIONS: Both cases demonstrate that intraoral scans can produce misleading representations of lower incisor number. Scan artefacts may falsely suggest missing or additional incisors, leading to inaccurate study models or non-fitting orthodontic appliances. Awareness of these limitations and the need to verify digital scans clinically is essential to ensure accurate orthodontic treatment planning and appropriate orthodontic appliance design.

Abstract citation ID: cjag070.349
SP392 TWO-YEAR COMPARATIVE EVALUATION OF LARGE LANGUAGE MODEL PERFORMANCE ON ORTHODONTIC CLINICAL QUESTION-ANSWERING

Fanouria Papaioannou[1], Miltiadis A. Makrygiannakis[1], Kostis Giannakopoulos[2], Eleftherios G. Kaklamanos[3]; *[1]National and Kapodistrian University of Athens, School of Dentistry, Athens, Greece, [2]European University Cyprus, School of Denistry, Nicosia, Cyprus, [3]Aristotle University of Thessaloniki, School of Dentistry, Thessaloniki, Greece*

AIM: To evaluate the performance of four contemporary large language models (LLMs), Google Gemini, Gemini Advanced, OpenAI ChatGPT-5, and Microsoft Copilot, in responding to orthodontic clinical questions, and to compare their results with those of earlier models (Google Bard, ChatGPT-4, and Microsoft Bing Chat) assessed approximately two years ago.
MATERIALS AND METHOD: Ten open-ended clinical orthodontic questions were posed once to each LLM using single-turn English prompts. Two orthodontists independently rated each answer on a 0–10 scale using a predefined rubric that considered comprehensiveness, accuracy, clarity, and relevance, with high-level evidence (consensus statements, systematic reviews). The same evaluators repeated the scoring after two weeks. Inter- and intra-rater agreement, as well as differences between models, were analysed using Friedman and Wilcoxon tests. Current mean scores were compared with those from the previous assessment of Bard, ChatGPT-4, and Bing Chat with Wilcoxon tests.
RESULTS: Inter- and intra-evaluator agreement was high; therefore, scores were averaged for analysis. Gemini Advanced achieved the highest mean score (7.8), followed by Copilot (6.3), ChatGPT-5 (6.1), and Gemini (4.7). Gemini Advanced performed significantly better than ChatGPT-5 ($p = 0.010$), Copilot ($p = 0.031$), and Gemini ($p = 0.002$). Both Copilot and ChatGPT-5 scored significantly higher than Gemini ($p = 0.041$ and $p = 0.040$, respectively). Compared to the earlier evaluation, Gemini Advanced and ChatGPT-5 showed notable improvements over Bard and ChatGPT-4, while Copilot scored significantly lower than Bing Chat.
CONCLUSIONS: Over the last two years, LLMs have become more capable of answering orthodontic clinical questions, with Gemini Advanced currently leading. However, even the top-performing model still lacks the expertise of a specialist orthodontist and should be seen solely as a supportive tool rather than a replacement for professional clinical judgment.

Abstract citation ID: cjag070.350
SP393 SURGICAL EXPOSURE OF THE UNILATERAL PALATALLY IMPACTED CANINE – A QUALITATIVE STUDY

Claire Murphy, Declan Millett, Catherine Gallagher, Mairead Harding; *University College Cork, Cork, Ireland*

AIM: To explore the patients' knowledge, understanding including perceived benefits and risks, attitude, experience and level of involvement in shared decision-making regarding open exposure under local anaesthesia of a unilateral palatally impacted canine (PIC).
MATERIALS AND METHOD: Following ethical approval and informed consent, semi-structured one-to-one interviews were conducted by a trained interviewer, approximately 10 days after open surgical exposure of a unilateral PIC under local anaesthesia and immediately prior to surgical pack removal. Interviews were held in a private office adjacent to the clinical environment; these were recorded, transcribed verbatim, and analysed using interpretative phenomenological analysis by specialist qualitative researchers using NVivo software. In line with qualitative methodology, no statistical testing was undertaken.
RESULTS: Data saturation was reached following interviews with 15 adolescents (10 males, 5 females; mean age 14.9 (SD 1.5) and 13.9 (SD 1.6) years, respectively). Patients had a good overall knowledge of the treatment process. They expressed high levels of satisfaction with the explanations provided regarding all aspects of the surgery. Patients initially felt nervous, but anxiety dissipated when provided with reassurance from the surgeon and after administration of local anaesthetic. In general, patients were not well versed in potential causes of the impaction or the possible risks of leaving a PIC untreated. Regarding shared decision-making, patients felt involved in this along with their parents and the operator. Surgery had a minimal impact on eating, speaking and other activities. Overall, patients had more positive than negative experiences.
CONCLUSIONS:

- Patients had varying levels of knowledge and understanding regarding open exposure of a PIC.
- In particular, patients were not familiar with causes of impaction or the potential risks of leaving a PIC untreated.
- Patients were generally pleased with the overall experience and with their level of involvement in the shared decision-making process.

PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.351
SP394 PERCEPTION OF ASYMMETRY AND FACIAL ATTRACTIVENESS IN CLASS II SUBDIVISION

Patricia Gomes, Sara Fernandes, Jessica Feliciano, Joana Godinho, Luis Jardim; *Universidade de Lisboa Faculdade de Medicina Dentária, Lisbon, Portugal*

AIM: This study aimed to evaluate the perception of facial attractiveness and asymmetry in individuals with Class II subdivision malocclusion and to compare these perceptions between orthodontists and laypersons.
MATERIALS AND METHODS: The sample consisted of 80 frontal photographs (40 Class I and 40 presenting 100% Class II subdivision) of individuals aged 18 to 35 years, all without previous orthodontic treatment. The photographs were assessed by 12 orthodontists and 12 laypersons using visual analogue scales to rate facial symmetry and attractiveness. Statistical analysis included analysis of variance (ANOVA), Tukey HSD post-hoc tests, paired Student's *t*-tests, and Pearson correlation coefficients. The level of significance was set at $p < 0.05$.
RESULTS: No significant differences were found in the perception of facial asymmetry between Class I and Class II subdivision individuals, when assessed by laypersons ($p = 0.213$) or orthodontists ($p = 0.170$). Similarly, no significant differences in perceived attractiveness were found between the two groups ($p = 0.786$ and $p = 0.276$, respectively). Orthodontists assigned higher attractiveness scores than laypersons ($p < 0.001$). However, both groups provided similar symmetry ratings ($p = 0.411$). The correlation between symmetry and attractiveness was weak and not significant, whether assessed by laypersons ($r = -0.148$, $p = 0.190$) or orthodontists ($r = -0.073$, $p = 0.519$).
CONCLUSION: Individuals with Class II subdivision were not perceived as less attractive or more asymmetric than those with Class I occlusion. Orthodontists tended to rate attractiveness higher than laypersons, while symmetry assessments

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

remained comparable between the two groups. Future research should consider larger sample sizes, additional clinical and perceptual variables, and alternative assessment methodologies.

Abstract citation ID: cjag070.352
SP396 TIME-DEPENDENT EFFECTS OF COFFEE EXPOSURE ON THE TRANSLUCENCY OF PET-G POLYMER: A PILOT STUDY

WAN SALMAH YANG MOHSIN, NIK MUKHRIZ NIK MUSTAPHA, NUR ALIANA HIDAYAH MOHAMED, SARASWATHY DEVI SINNIAH; *Universiti Teknologi Mara (UiTM), Selangor, Malaysia*

AIM: PET-G thermoplastic retainers are widely selected for their clarity, yet their optical stability may be compromised by exposure to dietary staining agents. This study aimed to evaluate the effect of coffee immersion at different durations (24, 48, and 72 hours) on the translucency of PET-G (Erkodur®) retainer material using Konica Minolta CM-5 spectrophotometer.
MATERIALS AND METHOD: An in-vitro experimental design was employed using Erkodur® PET-G sheets (1 mm thickness), standardised into flat specimens measuring 5 × 4 cm. Translucency was assessed using the Konica Minolta CM-5 spectrophotometer under D65 illumination and a 10° standard observer, with measurements recorded in the CIE Lab* system. Samples were divided into four groups: clear (baseline), coffee immersion for 24 hours, 48 hours, and 72 hours. Each specimen was fully submerged in 20 mL black coffee at room temperature. Triplicate readings were recorded for each condition, and translucency values (E*) were calculated using established protocols. Statistical analysis included one-way and two-way ANOVA with significance set at $p < 0.05$.
RESULTS: Clear flat PET-G demonstrated a mean translucency of 96.02 ± 0.00. Coffee immersion for 24 hours produced no significant difference from baseline ($p > 0.05$). However, a significant translucency reduction was observed after 48 hours (mean difference 0.11; $p = 0.016$), with the largest decrease occurring at 72 hours (mean difference 0.30; $p < 0.001$). Pairwise comparisons confirmed a progressive, time-dependent decline, with the 72-hour group showing the greatest translucency change.
CONCLUSION: Translucency of PET-G thermoplastic retainer material decreases with increasing duration of coffee exposure, becoming significant after 48 hours and most pronounced at 72 hours. These findings underscore the material's susceptibility to staining over time and reinforce the need for patient dietary guidance and further investigation of long-term optical behaviour in thermoplastic orthodontic appliances.

Abstract citation ID: cjag070.353
SP398 ‡‡‡ DEVELOPMENT OF A HYDROGEL-BASED OPTICAL TISSUE CLEARING AND IMMNUOLABELLING PROTOCOL FOR THREE-DIMENSIONAL IMMUNOFLUORESCENCE IMAGING OF WHOLE-MOUNT MURINE ANTERIOR DIGASTRIC MUSCLES

Jarlath Mc Donnell, Barry Sessle, James Posluns, Limor Avivi-Arber; *University of Toronto, Toronto, Canada*

AIM: To develop an immunolabelling protocol compatible with a hydrogel-based optical tissue-clearing method for three-dimensional visualisation of myofibre architecture in whole-mount murine anterior digastric muscles; as a prerequisite for a broader research programme investigating the effects of age, sex, and genetics on neuromuscular organisation and functional plasticity of orofacial muscles following orthodontic and other dental interventions.
MATERIALS AND METHODS: This study utilised the Clear Lipid-exchanged Acrylamide-hybridized Rigid Imaging/Labelling/in-situ-hybridization-compatible Tissue hYdrogel (CLARITY) technique to optically clear whole anterior digastric muscles harvested from old and young, male and female mice of white (A/J) and black (C57BL/6J) strains (n=2/group). CLARITY comprises transcardial hydrogel perfusion, fixation, embedding, decolourisation, delipidation, and immunolabelling.

Immunolabelling optimisation trials in digastric muscles of the C57BL/6J mouse tested laminin, wheat germ agglutinin, neurofilament, and other candidate markers. The final successful protocol used laminin conjugated to Alexa-Fluor 647. Muscles were incubated for 4-weeks with weekly solution refreshing. This protocol was then applied to the 8 experimental mice. Light-sheet fluorescence microscopy was used to acquire three-dimensional images to assess label penetration, signal-to-noise ratio, and myofibre morphology and delineation.
RESULTS: CLARITY processing preserved gross tissue morphology and architecture. Of the panel of fluorescent labels tested, only laminin and wheat germ agglutinin produced consistent, specific, and robust labelling. The optimised immunolabelling protocol yielded good label penetration through all anterior digastric bellies. Myofibre delineation and signal-to-noise ratio were regionally variable, ranging from excellent in some areas to poor in others. Zones of poor image quality were consistent with refractive index mismatch, potentially arising from optical inhomogeneities originating from upstream CLARITY processing.
CONCLUSIONS: The CLARITY-based hydrogel clearing and optimized laminin immunolabelling protocol enables three-dimensional visualisation of myofibre architecture in whole-mount anterior digastric muscles of male and female, old and young, black and white mice. However, some regional variability in image quality was present likely due to residual refractive index mismatch. This methodology provides a foundation for future quantitative studies of the orofacial neuromuscular connectome in the context of orthodontic and other dental interventions.

Abstract citation ID: cjag070.354
SP399 *** COMPARISON OF MULTIPLE SKELETAL MATURATION INDICES IN KOREAN GROWING PATIENTS WITH SKELETAL CLASS I AND CLASS III MALOCCLUSION

SO YOUNG JOO and SUNG HUN KIM; *Pusan national university, Yangsan, Republic of Korea*

INTRODUCTION: Skeletal maturation is a critical determinant in planning orthopedic interventions. However, few studies have simultaneously evaluated multiple skeletal maturation indices in Korean patients. This study aimed to compare skeletal maturation patterns in Korean growing patients with skeletal Class I and Class III malocclusions using cone-beam computed tomography (CBCT) and lateral cephalometric radiography.
METHODS: This retrospective study included 105 patients aged 6–18 years (54 Class I; 51 Class III) who underwent CBCT and lateral cephalograms. Groups were defined by ANB, SNA, and anterior overjet values. Skeletal maturation was assessed using cervical vertebral maturation (CVM), spheno-occipital synchondrosis (SOS), midpalatal suture (MPS), zygomaticotemporal suture (ZTS), and zygomaticomaxillary suture (ZMS) stages. Intergroup comparisons were performed using independent t-tests.
RESULTS: Class III patients demonstrated significantly earlier maturation at early stages of CVM, SOS, MPS, ZTS, and ZMS compared with Class I patients ($P < 0.05$). However, delayed progression was observed in advanced stages of MPS and ZMS, indicating residual but less responsive growth potential. These findings suggest altered craniofacial growth trajectories in Class III malocclusion, characterized by premature sutural closure followed by delayed late-stage maturation.
CONCLUSIONS: Korean Class III patients exhibit distinct skeletal maturation patterns, with early acceleration and late delay compared with Class I patients. Clinicians should consider earlier initiation of growth modification to optimize treatment outcomes.

Abstract citation ID: cjag070.355
SP400 PATIENT HARM FROM ORTHODONTIC CARE (PART II): INCIDENT ANALYSIS OF CONTRIBUTORY FACTORS AND PERCEIVED AVOIDABILITY OF HARM

Nikolaos Ferlias, Athanasia` Grigoroudi, Julian Woolley, Sukeshana Srivstav, Peter Stoustrup; *Section of Orthodontics, Department of Dentistry and Oral Health, Aarhus University, Aarhus, Denmark*

BACKGROUND: Patient safety, defined as absence of avoidable harm, in orthodontics is in its infancy. Knowledge on the subject is limited.
AIM: (1) To conduct an incident analysis (2), to measure avoidability and (3) to investigate the relationship between contributory factors and perceived avoidability of harm from orthodontic care, and (4) to suggest methods to mitigate potential patient harm incidents.
MATERIALS AND METHODS: Data was retrospectively collected from consecutively filed orthodontic-related claims from the Danish Dental Compensation Association (DDCA) and included all approved-for-compensation claims from September 2019 to August 2024. Reason for filing the claim, harm category, and harm-causing events were recorded. Incident analysis was conducted for each claim based on the Eindhoven criteria and AI-assisted qualitative analysis using a large language model, was performed to identify and interpret the interplay between the contributory factors. Perceived avoidability of harm was based on a 6-point rating system.
RESULTS: A total of 125 claims were identified and reviewed. Based on the Eindhoven incident analysis, most frequent root causes were human related factors (monitoring, verification and clinical knowledge amongst others) followed by organizational factors (management priorities, protocols and workplace culture) amongst others illustrating complex interrelationships. The majority of claims (70.1%, n=82) were avoidable harm, being rated as either *probably avoidable in more than 50% of cases, high certainty of avoidability, or completely avoidable*. While low-avoidability harm events were characterized by few contributory factors

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

in contrast to , high-avoidability cases where numerous human and organizational failures were involved.
CONCLUSION: The analysis of 125 compensated orthodontic harm cases showed that 70.1% of the cases were deemed avoidable and most harms were multifactorial in nature, with human and organizational contributors playing the primary role. This multifactorial pattern provides new insights and forms a foundation for future patient-safety initiatives in orthodontic practice and research.

Abstract citation ID: cjag070.356
SP401 *** MECHANICAL CHARACTERIZATION OF CRANIAL DEFORMATION INDUCED BY RAPID MAXILLARY EXPANSION: A NOVEL APPROACH INTEGRATING FINITE ELEMENT ANALYSIS AND LATIN HYPERCUBE SAMPLING

Sho Kuroe, Yusuke Suzuki, Shinichi Negishi; *Department of Orthodontics, Nihon University School of Dentistry at Matsudo, Chiba, Japan*

AIM: The aim of this study was to understand how the skull changes shape during rapid maxillary expansion (RME). We used finite element analysis (FEA) together with Latin Hypercube Sampling (LHS). LHS is a statistical method that helps explore many different conditions and understand how much the results may vary.
MATERIALS AND METHODS: We made a three-dimensional finite element model of an adult human skull. The maxilla and the surrounding sutures were reconstructed in detail. The periodontal ligament was not included because it can cause large variation in the model. We studied two factors that may differ between people: ①Bone stiffness (Young's modulus: 7,000–15,000 MPa). ②Daily expansion amount (0.1–0.5 mm). Each factor range was divided into 20 parts, and LHS was used to create 20 different combinations. For each of the 20 cases, we calculated skull displacement in the X, Y, and Z directions. We also calculated the total displacement (norm) at several anatomical landmarks. Results: The front part of the maxilla, including the anterior nasal spine (ANS), moved more in the transverse (X) direction. This region also showed large differences between the 20 LHS cases.The back part of the maxilla and the skull base showed smaller differences between cases, but they still showed some displacement. Several sutural areas—such as the zygomaticomaxillary, frontozygomatic, and nasomaxillary sutures —and skull-base areas showed a negative relationship between bone stiffness and displacement. This means stiffer bone moved less. The total displacement (norm) was largest in the front part of the maxilla. This showed a fan-shaped expansion pattern, which is typical for Hyrax-type expanders. Conclusions: Using LHS together with FEA made it possible to measure how much the differences in bone stiffness and expansion amount can change the displacement pattern of the skull.The Hyrax-type expander created a fan-shaped expansion, with large movement in the front and small movement in the back. The front area showed larger variation between cases, which means that individual differences may strongly affect expansion there. Posterior movement showed little variation and was more affected by bone stiffness.This method may help predict patient-specific biomechanical responses during RME in a simpler and more reliable way.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.357
SP402 INVESTIGATION OF THE ONSET OF FACIAL ASYMMETRY USING 3-DIMENSIONAL FACIAL SCANNING

Naoya Antsuki, kaori Ishii, Yusuke Suzuki, Sho kuroe, Shinichi negishi; *Nihon university school of dentistry at Matsudo, Chiba, Japan*

AIM: Facial asymmetry is a multifactorial condition influenced by skeletal morphology, dentition, and perioral musculature, and complete correction remains difficult even with orthognathic surgery. The developmental timing of soft-tissue asymmetry has not been clarified. This study aimed to retrospectively examine age-related differences in facial asymmetry and identify when asymmetry first becomes evident.
MATERIALS AND METHODS: Participants were categorized into four age groups: Early Childhood (EC; $n = 128$, 7.0 ± 0.8 years), Early Adolescence (EA; $n = 58$, 11.9 ± 1.5 years), Late Adolescence (LA; $n = 67$, 16.5 ± 1.3 years), and Young Adults (YA; $n = 39$, 22.3 ± 1.3 years). Three-dimensional facial images were obtained using a structured-light scanner (VECTRA® H2). Individuals with soft-tissue Menton deviation > 4.0 mm from the facial midline were excluded. Nineteen landmarks were digitized, and midline deviation and left–right discrepancies were calculated (Body-Rugle®). Each measurement was repeated three times. After normality testing, Student's t-tests and the Kruskal–Wallis test with Bonferroni correction were performed.
RESULTS: For midline deviation, significant gender differences were found only in Pog' and Menton' within the EC group ($p = 0.04$). No other gender-related differences were detected. In age-group comparisons, pronasale was the only landmark showing a significant difference ($p = 0.001$). For bilateral landmarks, significant gender differences were observed only in the nasal alar region in YA ($p = 0.02$). Although age-group differences were not statistically significant, left–right discrepancies increased gradually with age. In the gonial region, an approximate 4-mm discrepancy was already present in EC, suggesting early onset before this developmental stage. In contrast, asymmetry in the oral commissure region increased from the EA period onward. These findings indicate region-specific variation in both onset and progression of facial soft-tissue asymmetry.
CONCLUSIONS: Although no gender-related differences were identified in the onset of facial soft-tissue asymmetry, left–right discrepancies tended to increase progressively with age. The gonial region showed earlier onset, whereas perioral asymmetry developed later, highlighting location-dependent patterns of asymmetry during growth.

Abstract citation ID: cjag070.358
SP403 STUDY OF THE FORCES DISTRIBUTED BY A FACEMASK USING FIBER OPTIC SENSORS

Maura S. Milczewski, Alana Nemes Tineu, Emmanuell Scolimoski, Gustavo Macioski, Jean Carlos C. da Silva; *Federal University of Technology-Parana, Curitiba, Brazil*

AIM: Improvements in surgical methods for opening the calvarium to adapt the tissue development in craniosynostosis cases have brought new perspectives on life for these children. Parents are now concerned about their children's appearance, social integration, and adult life in the future. However, surgery on the midface and adjacent bones is postponed until later. On the other hand, an orthopedic approach using a Haas expander in conjunction with a protraction facemask, used until the end of early childhood, enables dentition development and promotes bone growth. This study analyzes the force distribution derived from appliances (facemask) installed in the midface using a 3D plastic craniofacial model with fiber optic sensors (fiber Bragg gratings).
MATERIALS AND METHOD: The 3D craniofacial model was constructed using a tomography obtained for medical purposes from a five-year-old girl with Pfeiffer syndrome. The model was instrumented with fiber Bragg grating (FBG) sensors. These strain sensors have minimal dimensions (3 mm in length and 125 μm in diameter) and high resolution. The FBG resonance wavelength is sensitive to strain. Therefore, with the correct calibration, one can measure the force applied to the sensors. This study examined the response of ten FBG sensors placed in strategic locations on the model when facemask forces of 800 g were applied. The calibration coefficient used was 0.31 nm/N/mm.
RESULTS: After the installation of the appliance (facemask), the FBGs registered forces between 0.08 N and 0.30 N in the following suture regions: zygomatic-maxillary, fronto-zygomatic, frontonasal, and coronal, as well as in the following bones: temporal, zygomatic process, frontal, and the orbital surfaces of the zygomatic and maxilla, and the frontal process of the maxilla. The FBGs precisely sensed the tension regions caused by dissipated forces acting on the cranium and facial bones due to the facemask.
CONCLUSION: The importance of this study is to highlight the possibility of promoting face bone remodeling in early-aged craniosynostosis cases using the tensile forces of the facemask.

Abstract citation ID: cjag070.359
SP404 DENTOSKELETAL VARIABLES ASSOCIATED WITH FAILURE OF ORTHOPEDIC MAXILLARY EXPANSION IN ADULTS

Jungeun Yang, Sug-Joon Ahn, Jung-Sub An; *Dental Research Institute and Department of Orthodontics, Seoul National University School of Dentistry, Seoul, Republic of Korea*

AIM: This study aimed to identify demographic and dentoskeletal factors associated with the failure of orthopedic maxillary expansion in adults using routinely obtained radiographs.
MATERIALS AND METHODS: This retrospective study included 115 adult patients (≥18 years) diagnosed with transverse maxillary deficiency who underwent miniscrew-assisted rapid palatal expansion (MARPE). Patients demonstrating midpalatal suture separation on radiographs after expansion were assigned to the success group, whereas those showing no radiographic or clinical evidence of suture separation were classified into the failure group. Pretreatment lateral cephalometric and panoramic radiographs were analyzed to evaluate dentoskeletal characteristics. Differences in sex distribution and sagittal and vertical skeletal patterns between groups were assessed using Fisher's exact test. Three demographic and twenty dentoskeletal variables were screened using univariate logistic regression analysis for covariate selection. Continuous variables were categorized based on

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

ethnic norms and cluster analysis. Selected variables were incorporated into a multivariate logistic regression model to identify factors significantly associated with MARPE failure.
RESULTS: The failure group showed a higher proportion of males than the success group, while no significant differences were observed in sagittal or vertical skeletal patterns. Univariate logistic regression identified ten variables for covariate selection, including sex, age, ANB angle, saddle angle, the distance from the mesiobuccal cusp of the maxillary first molar (U6MBC) to the palatal plane (U6-to-palatal plane), the distance between ANS and the projection of the U6MBC onto the palatal plane, the distance between ANS and PNS, number of missing posterior teeth, alveolar bone height in the maxillary premolar region (U4-U5 alveolar height), and the extent of root penetration of canines and posterior teeth above the base of the maxillary sinus floor on panoramic radiographs. Multivariate logistic regression analysis revealed that male sex (odds ratio [OR], 8.0), older age (> 20 year, OR, 8.7), increased saddle angle (> 124.0°, OR, 3.3), greater U6-to-palatal plane (> 48 mm, OR, 6.0), and reduced U4-U5 alveolar height (< 21.2 mm, OR, 5.2) were significantly associated with MARPE failure.
CONCLUSIONS: This study indicates that male sex, older age, increased saddle angle, greater palatal depth, and advanced maxillary sinus pneumatization may be risk factors for MARPE failure in adults.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.360
SP405 ‡‡‡ *** REDUCED MASTICATORY STIMULATION DURING GROWTH IMPAIRS COGNITIVE DEVELOPMENT THROUGH DECREASED SOMATOSTATIN AND NEPRILYSIN ACTIVITY IN THE HIPPOCAMPUS

Keigo Nakamura, Chiho Kato, Eri Misawa, Moe Tanigawa, Takashi Ono; *Department of Orthodontic Science, Graduate School of Medical and Dental Sciences, Institute of Science Tokyo, Tokyo, Japan*

AIM: Reduced masticatory stimulation during growth has been suggested to adversely affect cognitive development, potentially through impaired neural activity in the hippocampus. Somatostatin (SST) and neprilysin (NEP) are key modulators of amyloid-β (Aβ) metabolism and synaptic regulation. This study aimed to investigate whether decreased mastication during growth alters hippocampal SST and NEP expression and activity in mice.
MATERIALS AND METHODS: Sixteen 3-week-old male mice were randomly assigned to a solid food group (Group C, n=8) or a powdered food group (Group P, n=8) and fed each food until 10 weeks of age. Short-term working memory and long-term retention were assessed using a Y-maze and passive avoidance test, respectively. Hippocampal SST and NEP expression was measured by RT-PCR and Western blotting, NEP enzymatic activity by a fluorometric assay, and Aβ deposition in the hippocampal CA1, CA3, and dentate gyrus (DG) regions by immunofluorescence staining. Statistical significance was determined using the t-test ($p<0.05$).
RESULTS: No significant difference in body weight was observed between the groups at 10 weeks (26.6±0.3 g vs. 26.7±0.3 g). Group P showed significantly impaired performance in both behavioral tests compared with Group C (Y-maze alternation: 67.6±7.7% vs. 51.5±4.5%; passive avoidance retention latency: 176.2±82.9 s vs. 4.5±17.9 s; both $p<0.05$). SST mRNA expression was significantly reduced in Group P (1.07±0.41 vs. 0.45±0.35; $p<0.05$), while neither NEP mRNA nor SST/NEP protein expression showed significant differences ($p>0.05$). However, NEP enzymatic activity was significantly decreased in Group P (2549.07±80.56 vs. 2319.01±50.02 RFU/min/mg; $p<0.05$). No significant difference in Aβ deposition was observed in any hippocampal region ($p>0.05$).
CONCLUSIONS: Reduced mastication during growth suppresses SST expression and NEP activity, impairing Aβ-degrading capacity without increasing Aβ accumulation. These findings suggest that chewing deprivation may disrupt hippocampal cognitive development through early Aβ-independent mechanisms, such as altered neurogenesis or synaptic plasticity, rather than direct Aβ deposition. Understanding the mastication–brain relationship during growth period may lead to preventive strategies for cognitive disorders associated with reduced chewing function.

Abstract citation ID: cjag070.361
SP406 ‡‡‡ PALATAL BONE HEALING AFTER REMOVAL OF MINISCREW-ASSISTED RAPID PALATAL EXPANDER DEVICES

Jahyeong Ku, HeeYoung Maeng, Hieu Nguyen, JuHui Han, Yoon Jeong Choi; *Department of Orthodontics, The Institute of Craniofacial Deformity, Yonsei University College of Dentistry, Seoul, Republic of Korea*

AIM: Miniscrew-assisted rapid palatal expansion (MARPE) is an effective approach for correcting maxillary constriction in adults. This study aimed to evaluate palatal bone healing after miniscrew removal in MARPE-treated patients and to identify key factors influencing the healing process.
MATERIALS AND METHOD: This retrospective study included 38 patients (18 men, 20 women; mean age at ≥6 months postremoval [T2], 24.7 ± 4.2 years) and analyzed 152 removal sites (76 anterior and 76 posterior). The average number of MARPE screw turns and expansion width were 29.5 ± 6.1 and 5.9 ± 1.2 mm, respectively. At the end of the consolidation phase (T1) and T2, miniscrew inclination, distance to the midpalatal suture, palatal bone thickness, and removal site dimensions (width, depth, volume, and total surface area) were measured. The average T1-T2 interval was 12.0 ± 3.7 months. Volume and total surface area healing ratios—representing percentage of bone recovery— were separately compared between anterior and posterior sites, and between monocortical and bicortical sites using either independent *t* tests or Mann-Whitney U tests. Paired *t* tests or Wilcoxon signed rank tests were performed to compare the mean values between T1 and T2. Correlation analyses (point-biserial, Spearman, or Kendall's tau) assessed relationships between healing and patient-related and miniscrew-related factors.
RESULTS: All removal site dimensions decreased significantly at T2, with an overall volume healing ratio of 92.5%. Anterior sites demonstrated significantly greater healing than posterior sites (98.3% vs 86.6%, $p < .001$). Similarly, monocortical sites showed higher volume healing than bicortical sites (96.5% vs 84.4%, $p < .001$). Posterior site healing ratios were significantly correlated with age at T2, healing duration, MARPE width, distance to midpalatal suture, palatal bone thickness, and anchorage type.
CONCLUSIONS: Substantial palatal bone healing occurred after miniscrew removal in patients treated with MARPE. Healing was greater at anterior and monocortical sites, whereas posterior site healing was influenced by patient/miniscrew-related factors. This study addresses concerns regarding healing at the miniscrew removal site after MARPE; however, long-term follow-up is recommended for comprehensive insights.

Abstract citation ID: cjag070.362
SP407 ‡‡‡ THE EFFECT OF LOWER INCISOR EXTRACTION ON JAW RELATIONSHIPS IN ORTHOGNATHIC SURGERY PATIENTS

Päivi Roininen; *Department of Oral and Maxillofacial Diseases, University of Helsinki and Helsinki University Hospital, Helsinki, Finland, Helsinki, Finland*

THE EFFECT OF LOWER INCISOR EXTRACTION ON JAW RELATIONSHIPS IN ORTHOGNATHIC SURGERY PATIENTS

[1]Päivi Roininen, [1]Emilia Lottonen, [1]Satu Strausz, [1] David P Rice, [1]Anu Kiukkonen
[1]Department of Oral and Maxillofacial Diseases, University of Helsinki and Helsinki University Hospital, Helsinki, Finland

AIM: The aim of this study was to evaluate whether lower incisor angulation and/or the type of orthognathic surgery influence the achievement of ideal occlusion. Extraction of a lower incisor is an uncommon orthodontic approach, occasionally considered in Class III patients with mild anterior crossbite or as part of orthognathic surgery treatment.
SUBJECTS AND METHODS: This study was a retrospective study that included 77 patients treated in Helsinki University Hospital between the years 2013 and 2024. All patients underwent lower incisor extraction before the orthognathic surgery. Data was collected from patient records. Patients were divided into three groups; group 1: patients treated with Le Fort I osteotomy, group 2: patients treated with bilateral sagittal osteotomy and group 3: patients treated with bimaxillary osteotomy. Horizontal overjet, vertical overbite, and Angle's classification were recorded pre- and post-treatment. Cephalometric analysis was performed using Dolphin Imaging Software (v12.0.63) at T_0 (before surgery) and T_1 (after surgery). Ethical approval was obtained from the HUS Regional Committee on Medical Research Ethics.
RESULTS: At T_0, no significant differences were observed among groups. Incisor–mandibular plane angle (IMPA) did not predict ideal occlusion. At T_1, 18.2% (n=14) achieved ideal occlusion, while 81.8% (n=63) did not. Significant skeletal changes were noted: maxillary position (SNA) changed in Group 3 with non-ideal occlusion; mandibular position (SNB) changed in Group 2 (both occlusion subgroups) and Group 3 with non-ideal occlusion; jaw interrelationship (ANB) changed significantly in Group 2. Lower incisor angulation decreased significantly in Group 2 and Group 3 with non-ideal occlusion but not in ideal occlusion subgroups.
CONCLUSION: Only a minority of patients achieved ideal occlusion, suggesting that surgical correction of skeletal discrepancies does not guarantee optimal occlusal outcomes when a lower incisor is extracted. These findings highlight the need to consider the interplay between skeletal and dental relationships during surgical planning.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.363
SP411 ‡‡‡ MACHINE LEARNING-BASED MODEL FOR PREDICTING SHORT- AND LONG-TERM GROWTH IN UNTREATED CLASS III MALOCCLUSION

Maria Denisa Statie, Veronica Giuntini, Lorenzo Franchi; *Scuola di Specializzazione in Ortognatodonzia, Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy*

AIM: To develop a Machine Learning-based model to predict growth of Caucasian subjects with untreated Class III malocclusion in the short- and long-term.
MATERIALS AND METHOD: A longitudinal sample of 144 Caucasian subjects with untreated Class III malocclusion was selected (80% training data; 20% test data). Cephalograms of the subjects of the test group were divided into short- and long-term observations. Sixteen cephalometric landmarks were digitized in a X Y Cartesian coordinate system. The trained model was a Graph Neural Network. A one sample t-test and the Euclidean distances between predicted and observed values were calculated.
RESULTS: In the short-term prediction, 16 subjects were examined. On the X Y-axis, the following cephalometric points were statistically significant: SX, PgY, BY, PNSY, NY and SY. Mean Euclidean distance between predicted and actual values revealed high values for the mandibular points Go (2.6 mm), Me (1.9 mm), Gn (1.9 mm), Pg (2.0 mm), and B (2.0 mm). In the long-term prediction, 13 subjects were examined. On the X Y-axis, the following cephalometric points were statistically significant: MeX, GnX, PgX, BX, BY and PtY. Mean Euclidean distance between predicted and actual values revealed high values for the mandibular points Go (3.1 mm), Me (4.3 mm), Gn (4.1 mm), Pg (4.5 mm), and B Point (4.1 mm).
CONCLUSIONS: The ML-based prediction model was accurate for the majority of the landmarks. Cephalometric mandibular landmarks (Go, Me, Gn, Pg and B Points) showed the highest mean Euclidean distances between predicted and observed values, indicating lower prediction accuracy.

Abstract citation ID: cjag070.364
SP413 MACHINE-LEARNING AND DEEP-LEARNING MODELS FOR PREDICTING MESIODISTAL WIDTHS OF UNERUPTED CANINES AND PREMOLARS IN EMIRATIS

Nour Alnusairat[1], Widad Nsairat[2], Hasna Alseed[1], Amar Hassan Khamis[1], Nameer Al-Taai[3]; [1]*Hamdan Bin Mohammed College of Dental Medicine, Dubai, United Arab Emirates,* [2]*Private Practice, Abu Dhabi, United Arab Emirates,* [3]*Orthodontics, Odontology Department, Umeå University, Umeå, Sweden*

AIM: Accurate prediction of the mesiodistal widths of unerupted canines and premolars is essential for space analysis during the mixed dentition stage. The widely used Tanaka and Johnston prediction equation estimates these teeth widths based on the summed widths of mandibular incisors; however, its reliability has been questioned across different ethnic populations. This study aimed to develop a more accurate model for predicting the widths of unerupted canines and premolars in Emirati children, using deep learning and machine learning techniques.
MATERIALS AND METHOD: Dental models of 380 Emirati individuals, aged 15-30 years, were collected from the Primary Dental Care Units in Dubai and Abu Dhabi. The mesiodistal widths of permanent teeth were measured using a standardized orthodontic digital caliper (real values). Regression models were developed using linear regression, Support Vector Regression (SVR; machine learning), and Artificial Neural Network regression (ANN; deep learning). The widths of lower lateral incisors, central incisors, and the summed width of lower incisors were used as predictors. A two-tailed paired t-test was used to assess differences between real and predicted values. The pass rate (1-mm tolerance) was defined as the proportion of predicted values falling within $\pm$ 1 mm of the real measurements.
RESULTS: A statistically significant difference ($p < 0.0001$) was found between the measurements predicted by the Tanaka and Jonsson equation and the real measurements. In contrast, no significant differences were observed between the real measurements and those predicted by newly derived models. The highest average pass rate (78.5%) was achieved using linear regression with one predictor (summed width of the lower incisors), followed by three-predictor linear regression and one-predictor SVR (78%), three-predictor SVR (77.5%), and linear regression models without an intercept (70.5%). The best-performing prediction equations were:

Maxillary unerupted teeth = 0.52 × (summed width of mandibular incisors) + 9.69

Mandibular unerupted teeth = 0.55 × (summed width of mandibular incisors) + 7.59

CONCLUSIONS: New prediction equations were developed that more accurately estimate the mesiodistal widths of maxillary and mandibular unerupted canines and premolars in the Emirati population than the Tanaka and Johnston method.

Abstract citation ID: cjag070.365
SP416 COMPARATIVE EFFECTIVENESS OF ORTHODONTIC TREATMENT WITH EXTRACTIONS USING CONVENTIONAL, SELF-LIGATING, LINGUAL BRACKETS, AND CLEAR ALIGNERS: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

Vasileios Zymperdikas[1], Angeliki Mekaka[2], Sofia Tsokani[2], Anna-Bettina Haidich[2], Moschos Papadopoulos[1]; [1]*Department of Orthodontics, Faculty of Dentistry, School of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece,* [2]*Laboratory of Hygiene, Social & Preventive Medicine and Medical Statistics, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece*

AIM: To compare the effectiveness of various appliances implemented for comprehensive orthodontic treatment requiring extractions, by performing a network meta-analysis.
MATERIALS AND METHODS: Only randomized (RCTs) or non-randomized controlled trials (non-RCTs) providing angular measurements on lateral cephalometric radiographs were considered eligible. 16 electronic databases were systematically and unrestrictedly search up to November 2025, supplemented by manual searches. Risk of bias assessment was performed with the Cochrane Rob 2.0 and ROBINS-I tools. Mean differences (MDs) and the respective 95% confidence intervals (95% CIs) were calculated for primary outcomes. Random-effects network meta-analyses were performed based on a graph theoretical approach within a frequentist framework. The GRADE approach was used for rating our confidence on effect estimates.
RESULTS: 8 non-RCTs were included in the network meta-analysis, assessing 456 subjects and reporting on angular cephalometric variables following extraction treatment. Based on the results of the network meta-analyses, lingual appliances were found significantly most effective in correcting the proclination of both upper and lower incisors, whereas clear aligners were the less effective treatment alternative in this regard. Furthermore, no significant differences could be found between the assessed treatment approaches for any of the assessed sagittal and vertical skeletal variables. The overall confidence on the effect estimates for the primary outcomes ranged from low to very low.
CONCLUSIONS: According to the findings of the present study, lingual appliances seem to be the most effective treatment approach for correcting the excessive proclination of the upper and lower incisors in extraction cases. However, no differences could be found in matters of skeletal changes between the examined appliances.
CONFLICTS OF INTEREST: None
FUNDING: None

Abstract citation ID: cjag070.366
SP417 FAILURE TO REPORT ETHICAL APPROVAL IN ORTHODONTIC RCT PUBLICATIONS - 55-YEAR FOLLOW-UP

Sofia Petrén, Lars Bondemark, Mikael Sonesson, Liselotte Paulsson; *Malmö university, Malmö, Sweden*

AIM: To assess the extent to which ethical reviews or considerations were reported in orthodontic randomized controlled trials (RCTs) over the past 55 years.
MATERIALS AND METHODS: The databases MEDLINE via Entrez PubMed, Cochrane library and Web of Science were searched for human orthodontic RCT publications from 1 January 1968 to 31 December 2024. Based on initial inclusion and exclusion criteria and a predisposed protocol, the full-text articles were analyzed and evaluated by four researchers. The assessments were carried out independently of each other and in case of disagreement, the articles were reread and discussed until agreement was reached. The primary outcome was report of ethical approval and whether the trial was approved by an ethics government/professional committee or institutional/hospital review board as well as if stated to comply with the Declaration of Helsinki. The secondary outcomes were to analyze whether there was any connection or correlation between ethical reporting over time, type of RCT and correlation with level of risk of bias. Data was analyzed using SPSS 29.0 software (IBM, USA). The rates were compared by use of Chi-square tests. All P values were two-sided, and the value of $P < 0.05$ was indicated significant.
RESULTS: Overall, only 3.8% of the articles explicitly reported ethical approval by a governmental ethics committee in accordance with the Declaration of Helsinki. The proportion of studies providing such reporting increased over time. Multicenter RCTs (8.6%) and those characterized by a low risk of bias (10.3 %) accounted for the largest share of studies with documented ethical approval. In contrast, 12% of articles failed to report ethical approval; these were predominantly split-mouth studies and studies assessed as having a high risk of bias. Notably, the proportion of articles lacking ethical approval reporting declined over time.
CONCLUSIONS: In the past 55 years, only a minority of RCTs reported ethical review accurately. However, multicenter studies conducted after 2010 and RCTs with low risk of bias yielded the most reliable ethical outcomes.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.367
SP418 ORAL HEALTH-RELATED QUALITY OF LIFE CHANGES ACROSS TREATMENT STAGES IN ADOLESCENTS: A COMPARISON OF THREE DIFFERENT CLASS II CORRECTION METHODS

Sinem İnce Bingöl[1], Aslınur Mamuk[2], Sinem Tekdemir[1], Selin Erdoğan[1], Burçak Kaya[1]; [1]Başkent University Department of Orthodontics, Ankara, Turkey, [2]Private Practice, Ankara, Turkey

AIM: To investigate how oral health-related quality of life (OHRQoL), measured by the Oral Health Impact Profile-14 (OHIP-14), and perceived pain, measured by Visual Analogue Scale (VAS), change following treatment with Class II elastics, intraoral distalization, or fixed functional appliances (FFA) in adolescents.
MATERIALS AND METHODS: Fifty-four adolescents with Class II malocclusion (38 girls, 16 boys; mean age: 13.3 years) were equally allocated to three treatment groups. Treatment need and the psychosocial impact of malocclusion were assessed using the Index of Complexity, Outcome, and Need (ICON) and the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ), respectively. Baseline data included age, gender, ICON, PIDAQ, VAS, and OHIP-14 scores. VAS and OHIP-14 scores were recorded at four time points: pretreatment (T0), 1 month (T1), 6 months (T2), and posttreatment (T3). Inter-group comparisons were performed using the Kruskal-Wallis and ANOVA tests, while within-group changes over time were analyzed with repeated-measures ANOVA with Bonferroni correction. A multivariable stepwise regression analysis was conducted to examine how pretreatment variables influenced the mean change in OHRQoL from T0 to T3.
RESULTS: At T0, no significant differences were observed between treatment groups regarding age, gender, ICON, OHIP-14, or PIDAQ scores ($p>0.05$). OHIP-14 scores decreased significantly after T2 and reached their lowest level at T3 across all groups. VAS scores peaked at T1 and gradually reduced to T3 in all groups. No significant inter-group differences were found between groups at T1 or T2; however, the FFA group reported the lowest pain at T3 ($p=0.002$). From T0 to T3, all groups demonstrated clear improvement in OHRQoL. Mean OHIP-14 scores decreased by 6.6, 7.1, and 8.2 in the intraoral distalization, Class II elastics, and FFA groups, respectively ($p=0.838$). Regression analysis revealed that improvements in OHRQoL were significantly associated with pretreatment PIDAQ scores ($B = 0.148$, $p = 0.019$).
CONCLUSIONS: All three methods for correcting Class II malocclusion improved OHRQoL by the end of treatment. Early discomfort during the first month was common but diminished over time. Overall, changes in treatment-related OHRQoL were primarily associated with adolescents' initial self-perceived psychosocial impact rather than age, gender, treatment need, or appliance type.

Abstract citation ID: cjag070.368
SP419 ACCURACY OF PREDICTED EXPANSION WITH CLEAR ALIGNERS IN THE MIXED DENTITION

Muammer Üşümez[1], Mehmet Esad Güven[2], Serdar Üşümez[3], Derya Germeç Çakan[1]; [1]Yeditepe University, Istanbul, Turkey, [2]Necmettin Erbakan University, Istanbul, Turkey, [3]Dental Plus Istanbul Clinic, Istanbul, Turkey

AIM: The aim of this study was to evaluate the accuracy of predicted intermolar and intercanine expansion in mixed dentition children treated with clear aligners.
METHODS: The study included 24 patients (12 boys, 12 girls, average age 8.5±4.7 years) treated with Invisalign First appliance. Various amounts of maxillary expansion were prescribed as a part of clear aligner treatment for all cases. The average number of aligners was 26.2±4.7. Digital scans were acquired before and after treatment using 3Shape (3Shape Trios 3, Copenhagen, Denmark) intraoral scanner. The pretreatment (T0) and posttreatment (T1) intraoral scans, and final (T1') ClinCheck digital models reflecting the end of treatment were exported to Geomagic software. Predicted expansion values (PEV) were measured by subtracting T0 measurements from T1' measurements and actual expansion values (AEV) were measured by subtracting T0 measurements from T1 measurements for intercanine and intermolar widths. In addition, prediction accuracy was calculated as the percentage of AEV to PEV. The results were analyzed using t-test.
RESULTS: The PEV and AEV for intermolar width was 6.2±1.1 mm and 3.2±1.7 mm, respectively. The PEV and AEV for intercanine width was 5.5±2.3 mm and 2.7±2.0 mm, respectively. The mean accuracy of clear aligners was 52% for intermolar and 48% for intercanine expansion. Actual intermolar and intercanine expansion was statistically significantly lower compared to predicted amounts of expansions ($p<0.001$). There was no statistically significant difference between prediction accuracy of intercanine and intermolar measurements ($p>0.05$). No significant correlations were detected between the prediction accuracy and pretreatment intermolar or intercanine distances, amount of predicted expansion or number of aligners.
CONCLUSION: Invisalign First Appliance can provide significant amount of intermolar and intercanine expansion. However, actual expansion is about half that of the predicted and presents a high variation. Clinicians should keep in mind the reduced accuracy to build necessary compensation and overcorrection into the virtual treatment plan and consider alternative appliances when necessary.

Abstract citation ID: cjag070.369
SP420 THREE-DIMENSIONAL ASSESSMENT OF THE CURVE OF SPEE: INFLUENCE OF VERTICAL PATTERN, SAGITTAL DISCREPANCY ANTEGONIAL NOTCH DEPTH AND SYMPHYSIS MORPHOLOGY

Arda Tabancalı[1], Rumeysa Bilici Geçer[2], Aslı Pelin Kaya Bursa[1], Necati Türkmen[1]; [1]Department of Orthodontics, Faculty of Dentistry, Istanbul Aydin University, Istanbul, Turkey, [2]Department of Orthodontics, Hamidiye Faculty of Dental Medicine, University of Health Sciences, Istanbul, Turkey

AIM: This study aimed to three-dimensionally (3D) evaluate the Curve of Spee (COS) in hyperdivergent, normodivergent, and hypodivergent individuals and to examine its relationships with vertical skeletal pattern, sagittal skeletal parameters, anterior gonial notch (AGN) depth, and mandibular symphysis morphology. A further objective was to determine the independent morphological determinants of COS depth using multivariate modeling.
MATERIALS AND METHODS: Ninety patients were allocated equally into hyperdivergent, normodivergent, and hypodivergent groups ($n = 30$ each). Mandibular arches were scanned with an intraoral scanner, and the STL files were imported directly into 3Shape OrthoAnalyzer to generate virtual 3D models and quantify COS depth. The occlusal reference plane was defined using the distobuccal cusp of the mandibular second molar and the incisor edge. Lateral cephalograms were used to record vertical measures (SnGoMe, FMA, Y-Axis), sagittal indicators (SNA, SNB, ANB, Witts value), AGN depth, and symphysis morphology. Depending on data distribution, one-way ANOVA or Kruskal–Wallis tests were applied, followed by post-hoc comparisons. Pearson correlation analysis assessed linear associations, and multiple linear regression identified independent predictors. Statistical significance was set at $p<0.05$.
RESULTS: Low-angle patients demonstrated a significantly lower Symphysis Ratio, whereas COS depth was markedly greater in the low-angle group compared with the normo-angle group ($p = 0.024$). Significant intergroup differences were also observed for SNA, SNB, and AGN depth ($p<0.05$). Bonferroni-adjusted pairwise comparisons indicated that AGN depth was substantially lower in the low-angle cohort ($p = 0.003$). Pearson analysis revealed a direct linear association between COS depth and Witts's appraisal and an inverse association between COS depth and symphysis ratio. No significant relationship emerged between AGN depth and COS depth within any vertical skeletal subgroup. In the multivariate model, Witts values remained the only independent determinant of COS depth, whereas vertical skeletal measures and symphyseal dimensions did not contribute significantly.
CONCLUSION: This study demonstrated that COS depth varies meaningfully across vertical skeletal patterns. Low-angle patients exhibited the greatest deepening of the COS, while sagittal discrepancy reflected by the Witts appraisal proved to be the principal determinant. These findings emphasize the relevance of 3D COS morphology assessment in interpreting craniofacial growth patterns.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.370
SP421 COMPARISON BETWEEN MACHINE LEARNING AND MOYERS' FOR MIXED DENTITION ANALYSIS FOR UNERUPTED TOOTH SIZE PREDICTION

Christian Kirschneck[1], Cristiano Miranda de Araújo[2], Aleyna Cakir[1], Svenja Beisel-Memmert[1], Erika Calvano Küchler[1]; [1]University Hospital Bonn, Bonn, Germany, [2]University of Tuiuti of Paraná, Curitiba, Brazil

AIM: While space analysis during the mixed dentition is essential for predicting the mesiodistal size of unerupted canines and premolars, traditional approaches such as Moyers' probability tables rely exclusively on the sum of the lower incisors and may not fully account for individual variability. To address these limitations, this study evaluated the applicability of machine learning models in predicting mandibular space requirements and compared their performance directly with the traditional Moyers method.
SUBJECTS AND METHOD: A cross-sectional sample of 428 digital dental models from German patients was analysed. Measurements included the sum of the mesiodistal widths of the lower incisors and permanent first molars, as well as the required space in the lower arch. Eight machine learning models were trained and validated using five-fold cross-validation and hyperparameter optimization.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Model performance was assessed using the Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and the Coefficient of Determination (R^2).
RESULTS: Across the test data, MAE ranged from 0.63 mm for linear regression and the multilayer perceptron to 0.87 mm for the decision tree, while R^2 values ranged from 0.23 for the decision tree to 0.55 for linear regression and the multilayer perceptron. Predictions generated by each model were compared with values estimated through the traditional Moyers probability tables at the 50, 65, 75, 85, and 95 percent levels. Machine learning models consistently produced lower predictive errors than Moyers' tables across all probability levels.
CONCLUSION: Machine learning based models provided more accurate predictions than the traditional Moyers method, supporting their use as a flexible and clinically applicable alternative for space analysis in mixed dentition.

Abstract citation ID: cjag070.371
SP423 POLYMORPHISMS IN GENES INVOLVED IN MINERALIZED TISSUE FORMATION ASSOCIATION WITH PULP CALCIFICATION IN ORTHODONTIC PATIENTS

Christian Kirschneck[1], Daniel Hemming[2], Rafaela Scariot[3], Bianca Marques de Mattos de Araujo[2], Erika Calvano Küchler[1]; *[1]University Hospital Bonn, Bonn, Germany, [2]University of Tuiuti of Paraná, Curitiba, Brazil, [3]Federal University of Paraná, Curitiba, Brazil*

AIM: The present study aimed to evaluate the association between pulp stones in molars of orthodontic patients and polymorphisms in mineralization-related genes.
SUBJECTS AND METHOD: This cross-sectional study analysed genomic DNA and panoramic radiographs from 235 Brazilian patients with a history of orthodontic treatment. PS were identified as well- or poorly-defined radiopaque opacities located within the pulp chamber of the maxillary and mandibular first and second permanent molars. Participants were eligible for inclusion if they presented complete root formation. Exclusion criteria comprised radiographs with poor image quality, syndromic conditions, the presence of cleft lip and/or palate, teeth with extensive coronal destruction, and teeth with extensive restorations preventing visualization of the pulp chamber. The genetic analysis focused on seven polymorphisms: BMP2 (rs235768, rs1005464), BMP4 (rs17563), SMAD6 (rs3934908, rs2119261) and RUNX2 (rs59983488, rs1200425). Allele and genotype frequencies distributions were calculated using the chi-square test. Logistic regression analyses were performed to control for potential confounders. The significance level established at $\alpha = 0.05$.
RESULTS: A total of 121 patients presented with pulp stones and 114 served as controls. The sample included 143 females (60.9%) and 92 males (39.1%). Statistical analyses revealed no statistically significant differences between groups with respect to age (p=0.087) or sex distribution (p=0.088). For the polymorphism rs59983488 in RUNX2, a statistical association was observed for genotype distribution in the dominant model (p=0.033) and for allele distribution (p=0.022). For the polymorphism rs1200425 in RUNX2, a statistical association was observed for genotype distribution in the recessive model (p=0.046; OR=2.0, CI95% 1.0 to 3.8).
CONCLUSION: Genetic polymorphisms in RUNX2 may be involved in the susceptibility to pulp stone formation in orthodontic patients.

Abstract citation ID: cjag070.372
SP424 DIRECT MEASUREMENT OF CONTACT POINT TIGHTNESS AFTER SURGICAL REMOVAL OF LOWER IMPACTED THIRD MOLARS

Efthimia Tsoukala, Ioanna Pouliezou, Christos Perissanidis, Demetrios Halazonetis, Iosif Sifakakis; *NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS, ATHENS, Greece*

The mandibular third molar has been proposed as a possible, though highly debated, contributor to crowding in late adolescence through the application of mesial forces on adjacent teeth. Clinical guidelines remain inconclusive, as some studies report minimal or no association, whereas others support a potential relationship.
AIM: This prospective study evaluated the contact point tightness (CPT) and the anterior component of occlusal force (ACF) in the anterior area of the lower dental arch, directly, before and after surgical removal of lower third molars.
SUBJECTS AND METHOD: Nineteen healthy individuals, between 15 and 25 years of age, who had mesially inclined, impacted third molars (Ganss ratio <1) were recruited. Prior to extraction (T0) and 30 days after staged bilateral removal (T1), CPT and ACF were measured in mandibular rest position and in maximum bite effort, using a piezoresistive sensor (FlexiForce®). Shapiro-Wilk tests, paired t-tests or Wilcoxon signed-rank tests and repeated-measures Cohen's d for effect size were used for the statistical analysis.
RESULTS: CPT significantly decreased after extraction under both rest (Mean $\Delta = -121.8$ N; $p < 0.001$; $d = -1.11$) and bite conditions (Mean $\Delta = -139.4$ N; $p < 0.001$; $d = -1.34$). Additionally, ACF dropped significantly (Median $\Delta = 0$ N; $p = 0.041$; $d = -0.74$). Intra- and interobserver reliability was excellent (ICC ≥ 0.9996).
CONCLUSIONS: The removal of mesially inclined, impacted lower third molars may decrease anterior interproximal contact forces, in mandibular rest position as well as in maximum bite effort. The hypothesis that posterior tooth pressure may be an etiological factor in late mandibular crowding is supported by the present results.

Abstract citation ID: cjag070.373
SP426 THERMAL CHARACTERISTICS OF A NOVEL **B**-TITANIUM ORTHODONTIC ARCHWIRE ASSESSED BY DSC

Mirela Georgieva[1], Angelina Stoyanova-Ivanova[2], Zlatka Delcheva[3], Velizar Georgiev[2], Valeri Petrov[1]; *[1]Medical University of Sofia, Faculty of Dental Medicine, Department of Orthodontics, Sofia, Bulgaria, [2]G. Nadjakov Institute of Solid State Physics, Bulgarian Academy of Sciences, Sofia, Bulgaria, [3]Institute of Mineralogy and Crystallography—Bulgarian Academy of Sciences; PERIMED, Central District, Vasil Aprilov Blvd. 15A., Sofia, Plovdiv, Bulgaria*

INTRODUCTION: Ti–Nb–Ta–Zr–O β-titanium orthodontic alloys demonstrate a characteristic thermal behavior that differs fundamentally from NiTi alloys. Published data show a thermally stable β-phase, with no thermo-induced martensitic transformations and no detectable endothermic or exothermic peaks during heating or cooling cycles. This suggests a uniform thermal response independent of phase transitions, making thermal characterization particularly through DSC essential for evaluating newly developed β-titanium wires.
AIM: To characterize the thermal behavior of a newly developed β-titanium orthodontic archwire Gummetal® using differential scanning calorimetry (DSC).
METHODS: DSC analysis will be performed over a temperature range sufficient to capture all possible thermal events associated with metallurgical transitions. The evaluation will include: a) identification of endothermic and exothermic peaks; b) assessment of β-phase stability across heating and cooling cycles; c) detection of subtle thermal irregularities indicating microstructural heterogeneity.
CONCLUSION: The DSC analysis of the novel β-titanium orthodontic archwire (Gummetal®) performed within the –80°C to +80°C temperature interval revealed a distinct thermal event occurring near 0°C. This transition does not correspond to the classical austenite–martensite transformation observed in conventional Ni-Ti alloys. Instead, the endothermic/exothermic signal is consistent with a $\beta \rightarrow \beta + \alpha$ phase separation, which is characteristic of metastable β-titanium alloys. The DSC-based thermal characterization will provide fundamental insight into the phase stability and transformation behavior of the new β-titanium archwires. This initial thermal assessment represents a critical step in defining the material's potential as a next-generation orthodontic wire.

Acknowledgments: Z.D. thanks the program "Research, Innovation and Digitalization for Smart Transformation" 2021-2027, funded by the European Union, Project BG16RFPR002-1.014-0007 "Center for Competence "PERIMED-2" for supporting analytical measurements

Abstract citation ID: cjag070.374
SP427 PHYSICAL AND MECHANICAL PROPERTIES OF CLEAR PLASTIC RETAINERS: A SCOPING REVIEW

Leah Sidhu and Maurice Meade; *The University of Adelaide, Adelaide, Australia*

AIM: Clear plastic retainers (CPRs) are the most frequently prescribed removable retainer. Optimal CPR physical and mechanical properties are essential to ensure clinical effectiveness, patient satisfaction, CPR survival and minimization of harm. The aim of this scoping review is to collate and synthesize the current evidence regarding the physical and mechanical properties of CPRs.
MATERIALS AND METHOD: A systematic search of six databases and one grey literature source and independent screening was conducted by two reviewers. The present review was carried out in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analyses Extension for Scoping Reviews guidelines.
RESULTS: A total of 39 studies from the 909 publications identified in the searches, that met the inclusion and exclusion criteria, were evaluated. Thirty-four were in-vitro/laboratory investigations with five utilizing an in-vivo methodology. Most studies (n=35) focused on thermoplastic/thermoformed CPRs whereas four studies included at least one testing group of 3-dimensional (3D) printed retainers. The review included extraction of data according to eight categories: optical properties, surface characteristics, dimensional stability, wear resistance, fracture/fatigue resistance, stiffness and elastic behavior, properties related to strength and properties related to strain. Following collation of data, a narrative synthesis was conducted.
Conclusions/Clinical Implications: The present scoping review found thermoplastic/thermoformed CPRs generally exhibited superior mechanical and optical

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

properties compared with 3D printed retainers although post-processing appeared to improve these properties in the 3D printed retainers. Staining/colour change of CPRs (both 3D-printed and thermoformed) was frequently seen with exposure to coffee and curry. Most cleaning solutions do not appear to significantly alter the physical or mechanical properties of CPRs and the retainers, therefore, can be safely worn by patients. Bleach used as a cleaning agent, however, was found to negatively affect the flexural modulus, strength, and surface roughness of CPRs. CPRs should not be used as receptacles for tooth whitening materials for the same reasons. Although the findings of this review can inform decision-making retention practices, further in-vivo research is required to fully determine the impact of the oral environment on physical and mechanical properties of CPRs.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.375
SP430 WEAR RESISTANCE AND MECHANICAL PERFORMANCE OF THREE ORTHODONTIC BAND ADHESIVES USED AS OCCLUSAL BITE RAMPS: A MULTIMODAL IN VITRO EVALUATION

Leen Almanie[1], Susanne Croff Larsen[2], Magnus Johansen Anderson[2], Agneta Karsten[1]; [1]Karolinska Institutet, Huddinge, Sweden, [2]Nordic Institute of Dental Materials, Oslo, Norway

AIM: To compare the mechanical performance, wear behaviour, and wear particle generation of three orthodontic band adhesives used as occlusal bite ramps with a multimodal in vitro testing protocol.
MATERIALS AND METHODS: Three orthodontic materials (Ultra Band Lok Blue, BracePaste® Band and Build LC, and 3M™ Transbond™ Plus Band Adhesive) were evaluated using standardized discs cured under controlled conditions. Wear resistance was assessed in a chewing simulator (12,600 cycles; 20 N sliding, 70 N static), and volumetric surface loss was quantified by 3D optical profilometry.

Wear debris and worn surfaces were examined by SEM. Mechanical properties were measured by Vickers microhardness and three point flexural strength according to ISO 4049. Wear-particle size was characterized by dynamic light scattering (DLS) in filtered and unfiltered suspensions.

Hardness and flexural strength were compared using one-way ANOVA with Tukey post-hoc tests (n = 5), and their relationship was assessed using Pearson correlation. DLS parameters (n = 3 per condition) were analysed descriptively, and filtration effects were evaluated using paired t-tests. Wear volume was available as one measurement per material and therefore reported descriptively.
RESULTS: Profilometry showed differences in wear behaviour, with wear volumes of 1.78×10^8 μm³ (BP), 8.17×10^8 μm³ (TB), and 1.18×10^9 μm³ (UBL).

Mechanical properties varied substantially: hardness values were 114.77 HV10 (TB), 83.21 HV10 (UBL), and 68.58 HV10 (BP), whereas flexural strength measured 126.10 MPa (UBL), 114.06 MPa (BP), and 86.77 MPa (TB). Hardness and flexural strength showed a significant negative correlation ($r = -0.74$, $p = 0.0016$).

Wear behaviour did not follow the ranking of hardness or flexural strength. BP, the softest material, exhibited the lowest wear, while UBL, the strongest in flexure, demonstrated the highest wear.

DLS showed material-dependent particle sizes in the unfiltered condition—348 nm (BP), 428 nm (TB), 326 nm (UBL)—with filtration reducing Z-Average values while preserving the same order. Particle size did not correspond to wear.
CONCLUSIONS: Wear resistance did not align with hardness, flexural strength, or particle size, indicating that orthodontic bite ramp wear behaviour is governed by complex material factors rather than single mechanical or microstructural properties.

Abstract citation ID: cjag070.376
SP431 ‡‡‡ THE ROLE OF OCCLUSION ON PERIODONTAL BREAKDOWN OF ANTERIOR TEETH IN SUBJECTS WITH STAGE III-IV PERIODONTITIS: A PROSPECTIVE CLINICAL AND CBCT STUDY

Egle Zasciurinskiene[1], Migle Mackeviciute[2], Agnius Matuzas[1], Kristupas Skarulis[3]; [1]Orthodontic Department, Lithuanian University of Health Sciences, Kaunas, Lithuania, [2]Faculty of Odontology, Lithuanian University of Health Sciences, Kaunas, Lithuania, [3]Department of Dental and Oral Pathology, Lithuanian University of Health Sciences, Kaunas, Lithuania

AIM: This study aimed to evaluate the effect of occlusal trauma (OCT) on anterior teeth (AT), focusing on periodontal probing depth (PPD), gingival recession (REC), clinical attachment level (CAL), and alveolar bone level (ABL) in patients with Stage III–IV periodontitis.
MATERIALS AND METHODS: This prospective study involved 23 subjects with Stage III–IV periodontitis who had CBCT examinations for orthodontic/restorative treatment. Periodontal assessments included PPD, REC, and CAL measurements, along with orthodontic examinations to find antagonistic tooth pairs with OCT (positive fremitus test). Teeth were classified as periodontitis-affected (PA) or periodontally healthy (PH). ABL was measured on CBCT images from the cemento-enamel junction to the marginal alveolar bone. Comparisons were made between teeth with and without OCT. Group comparisons were conducted using Kruskal–Wallis and Mann–Whitney U tests, with a significance level of $p<0.05$.
RESULTS: The greatest periodontal destruction ($p<0.05$) was observed in AT affected by periodontitis (PA) and occlusal trauma (OCT). Mean PPD in maxillary AT with OCT+PA was significantly greater (3.96 mm; 95% CI: 3.60–4.33; $p<0.05$) compared to non-OCT+PA (3.17 mm; 2.85–3.49). There was no significant difference ($p>0.05$) in mean PPD between mandibular AT with OCT+PA (2.77 mm; 2.27–3.28) and mandibular non-OCT+PA (2.53 mm; 2.26–2.81).

Mean REC differed in maxillary AT with OCT+PA (0.76 mm; 0.17–1.34; $p<0.05$) compared to non-OCT+PA (-0.12 mm; -0.68–0.44), while no difference in REC values was found in periodontally affected mandibular AT with and without OCT ($p>0.05$).

Mean CAL in maxillary AT with OCT+PA was significantly greater (5.06 mm; 4.53–5.59; $p<0.05$) than in non-OCT+PA (4.03 mm; 3.63-4.42). Similarly, CAL was greater in mandibular AT with OCT+PA (5.64 mm; 4.75–6.53) than in non-OCT+PA (4.76 mm; 4.33–5.20; $p<0.05$).

Mean ABL did not differ between periodontally affected maxillary or mandibular AT with and without OCT ($p>0.05$).
CONCLUSIONS: Occlusal trauma of periodontitis-affected maxillary AT resulted in greater PPD, REC, and CAL. Occlusal trauma of periodontitis-affected mandibular AT resulted in greater CAL. This confirms the treatment need in subjects with stage III-IV periodontitis with occlusal trauma diagnosis.

Abstract citation ID: cjag070.377
SP432 ‡‡‡ LOW INTENSITY PULSED ULTRASOUND EXERTS MODULATORY EFFECTS ON HUMAN PERIODONTAL LIGAMENT CELLS UNDER MECHANICAL LOADING

Laura Kürschner[1], Jana Marciniak[1], Lamia Singer[2], Christian Kirschneck[1], Svenja Beisel-Memmert[1]; [1]Department of Orthodontics, Center of Dento-Maxillo-Facial Medicine, University of Bonn Medical Center, Bonn, Germany, [2]Department of Orthodontics and Department of Oral Technology, Center of Dento-Maxillo-Facial Medicine, University of Bonn Medical Center, Bonn, Germany

AIM: Low-intensity pulsed ultrasound (LIPUS) has been associated with accelerated orthodontic tooth movement and enhanced periodontal repair. While anti-inflammatory and pro-regenerative effects of LIPUS have been described in mechanically challenged periodontal tissues, its direct cellular impact on human periodontal ligament (hPDL) fibroblasts exposed to compressive force remains insufficiently understood. This study aimed to assess how LIPUS modulates inflammatory and osteogenic responses in hPDL cells subjected to mechanical loading.
MATERIAL AND METHODS: Primary hPDL cells (passage 5) were cultured under conditions of mechanical compression with or without daily LIPUS application. Ultrasound was delivered at 1.5 MHz for 20 min/day using intensities of 85, 100, or 120 mW/cm². Cells were stimulated for either 1 day or 7 days. Gene and protein expression of the pro-inflammatory cytokines IL-6 and IL-8, and the osteogenic markers BMP-2 and RUNX2, were quantified by real-time PCR and ELISA. Statistical comparisons were performed using Dunnett's and Tukey's post-hoc tests.
RESULTS: High-intensity LIPUS induced significant upregulation of all investigated markers in the absence of mechanical force. Mechanical loading alone significantly increased IL-6, IL-8, and RUNX2 expression, whereas BMP-2 levels were markedly decreased. When mechanical compression was combined with LIPUS, inflammatory and osteogenic responses were amplified beyond levels observed with mechanical stimulation alone. Prolonged stimulation (7 days) resulted in stronger expression shifts than short-term exposure (1 day), and a higher number of genes exhibited significant modulation at the later time point.
CONCLUSION: LIPUS exerts measurable modulatory effects on hPDL cells under compressive force, enhancing both inflammatory and osteogenic signalling pathways. These findings suggest that LIPUS influences cellular processes involved in periodontal repair and tissue remodelling associated with orthodontic tooth movement. The data provide a biological rationale for exploring LIPUS as an adjunctive therapeutic approach in orthodontic treatment.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.378
SP435 ‡‡‡ IMPACT OF SAGITTAL SKELETAL MALOCCLUSION AND SEX ON UPPER AIRWAY GROWTH IN ORTHODONTIC PATIENTS

Kristin Miebach[1], Christian Kirschneck[1], Cristiano Miranda de Araujo[2], Erika Calvano Küchler[1], Svenja Beisel-Memmert[1]; [1]Department of Orthodontics, Center of Dento-Maxillo-Facial Medicine, University of Bonn Medical Center, Bonn, Germany, [2]School of Dentistry, University of Tuiuti of Paraná, Curitiba, Brazil

AIM: Orthodontic patients undergo substantial craniofacial and airway development during our treatment time. This study aimed to determine whether growth-related changes in upper airway dimensions differ according to initial sagittal skeletal malocclusion, sex, treatment duration, or age at beginning of treatment in growing orthodontic patients.
MATERIAL AND METHODS: This retrospective longitudinal study analysed lateral cephalograms of orthodontic patients aged 7–12 years. Individuals with a history of facial trauma, craniofacial syndromes, systemic disease, or cleft lip/palate were excluded. Dimensions of the naso-, oro-, and hypopharynx were quantified using ImageJ, and sagittal skeletal pattern was classified using the ANB angle measured in OnyxCeph. Airway changes were defined as the difference between post- and pre-treatment measurements. Multivariate normality and homogeneity of covariance were assessed via Shapiro–Wilk and Box's M tests; due to violations of assumptions, Pillai's Trace was selected as a robust multivariate statistic. A multivariate analysis of covariance (MANCOVA) was performed with significance set at $\alpha = 0.05$.
RESULTS: A total of 120 orthodontic patients (50% male) met the inclusion criteria. At baseline, 55 patients (45.8%) presented with skeletal Class I and 65 (54.2%) with skeletal Class II sagittal patterns. The mean observational period (treatment/growth duration) was 31.1 ± 19.9 months. MANCOVA revealed significant multivariate effects of sex and treatment duration on combined upper airway changes ($p < 0.05$). No significant effects were detected for initial sagittal skeletal malocclusion, the interaction between malocclusion and sex, or starting age ($p > 0.05$).
CONCLUSION: Growing orthodontic patients exhibit sex-specific patterns of upper airway development between ages 7 and 12. In contrast, the initial sagittal skeletal malocclusion did not influence growth-related changes in airway dimensions in this cohort. These findings highlight the importance of considering sex and treatment duration when interpreting airway development in orthodontic diagnostics and longitudinal treatment planning.

Abstract citation ID: cjag070.379
SP437 ‡‡‡ ELECTROMYOGRAPHIC ASSESSMENT OF MASTICATORY MUSCLE ADAPTATION TO ANTERIOR AND POSTERIOR BITE BLOCKS: A CROSSOVER STUDY

Ruggiero Valentino, Rosaria Bucci, Giorgio Oliva, Roberto Rongo, Vincenzo D'Antò; University Federico II, Naples, Italy

AIM: The aim of this study is to assess how masticatory muscle activity in healthy participants is influenced by anterior and posterior bite blocks and to identify distinct adaptation patterns through cluster analysis.
MATERIALS AND METHOD: Twenty-four healthy adult volunteers (M 6, F 18; mean age 27.3 ± 3.8 years) were enrolled in a crossover study designed to compare anterior and posterior bite blocks delivered via removable passive aligners. They underwent baseline electromyographic (EMG) assessment and completed psychosocial questionnaires. All participants wore removable passive aligners with anterior and posterior bite blocks for one week each, separated by a washout period without any aligners. EMG recordings were performed at specific time points—upon delivery of the bite blocks, at 24 hours, 48 hours, and 7 days—both with and without the bite blocks in situ. Response patterns were identified through variability and clustering analyses, and psychosocial differences were evaluated using t-tests.
RESULTS: Immediately after insertion, anterior bite blocks reduced the intensity of muscle activity; however, the magnitude of this response was significantly variable among the sample and across time points ($p = 0.030$ at T1 and $p = 0.047$ at T3). Hierarchical clustering identified two distinct adaptation patterns. The two identified clusters have statistically different scores in psychosocial questionnaires ($p = 0.040$). Posterior bite blocks led to modifications in muscle activity but showed no significant variability changes across time points ($p > 0.05$).
CONCLUSIONS: Anterior bite blocks reduce masticatory muscle activity with considerable inter-individual variability, revealing distinct adaptation patterns linked to psychosocial differences. Posterior bite blocks modify muscle activity more consistently. These results emphasize the role of individual variability in short-term neuromuscular responses to bite blocks.

Abstract citation ID: cjag070.380
SP438 EVALUATION OF TRANSVERSE CRANIOFACIAL WIDTHS AND DENTAL ARCH MORPHOLOGIES IN PEDIATRIC OBSTRUCTIVE SLEEP APNEA PATIENTS

Hande Gorucu-Coskuner, Irmak Ocak, Ezgi Atik, Bengisu Akarsu-Guven, Tulin Taner; Hacettepe University, Faculty of Dentistry, Department of Orthodontics, Ankara, Turkey

AIM: To compare the transverse craniofacial dimensions and dental arch morphologies of orthodontic patients diagnosed with pediatric obstructive sleep apnea (OSA) with those of patients without OSA risk.
MATERIALS AND METHOD: OSA group consisted of 35 patients aged 9 to 14 years who were diagnosed with pediatric OSA. An age- and sex-matched control group was established from the patients with a Pediatric Sleep Questionnaire (PSQ) score of "0". Anteroposterior (AP) cephalometric radiographs, dental casts, PSQ and polysomnography records were evaluated.

Cephalometric measurements, including interorbital width, bizygomatic width, nasal cavity width, maxillary skeletal width, maxillary molar width, mandibular molar width and antegonial width, were performed using ImageJ software (Version 1.54i). Dental cast measurements were conducted using the 3Shape OrthoAnalyzer software and included maxillary and mandibular intercanine and intermolar widths, maxillary palatal depth and palatal width at the molar level.

Statistical analyses were conducted using IBM SPSS version 27. Independent samples t-test or Mann–Whitney U test was used to compare the groups. Spearman correlation analyses were used to evaluate relationships between variables. Pearson's chi-square test was used for categorical variables.
RESULTS: AP radiographs of 70 patients (OSA group:20 females, 15 males; mean age=11.1±1.5 years; Control group:20 females, 15 males; mean age=11.1±1.5 years) and dental casts of 48 patients (OSA group:14 females, 12 males; mean age=10.6±1.2 years; Control group:11 females, 12 males; mean age=11.0±1.7 years) were analyzed. No statistically significant differences were found between groups regarding age or BMI. The OSA group demonstrated significantly lower maxillary skeletal width, intercanine width, palatal depth, and palatal depth/width ratios ($p<0.05$).

Correlation analyses revealed a positive, low-level relationship between AHI scores and age ($p=0.032$; $r=0.327$). Negative, low-level correlations were found between AHI scores and maxillary molar width ($p=0.039$; $r=-0.315$), maxillary intercanine width ($p=0.020$; $r=-0.402$) and mandibular intercanine width ($p=0.031$; $r=-0.375$).
CONCLUSIONS: Pediatric OSA patients exhibited significantly reduced maxillary skeletal width, intercanine width, palatal depth, and palatal depth/width ratios. Additionally, narrower maxillary and mandibular transverse dimensions were associated with increased OSA severity, supporting the potential role of craniofacial morphology in the pathophysiology of pediatric OSA.

Abstract citation ID: cjag070.381
SP439 EFFECT OF SURFACE SEALANT ON THE COLOR AND SURFACE DEVIATION OF ALIGNER ATTACHMENTS: A FORWARD-THINKING AND INNOVATIVE APPROACH

Ezgi Atik[1], Hilal Turkoglu Boynuyogun[1], Mustafa Ozcan[1], Ulku Tugba Kalyoncuoglu[2]; [1]Department of Orthodontics, Faculty of Dentistry, Hacettepe University, Ankara, Turkey, [2]Department of Prosthodontics, Gülhane Faculty of Dentistry, University of Health Science, Ankara, Turkey

AIM: To evaluate the effect of surface sealant on the color stability and surface deviation of aligner attachments after staining and simulated conditions.
MATERIALS AND METHOD: Four epoxy resin-printed models, each with 14 teeth, were created to simulate upper arches. All attachments were bonded with Filtek Z350 XT Universal composite. Models were divided into two groups (N=28 teeth each) based on surface treatment:Group 1, the control group with a non-sealed attachment surface; and Group 2, with a sealed attachment surface using PermaSeal coating agent. Initial staining of attachments was performed with coffee over 6 days, representing 6 months of consumption. After staining, aligners were inserted and removed 1680 times per model over 24 weeks. Color measurements were taken before and after staining using VITA Easyshade V, and ΔE_{00} and the Whiteness Index for Dentistry (WI_D) were calculated. In Group 2, attachment surface deviations were measured using 3D Geomagic software after both surface sealing (T1) and staining and insertion-removal simulations (T2). The data were analyzed with IBM SPSS 27.0. The significance level was set at $p<0.05$.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: Regarding the changes in CIE L*a*b* values after staining, ΔL showed a larger decrease in Group 1 (-33.37±7.56) compared to Group 2 (-22.42±7.7; p<0.001). Δa was significantly higher in Group 1 (10.33±4.82) compared to Group 2 (8.48±1.2; p=0.018). The ΔE_{00} measurement for Group 1 (30.03±7.63) was higher than that of Group 2 (20.35±5.34; p<0.001). The decrease in whiteness index (ΔWI_D) was greater in Group 1 (-57.15±16.28) than in Group 2 (-47.81±7.54; p=0.005).Regarding surface deviation analysis, applying sealant caused a slight increase on the attachment surface (0.016±0.011 mm). Following the aligner insertion–removal simulation, no significant reduction in surface deviation was observed on the coated attachments (T2–T0:0.015±0.014) compared with the initial post-coating measurement (T1–T0:0.016±0.011;p=0.569).
CONCLUSIONS: The color and whiteness changes of the non-sealed attachments were more pronounced than those of the sealed attachments with PermaSeal coating agent. The application of surface sealants to attachment surfaces may constitute a clinically relevant, innovative strategy to minimize discoloration during aligner therapy.

Abstract citation ID: cjag070.382
SP440 INFLUENCE OF ORTHODONTIC APPLIANCE MATERIAL ON SUPRAGINGIVAL PLAQUE MICROBIOME DIVERSITY AND TOOTH-GINGIVAL INTERFACE IN ORTHODONTIC TREATMENT

BOJAN GLAMOCANIN[1], MARTINA ZIGANTE[2], VJERA PERKOVIC[2], STJEPAN SPALJ[3]; *[1]University of Rijeka, Faculty of Medicine, Rijeka, Croatia, [2]University of Rijeka, Faculty of Dental Medicine, Rijeka, Croatia, [3]University of Rijeka, Faculty of Dental Medicine,Rijeka , Croatia and J. J. Strossmayer University of Osijek, Faculty of Dental Medicine and Health, Osijek, Croatia*

AIM: To analyze the influence of the material of fixed orthodontic appliances on changes in the diversity of bacterial species in supragingival plaque and to relate these findings to clinical conditions and quality of life. It was hypothesized that metal appliances would lead to greater changes due to oral corrosion compared to non-metal appliances.
MATERIAL AND METHODS: The study was a randomized controlled trial with two parallel groups. A total of 41 adolescents with malocclusions aged 13–18 years (median 15, 51% females), were analyzed. The metal-appliance group (metal fixed labial stainless-steel multibracket appliance and 0.014'' NiTi archwire) included 21 participants, while the non-metal group (ceramic brackets and 0.014'' polymer thread) included 20 participants. Oral hygiene, number of white spot lesions (WSL), gingival enlargement, and gingivitis were evaluated before and during the leveling phase of orthodontic treatment. Participants reported oral-health-related quality of life using the Oral Health Impact Profile specific for gingival and periodontal conditions. The supragingival dental plaque microbiome was assessed using metagenomic analysis, with detection of alpha and beta bacterial diversity.
RESULTS: In the non-metal appliance group, gingival volume increased significantly (p<0.001), but there were no significant changes in gingivitis, plaque accumulation, WSL, quality of life, or bacterial diversity. In the metal appliance group, gingival volume also increased significantly (p<0.001), and plaque accumulation increased (p=0.017). However, there were no significant changes in gingivitis, number of WSL, quality of life, or bacterial diversity. No significant between-group differences were found in changes in clinical parameters, quality of life, or alpha-diversity. Changes in variables did not correlate with one another. Non-metal appliances demonstrated a significantly more stable microbiota than metal appliances (p≤0.028).
CONCLUSION: Non-metal appliances appear to have less influence on the supragingival plaque microbiome than metal appliances, although these differences are not reflected in clinical parameters at the tooth–gingival interface.
Keywords: plaque, microbiome, fixed appliance, metal

ACKNOWLEDGMENT: Funded by the project "Environmental Factors and Microbiological Interactions in the Structure of the Dental Biofilm", Croatian Science Foundation (IP-2020-02-4027), Principal Investigator: Stjepan Spalj.

Abstract citation ID: cjag070.383
SP441 FORCED ORTHODONTIC EXTRUSION FOR PAPILLA AND RIDGE REGENERATION: SYSTEMATIC REVIEW AND CASE REPORT

Alice Angelopoulos[1], George Chrysochoou[2], Eleni Androuliadaki[2], Gerassimos Angelopoulos[2]; *[1]European University Cyprus, Nicosia, Cyprus, [2]National and Kapodistrian University of Athens, Athens, Greece*

BACKROUND: Orthodontic forced eruption (OFE) is a controlled vertical tooth movement that applies tensile forces to periodontal fibers, stimulating coronal migration of alveolar bone and gingival tissues. OFE is used to regenerate interdental papillae and augment ridge height before restorative or implant therapy. While biologically plausible, reported clinical outcome vary considerably.
AIM: To systematically review literature (2005-2025) on alveolar bone and papilla regeneration after OFE, and to illustrate clinical application with a low-force anterior extrusion case.
MATERIALS AND METHODS: A systematic search of PubMed, Scopus, and Science Direct was conducted using: ("orthodontic extrusion"OR "forced eruption" AND ("alveolar bone"OR "crestal bone"OR "bone remodeling"OR "bone migration"). Records identified (before deduplication): 374 after duplicate removal: 229. Titles/abstracts screened: 229; full-text articles assessed: 38; studies included: 15. Inclusion: human studies reporting hard-tissue outcomes; study types: case reports, case series, prospective studies, RCTs. Data extracted: sample size, extrusion protocol, follow-up, and bone/soft-tissue outcomes. Heterogeneity of study designs, extrusion protocols, and outcome measures precluded quantitative synthesis.
CLINICAL CASE: A 47-year-old woman with maxillary anterior papilla loss underwent OFE of teeth 11 and 21 using 0.022 ceramic brackets: 0.016″ super-cable Ni-Ti (~0.25 mm/week) followed by 0.017 × 0.025″ Ni-Ti for a total 4 mm extrusion with monthly activations and palatal root torque. Retention: fixed retainer 9 months; provisional crowns for stabilization. Outcomes assessed clinically and radiographically.
RESULTS: OFE consistently induced coronal migration of buccal alveolar bone and papilla, but magnitude varied by site, extrusion rate, retention, and periodontal phenotype. Prospective CBCT studies (Arsić et al., 2022) reported buccal bone gain 0.8–1.4 mm, mesial interdental septum ~1.35 mm, palatal changes inconsistent.In the clinical case, papilla fill reached ~80% of the pre-treatment deficit, achieving esthetic soft-tissue harmony.
CONCLUSION: Low-force OFE with stable retention can achieve meaningful papilla and ridge regeneration. Evidence demonstrates modest, variable gains, emphasizing careful case selection. Standardized prospective studies are needed to identify predictors of tissue response and inform evidence-based clinical guidelines.
Keywords: Orthodontic extrusion, Forced eruption, Papilla regeneration, Alveolar bone gain, Low-force mechanics

Abstract citation ID: cjag070.384
SP442 FACTORS INFLUENCING THE STABILITY OF ORTHODONTIC MINI-IMPLANTS: A COMPREHENSIVE SYSTEMATIC REVIEW

Kaiyisah Kamaludin, Nurul Aida Ngah, Maryati Md Dasor; *Universiti Teknologi MARA, Sungai Buloh, Malaysia*

AIM: Orthodontic mini-implants (OMIs) offer flexible anchorage options, but their success still varies widely because outcomes depend on the implant design, the quality of the surrounding bone, and the way the implant is placed. This review aimed to evaluate the factors that influence the stability of orthodontic mini-implants (OMIs), focusing on how implant design, bone characteristics, and surgical placement techniques contribute to primary and secondary stability.
MATERIALS AND METHOD: This systematic review examined 38 studies identified through Web of Science, Scopus, and PubMed, following PRISMA guidelines. The included clinical, animal, and in-vitro studies were grouped into three main areas: (1) implant design and surface modification, (2) host bone characteristics and anatomical factors, and (3) surgical techniques and methods used to assess stability. Findings from the selected studies were systematically examined to highlight recurring trends and determine the factors that consistently affected stability across various study designs.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULT: Across studies on implant design, wider diameters, adequate length, conical thread profiles, and surface treatments such as roughening or acid-etching consistently contributed to better primary and secondary stability. In terms of bone factors, a cortical thickness of at least 1.0 mm and denser sites, particularly in the mandible, were repeatedly associated with higher insertion torque and lower failure rates. Conversely, placement in low-density regions increased the likelihood of instability. Findings related to surgical technique showed that using controlled insertion torque and placing the implant at an appropriate angulation improved initial stability. Stability over time was effectively monitored with tools such as resonance frequency analysis and the Periotest®.
CONCLUSIONS: Overall, OMIs stability is strongest when implant dimensions and surface features are chosen with bone quality in mind and when placement follows torque-controlled protocols. However, more standardized outcome measures and well-designed clinical trials are still needed to establish clear, evidence-based guidelines for practice.

Abstract citation ID: cjag070.385
SP444 MINISCREW-ASSISTED RAPID PALATAL EXPANSION (MARPE) IN YOUNG ADULTS

Mette Hedegaard[1], Stratos Vassis[1], Thomas Klit Pedersen[2]; *[1]Department of Dentistry and Oral Health, Section of Orthodontics, Aarhus University, Aarhus, Denmark, [2]Department of Dentistry and Oral Health, Section of Orthodontics, Aarhus University. Department of Oral and Maxillofacial surgery, Aarhus University hospital,, Aarhus, Denmark*

AIM: This pilot study assessed skeletal and dental effects of miniscrew-assisted rapid palatal expansion (MARPE), focusing on variability in dental movements—including inclination, angulation, rotation, and displacement—and evaluated radiological side effects in patients treated at a postgraduate orthodontic clinic.
MATERIALS AND METHODS: Inclusion criteria: required usable pre-treatment (T0) and post-treatment (T1) intraoral scans and radiographs of the midpalatal suture. Exclusion criteria: dentofacial growth anomalies, cleft lip and palate, syndromic conditions, or systemic compromise. Digital dental models were analyzed by superimposing scans twice on the third palatal rugae and incisive papilla using OnyxCeph. Mean changes in inclination, angulation, rotation, buccolingual displacement, mesiodistal displacement, and vertical alterations were quantified and stratified by tooth group. Radiographs were examined for root resorption and calibrated to measure anterior midpalatal suture separation.
RESULTS: Six patients (age range 9.3–19.8 years; three male, three female) provided interpretable T0–T1 scans. Vestibular displacement varied markedly across the dentition. The overall mean vestibular shift was 0.66mm (SD 1.14 mm), with substantial dispersion. A posterior–anterior gradient was evident: posterior teeth showed greater vestibular displacement than anterior teeth. The extended posterior group (teeth 14–18 and 24–28) exhibited a mean shift of 1.09mm, whereas the anterior group (11, 12, 21, 22) showed minimal change(0.10 mm). Variability was also higher posteriorly (IQR 1.71 mm) than anteriorly (IQR 0.94 mm). First molars (16, 26) followed this pattern (mean 1.10mm). Four of six patients demonstrated asymmetric expansion at the first molars. Seven patients (age 9.3–19.8 years; three male, four female) had interpretable radiographs. Mean skeletal widening at the midpalatal suture was 4.51mm. Four patients displayed irregularities on one or both mesial root surfaces of the central incisors.
CONCLUSIONS: MARPE-associated dental movements show considerable variability, particularly posteriorly. A standardized clinical protocol is needed to better define appliance-related effects and to support clinicians in achieving predictable skeletal expansion while reducing potential side effects.

Abstract citation ID: cjag070.386
SP445 3D CHANGES IN THE PHARYNGEAL AIRWAY IN GROWING SKELETAL CLASS II PATIENTS FOLLOWING TREATMENT WITH FUNCTIONAL APPLIANCES: A RETROSPECTIVE CASE-CONTROL STUDY

Juen-Long Sunny Cheung, Marie A Cornelis, Paolo M Cattaneo; *University of Melbourne, Melbourne, Australia*

AIM: Only a limited number of Cone-Beam Computed Tomography (CBCT) studies have assessed the effects of functional appliances on upper airway morphology. No study has compared the effects of Twin Block (TB), Herbst appliances, and Class II elastics (CII-E). The objectives of this study were to assess and compare volumetric and 3D morphological changes in the pharyngeal airway (PA) in growing skeletal Class II patients after treatment with removable (TB) and fixed (Herbst) functional appliances or CII-E.
MATERIALS & METHODS: Pre- and post-treatment CBCT scans were collected from an existing dataset following completion of multibracket appliance treatment (ethics approval obtained). Three groups, each comprising 22 patients, treated with either CII-E, Herbst or TB appliances were matched for age, sex, ANB, and facial height. Total and partial PA volumes were calculated. PA morphology was assessed by measuring cross-sectional area (CSA) and hydraulic diameter (DH) along the PA centreline. Multiple dental and skeletal parameters were also measured three-dimensionally. Predicted mean changes and pairwise comparisons were computed via linear mixed-effects models. A Bonferroni correction was applied.
RESULTS: Following treatment, PA total and partial volumes increased ($p<0.001$ for all groups), whilst a reduction in PA constriction was seen (increased minimum CSA and DH; $p<0.005$). However, when changes across the three groups were compared, there were no statistically significant differences for all PA measurements. Dental and skeletal changes after treatment followed a similar significant incremental change to that observed for the PA in all three groups. When comparing the changes among the three groups, only four of them were statistically different: a greater increase in the Herbst group compared to CII-E and TB groups was seen for intermolar distance (1.85mm & 2.31mm, respectively; $p<0.0001$) and palatal width (1.52mm & 1.70mm, respectively; $p<0.0001$).
CONCLUSION: Similar changes were observed in the PA after treatment with CII-E or functional appliances (Herbst and TB), but it is unclear whether these were due to comparable treatment effects, normal growth, or a combination of both.

Abstract citation ID: cjag070.387
SP446 THE OCCURRENCE AND AMOUNT OF ROOT RESORPTION IN PATIENTS UNDERGOING FIXED APPLIANCE TREATMENT: A RE-AUDIT

Zahraa Ahmad[1], Zahraa Basha[2], Dirk Bister[1]; *[1]Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom, [2]King's College London, London, United Kingdom*

AIM: This re-audit aims to assess the incidence of root resorption in patients undergoing fixed appliance treatment and to determine whether patients are at greater risk of root resorption depending on several previously identified risk factors.
SUBJECTS AND METHOD: Retrospective analysis of 100 consecutive patients who underwent full fixed appliance orthodontic treatment. The inclusion criteria required the availability of pre-treatment and pre-debond panoramic radiographs (DPTs) for analysis. The standard was set at 5% of teeth to have severe root resorption of more than 4mm. Descriptive analysis was performed.

The relationship of the variables collected- including gender, age, ethnicity, medical history, treatment time, incisor relationship, extraction vs. non-extraction, use of rectangular wires, and use of inter-maxillary elastics- was tested using multiple linear regression to identify statistically significant predictors of the amount of root resorption.

Qualitative evaluation of the root shape of upper incisor teeth was performed using Malmgren index. Quantitative measurements were taken in millimetres using the digital ruler available in PACS software on the roots of the upper incisors, upper premolars and lower premolars. The difference between pre-treatment and pre-debond root length was regarded as the amount of root resorption.
RESULTS: To date, seventeen patients met the inclusion criteria. The average treatment time calculated for the cases studied was 36.5 months, ranging from 12.9 to 62.6 months.

The preliminary analysis of measuring 164 teeth (pre-treatment and pre-debond root lengths) showed an average reduction of 1.0mm for upper central incisors and 1.4mm for upper lateral incisors. Whilst the average reduction of upper first premolars roots was 0.4mm, upper second premolars 0.5mm, lower first premolars elongated by 0.1mm and lower second premolars reduced by 0.2mm. Severe root resorption (>4mm) was found in 3% of the teeth studied, indicating that the standard of this audit was met.
CONCLUSIONS: Upper and lower premolars exhibited less orthodontic-induced root resorption compared to upper incisors. Despite the relatively long average treatment time, the amount of root resorption detected in our cohort (average reduction < 1.0mm) is relatively mild. This finding is consistent with the results reported in the initial audit published in 2019.

Abstract citation ID: cjag070.388
SP447 ORTHODONTIC AND PERIODONTAL OUTCOMES OF PERIODONTALLY ACCELERATED OSTEOGENIC ORTHODONTICS (PAOO): A SYSTEMATIC REVIEW WITH A NETWORK META-ANALYSIS

Carmen Palma, Patricia Padilla, Eduardo Montero, Juan Carlos Palma, Conchita Martín; *UCM, Madrid, Spain*

AIM: Periodontally accelerated osteogenic orthodontics (PAOO) may expand the therapeutic possibilities of adult orthodontic treatment, overcoming biological limitations and potentially improving long-term stability of marginal periodontal tissues. The aim of this systematic review was to compare the effects of different

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

corticotomy-assisted procedures, with or without phenotype modification, in patients undergoing orthodontic treatment on periodontal and orthodontic outcomes.
MATERIALS AND METHODS: An electronic search was conducted in PubMed, Scopus, and Cochrane Central for randomized clinical trials (RCTs) and controlled clinical trials (CCTs) comparing PAOO with conventional orthodontics on the buccal bone thickness at 6 months. Data extraction and assessment of methodological quality and risk of bias were performed using RoB 2 and ROBINS-I tools. Network meta-analysis (NMA) for different grafting materials was carried out to evaluate direct and indirect comparisons for orthodontic outcomes (i.e., root resorption, occlusal changes, treatment duration) and periodontal outcomes (i.e., bone and gingival thickness changes). Global and local inconsistency were explored within the NMA.
RESULTS: Twelve studies (7 RCTs and 5 CCTs) were included in the NMA. Four studies evaluated bone thickness, eight treatment duration, and two root-resorption, comprising data from 116, 235 and 66 patients, respectively. Bone thickness gains ranged from 0.64 mm (CI 95%: 0.33 to 0.95) to 0.96 mm (CI 95%: 0.63 to 1.28). SUCRA probability rankings indicated superior outcomes for the use of xenografts. Total treatment time was reduced by 5.77 months (CI 95%: 1.33 to 10.20). No statistically significant differences were observed among interventions for root resorption. Data for other orthodontic or periodontal outcomes were insufficient or not consistently reported.
CONCLUSIONS: PAOO demonstrated significant thickening of the buccal bone plate at 6 months and a significant reduction in orthodontic treatment duration. Evidence regarding its impact on root resorption and long-term stability remains scarce.

This research was partially supported by a Clinical Grant from the Osteology Foundation (No- 23-037).

Abstract citation ID: cjag070.389
SP448 LONGITUDINAL 3D ANALYSIS OF CRANIOFACIAL GROWTH IN UNILATERAL CRANIOFACIAL MICROSOMIA TREATED WITH ORTHOPAEDIC FUNCTIONAL APPLIANCES

Akila Aiyar[1], Carlalberta Verna[2], Peter Stoustrup[1], Thomas Pedersen[1], Nikolaos Gkantidis[3]; [1]Section of Orthodontics, Department of Dentistry and Oral Health, Aarhus University, Aarhus, Denmark, [2]Department of Orthodontics and Pediatric Dentistry, University Centre for Dental Medicine, University of Basel, Basel, Switzerland, [3]Department of Orthodontics and Dentofacial Orthopaedics, University of Bern, Bern, Switzerland

INTRODUCTION: Unilateral craniofacial microsomia (UCM) is characterised by asymmetric craniofacial growth. The effect of orthopaedic functional appliance (OFA) therapy on differential growth between the affected and the unaffected side of the face remains unclear. Previous studies have relied mainly on 2D imaging or non-standardised outcome measures, limiting the reliability of the findings.

The present study used validated three-dimensional (3D) superimposition methods and consensus-based asymmetry variables, selected through a Delphi study, to assess whether OFA treatment promotes more symmetrical craniofacial growth pattern.
AIM: To evaluate whether craniofacial growth occurs symmetrically between the affected and unaffected sides in growing patients with UCM treated with OFA.
MATERIAL AND METHODS: We retrospectively included twenty growing patients with UCM (mean age at baseline (T0): 7.97 ± 2.27 years) treated with a standardised OFA protocol. Two CBCT scans per patient (mean interval: 5.02 ± 2.94 years) were registered using automated voxel-based superimposition on the anterior cranial base. Positional and rotational changes of the zygoma, condyle, and gonion regions were quantified using regional surface best-fit approximations and an ICP-based (Iterative Closest Point) workflow. Mandibular asymmetry was evaluated using five Delphi-recommended measures. Side differences and changes in asymmetry were analysed using repeated-measures MANCOVA, adjusting for age and severity.
RESULTS: Overall, skeletal growth was largely symmetrical between the affected and the unaffected side. No significant side differences were found in the positional or rotational changes of the zygoma, condyle, or gonion areas ($p > 0.05$). Furthermore, we observed no asymmetrical changes in the Pogonion area. A small inter-side difference was detected for x-axis gonial rotation (mean difference = −1.27°/year, $p = 0.043$), but this did not translate into broader asymmetry patterns. Mandibular asymmetry remained stable during the observation period according to all linear and axial Delphi-derived variables, except for an annual change in the mandibular sagittal angle (1.36°/year, $p = 0.021$), which was not considered clinically impactful.
CONCLUSIONS: During OFA therapy, growing UCM patients exhibited mainly symmetric craniofacial skeletal growth over an average period of five years, with no evidence of progressive asymmetry. These findings suggest that OFA treatment may help maintain balanced bilateral growth in mild-to-moderate UCM cases.

Abstract citation ID: cjag070.390
SP449 PRE-SURGICAL ORTHOPEDIC TREATMENT OF A CHILD WITH UNOPERATED COMPLETE BILATERAL CLEFT LIP AND PALATE BY LIOU-ALT RAMEC PROTOCOL

Julija Radojicic[1], Aleksandra Radojicic[2], Tatjana Cutovic[3]; [1]Faculty of medicine Univerzity of Nis, Nis, Serbia, [2]Faculty of medicine Univerzitet of Nis, Nis, Serbia, [3]Military academy, Belgrade, Serbia

AIM: Unoperated patients with bilateral complete cleft lip and palate (BCCLP), who do not receive orthopedic treatment in infancy and present with significant sagittal excess of the premaxilla, are among the most difficult patients to treat. Delay in primary reconstruction reduces the elastic characteristics of the tissues. The resulting rigidity of bony structures accompanied by the wide alveolar and palatal clefts associated with sagittal excess of the premaxilla pose a great challenge for both surgeon and orthodontist. There is no unique protocol for treatment of these conditions.
MATERIALS AND METHOD: This paper describes the use of orthopedic treatment in an unoperated three-year-old male child with BCCLP and a protrusive premaxilla whose appearance and function were both severely affected. A modified Meazzini -Lio-u technique, as described in operated BCCLP patients with a downward-displaced premaxilla, was used. The device itself consists of the two independent components mutually connected by a 17 x 25 steel arch. The first is an active fan-type expander. The second consists of an acrylic cap covering the premaxilla and three brackets used for the steel arch application. They are connected by a rectangular steel 17 x 25 archwire. Reduction of the premaxillary sagittal excess of a carried out with an elastic chain.
CONCLUSIONS: The use of this orthopedic appliance is areliable and valuable presurgical treatment in the therapy of children with BCCLP and protrusive premaxilla whose orthopedic and surgical treatment have been delayed.

Abstract citation ID: cjag070.391
SP450 EFFECT OF CLEAR ALIGNER ATTACHMENT DISCOLORATION ON TOOTH COLOR STABILITY

Hilal Kulahci Yildirim and Hande Gorucu Coskuner; Department of Orthodontics, Faculty of Dentistry, Hacettepe University, Ankara, Turkey

AIM: To evaluate the color stability of three composite resins used for clear aligner attachments and determine whether attachment discoloration influences the underlying tooth color.
MATERIALS AND METHOD: Eighty-one extracted human premolars were used, including both buccal and palatal surfaces. Attachments were prepared using Filtek Ultimate, Filtek Supreme Flowable, and Transbond XT. Each composite resin group, comprising 45 attachment-tooth units, was randomly allocated to coffee (n=14), black tea (n=15), and red wine (n=16) immersion groups. Control groups were created for each staining solution, and distilled water (n=6 per each). Specimens were subjected to 2500 thermal cycles (5°C/55°C) and immersed in staining solution at 37°C for 7 days. Spectrophotometric measurements of the attachments and tooth surfaces were taken at baseline and post-immersion by SpectroShade Micro (MHT, Verona, Italy), using attachment templates for standardization. Color changes were calculated using the CIEDE2000 (ΔE_{00}) formula. Statistical analysis included Spearman's rank correlation and stepwise linear regression.
RESULTS: Perceptible color changes were observed in both attachments (mean ΔE_{00}=15.59±7.76) and teeth (mean ΔE_{00}=9.84±4.52). While no statistically significant correlation was found between ΔE_{00} values of the attachments and tooth ($r=0.159$; $p=0.065$), significant negative correlations were detected for attachment ΔE_{00} values and specific chromatic coordinates of teeth, particularly Δa ($r=-0.379$; $p<0.001$) and Δb ($r=-0.263$; $p=0.002$). Regression analysis resulted in a strong predictive model for total tooth discoloration ($R^2=0.663$,$p<0.001$). The type of staining agent was the primary determinant, with red wine ($\beta=5.865$,$p<0.001$) and tea ($\beta=2.135$,$p<0.001$) causing the greatest tooth discoloration. Regarding material selection, the use of flowable composite resin was found to increase total tooth discoloration (ΔE_{00}; $\beta=1.215$,$p=0.001$) and contribute to greater darkening (ΔL; $\beta=-1.481$,$p=0.001$) compared to controls.
CONCLUSIONS: Although clear aligner attachments exhibit significant discoloration, attachment color change is not a reliable predictor of underlying tooth discoloration. Instead, the extent of tooth color alteration is primarily driven by the staining agent and the use of flowable composite resins, which significantly increase the risk of both discoloration and darkening. Clinically, material selection

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

and dietary habits are more critical factors for tooth color stability than the discoloration of the attachments.

Abstract citation ID: cjag070.392
SP451 QUALITY OF ONLINE INFORMATION RELATING TO CLEFT LIP AND PALATE: A SCOPING REVIEW

Emilija Jensen[1], Maurice Meade[1], Markus Siefert[1], Peter Anderson[2], Lisa Jamieson[1]; [1]Adelaide Dental School, Adelaide, Australia, [2]Cleft and Craniofacial SA Unit, Women's and Children's Hospital, Adelaide, Australia

AIM: Individuals with orofacial clefts face considerable ongoing medical, surgical, dental and orthodontic treatment burdens, with associated complex decision-making requirements. The global reach of the internet and the ubiquity of communication via social media platforms have meant that the seeking of health information through online sources is commonplace. The aim of this scoping review was to collate and evaluate the available evidence regarding the quality and readability of cleft information online.
MATERIALS AND METHODS: The Preferred Reporting Items for Systematic Review and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines were employed in the present review. Four electronic databases (PubMed, Embase, Web of Science, and Scopus) and one grey literature platform were searched using relevant keywords and index terms from inception to August 2025. Studies were included if they evaluated the quality or readability of cleft-related information available on websites and social media platforms.
RESULTS: A total of 34 studies, published between 2009 and 2025, satisfied the inclusion criteria. These studies applied both quality of information (QoI) tools, which assess accuracy, reliability, and comprehensiveness, and readability tools, which measure ease of understanding for lay audiences. The DISCERN instrument was most employed QoI tool and the most frequently utilized readability tool was the Flesch Reading Ease. The majority of studies reviewed general orofacial cleft information, while others focused on specialised areas: pre-surgical orthopaedics; speech, hearing and feeding; feeding plates; surgical management; alveolar bone grafting; and parenting in cleft lip and palate. Most studies reported that online cleft information was of variable quality, with many websites and videos lacking reliability, completeness, or readability appropriate for the lay public.
CONCLUSIONS: Online health information on orofacial clefts is widely available but often of suboptimal quality and readability. Families may therefore be exposed to inaccurate or difficult-to-understand resources which may preclude valid consent and lead to patient and family dissatisfaction. This underscores the need for clinicians and professional organisations to provide accessible, high-quality information across online platforms.

Abstract citation ID: cjag070.393
SP452 THREE-DIMENSIONAL EVALUATION OF CORTICAL BONE THICKNESS IN THE INFRA-ZYGOMATIC CREST OF INDIVIDUALS WITH UNILATERAL AND BILATERAL POSTERIOR CROSSBITE- A PILOT STUDY

Eren Kaya, Hanife Nuray Yilmaz, Gulden Karabiber; *Marmara University, Istanbul, Turkey*

AIM: This retrospective study aimed to compare bone thickness in the infrazygomatic crest region among individuals with different crossbite types using cone-beam computed tomography (CBCT).
MATERIALS AND METHODS: This study consisted of 24 adult individuals, categorized into three groups: unilateral posterior crossbite (UPC) (mean age: 18.11±1.45 years), bilateral posterior crossbite (BPC) (mean age:18.24±1.76 years, and control group without posterior crossbite (CG) (mean age:18.68±2.89 years). The bone thickness of infrazygomatic crest was measured in each group on CBCT images using the ITK-SNAP software. The measurements were performed at two angulations (65° and 70°) at the following anatomical sites: buccal to the mesiobuccal root of upper first molar (U6), buccal to the distobuccal root of U6 and the interradicular region between upper first and second molars. Intra-group comparisons for right and left infrazygomatic regions of the participants were conducted using independent samples t-tests, and Mann-Whitney U tests whereas One-Way ANOVA and Kruskal-Wallis tests were used for inter-group comparisons. The significance level was set at $p < 0.05$.
RESULTS: Intra-group comparisons showed no statistically significant difference in any of parameters regarding the bone thickness of infrazygomatic crest. Likewise, mean thickness values did not differ significantly among the groups. Furthermore, comparisons between non-constricted side of the UPC group versus the BPC group, and constricted side of the UPC group versus the CG group, showed no significant difference ($p<0.05$). When all samples regardless of being unilateral or bilateral crossbite were divided into two groups as constricted and constricted sides, no statistically significant difference was found. On the other hand, the cortical bone thickness of infrazygomatic crest was found thicker with the angulation of 70° in mesiobuccal root of U6 (MB70°) for each group. Additionally, non-constricted sides (3.2±0.57 mm for MB70°) were found quantitively thicker than constricted sides 2.92±0.44 mm for MB70°).
CONCLUSIONS: This study revealed that thickness of infrazygomatic crest was not affected from presence of crossbite. Measured values were below 4 mm which is considered the minimum threshold for stable miniscrew anchorage. A comprehensive study should be conducted with a larger samples grouped by considering vertical and sagittal values.

Abstract citation ID: cjag070.394
SP453 BIBLIOMETRIC MAPPING OF RESEARCH ON LARGE LANGUAGE MODELS IN ORTHODONTICS

Hibatullah Kanah[1], Miltiadis A. Makrygiannakis[1], Eleftherios G. Kaklamanos[2]; [1]*School of Dentistry, European University Cyprus, Nicosia, Cyprus,* [2]*School of Dentistry, Aristotle University of Thessaloniki, Thessaloniki, Greece*

AIM: To map the bibliometric landscape of research on large language models (LLMs) in orthodontics and identify leading contributors, research hotspots, and methodological limitations.
MATERIALS AND METHOD: A comprehensive search of PubMed, Scopus, and the Web of Science™ Core Collection was conducted to identify studies evaluating or using LLMs in an orthodontic context. After screening and eligibility assessment, data were extracted on bibliographic details, focus, LLM characteristics, and key methodological features. Descriptive scientometric analyses were performed.
RESULTS: Twenty-six studies published between 2023 and 2025 were included, showing a significant increase in output over time. Turkey was the most common country of the corresponding author, followed by Italy and Brazil, then China, Pakistan, and Saudi Arabia. Almost all studies evaluated ChatGPT-based systems, often alongside other LLMs such as Gemini, Copilot, Claude, or Ernie Bot. Over half of the articles had a mixed domain focus, while the remaining primarily addressed patient communication and education, research assistance, and treatment planning. Most investigations used small convenience samples of prompts, vignettes, or cases and primarily relied on Likert ratings, percentage accuracy, or agreement. Effect sizes were reported in only five studies.
CONCLUSIONS: Research on LLMs in orthodontics is growing rapidly and is mainly focused on evaluating ChatGPT for patient-facing information and general orthodontic advice. However, important methodological limitations, such as small sample sizes, diverse outcomes, and incomplete statistical reporting, limit the strength and generalizability of the available evidence. This overview provides an evidence-based map of the field and emphasizes the need for larger, better-reported, and clinically relevant studies to support the responsible integration of LLM technologies in orthodontic practice and research.

Abstract citation ID: cjag070.395
SP455 ASSESSMENT OF APICAL ROOT RESORPTION OF MAXILLARY CENTRAL INCISOR DURING ORTHODONTIC TREATMENT AND 10-YEAR POST-TREATMENT

Jaehyun Yim[1], Yoon Jeong Choi[2], Ji-Hyun Lee[1], Chooryung Chung[1], Kyung-Ho Kim[1]; [1]*Department of Orthodontics, Gangnam Severance Dental Hospital, Yonsei University, Seoul, Republic of Korea,* [2]*Department of Orthodontics, College of Dentistry, Yonsi University, Seoul, Republic of Korea*

AIM: This study evaluated apical root resorption of the maxillary central incisors during orthodontic treatment and 10-year retention, and to identify clinical and biomechanical factors associated with long-term prognosis. By analyzing root length changes at three time points using periapical radiographs, this study aimed to determine whether resorption occurring during treatment predicts additional resorption during retention.
MATERIALS AND METHOD: Ninety-seven patients who completed comprehensive orthodontic treatment with available periapical radiographs at pre-treatment (T0), post-treatment (T1), and 10-year retention (T2), and lateral cephalograms at T0–T1, were retrospectively analyzed. Root length was measured from CEJ to apex, and root resorption was quantified as changes between time points. Root apex displacement during treatment was indirectly estimated from superimposed cephalograms using axial inclination and trigonometric reconstruction. Clinical variables, including age, sex, trauma/endodontic history, root shape, surgical treatment, treatment duration, initial root length, and horizontal/vertical/total root displacement, were examined using non-parametric tests, correlation analysis, and multiple linear regression to identify independent predictors of resorption.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: Root resorption occurred during treatment (0.98 mm) and an additional resorption occurred during retention (0.42 mm). Initial root length, treatment duration, and vertical or total apex displacement were associated with both treatment-period and retention-period resorption in univariate analyses. However, multivariate regression identified initial root length as the only independent predictor for both phases. No significant associations were found for sex, age, trauma/endodontic history, or surgery. Resorption during treatment did not correlate with further resorption during retention, indicating independent processes. All affected teeth remained clinically stable throughout the 10-year period.
CONCLUSION: Maxillary central incisors exhibited mild additional root resorption during long-term retention, remaining within physiological limits. Initial root length was the only variable consistently associated to both treatment- and retention-period resorption, while demographic and clinical factors showed minimal influence. Root resorption during treatment did not predict long-term progression, suggesting favorable prognosis when monitored appropriately. Patients with long roots may benefit from closer radiographic follow-up throughout and after orthodontic treatment.

Abstract citation ID: cjag070.396
SP457 ‡‡‡ MECHANICAL BEHAVIOUR OF ORTHODONTIC MINI-IMPLANTS IN THE PORCINE HARD PALATE: AN EXPERIMENTAL AND FINITE ELEMENT INVESTIGATION

Maria Francesca Falconi[1], Alfredo Altieri[2], Cosimo Manieri[1], Silvia Cerroni[1], Roberta Condò[3]; [1]*Post-graduate student Orthodontic Program, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy,* [2]*Department of Health, Life and Environmental Science, University of L'Aquila, L'Aquila, Italy,* [3]*Assistant Professor, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy*

AIM: This study investigates how orthodontic mini-implants react mechanically when subjected to pull-out, push-in, and shear loading.
MATERIALS AND METHODS: The researchers developed a dedicated experimental set-up using a universal testing machine to characterise the mechanical behaviour of orthodontic mini-implants (OMI) inserted in the hard palate of pigs. Seven different screw types were analysed, and each was tested under pull-out, push-in, and shear forces. Every test condition was repeated three times and combined with three different insertion torques, for a total of 189 tests, in order to account for experimental uncertainty. From the resulting load–displacement curves, the secant stiffness and ultimate load-carrying capacity of the screws were determined for all three loading conditions. These experimental results were then used to construct a 3D finite element model aimed at evaluating the mechanical performance of the OMIs.
RESULTS: Insertion torque had a strong effect on both outcome variables in push-in tests. In contrast, screw length played a greater role in determining ultimate capacity in pull-out tests. Screw diameter influenced all types of tests, with a particularly marked effect on secant stiffness under shear loading.
CONCLUSIONS: Pull-out tests showed an almost linear response up to failure, whereas push-in tests exhibited increasing stiffness with growing deformation. Higher insertion torque led to greater ultimate capacity, with only a modest influence on stiffness. This work sheds light on the mechanical behaviour of orthodontic mini-implants and offers practical indications for clinicians and researchers. Understanding how insertion torque and implant geometry affect stability and performance under different loading conditions can guide the choice and design of mini-implants, with potential benefits for treatment quality and patient outcomes.

Abstract citation ID: cjag070.397
SP459 PREDICTORS OF MANDIBULAR INCISOR ALIGNMENT STABILITY DURING A TWO-YEAR RETENTION PERIOD

SILVIJA KANIZAJ UGRIN[1], VASKA VANDEVSKA RADUNOVIC[2], BOJAN GLAMOCANIN[3], STJEPAN SPALJ[4]; [1]*University of Zagreb, School of Dental Medicine, Zagreb, Croatia,* [2]*University of Oslo, Faculty of Dental Medicine, Oslo, Norway,* [3]*University of Rijeka, Faculty of Medicine, Rijeka, Croatia,* [4]*J. J. Strossmayer University of Osijek, Faculty of Dental Medicine and Health, Osijek, Croatia*

AIM: The study investigated pre-treatment, treatment-related, and retention-phase factors associated with the stability of mandibular incisor alignment during a two-year retention period.
MATERIALS AND METHODS: The study was designed as a three-arm parallel randomized controlled trial. A total of 93 subjects were analyzed. At the start of retention, participants were 12–21 years old, and 66% were female. Subjects were randomly allocated to one of three mandibular retainer groups: a removable vacuum-formed retainer (VFR), a bonded round-wire fixed retainer, or a bonded rectangular-wire fixed retainer. The presence of wisdom teeth, changes in mandibular arch form, incisor irregularity, and retainer failure were recorded.
RESULTS: Multiple logistic regression identified the strongest predictor of incisor irregularity during retention as a treatment-induced increase in intercanine width of ≥3 mm (odds ratio (OR) = 71.2; p = 0.008). Additional significant predictors were initiating retention at ≤15 years of age (OR = 16.6; p = 0.003), retainer type (not using a rectangular-wire retainer: OR = 10.1; p = 0.032; use of a VFR: OR = 8.0; p = 0.016), and male sex (OR = 5.1; p = 0.047). The model also accounted for retainer failure, the presence of wisdom teeth, the magnitude of treatment correction of incisor irregularity, changes in mandibular arch length, and reduction in intercanine width during retention—none of which had a significant effect.
CONCLUSION: Stability of mandibular incisor alignment during retention appears to be enhanced by avoiding excessive intercanine expansion during treatment, completing treatment after the reduction of sagittal growth, and using a bonded rectangular-wire retainer.
Keywords: orthodontic treatment, retention, relapse

Abstract citation ID: cjag070.398
SP460 DEVELOPING NURSE-LED RETAINER REVIEW CLINICS: A SUSTAINABLE QUALITY IMPROVEMENT PROJECT

Christina Tsirigoni[1], Mohammed Shaath[2], Catherine Tothill[1], Elinor Chalmers[1]; [1]*Dundee Dental School and Hospital, Dundee, United Kingdom,* [2]*Dental Hospital University of Manchester, Manchester, United Kingdom*

AIM: This quality improvement project aimed to evaluate the environmental impact of introducing telephone retainer review clinics in an Orthodontic Department,and specifically assessing reductions in carbon footprint (CF) associated with reduced patient travel and clinical resource use. The objective was to determine whether nurse-led telephone clinics provide a sustainable alternative to traditional face-to-face reviews across two Dental Centres.
MATERIALS AND METHODS: A two-cycle quality improvement study was undertaken. In Cycle 1, a nurse-led telephone retainer review clinic was implemented in Broxden Dental Centre. For each patient, the distance between their home address and the orthodontic clinic was calculated using an online route-map. The total mileage saved was recorded, and CF reductions were estimated using standard carbon conversion factors for petrol cars, diesel cars, and train travel. Additionally, reductions in CF linked to surgery use were calculated. Following the first cycle, a similar nurse-led telephone clinic was introduced in Dundee Dental Hospital, and data were collected retrospectively for the second cycle. Outcomes included total miles saved and CF reductions expressed in $kgCO_2e$.
RESULTS: Across 40 patients in Cycle 1, telephone clinics saved a total of 756.4 miles. Estimated CF reductions were 180.78 $kgCO_2e$ (petrol car), 204.23 $kgCO_2e$ (diesel car), and 54.08 $kgCO_2e$ (train travel), with an additional 220 $kgCO_2e$ saved from reduced surgery resource use. In Cycle 2, involving 50 patients at both Dental Centres, reduction was also observed. The total miles saved were 2,040.2 and estimated CF reductions were 487.62 $kgCO_2e$ (petrol car), 550.85 $kgCO_2e$ (diesel car), 145.88 $kgCO_2e$ (train travel), and 275 $kgCO_2e$ attributed to reduced surgery use.
CONCLUSIONS: Nurse-led telephone retainer review clinics substantially reduced carbon emissions through decreased patient travel and reduced clinical resource use. Implementation across two centres demonstrated consistent and meaningful environmental benefits, supporting telephone clinics as a sustainable model of orthodontic follow-up care. Further work may explore long-term patient outcomes, clinic efficiency, and integration of virtual reviews into broader departmental sustainability strategies.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.399
SP461 COMPARISON OF CEPHALOMETRIC TREATMENT EFFECTS OF CARRIERE MOTION, HEADGEAR AND CLASS II ELASTICS IN CLASS II MALOCCLUSION: A RETROSPECTIVE STUDY

BUSRA NUR ARSLAN and HAKKI YILMAZ; *Hatay Mustafa Kemal University Faculty Of Dentistry, Hatay, Turkey*

AİM: The aim of this study is to compare the cephalometric changes caused by three different treatment methods the Carriere Motion appliance, Cervical headgear, and Class II elastics in patients with Class II malocclusion and to evaluate the skeletal and dentoalveolar effects between the pre-treatment (T0) and post-treatment (T1) stages.
MATERIALS AND METHODS: The study sample consisted of 75 Class II malocclusion patients treated with one of three treatment methods: Carriere Motion (Group 1), Cervical headgear (Group 2) and Class II elastics (Group 3). Lateral cephalometric

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

radiographs taken at T0 and T1 were analyzed using standard cephalometric software. Statistical evaluation was performed using one-way ANOVA and Kruskal-Wallis tests to compare skeletal and dental measurements between groups.
RESULTS: In the Carriere Motion and Headgear groups, a significantly greater reduction in SNA was observed compared to Class II elastics group (p = 0.006). The Class II elastics group showed a significantly greater reduction in Pg–Nperp,mm compared to the other groups (p<0.001). The ANB value showed the least improvement in the Class II elastics group compared to other groups (p=0.004). Vertical parameters (FMA, p=0.007; PP/MP, p=0.006) showed a more pronounced increase in the Class II elastics group. The headgear group showed a significantly greater increase in the Mx6–PP,mm value (p=0.001). The decrease in overjet was significantly less in the Class II elastics group compared to the headgear group (p=0.007). Significant differences were also found between the headgear and Class II elastics groups in the Mx1–PTV,mm and Mx6–PTV,mm measurements (p = 0.016 and p = 0.012, respectively). A significant decrease in the Md1–PTV,mm value was observed in the Class II elastics group (p<0,001).
CONCLUSION: Three treatment methods have shown different dental and skeletal effects in correcting Class II malocclusion. Carriere Motion and headgear more effectively improved maxillary sagittal position. Class II elastics were associated with mandibular positional changes and increased vertical dimensions. Headgear resulted in more pronounced vertical and sagittal changes in maxillary molars. These findings highlight the importance of selecting the treatment approach according to individual sagittal and vertical characteristics.

Abstract citation ID: cjag070.400
SP465 A COMPARATIVE EVALUATION OF THE DIAGNOSTIC ACCURACY OF DIGITAL AND MANUAL CEPHALOMETRIC ANALYSIS IN IDENTIFYING SKELETAL MALOCCLUSIONS

Eda GÜRBÜZ DİNÇ[1], Ferit DİNÇ[1], Eladius Laswai DANIEL[2], Matilda Mtaya MLANGWA[2], M. Okan AKÇAM[3]; [1]*Ankara University, Faculty of Dentistry, Department of Orthodontics, Ankara, Turkey,* [2]*MUHAS, Muhimbili University of Health and Allied Sciences, Dar es Salaam, United Republic of Tanzania,* [3]*Ankara University, Faculty of Dentistry, Department of Orthodontics, Ankara, United Republic of Tanzania*

OBJECTIVE: The aim of this study is to assess the consistency of various cephalometric analysis methods used in the diagnosis of skeletal malocclusions and to identify the most appropriate method for clinical application.
SUBJECTS AND METHODS: The cephalometric records of 66 randomly selected patients who presented to the Department of Orthodontics at the Ankara University Faculty of Dentistry were classified into three groups—Angle Class I, Class II, and Class III—based on their skeletal malocclusion, with 22 patients allocated to each group.

For each radiograph, cephalometric analysis was performed using two digital software programs (Dolphin Ceph Tracing, Chatsworth, USA, and WebCeph, Seongnam, Republic of Korea) as well as a manual method. Eighteen cephalometric landmarks were identified on each pretreatment cephalogram, which had been randomly selected from the departmental archives by a single investigator. Nine angular and nine linear skeletal and dental measurements were subsequently calculated.

Statistical analyses were conducted using IBM SPSS version 22.0. Two-way ANOVA was employed to evaluate the effects of malocclusion class and measurement method on each cephalometric variable, followed by Tukey's HSD post-hoc test for pairwise comparisons (p < 0.05).
RESULTS: SNA and SNB measurements did not exhibit significant differences between analysis methods (p>0.05), whereas ANB showed significant variation across both methods and malocclusion classes (p<0.05).

In contrast, both angular and linear measurements of U1-NA and L1-NB demonstrated significant differences dependent on both the measurement method and malocclusion class. Linear parameters, including Co-A, Co-Gn, ANS-Me, NaPerp-A, and NaPerp-Pg, also exhibited significant variation across methods and skeletal classes, with manual tracing consistently producing lower values. Overall, method-related variability was more pronounced in linear measurements.
CONCLUSION: Although all three cephalometric analysis methods are widely used today, factors such as examiners attention, the performance of AI-based algorithms, and the quality of radiographic images may influence measurement outcomes. Therefore, repeating measurements regardless of the chosen method represents a safer and more reliable approach. Furthermore, compared with angular measurements, linear measurements require additional caution due to their greater sensitivity to methodological variation.

Abstract citation ID: cjag070.401
SP466 BIOLOGICAL PROPERTIES OF DIRECTLY PRINTED CLEAR ALIGNER MATERIALS: A SCOPING REVIEW

Thomas Manoukakis[1], Miltiadis A. Makrygiannakis[1], Eleftherios G. Kaklamanos[2]; [1]*School of Dentistry, European University Cyprus, Nicosia, Cyprus,* [2]*School of Dentistry, Aristotle University of Thessaloniki, Thessaloniki, Greece*

AIM: Clear aligner therapy has become an established treatment modality worldwide. The newest development is the direct 3D printing of aligners, offering an attractive alternative to conventional thermoforming, promising precision and enabling more patient-specific customization. Still, the biological behaviour of 3D-printed resins remains incompletely understood. This scoping review aims to systematically map and critically evaluate the existing evidence on the biological properties of materials used for directly printed aligners, focusing on cytotoxicity, biochemical properties, and microbiological aspects.
MATERIALS AND METHOD: The review followed PRISMA-ScR guidelines. A systematic search of PubMed, the Cochrane Central Register of Controlled Trials, the Cochrane Database of Systematic Reviews, Scopus, and the Web of Science™ Core Collection (from inception to May 2025) was conducted to identify studies evaluating the biological properties of resins used for direct aligner printing. Eligible studies assessed outcomes including cytotoxicity, biofilm formation, and the release of chemical compounds. Data were extracted on the study design, the materials investigated, the biological endpoints, the main findings, and key methodological limitations.
RESULTS: The search retrieved 2,220 records, of which seven met the inclusion criteria. All studies were conducted in vitro and investigated fibroblast cytotoxicity, microbial colonization, or monomer release from printed specimens. Reported findings varied, and significant heterogeneity was observed across resin formulations, aligner properties, printing and post-curing protocols, aging conditions, and biological assays, hindering direct comparisons and limiting robust clinical conclusions.
CONCLUSIONS: Current evidence regarding the biological properties of directly printed clear aligner materials is limited and varies in methodology. Future research should utilize standardised testing protocols, clinically relevant experimental conditions, and thorough analyses of resin-derived substances to more clearly define the biocompatibility profile of these materials.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.402
SP468 CRANIOFACIAL INTEGRATION AND MODULARITY IN UNTREATED BILATERAL CLEFT LIP AND PALATE

Marek Skotarski[1], Hans L.L. Wellens[2], Sariesendy Sumardi[3], Anne Marie Kuijpers-Jagtman[4], Piotr Fudalej[1]; [1]*Department of Orthodontics, Jagiellonian University in Kraków, Kraków, Poland,* [2]*Private Practice, Brugge, Belgium,* [3]*Department of Orthodontics, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia,* [4]*Department of Orthodontics, University Medical Center Groningen, University of Groningen,, Groningen, Netherlands*

AIM: To quantify craniofacial variation, integration, and modularity in untreated adults with bilateral CLP as well as in unaffected controls.
MATERIAL AND METHODS: Fourteen cephalometric landmarks depicting the skull base, maxilla, and mandible were identified on lateral cephalograms of 89 adult Proto-Malayid individuals. The sample included 39 individuals with unoperated clefts - 25 with complete bilateral cleft lip and alveolus (BCLA, mean age 24years) and 14 with complete bilateral cleft lip, alveolus, and palate (BCLAP, mean age 20.6 years) - and 50 unaffected controls (NORM, mean age 21.2 years). Geometric morphometrics were used to analyze craniofacial shape variability, integration, and modularity. Principal component analysis (PCA) was used to assess shape variability, while canonical variates analysis (CVA) was used to evaluate group differences by calculating Mahalanobis and Procrustes distances. Integration and modularity were tested for five scenarios: (1) skull base vs. maxilla vs. mandible, (2) skull base with maxilla vs. mandible, (3) skull base with mandible vs. maxilla, (4) skull base vs. maxilla with mandible, and (5) anterior vs. posterior modules. The RV coefficient and covariance ratio were used to assess covariation strength.
RESULTS: The first 6 principal components (PC1-PC6) explained 67.3% of the total shape variability, with vertical shape variation and sagittal relationships being the primary sources of variability. Craniofacial shape differed significantly across the groups, with the greatest Mahalanobis and Procrustes distances observed between the NORM and BCLA or BCLAP groups (p < 0.05), and the smallest distances

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

observed between BCLA and BCLAP. Unlike previously reported patterns of modularity and integration in untreated unilateral CLP, individuals with BCLA, BCLAP, and controls demonstrated similar, clearly defined modules involving the skull base, maxilla, and mandible, or a combined skull base–mandible module and a maxillary module.
CONCLUSIONS: Unoperated unilateral BCLA and BCLAP does not affect craniofacial integration and modularity.

Abstract citation ID: cjag070.403
SP469 SATISFACTION WITH DENTAL APPEARANCE IN PERMANENT DENTITION. A SYSTEMATIC REVIEW

Elina Koivuperä[1], Mervi Gürsoy[2], Anna-Liisa Svedström-Oristo[1]; [1]*Department of Paediatric Dentistry and Orthodontics, Institute of Dentistry, University of Turku, Turku, Finland,* [2]*Department of Periodontology, Institute of Dentistry, University of Turku, Turku, Finland*

AIM: To evaluate, which occlusal features affect adolescents' and young adults' satisfaction with their own dental appearance in permanent dentition.
MATERIALS AND METHOD: Articles were search from November 2024 to July 2025 from four databases (PubMed, Scopus, PsycInfo and Web of Science) and screened according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. The risk of bias was assessed using the Joanna Briggs Institute's (JBI's) Critical Appraisal Tool for Cross-sectional Studies. Inclusion criteria were original studies 1) written in English, 2) reporting occlusal and/or dental features that affected respondents' satisfaction with their own dental appearance, and 3) aged 12–29 years. Studies including children, elderly, peers' or guardians' opinion, syndromes or congenital anomalies, periodontitis, missing teeth, dental traumas, treatment interventions or prosthetic structures were excluded.
RESULTS: Of the retrieved 524 articles, four studies met the inclusion criteria. The total number of respondents was 1747 (range 12–82 years), of which 1594 (91.2 %) were 12–29 years old. According to the Index of Orthodontic Treatment Need (IOTN), one in three respondents had IOTN grade 3–5 malocclusion. The most often reported reasons for dissatisfaction were misalignment (33.8%), dental crowding (27.5%), diastema (15.3%) and dental protrusion (6.4%). Dissatisfaction with facial appearance was associated with Class III malocclusion and decreased overjet (OR=5.60, CI:1.85–6.91).
CONCLUSIONS: Misalignment, dental crowding, diastema and dental protrusion had the most profound effect on dissatisfaction with dental appearance among adolescents and young adults.
REGISTRATION: The protocol of this review was registered at PROSPERO under the number CRD420251005973.

Abstract citation ID: cjag070.404
SP470 MECHANICAL PROPERTIES OF DIRECT-PRINTED ALIGNER MATERIALS: A SCOPING REVIEW

Thomas Manoukakis[1], Miltiadis A. Makrygiannakis[1], Eleftherios G. Kaklamanos[2]; [1]*School of Dentistry, European University Cyprus, Nicosia, Cyprus,* [2]*School of Dentistry, Aristotle University of Thessaloniki, Thessaloniki, Greece*

AIM: Direct 3D printing of clear aligners has become an appealing alternative to traditional thermoforming, offering potentially better control of material thickness and more options for custom appliance design. This scoping review aimed to summarize current evidence and highlight gaps in knowledge regarding the mechanical behaviour of materials used for directly printed clear aligners, focusing on important properties, methodological limitations, and future research priorities.
MATERIALS AND METHOD: Following PRISMA-ScR guidelines, a comprehensive search of PubMed, the Cochrane Central Register of Controlled Trials, the Cochrane Database of Systematic Reviews, Scopus, and the Web of Science™ Core Collection (up to May 2025) was conducted. Studies evaluating the mechanical properties of materials used for directly printed aligners were eligible. Extracted outcomes included tensile and flexural strength, hardness, elastic modulus, stress relaxation, shape recovery, and wear behavior. Data were extracted for study design, material, testing protocols, main findings, and reported limitations.
RESULTS: The search identified 2,220 records, of which twenty-two met the inclusion criteria. All studies were laboratory-based. Reported mechanical properties varied, mainly due to significant variability observed in resin formulations, printing technologies, and resolution, specimen geometry, post-curing processes, and aging protocols, which limited direct comparisons and generalization.
CONCLUSIONS: Available evidence on the mechanical performance of directly printed clear aligner materials remains limited and highly variable. Standardized, clinically relevant mechanical testing protocols are necessary, including realistic intraoral loading and aging conditions. Future research should systematically examine how printing parameters and post-processing procedures affect both short- and long-term mechanical behaviour to improve material choice and enhance direct-print aligner therapy.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.405
SP471 A CONE BEAM COMPUTED TOMOGRAPHY EVALUATION OF MAXILLA FOLLOWING MAXILLARY EXPANSION

Elif Dilara Konukçu and Hatice Gökalp; *Ankara University Faculty of Dentistry Department of Orthodontics, Ankara, Turkey*

AIM: This study was performed to determine the effects of treatment with a Double Hinged Expander (DHE) employing the Alternate Rapid Maxillary Expansions and Constrictions (Alt-RAMEC) protocol in Class III malocclusion associated with maxillary retrognathia using cone beam computed tomography (CBCT).
MATERIALS AND METHOD: Thirteen individuals (5 females, 8 males; 12.97 years) that underwent maxillary expansion therapy with DHE by Alt-RAMEC were included. Each patient had CBCT images available before (T1), after (T2) maxillary expansion therapy. Coronal multiplanar reconstruction images were used to measure the linear transverse dimensions, inclinations of teeth, and thickness of the buccal alveolar bone. Statistical analysis was carried out using the IBM SPSS Statistics Version 22 software package. Mann–Whitney U test was used for maxillary right and left side measurements and Wilcoxon signed-rank test was used to compare the changes between the two times of imaging. The level of significance was established at $p<0.05$.
RESULTS: Treatment with the DHE using the Alt-RAMEC protocol was effective on the maxilla and the circummaxillary sutures. The expansion effect was greater in the sutures directly adjacent to the maxilla. The dental and dentoalveolar effects were greater than the skeletal effects. Maxillary expansion was greater at the first premolar level than at the first molar level. Compared with the upper segmental regions of the maxillary complex, the expansion was more pronounced in the lower part of the maxilla and was predominantly dentoalveolar.
CONCLUSIONS: Alt-RAMEC combined with DHE resulted greater expansion in the anterior region of the maxilla than posterior region. Therfore the Alt-RAMEC combined with DHE is an appropriate treatment modality for anterior maxillary transverse deficiency.

Abstract citation ID: cjag070.406
SP472 IDENTITY-INDUCED VARIATIONS IN ORTHODONTIC RESPONSES OF AN LLM-BASED CHATBOT

Kübra Arslan Çarpar[1], Yunus Çarpar[2], Melis Terler[1], Sevde Nihal Yongacı[1], Aslıgül Çeliker[1]; [1]*Mersin University Faculty of Dentistry, MERSİN, Turkey,* [2]*Private Practice, MERSİN, Turkey*

AIM: The aim of this study was to examine whether the responses of an LLM-based chatbot to orthodontic questions differ in terms of accuracy, hallucination, explanation quality, scientific consistency, terminology use, and linguistic characteristics when the model is prompted with different user identities.
METHODS: A total of 40 orthodontic True/False questions were presented to ChatGPT-5.*1*, an LLM-based conversational agent, under nine different user identity assignments. For each them, the model was instructed to provide a brief explanation of 1–2 sentences in addition to selecting True or False. Responses were evaluated for accuracy and hallucination, while explanation quality, scientific consistency, and terminology appropriateness were scored using 0–2 scale. Statistical analyses included Cochran's Q test, the Friedman test, and Wilcoxon signed-rank tests. Statistical significance was set at $p < .05$. Linguistic characteristics were examined using LIWC-22 outputs, Flesch–Kincaid (Freshman) readability levels, discourse analysis, and BERTScore similarity metrics.
RESULTS: Accuracy and hallucination rates did not significantly differ across identity conditions ($p > .05$). In contrast, explanation quality, scientific consistency, and terminology appropriateness were significantly higher in professional identity prompts ($p < .001$). BERTScore values indicated that the semantic content of responses remained largely similar across identities (0.92–0.95). Readability analyses showed that professional identities produced longer and more complex sentences, while most LIWC-22 categories did not show significant differences.
CONCLUSION: Although the LLM-based chatbot largely preserved the core informational content of its responses, presentation style and linguistic features varied substantially depending on the assigned user identity. While such adaptability may be

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

advantageous in clinical communication settings, identity prompting should be recognized as a potential factor influencing response quality in evaluation studies and research designs.

Abstract citation ID: cjag070.407
SP474 OCCLUSAL AND PERIODONTAL FACTORS RELATED TO GINGIVAL RECESSIONS IN ORTHODONTICALLY TREATED AND UNTREATED ADULT PATIENTS: A PROSPECTIVE STUDY

Lien Limbos[1], Charlotte De Bruyn[1], Maria Cadenas de Llano-Pérula[1], Ana Belén Castro-Sarda[2]; *[1]Department of Oral Health Sciences-Orthodontics, KU Leuven and Dentistry, University Hospitals Leuven, Leuven, Belgium, [2]Department of Oral Health Sciences-Periodontology, KU Leuven and Dentistry, University Hospitals Leuven, Leuven, Belgium*

AIM: To compare the periodontal and occlusal parameters of a cohort of orthodontically treated and untreated adult subjects with and without gingival recessions.
MATERIALS AND METHODS: Healthy patients >18 years-old with and without gingival recessions on the labial aspect of the lower incisors and with and without history of orthodontic treatment were prospectively included. Demographic data, periodontal parameters and presence of parafunctions were assessed. Occlusal parameters were measured on digital casts. Lower incisor inclination was measured on available cephalograms. Mann-Whitney U and Fisher's Exact tests were used.
RESULTS: A total of 223 patients were included: 107 orthodontically treated (mean age 27.29±9.20 years, 60 with and 47 without recessions) and 116 untreated (mean age 37.75±16.11 years, 57 with and 59 without recessions). Patients with recessions were significantly older in both treated (p=0.007) and untreated (p=0.0004) groups. In orthodontically treated subjects, prevalence did not differ between sexes. Recessions were associated with higher Little's irregularity index (p=0.039). Among men, higher full-mouth plaque scores (p=0.013) and probing depth (p=0.0004) were observed. Women with recessions showed a higher frequency of molar class II (p=0.017), smaller lower intermolar and (p=0.0001) intercanine distances (p=0.012) and more incisal contact (p=0.0179). In untreated individuals, males presented significantly more recessions (p=0.0038), especially when taking medication (p=0.0078), and had greater arch length discrepancy (p=0.014). Women with recessions presented a smaller mean overjet (p=0.0039) and more incisal contact (p = 0.0135), also in comparison with men with recessions (p=0.0074)(p=0.0361). Across both groups, no relation was found between recessions and smoking, full mouth bleeding score, frenal attachment, gingival thickness, parafunctions (lip and nail biting, clenching, bruxism), sagittal canine occlusion, presence of open bite and injury to the lower incisors.
CONCLUSION: Age was consistently related to gingival recessions in orthodontically treated and untreated adults. Additional occlusal and periodontal contributors differed between groups and sexes. In treated patients, lower incisor crowding and sex-specific occlusal patterns were relevant, whereas in untreated patients sex and medication (men), reduced overjet and increased incisal contacts (women) were associated. Other investigated periodontal and occlusal parameters were not significantly different in patients with and without recessions.

Abstract citation ID: cjag070.408
SP475 INTEGRATION OF ARTIFICIAL INTELLIGENCE-ASSISTED RADIOLOGICAL AND CEPHALOMETRIC ANALYSIS INTO ORTHODONTIC DIAGNOSIS AND EDUCATION: A PILOT STUDY USING DIAGNOCAT AT "VICTOR BABEŞ" UNIVERSITY OF MEDICINE AND PHARMACY OF TIMIŞOARA

Vlad Costin Iliescu[1], Bianca Dragoș[2], George Popa[3], Remus-Christian Bratu[4], Dana-Cristina Bratu[5]; *[1]Department of Orthodontics II, Faculty of Dental Medicine, "Victor Babeș" University of Medicine and Pharmacy of Timișoara, Timișoara, Romania, [2]Research Centre in Dental Medicine Using Conventional and Alternative Technologies, Faculty of Dental Medicine, "Victor Babeș" University of Medicine and Pharmacy of Timișoara, Timișoara, Romania, [3]Department of Orthodontics II, Orthodontic Research Centre, Faculty of Dental Medicine, "Victor Babeș" University of Medicine and Pharmacy of Timișoara, Timișoara, Romania, [4]Faculty of Dental Medicine, "Victor Babeș" University of Medicine and Pharmacy of Timișoara, Timișoara, Romania, [5]Department of Orthodontics II, Orthodontic Research Centre, Faculty of Dental Medicine, "Victor Babeș" University of Medicine and Pharmacy of Timișoara, Timisoara, Romania*

AIM: Students and residents conventionally rely on orthopantomograms (OPGs), lateral cephalograms and cone beam computed tomography (CBCT) scans obtained from various diagnostic imaging centres, which increases patient costs and introduces variability in image quality and diagnostic accuracy. Cephalometric analyses are typically performed manually or via web-based tools, contributing to additional inter-operator variability.

The aim of the study was to evaluate the clinical utility and educational impact of integrating a new artificial intelligence (AI)-assisted radiological analysis, cephalometric evaluation and 3D data processing into orthodontic diagnosis, treatment planning and resident training.
MATERIALS AND METHODS: Between 15th of October - 6th of December 2025, a unified digital platform (Diagnocat) was introduced in the Department of Orthodontics II UMFVBT , integrating OPGs, cephalograms, CBCTs, CBCT-derived 3D rendering, intraoral scans, 3D study models and AI-assisted cephalometric analysis. A total of 107 orthodontic cases were assessed using this workflow. Diagnostic efficiency, inter-observer variability, impact on treatment planning time, and educational feedback were evaluated descriptively through user forms.
RESULTS: The integrated platform improved access to paraclinical investigations and substantially reduced diagnostic and treatment-planning time. In the conventional workflow, completing the clinical case documentation typically required 2-3 patient appointments across 14-calendar days, largely due to 5-7-day laboratory related delays for model fabrication, reliance on printed radiographs, together with 30-40 minutes of manual or semi-digital cephalometric tracing.

With the new workflow - incorporating intraoral scanning, CBCT acquisition and AI-based analysis - the complete case documentation was achieved in 2 appointments over 7 days, with laboratory processing limited to a maximum of 3 days. This represented an average of 20% reduced repeat appointments, a 32-40% decrease in patient chair time, and a 50-56% reduction in the overall timeframe. AI-generated cephalometric analyses demonstrated high reproducibility, reducing observer-dependent variability.

Both students and residents reported greater confidence in CBCT interpretation, pathology detection and structured case discussion, in contrast with the previous fragmented workflow, associated with inconsistent radiographic quality.
CONCLUSIONS: Integration of AI tools into orthodontic workflows can enhance diagnostic consistency, reduce treatment-planning time and lower appointment burden. The system supports improved training, communication, and clinical efficiency, representing a potential valuable complement to contemporary orthodontic diagnostic protocols.

Abstract citation ID: cjag070.409
SP476 THE CYTOTOXIC POTENTIAL OF THERMOFORMED AND IN-HOUSE MANUFACTURED THREE-DIMENSIONALLY PRINTED ORTHODONTIC APPLIANCES

Tennent M Emerson, Syed A Hamza, Marie A Cornelis, Paolo M Cattaneo, Antonio Celentano; *The University of Melbourne, Melbourne, Australia*

AIM: This study aimed to determine and compare the in vitro cytotoxicity of commonly used traditional thermoformed (TF) orthodontic aligner materials and three-dimensionally (3D) printed aligner and retainer materials. As digital workflows and 3D-printing become increasingly common in orthodontic practice, offering efficiency, cost, and environmental advantages, there is a growing need to understand the biological safety of these materials once manufactured and subjected to intraoral aging.
MATERIALS (OR SUBJECTS) AND METHODS: Four commercially available materials were evaluated: two TF clear aligner materials, Invisalign SmartTrack® (I) and Spark TruGEN™ (S); one 3D-printed clear aligner resin, Graphy Tera Harz TA-28 (G28); and one 3D-printed clear retainer resin, Graphy Tera Harz TR-07 (G7). Each material was prepared as standardized rectangular pieces (5 × 25 mm; P) or cryogenically ground particles (G) to simulate wear-related degradation. Samples were incubated in artificial saliva (AS) at 0.2 g/mL for 0, 7, 14, and 28 days at 37 °C. Eluates were collected, diluted to 30% (v/v) with growth medium, and applied to human gingival keratinocytes for 4- and 24-hour exposures. Experiments were performed in triplicate across independent runs. Cell viability assays were used to assess cytotoxicity. Data were analysed with two-way ANOVA and Tukey's post-hoc tests ($P < 0.05$).
RESULTS: AS only was used as control samples. No cytotoxicity was observed for the three clear aligner materials (I, S, G28) in either P or G form at any time point. In contrast, the G form of the 3D-printed retainer resin G7 demonstrated statistically significant cytotoxicity ($P < 0.05$) after 24-hour exposure for eluates collected at 14 and 28 days. No cytotoxic effects were detected for G7 in P form.
CONCLUSIONS: Traditional TF and 3D-printed clear aligner materials appeared biologically safe under the conditions tested. However, the cytotoxicity identified in the ground, aged form of the 3D-printed TR-07 retainer material raises concerns. Given that retainers undergo prolonged use, continuous mucosal contact, and mechanical wear particularly in bruxism, these findings highlight the need for further research into intraoral degradation, microplastic formation, and potential release of harmful compounds from 3D-printed retainer materials.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.410
SP477 ATTENTION-GATED U-NET CONVOLUTIONAL NEURAL NETWORK FOR BINARY TOOTH SEGMENTATION ON PANORAMIC RADIOGRAPHS: A BENCHMARK STUDY FOR ORTHODONTIC APPLICATIONS

Miltiadis A. Makrygiannakis[1], Apostolos Ntokos[2], Eleftherios G. Kaklamanos[3]; [1]School of Dentistry, European University Cyprus, Nicosia, Cyprus, [2]Independent Scholar, Athens, Greece, [3]School of Dentistry, Aristotle University of Thessaloniki, Thessaloniki, Greece

AIM: Panoramic radiographs are indispensable in orthodontics, but their interpretation can be time-consuming and challenging. This study aimed to develop and internally validate an Attention-gated U-Net convolutional neural network for binary segmentation of teeth versus background on a large, publicly available dataset of panoramic radiographs, and to establish a transparent performance benchmark for orthodontic applications.
MATERIALS AND METHODS: An Attention-gated U-Net architecture was trained on the “Teeth Segmentation on Dental X-ray Images” dataset, which includes 598 annotated panoramic radiographs. Images were split at the patient level into training (70%), validation (10%), and test (20%) sets using stratified sampling based on the tooth-to-background pixel ratio. The model was optimized with a combined Binary Cross-Entropy and Dice loss to address class imbalance. Performance on the held-out test set was evaluated using Dice Coefficient, Mean Intersection over Union (IoU), Precision, Recall, Pixel Accuracy, and area under the ROC and Precision–Recall curves. Additional analyses examined performance across quintiles of tooth-to-background pixel ratio and in a subset of challenging cases, including mixed dentitions and unerupted or impacted teeth. Inference time per image and visual inspection of segmentation masks were also assessed.
RESULTS: On the test set, the attention-enhanced U-Net achieved a Dice Coefficient of 0.911, a Mean IoU of 0.838, and a Pixel Accuracy of 0.975. The model maintained high performance across all tooth-to-background strata and showed improved sensitivity in challenging cases. Inference was fast and stable, with prediction times in the millisecond range per image. Visual inspection confirmed accurate delineation of tooth boundaries, including complex occlusal and interproximal areas.
CONCLUSIONS: The Attention-gated U-Net model provided robust, reliable, and computationally efficient binary segmentation of teeth versus background in panoramic radiographs. Its high quantitative performance and visually coherent masks support its use for automated quality control of panoramic images and form a solid, reproducible benchmark for future, more complex segmentation and diagnostic workflows in orthodontics.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.411
SP479 PRESURGİCAL NASOALVEOLAR MOLDİNG THERAPY USİNG A THREE-DİRECTİON EXPANSİON SCREW APPLİANCE İN AN INFANT WİTH BİLATERAL CLEFT LİP AND PALATE

Ahsen Ozturk, Esra Mutluol, Seyma Yildiz; SELCUK UNIVERSITY FACULTY OF DENTISTRY DEPARTMENT OF ORTHODONTICS, KONYA, Turkey

AIM: Cleft lip and palate are common orofacial anomalies. In affected infants, nasoalveolar molding (NAM) as described by Grayson, together with consistent parental involvement, leads to favorable early outcomes. Presurgical NAM improves the surgical field and enhances postoperative aesthetics and function. This case report describes the hard and soft tissue changes obtained using a three-direction expansion screw appliance in an infant with bilateral cleft lip and palate, demonstrating the benefits of structured presurgical molding therapy.
MATERIALS AND METHODS: This report describes the presurgical management of an 8-day-old male infant referred to our clinic with a complete bilateral cleft lip and palate. An impression was taken under oxygen support using a C-type silicone impression material, and a plaster model was prepared. To reposition the protrusive premaxilla, a rigid acrylic plate was fabricated, and the anterior segment of a three-direction expansion screw was fully activated and embedded into the plate. A retention button was added to approximate the lip segments, and parents were instructed in the application of oblique and horizontal lip taping. They were also taught to turn the screw one full rotation backward every two days. Weekly follow-up visits were scheduled to allow for appliance activation and necessary adjustments.

After the infant adapted to the appliance, modifications and incremental additions were performed to guide the alveolar segments toward each other, and gradual closure of the screw repositioned the premaxilla into an ideal alignment. When the infant reached 50 days of age, 0.9-mm stainless-steel nasal stents were added to the plate to initiate nasal molding. Lip repair was performed at 15 weeks, followed by alveolar and hard palate repair at 10 months.
RESULTS: Nasoalveolar molding resulted in improved alignment of the alveolar segments, proper repositioning of the premaxilla, lengthening of the deficient columella, and enhanced nasal tip projection.
CONCLUSION: In infants with bilateral cleft lip and palate, presurgical shaping of the nose, lips, alveolus, and palate can be successfully achieved using a three-direction expansion screw appliance, taping methods, and nasal stents. Presurgical NAM improves surgical outcomes and reduces the need for secondary corrective procedures.

Abstract citation ID: cjag070.412
SP481 DENTOSKELETAL AND SOFT-TİSSUE CHANGES FOLLOWİNG TWİN BLOCK THERAPY: EVALUATİON USİNG STEİNER ANALYSİS AND THE BARCELONA LİNE

Esra Mutluol, Zehra Ileri, Ahsen Ozturk, Seyma Yildiz; SELCUK UNIVERSITY FACULTY OF DENTISTRY DEPARTMENT OF ORTHODONTICS, KONYA, Turkey

AIM: The aim of this study was to evaluate skeletal, dental, and soft-tissue changes in Class II Division 1 individuals treated with Twin Block followed by fixed orthodontic appliances using Steiner analysis and the Barcelona Line. In addition, the sagittal position of the maxillary incisor relative to the Barcelona Line (U1–BL) was examined, and its relationship with skeletal, dentoalveolar, and soft-tissue parameters was assessed.
MATERIALS AND METHOD: This retrospective study included 20 patients (9 males, 11 females) with Class II Division 1 malocclusion who received Twin Block therapy and later completed fixed orthodontic treatment. Sixty lateral cephalometric radiographs were evaluated at three time points: T0 (pre–Twin Block), T1 (post–Twin Block), and T2 (post–fixed treatment). The Barcelona Line was defined as a vertical reference passing through the soft-tissue nasion and perpendicular to the floor. The sagittal distance of the maxillary incisor to this line (U1–BL), as well as Pog’–BL and lip–BL, was recorded. Steiner skeletal, dental, and soft-tissue parameters were also measured. Changes over time were analyzed using paired t-tests, and the correlations of U1–BL with Pog’–BL, lip–BL, and Steiner parameters were evaluated using Pearson correlation analysis.
RESULTS: Twin Block followed by fixed treatment resulted in significant skeletal improvement, with increased SNB and reduced ANB and facial convexity. The maxillary incisors tended to upright relative to NA. At T0, U1–BL showed moderate correlations with SNA, SNB, ANB, and convexity; a weak correlation with Mx1–SN; and strong correlations with lip–BL and Pog’–BL. At T1 and T2, strong correlations between U1–BL and lip–BL and Pog’–BL persisted.Treatment-related changes in U1–BL were positively correlated with Mx1–SN1 ($r=0.562$), Mx1–NA angle ($r=0.568$), Mx1–NA1 linear measurement ($r=0.765$), upper lip–S ($r=0.502$), and lip–BL ($r=0.463$) ($p<0.05$).
CONCLUSIONS: The combined Twin Block and fixed orthodontic therapy produced favorable dentoskeletal and soft-tissue improvements. Additionally, U1–BL showed significant associations with skeletal, dental, and soft-tissue parameters, supporting the Barcelona Line as a clinically meaningful referance for cephalometric analysis.

Abstract citation ID: cjag070.413
SP482 CORRELATION BETWEEN GINGIVAL THICKNESS AT MANDIBULAR INCISORS AND PALATAL MUCOSA THICKNESS AT MULTIPLE ANATOMICAL SITES. A CROSS-SECTIONAL STUDY

SOTIRIOS PAPAIOANNOU[1], ELENI ZAFEIROPOULOU[2], ELLIE LASPOU[3], ELINA PETEVINOU[3], DIMITRIOS KLOUKOS[4]; [1]251 HELLENIC AIR FORCE HOSPITAL, ATHENS, Greece, [2]UNIVERSITY OF ATHENS, ATHENS, Greece, [3]UNIVERSITAT INTERNATIONAL DE CATALUNYA, BARCELONA, Spain, [4]UNIVERSITY OF BERN, BERN, Switzerland

AIM: Soft tissue thickness is a critical factor in orthodontic, periodontal and prosthetic treatment planning. This study investigated the correlation between gingival thickness at mandibular incisors and palatal mucosa thickness at multiple anatomical sites to determine whether gingival thickness could serve as a predictor of palatal mucosal dimensions.
MATERIALS AND METHODS: A cross-sectional analysis was conducted on 89 patients (mean age 16.9 ± 5.5 years; 50.6% female) with balanced gender distribution and orthodontic treatment status. Gingival thickness was measured at the mandibular incisors (USD#31 and USD#41), while palatal mucosa thickness was assessed at six sites: mid-palatal region, mid-palatal at positions 16/26, and palatal/lateral sites at teeth #14, #24, #16, and #26. Pearson and Spearman correlation coefficients with 95% confidence intervals were calculated. Normality was tested using the Shapiro-Wilk test.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: No statistically significant correlations were found between gingival thickness and palatal mucosa thickness at any measured site (all p-values > 0.05). Pearson correlation coefficients ranged from -0.090 to 0.154, representing negligible to weak associations. The strongest correlation was between USD#31 and mid-palatal mucosa at 16/26 ($r = 0.154$, $p = 0.1496$), which explained only 2.37% of variance ($R^2 = 0.0237$). Spearman's rank correlations yielded similar results, confirming the absence of meaningful associations.
CONCLUSIONS: Gingival thickness at lower anterior teeth is independent of palatal mucosa thickness and cannot be used as a clinical predictor of palatal dimensions. These findings underscore the substantial anatomical heterogeneity across different oral regions and the necessity for direct measurement of palatal mucosa thickness in clinical and surgical planning.

Abstract citation ID: cjag070.414
SP483 PREDICTING SLEEP-DISORDERED BREATHING IN TEENAGERS USING LATERAL CEPHALOGRAMS AND ARTIFICIAL INTELLIGENCE

Jason Liu, Stratos Vassis, Thomas Klit Pedersen, Ruben Pauwels, Peter Stoustrup; *Aarhus University, Aarhus, Denmark*

AIM: Sleep-disordered breathing (SDB) in children ranges from snoring to obstructive sleep apnea can impact behavioral, neurocognitive and craniofacial development. Although polysomnography remains the gold standard, its cost and limited accessibility challenge timely diagnosis. The validated Pediatric Sleep Questionnaire (PSQ) provides an efficient symptom-based screening method. With the growing integration of artificial intelligence in clinical diagnostics, lateral cephalograms may offer valuable information for the early detection of sleep-disordered breathing. This study aimed to evaluate whether AI can identify patients at risk of SDB by the use of orthodontic lateral cephalograms.
MATERIALS AND METHODS: Data were collected from the Section of Orthodontics, Aarhus University, including patients under 18 years who attended an initial consultation between 01.09.2019 and 01.06.2024 with both a lateral cephalogram and a fully completed PSQ. After excluding partially completed PSQs, previous orthodontic treatment, and duplicates from two-phase treatment, 517 patients were eligible for inclusion. Patients were classified into high-risk (PSQ score ≥0.33) or low-risk (PSQ score <0.33) SDB groups. Collected variables included age, gender, body mass index (BMI), full PSQ responses, and cephalometric measurements from a modified Björk analysis, including hyoid bone position and uvula dimensions. A fully connected artificial neural network was developed in TensorFlow/Keras, using Adam optimization. Mean squared error or weighted MSE addressed class imbalance. Data were split into training, validation, and test sets (80:10:10), with early stopping applied to avoid overfitting.
RESULTS: The neural network showed limited ability to identify children at risk of SDB, with performance heavily affected by class imbalance (7% high-risk cases), resulting in reduced sensitivity and poor generalization (test $R^2 = -0.055$). Supplementary XGBoost analyses run in both regression and classification modes, demonstrated similarly weak predictive value; regression models showed low predictive performance, while classification models overfitted when evaluated on test data. Across models, mandibular inclination (NSL/ML) consistently emerged as the most influential predictive feature, although feature importance analyses were highly variable, limiting firm conclusions about individual predictor effects.
CONCLUSION: The model failed to identify high-risk SDB subjects, highlighting the need for larger, more balanced datasets and multimodal approaches for reliable screening.

Abstract citation ID: cjag070.415
SP484 PALATE-FRIENDLY PACIFIER? A CLINICAL TRIAL

Theodora Giannakopoulou, Reto Odermatt, Andreas Egger, Cornelia Filippi, Carlalberta Verna; *Universität Basel, Basel, Switzerland*

AIM: To investigate the effect of a pacifier with flat, trapezoidal morphology (CURAPROX-BABY-SCHNULLER Medical Pacifier, Curaden, Switzerland) on transversal, vertical, and sagittal dimensions in young children in a prospective randomized controlled trial.
SUBJECTS AND METHOD: Thirty-two children aged 2–5 years attending the University Center for Dental Medicine at the University of Basel for routine dental examinations were included.

Inclusion criteria: Use of a pacifier and/or baby bottle for ≥6 months plus at least one of the following: posterior crossbite of ≥1 tooth, posterior edge-to-edge, anterior open bite on central deciduous incisors and anterior edge-to-edge on central deciduous incisors.

Children were randomly assigned to a study or control group. The study group switched to the test pacifier and stopped all other non-nutritive sucking habits. The control group discontinued all pacifiers, bottles, and other non-nutritive sucking.
METHODS: Primary outcome: crossbite/edge-to-edge (yes/no). Secondary outcomes: open bite (yes/no), intercanine and intermolar distances, overjet, and overbite.

Intraoral scans (Trios, 3Shape) were taken at T0–T4 over 12 months and were analyzed in OnyxCeph3. Measurements included: vertical distance between upper and lower incisors, horizontal distances between incisors, intercanine width, and intermolar width.

After testing for normality, data were analyzed with parametric statistics. Within-group differences between T0 and T4 were assessed using paired-sample t-tests. Paired differences were then compared between groups using one-tailed t-tests with unequal variance ($\alpha = 5\%$).
RESULTS: Of 32 patients (15 study, mean age 3.53; 17 control, mean age 3.19), 10 did not complete follow-up. Crossbite correction occurred in 4 over 5 study subjects vs. 1 over 4 controls. Open bite resolved in 8 over10 study and 10 over 11 control subjects. Intercanine distance significantly increased in the study group (0.61 mm ±0.5) but not in controls (0.21 mm ±0.62); between-group differences were not significant. Intermolar distance increased significantly in both groups, with higher—but not significant—values in the study group. Overbite and overjet decreased significantly in both groups, without intergroup differences.
CONCLUSIONS: Pacifier morphology can positively influence upper-jaw transverse development, particularly in the canine region, and supports spontaneous correction of overbite and overjet.

Abstract citation ID: cjag070.416
SP485 DURATION OF FORCED ERUPTION OF IMPACTED MAXILLARY CANINES AND ASSOCIATED FACTORS

Monika Montrimaitė and Rūta Almonaitienė; *Vilnius University, Vilnius, Lithuania*

AIM: To evaluate duration of forced eruption (FE) of impacted maxillary canines (IMC) and determine associated factors.
MATERIALS AND METHOD: In retrospective study, treatment records and panoramic X-rays of patients who underwent FE of IMC with closed eruption technique and TMA auxiliary wire, elastic chain, NiTi wire or mixed traction were analysed. Immediate or delayed FE was applied for palatally and buccally IMC. Regarding bilateral IMC, canine with greater alpha angle was included. Duration was measured from first activation until canine's emergence into oral cavity. Collected data: FE duration, patient's age, sex, canine's angulation to upper midline (alpha angle), to axis of lateral incisor (beta angle), to axis of first premolar (eta angle), perpendicular distance from tip of canine's crown to occlusal plane, horizontal (by Ericson and Kurol) and vertical position (by Stivaros and Mandall), type of FE and anchorage. Data was analysed using descriptive statistics, Spearman correlation, Mann-Whitney U and Kruskal-Wallis test.
RESULTS: Overall, 108 patients (26 men (24.1%) and 82 women (75.9%) and 108 IMC (55 (50.9%) right and 53 (49.1%) left side) were included. Mean (SD) age was 15.4 (4.7) years. Mean (SD) and median (IQR) FE duration was 295.9 (291.5) and 209 (253) days, respectively. There was positive correlation between FE duration and measured angles (alpha ($r(106)=0.34$, $p<0.001$), beta ($r(106)=0.30$, $p=0.001$), eta ($r(106)=0.40$, $p<0.001$), distance from tip of canine's crown to occlusal plane ($r(106)=0.61$, $p<0.001$) and no correlation with age. FE duration was longer in group where IMC were mesial to lateral incisors than in group where IMC were distal to central incisors ($U=945$, $p=0.008$), also longer in group where IMC were higher than half the length of lateral incisor's root compared to group where IMC were lower ($U=695$, $p<0.001$). There was no significant difference in FE duration between groups of sex, sides of maxilla, types of FE and anchorage.
CONCLUSIONS: Average duration of forced eruption of impacted maxillary canines was about 10 months. Longer duration was associated with canines' higher vertical and more mesial position, greater angulation to adjacent teeth and upper midline.

Abstract citation ID: cjag070.417
SP486 COLOR STABILITY AND STAIN RESISTANCE OF CLEAR ALIGNER ATTACHMENTS: A REVIEW

Natasa Puskar[1], Mila Janjic Rankovic[2], Hisham Sabbagh[2]; [1]*Department of Orthodontics, Clinic of Dental Medicine of Vojvodina, Faculty of Medicine Novi Sad, University of Novi Sad, Novi Sad, Serbia,* [2]*Department of Orthodontics and Dentofacial Orthopedics, LMU University Hospital, LMU Munich, 80336 Munich, Germany, Munich, Germany*

AIM: The esthetic performance of composite attachments plays a critical role in patient esthetic perception during orthodontic treatment. This review aims to evaluate the color stability, stain resistance, and durability of different composite

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

attachment materials under various staining conditions and usage of different whitening agents.
MATERIALS AND METHOD: This review was conducted in line with PRISMA guideline for systematic reviews. An electronic search was conducted in PubMed, Embase, and Web of Science databases using a predefined search strategy. Two reviewers independently screened the results for relevant titles, keywords, and abstracts. Full texts of the selected studies were then obtained and evaluated for eligibility based on predefined selection criteria by the same reviewers. After full-text reading, the articles not fulfilling the inclusion criteria were excluded, while the remaining were considered for data extraction. The data were collected using a pre-tailored data extraction table including details on study type, objectives, materials and methods, evaluation method, main findings and conclusions related to the research questions.
RESULTS: Seven studies were included in this review. Some investigated which beverages, whitening agents, or aerosols caused the greatest discoloration, while others compared the performance of flowable versus packable composites or assessed single-shade materials. Patients' perceptions of esthetic changes in real clinical use were also evaluated. The degree of discoloration was strongly influenced by composite type, staining substance, and exposure duration. Flowable and single-shade composites demonstrated superior color stability. In vivo study demonstrated, patients perceived no esthetic differences between Tetric EvoCeram and Transbond XT, compared to Tetric EvoCeram for better stain resistance and overall appearance.
CONCLUSION: Omnichroma, G-aenial Universal Injectable Flowable composite and Filtek Supreme Ultra showed superior color stability and esthetics. Smoking and exposure to aerosols were shown to reduce transparency and increase surface roughness, leading to visible discoloration. Coffee was identified as the most staining solution, followed by red wine, while cola and distilled water produced negligible changes. Carbamide peroxide and whitening rinses partially reduced staining but did not fully restore the original shade.

Abstract citation ID: cjag070.418
SP487 LINKING FACIAL TYPOLOGY TO DENTAL MORPHOLOGY AND GINGIVAL CHARACTERISTICS: A CROSS-SECTIONAL STUDY

Zuzanna Oruba, Piotr Stós, Karolina Kukuczka, Anna Chyla, Piotr Fudalej; *Jagiellonian University Medical College, Kraków, Poland*

AIM: To investigate potential associations between facial typology, dental morphology, and gingival characteristics.
MATERIAL AND METHODS: A cross-sectional study was conducted involving young, periodontally healthy individuals. The following facial measurements were obtained using a caliper: facial height (Nasion–Menton, N–Me), facial width (Zygion–Zygion, Zy–Zy), and facial index (FI = (N–Me / Zy–Zy) × 100%). Periodontal assessments were performed at all maxillary and mandibular incisors and included the determination of gingival biotype (GB) using the periodontal probe visibility (PPV) method, measurement of the width of attached gingiva (AG) with the UNC-15 periodontal probe, and evaluation of gingival thickness (GT) using an ultrasound Pirop device. Dental morphology parameters included crown height (CH), crown width (CW), and the CH/CW ratio. Statistical analyses comprised descriptive statistics and Spearman's rank correlation to assess associations between quantitative variables. The significance threshold was set at $p < 0.05$. Analyses were performed in R ver. 4.5.1.
RESULTS: Sixty-one subjects (43 females, 18 males) aged 21 – 30 years were included. The CW of maxillary and mandibular central incisors showed a significant positive correlation with Zy–Zy. GT at teeth 22 and 42 correlated positively with Zy–Zy, while GT at 31 and 32 correlated negatively with FI. No significant correlations were observed between N–Me and either CH or GT. However, AG at teeth 11, 42, 41, 31, and 32 demonstrated significant positive correlations with N–Me. Additionally, AG at teeth 11 and 21 correlated negatively with CH of these teeth. Multiple significant positive correlations were observed between GT and CW across different incisors.
CONCLUSIONS: Individuals with a wider facial morphology tend to have wider central incisor crowns and relatively thicker gingival tissue. Conversely, greater facial height is associated with a wider band of attached gingiva at incisors. Further studies employing standardized methodologies are needed to confirm these relationships and validate the patterns observed.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.419
SP489 SURFACE DEGRADATION AND CLINICAL AGING OF CLEAR ALIGNER ATTACHMENTS: A REVIEW

Natasa Puskar[1], Hisham Sabbagh[2], Mila Janjic Rankovic[2]; *[1]Department of Orthodontics, Clinic of Dental Medicine of Vojvodina, Faculty of Medicine Novi Sad, University of Novi Sad, Novi Sad, Serbia, [2]Department of Orthodontics and Dentofacial Orthopedics, LMU University Hospital, LMU Munich, 80336 Munich, Germany, Munich, Germany*

AIM: Composite attachments play a critical role in biomechanical optimization of clear aligner therapy. However, their clinical effectiveness depends heavily on material stability and resistance to wear. This review aims to provide a summary of how mechanical and thermal stresses affect clear aligner attachment wear.
MATERIALS AND METHOD: This review was conducted in line with PRISMA guideline for systematic reviews. An electronic search was conducted in the PubMed, Embase, and Web of Science databases using a predefined search strategy. Two reviewers independently screened the results for relevant titles, keywords, and abstracts. Full texts of the selected studies were then obtained and evaluated for eligibility based on predefined selection criteria by the same reviewers. After full-text reading, the articles not fulfilling the inclusion criteria were excluded, while the remaining were considered for data extraction. The data were collected using a pre-tailored data extraction table. The extracted data included details on study type, aim of the study, details concerning study sample, methodology, summarized main findings and conclusions related to the research questions. The data collection was performed independently by two reviewers.
RESULTS: From total of 554 identified studies, ten studies met the inclusion criteria, including six in vitro and four in vivo studies. In vitro studies assessed the effects of brushing, thermocycling, and aligner removal on attachment wear, while in vivo studies evaluated the impact of clinical aging combined with aligner use. Overall, attachment wear was primarily influenced by the type of composite material and cumulative mechanical stress. Flowable resins were more prone to degradation, whereas highly filled or bulk-fill composites demonstrated greater durability. Clinically, wear accumulated over time, particularly in the gingival and distal regions, highlighting the need for careful material selection and regular monitoring of attachments during treatment.
CONCLUSION: Attachment wear is a multifactorial process affected by both material properties and mechanical stresses. Selecting durable composite materials and monitoring attachment integrity throughout treatment are essential to ensure optimal clinical performance of clear aligner therapy.

Abstract citation ID: cjag070.420
SP490 ELECTROMYOGRAPHIC EVALUATION OF THE IMMEDIATE MUSCULAR RESPONSE TO CHANGES IN VERTICAL DIMENSIONS WITH BITE-BLOCKS IN DENTATE PATIENTS

Margarida Fernandes, Hélder Nunes Costa, Iman Bugaighis, Luís Proença, Pedro Mariano Pereira; *Egas Moniz School of Health and Science, Almada, Portugal*

AIM: Altering the vertical dimension with bite planes is a common procedure during orthodontic treatment. However, there is no consensus in the literature regarding the muscular response to these increases in vertical dimension. Thus, this study aimed to evaluate the effect of varying heights and locations of interocclusal bite-blocks on the electromyographic activity of the masseter, temporal and digastric muscles.
MATERIALS AND METHODS: This prospective exploratory study involved ten volunteers (eight females and two males, aged 25-35 years) with Class I occlusion, normal overjet and overbite, and full permanent dentition, including second molars. None had TMD problems or parafunctional habits, and with less than 0.5mm betweenMaximum Inter-Cuspation (MIC) and Centric Occlusion (CO). Silicone bite registrations, electronic axiography (CADIAX 4 Gamma®), and mounting on a fully adjustable articulator (Reference SL Gamma®) were performed. The inter MIC -CO distance was determined using the CPM®. Three acrylic splints (Orthocryl®, Dentaurum) were fabricated with pin heights of 1.5mm, 5mm and 7mm. Muscle activity was measured at each height with 15-minute intervals between measurement sets. Additionally, the 5mm splint was divided into segments: incisors, premolars, and molars, with muscle responses evaluated at random, allowing 15-minutes of rest between sets. Descriptive and inferential statistical analysis was performed, with a significant level of 5%.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

RESULTS: Significant differences were observed in the mean maximum voluntary contraction values across different vertical dimensions, MIC at 0mm, 1.5mm, 5mm, 7 mm ($p<0.05$). The highest mean MVC values were observed in the masseter muscle at MIC (0mm). Notably, muscle activity decreased significantly with increased of the vertical dimension. There are also statistically significant differences between different locations of the bite-blocks ($p<0.05$).with a significantly decreasing muscles activity when the bite-blocks were positioned on the incisors.
CONCLUSIONS: The muscle activity decreases when increasing bite-blocks height and as the bite-blocks become more anterior. However, the results of this study require confirmation with a larger sample.

Abstract citation ID: cjag070.421
SP492 EVALUATION OF THE EFFECTS OF MAXILLARY EXPANSION ON UPPER AIRWAY DIMENSION THROUGH RESPIRATORY POLYGRAPHY

Ana Luísa Figueiredo[1], Óscar Gonçalves[2], Marco Loureiro[3], Inês Francisco[4], Francisco Vale[4]; *[1]Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Coimbra, Portugal, [2]Faculty of Medicine, University of Coimbra, Coimbra, Portugal, [3]Institute of Occlusion and Orofacial Pain, Faculty of Medicine, University of Coimbra, Coimbra, Portugal, [4]Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal; Institute for Clinical and Biomedical Research, Faculty of Medicine, University of Coimbra, Portugal; Environment, Genetics and Oncobiology Research Centre, University of Coimbra, Portugal; Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra, Portugal; Coimbra Academic Clinical Centre, Portugal; Centre for Mechanical Engineering, Materials and Processes, University of Coimbra, Coimbra, Portugal*

AIM: Obstructive sleep apnea syndrome is a respiratory sleep disorder that affects 1% to 5% of the pediatric population worldwide. This condition may negatively affect cognitive and physical development, if not treated. Maxillary expansion has been employed in the management of pediatric obstructive sleep apnea to enhance upper airway dimensions. The present study aimed to evaluate the effectiveness of maxillary expansion protocols in increasing airway volume and improving respiratory parameters in children, using a respiratory polygraphy device.
MATERIALS AND METHODS: This prospective clinical study was conducted on nine healthy children treated in the Institute of Orthodontics of the Faculty of Medicine of University of Coimbra. Demographic and clinical data (sex, age, race, health status, and type of maloclusion) were retrieved from patients who underwent orthodontic treatment via maxillary expansion, following informed consent obtained from their legal guardians. Respiratory parameters and upper airway dimensions were evaluated at home usind respiratory polygraphy (BTI APNiA®) before (T0) and after expansion (T1). Data analysis was performed using descriptive statistics.
RESULTS: The analysed paediatric population had a mean age of 10.1 ± 1.6 years, a mean apnea-hypoapnea index of 1.6 ± 0.8 events/hour and a minimum peripheral oxygen saturation of $93.9 \pm 2.0\%$ at T0. At T1, two individuals were reassessed, showing a mean apnea-hypoapnea index of 2.0 ± 1.2 events/hour and minimum peripheral oxygen saturation of $95.5 \pm 2.1\%$. Overall, no significant improvements were observed in the respiratory parameters assessed.
CONCLUSIONS: This study found no significant changes in respiratory parameters after maxillary expansion in children with obstructive sleep apnea. Findings are limited by small sample size and short follow-up, highlighting the need for larger, long-term studies using more sensitive diagnostic tools.

Abstract citation ID: cjag070.422
SP494 RESIN INFILTRATION VERSUS FLUORIDE APPLICATION FOR WHITE SPOT LESIONS DURING MULTIBRACKET TREATMENT: A 12-MONTH FOLLOW-UP RANDOMIZED CONTROLLED TRIAL

Pervin Aslanalp[1], Yamen Kashash[2], Sascha Herin[3], Theodosia Bertzela[4]; *[1]Department of Orthodontics, Charité, Berlin, Germany, [2]private practice, Berlin, Germany, [3]School of DEsign, university of Leeds, Leeds, United Kingdom, [4]Department of Orthodontics, University Hospital Carl Gustav Carus, Dresden, Germany*

AIM: This 12-month follow-up randomized trial evaluated color stability of white spot lesions (WSLs) treated with either resin infiltration (Icon®) or fluoride varnish (Flairesse®) during active multibracket orthodontic therapy.
MATERIALS AND METHODS: Twenty-one patients (77 teeth) participated in this follow-up. All included teeth had received either resin infiltration (Icon®) or fluoride varnish (Flairesse®) during active multibracket therapy. Standardized cross-polarized intraoral photographs were taken at six months (T5) and 12 months (T6) following WSL treatment using the eLAB® protocol. Pre-defined binary segmentation masks captured the treated WSL area (M2) and the sound adjacent enamel (M3). Color differences (ΔE_{00}) between T5 and T6 were quantified through a validated MATLAB® workflow. A generalized linear model (GLM) with identity link accounted for repeated measurements and clustering of teeth within patients. The primary outcome was ΔE_{00} in M2; the secondary outcome was ΔE_{00} in M3.
RESULTS: After 12 months, the fluoride group (34 teeth) showed a mean ΔE_{00} of 7.07 ± 7.60 in the WSL area, indicating greater color variation over time. The resin infiltration group (43 teeth) exhibited a mean ΔE_{00} of 5.87 ± 7.83, suggesting a tendency toward greater color preservation. The generalized linear model showed no statistically significant difference between the groups for color change ($\beta = 1.73$; 95% CI: −0.84 to 4.30; $p = 0.188$). Both interventions produced measurable esthetic improvement, with resin infiltration showing a tendency toward more stable long-term results. No unwanted color shifts were observed in adjacent sound enamel.
CONCLUSIONS: Both minimally invasive approaches improved the visual appearance of WSLs during orthodontic treatment. Resin infiltration demonstrated more consistent color stability over the 12-month period. Although intergroup differences did not reach statistical significance, the overall trend suggests that early Icon® application during fixed appliance therapy provides a more durable esthetic benefit. These findings support resin infiltration as a minimally invasive and durable esthetic approach for managing WSLs during multibracket therapy.

Abstract citation ID: cjag070.423
SP495 AIRWAY CHANGES IN GROWING CLASS II PATIENTS TREATED WITH HERBST (WITH OR WITHOUT SKELETAL ANCHORAGE) AND TWIN BLOCK APPLIANCES: A RANDOMIZED CONTROLLED TRIAL

Klaus Batista[1], Luisa Barreto[1], Bruno Neves[2], Catia Quintão[1], Jose Augusto Miguel[1]; *[1]Rio de Janeiro State University, Rio de Janeiro, Brazil, [2]Pontifícia Universidade Católica, Rio de Janeiro, Brazil*

AIM: This study investigates dimensional changes in the upper airway, specifically within the oropharyngeal space (OP), following Herbst appliance therapy using either dental anchorage (HDA) or skeletal anchorage (HSA) and Twin Block appliance (TB) in growing patients with Class II Division 1 malocclusion.
MATERIALS AND METHODS: This single-center, two-arm, parallel randomized controlled clinical trial included 60 young patients (10 – 14 years old) randomly assigned using block randomization to the HDA ($n = 20$), HSA ($n = 20$), or TB ($n = 20$) groups and treated for 12 months. The change in oropharyngeal volume (cm^3), including airway length, the minimum, maximum, and average cross-sectional areas, was measured by cone-beam computed tomography (CBCT) as secondary outcomes at two time points: pre-treatment (T1) and post-treatment (T2). All outcomes were assessed using AI-assisted InVivo7 software. An intention-to-treat analysis was used to handle missing data. ANOVA with Bonferroni correction was performed for statistical analysis.
RESULTS: All groups (HAD, HSA, and TB) showed increases in oropharyngeal volume and dimensions. Within-group analysis revealed a statistically significant improvement in the minimum axial area only for the HDA group ($p < 0.05$). In contrast, between-group comparisons indicated significantly higher mean values for the HSA group in volume ($p < 0.05$), airway length ($p < 0.05$), maximum cross-sectional area ($p < 0.05$), and average area ($p < 0.05$). No significant differences were found for the minimum area.
CONCLUSIONS: The Herbst appliance (with or without skeletal anchorage) and the Twin Block appliance increased oropharyngeal airway dimensions in growing Class II patients, with a more favourable volumetric trend observed with skeletal anchorage.

Abstract citation ID: cjag070.424
SP496 DETERMINANTS OF OCCLUSAL OUTCOMES IN CLASS II/1 AND CLASS III PATIENTS UNDERGOING ORTHODONTIC–ORTHOGNATHIC TREATMENT

Maria Christina Richter[1], Nikolaos Pandis[2], Günter Lauer[3], Adrian Franke[3], Theodosia Bartzela[1]; *[1]Department of Orthodontics, University Hospital Carl Gustav Carus, Technische Universität Dresden, Dresden, Germany, [2]Department of Orthodontics and Dentofacial Orthopedics, Dental School/Medical Faculty, University of Bern, Bern, Switzerland, [3]Department of Oral Maxillofacial Surgery, University Hospital Carl Gustav Carus, Technische Universität Dresden, Dresden, Germany*

AIM: This retrospective single-center cohort aimed to quantify occlusal changes using the weighted Peer Assessment Rating (wPAR) index in Class II/1 and Class III patients undergoing combined orthodontic and orthognathic treatment. Furthermore, to identify patient- and treatment-related predictors of treatment success.
MATERIALS AND METHODS: Eighty-five skeletally mature patients (Class II/1: 45; Class III: 40) treated between 2009 and 2024 at the University Hospital Dresden

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

were included. Dental casts were assessed using the wPAR index pre-treatment (T1) and after completion of the combined orthodontic–orthognathic therapy (T2). Based on these assessments, the absolute and percentage changes in wPAR scores from pre- to postoperative time points were calculated. Multivariable median regression (adjusted for confounders) assessed the impact of age, sex, malocclusion group, surgical intervention, surgeon experience, baseline wPAR score, and preoperative overjet on the extent of occlusal improvement.
RESULTS: The mean baseline wPAR score was 48.4 ± 17.3 and decreased by 89.9 ± 9.5% post-treatment (91% "great improvement", ≥70% or ≥22 points). Class III showed a higher reduction (94.4 ± 5.2%) vs Class II/1 (85.9 ± 10.7%). Younger ($\beta = -0.66$; $p = 0.008$) and male patients ($\beta = 18.0$; $p = 0.006$) predicted larger wPAR reductions, indicating a more favorable treatment response. Neither the type of surgical intervention nor the surgeon's experience significantly influenced the magnitude of occlusal improvement ($p > 0.13$). Preoperative overjet, however, significantly predicted postoperative values ($\beta = 0.125$; $p = 0.003$). The achieved overjet was comparable between groups (Class II/1: 3 mm [IQR 1.0]; Class III: 2.5 mm [IQR 1.0]) and both aligned with the normative range of 2-3 mm.
CONCLUSIONS: Combined orthodontic-orthognathic treatment resulted in substantial wPAR normalization in Class ll/1 and Class III patients, with age and sex outperforming procedural variables. Findings underscore the need for individualized planning and highlight the importance of future studies that integrate functional assessments and patient-reported outcomes to capture a broader perspective on treatment success.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.425
SP497 A PRELIMINARY IN VITRO INVESTIGATION OF THE COMPARATIVE REMINERALIZING EFFICACY OF CLINPRO™ CLEAR FLUORIDE TREATMENT AND DURAPHAT™ VARNISH ON ENAMEL WHITE SPOT LESIONS ADJACENT TO ORTHODONTIC ATTACHMENTS

Sukhontamala Phuanglerngsri, Aggasit Manosudprasit, Apa Juntavee, Araya Pisek; *khon kaen university, khon kaen, Thailand*

AIM: To evaluate and compare the remineralization efficacy of two fluoride-based therapeutic protocols—Duraphat™ Varnish single application (DV) and Clinpro™ Clear fluoride treatment (CC)—versus a non-treatment control on artificially induced white spot lesions surrounding orthodontic brackets, utilizing Vickers microhardness number (VHN) as the assessment parameter.
MATERIALS AND METHODS: Twelve human premolars extracted for orthodontic purposes were sectioned, and buccal enamel segments were mounted in acrylic resin. Following bracket placement, specimens were subjected to artificial cariogenic challenge using lactic acid gel (pH 5.0) for 12 hours to induce subsurface demineralization. Baseline surface microhardness (VHN_1) was recorded, and specimens were randomly assigned to three experimental groups (n=3/group): Group 1 received Duraphat™ Varnish application; Group 2 received Clinpro™ Clear fluoride treatment; Group 3 served as non-treatment control. Subsequently, all specimens underwent a 7-day pH-cycling regimen simulating the intraoral cariogenic environment, consisting of alternating immersion in demineralizing solution (DS, 1 hour), remineralizing solution (RS, 5 hours), and deionized water (DI, 12 hours) at 37°C, repeated twice daily. Post-treatment surface microhardness (VHN_2) was measured following bracket debonding. Statistical analysis employed one-way ANOVA with post-hoc comparisons ($p<0.05$).
RESULTS: All fluoride treatment groups demonstrated increased surface microhardness following the cariogenic challenge and pH-cycling protocol. The DV group exhibited significantly greater microhardness recovery compared to the non-treatment control ($p<0.05$). The CC group showed no statistically significant difference in remineralization capacity compared to other groups ($p>0.05$).
CONCLUSIONS: Fluoride-based therapeutic protocols demonstrated capacity for managing incipient carious lesions. Duraphat™ Varnish exhibited superior remineralization potential and remains the recommended clinical intervention for white spot lesion management. Clinpro™ Clear fluoride treatment demonstrated remineralization capacity; however, protocol optimization may be warranted to enhance therapeutic efficacy.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.426
SP498 SELF-CARE ADVICE ON DUTCH ORTHODONTISTS' WEBSITES

Merthijn Huiman[1], M.C. van Capelleveen[2], Y. Liu[1], R.E.G. Jonkman[1], D.E. Slot[2]; *[1]Department of Orthodontics, Academic Centre for Dentistry Amsterdam (ACTA), Amsterdam, Netherlands, [2]Department of Periodontology, Academic Centre for Dentistry Amsterdam (ACTA), Amsterdam, Netherlands*

AIM: This study aimed to evaluate the oral hygiene information provided on websites of orthodontic practices affiliated with the Dutch Society of Orthodontists (NVvO).
MATERIAL AND METHODS: A cross-sectional study was conducted by analyzing publicly accessible websites of NVvO-affiliated specialist orthodontic practices in the Netherlands. Websites were identified through the NVvO directory and Google. For each eligible website, data were extracted on content format, recommendations for patients with different types of appliances, brushing specifications, toothbrush types, fluoride use, additional oral care methods, and supplementary educational resources by a standardized form. These data were then systematically collected and analyzed.
RESULTS: A total of 233 orthodontic practice websites were included and analyzed. Oral hygiene information was mainly presented in text format (68%), with fewer using visual aids including images (29%) and videos (9%). For patients with fixed appliances, brushing instructions were provided on 28% of websites, while 33% recommended the use of interdental brushes. For patients with removable appliances, 25% advised daily cleaning, with specific recommendations including cleaning tablets (17%), vinegar (15%) and toothpaste (14%). Regarding brushing specifications, 30% of websites described brushing techniques; 47% recommended brushing twice daily; 23% advised brushing after meals; 22% specified brushing duration; and 27% recommended maintaining a 45-degree brushing angle. Fluoride toothpaste and mouthwash were each recommended by 26% of websites. Interdental cleaning was mentioned on 15%, with 12% recommending the use of interdental brushes.
CONCLUSION: Despite the presence of oral hygiene advice on most practice websites, the information was often limited and varied by content and format. Visual or animated resources were rarely used, and specific instructions for both fixed and removable appliances were frequently missing. Improving the quality, consistency, and comprehensiveness of online instructions, as well as differentiating modes of presentation, may enhance patient understanding and support better oral health during orthodontic treatment.

Abstract citation ID: cjag070.427
SP499 DIGITAL EVALUATION WITH ABO ECRE OF TREATMENT QUALITY AND EFFICIENCY WITH COMPLETELY CUSTOMIZED LINGUAL AND PREFABRICATED VESTIBULAR APPLIANCES IN COMBINED ORTHODONTIC-ORTHOGNATHIC THERAPY

Franziska Lang, Norbert Lang, Gwendolyn Lode, Rogerio Bastos Craveiro, Michael Wolf; *University Hospital RWTH Aachen, Aachen, Germany*

AIM: Precise orthodontic pre-surgical decompensation is a critical prerequisite for optimal outcomes in orthognathic surgery. However, the relative effectiveness of completely customized lingual appliances (CCLAs) versus prefabricated vestibular appliances (PVMAs) remains insufficiently established. This study compared the decompensation efficiency, treatment quality, and overall clinical performance of these two appliances.
MATERIALS AND METHOD: The study included 60 consecutive patients who underwent orthodontic-orthognathic surgery: 30 with CCLA and 30 with PVMA. To ensure quality, the digital ABO CRE for each scanned model was evaluated using Onyxceph3™ diagnostic software, and the efficiency of each appliance was recorded in the respective patient files. Both groups underwent the same evaluation protocol involving initial, intermediate (pre-surgery) and final casts. An additional set-up model was included for the CCLA group only.
RESULTS: Both groups exhibited identical baseline scores (CCLA: 70.60 ± 13.99; PVMA: 66.50 ± 12.09). CCLAs demonstrated significantly lower ABO scores than the PVMA group, particularly in the final model (19.73 ± 6.70 vs. 31.80 ± 9.05). This represents a total reduction of 71.24% ± 10.59, compared to a reduction of 50.13% ± 16.00 in the PVMA group. Treatment efficiency, as measured by overall treatment duration and the number of clinical appointments, particularly during the decompensation phase, was significantly improved in the CCLA group.
CONCLUSIONS: CCLAs demonstrated superior efficiency and higher treatment quality compared with PVMAs in patients undergoing combined orthodontic–orthognathic therapy. The high accuracy of digital set-up transfer enables reliable and predictable treatment planning, independent of case complexity or the interdisciplinary nature of the therapeutic approach.

Abstract citation ID: cjag070.428
SP501 ORTHODONTIC TREATMENT NEED AND OCCLUSAL CHARACTERISTICS AMONG ADOLESCENTS AND YOUNG ADULTS IN NORTHERN NORWAY

Kine-Louise Nikoline Forsbakk Jacobsen, Julia Sundquist, Bo Wold Nilsen, Gro Eirin Holde; *University of Tromsø - UiT, Tromsø, Norway*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

ABSTRACT

Title: Orthodontic treatment need and occlusal characteristics among adolescents and young adults in northern Norway

Authors: Kine-Louise Nikoline Forsbakk Jacobsen[1], Julia Sundquist[1], Gro Eirin Holde[1], Bo Wold Nilsen[1] [1]UiT The Arctic University of Norway, Department of Clinical Dentistry, Tromsø, Norway

AIM: To estimate orthodontic treatment need and describe occlusal characteristics among adolescents and young adults in Troms County, Norway, and to compare these age groups in relation to previous orthodontic treatment.

MATERIALS AND METHOD: Data were obtained from the population-based Fit Futures study, including two age groups: Fit Futures 1 (FF1, n = 1,038; age 15–18) and Fit Futures 3 (FF3, n = 597; age 25–28). Dental examinations included digital models and photographs. Occlusal characteristics were recorded. Orthodontic treatment need was assessed using the Need for Orthodontic Treatment Index (NOTI). Associations with previous orthodontic treatment were tested using chi-square analysis ($p < 0.05$).

RESULTS: FF1 included 852 dental models and FF3 included 539, with questionnaire data available for 838 and 509 individuals, respectively. Among adolescents, 68.9% had little/no treatment need, 23.0% obvious need, and 8.1% great need. Among young adults, 58.3% had little/no need, 28.7% obvious need, and 13.0% great need. Previous orthodontic treatment was significantly associated with treatment-need category (FF1: $p < .001$; FF3: $p = .024$). Positive overjet was mostly mild (3–4 mm) in both age groups, regardless of treatment status; severe overjet (>7 mm) was rare (<4%). Ideal overbite was more frequent among young adults (39.8% in untreated; 57.7% in treated) compared to adolescents (31.5% in untreated; 50.2% in treated). Crowding was common among untreated participants (FF1: 72%; FF3:75%) but less frequent in those previously treated (FF1: 43%; FF3: 42%). Spacing and midline diastema were observed more often in adolescents than in young adults. Posterior crossbite affected approximately 20–27% in both treated and untreated groups in FF1 and FF3, while scissor bite remained uncommon (<4%).

CONCLUSIONS: Orthodontic treatment need and occlusal characteristics differ between adolescents and young adults. Previously treated individuals generally had less treatment need compared to those without prior treatment; however, cases with great treatment need persisted in adulthood.

Abstract citation ID: cjag070.429

SP502 EVALUATION THE ACCURACY OF ARTIFICIAL INTELLIGENCE IN ORTHOGNATHIC TREATMENT PLANNING

Tahara Hassanaly; *Paris, PARIS, France*

AIM: This study aims to evaluate the accuracy of artificial intelligence (AI) models in clinical decision-making for orthognathic surgery, with a particular focus on predicting skeletal movements and their association with soft-tissue outcomes.

MATERIAL: An electronic search was performed in PubMed, Google Scholar, and Cochrane databases to collect investigations on AI-based tools applied to orthognathic surgery planning. Eligible studies included AI models designed to support diagnosis, surgical decision-making, skeletal prediction, or soft-tissue simulation for patients undergoing orthognathic surgery. The exclusion criteria were studies using AI models for treatment planning without orthognathic surgery (extractions, camouflage treatments) or studies only using non-AI tools to predict treatment outcomes. The following keywords were used: *artificial intelligence, neural network, deep learning,* and *orthognathic surgery*.

RESULTS: Among the 540 studies identified, 5 were considered relevant. Hyuk-Il Choi *et al.* compared the clinician's diagnosis with the one produced by an artificial neural network (based on 12 cephalometric measurements and 6 additional indices), reporting a 96% success rate of the AI model in surgical decision-making. Sung Joo Cho *et al.* demonstrated that AI tools are efficient in predicting soft-tissue changes (from the inferior menton to the terminal point of the neck). Similarly, Jeffrey Roseth *et al.* reported that facial growth prediction is more accurate with AI models than with other approaches (such as partial least squares models), for both hard and soft tissues. On average, the AI tool showed a 0.61 mm lower prediction error than PLS.

CONCLUSION: AI is an accurate and predictable tool that helps with treatment planning prior to surgery. However, there is still a discrepancy between AI capabilities and clinical reality. A hybrid workflow that integrates both conventional techniques and AI-based tools is necessary.

Abstract citation ID: cjag070.430

SP503 A COMPARATIVE STUDY OF THE PSYCHOSOCIAL IMPACT OF DENTAL APPEARANCE IN FINNISH AND BRAZILIAN ADULTS BETWEEN 2020 AND 2024

Lucas Campos[1], Gil Guilherme Gasparello[2], Linnea Närhi[2], Anna-Sofia Silvola[2]; *[1]University of Eastern Finland, Kuopio, Finland, [2]University of Oulu, Oulu, Finland*

AIM: To assess changes in the psychosocial impact of dental appearance between 2020 and 2024 in Finnish and Brazilian adults, considering sex differences.

SUBJECTS AND METHOD: Two independent cross-sectional samples of adults (18–45 years) from Finland (2020: n=663, 80.4% female, mean age = 27.8 [SD=7.0]; 2024: n=579, 81.0% female, mean age=25.6 [SD=5.9]) and Brazil (2020: n=641, 76.4% female, mean age=27.4 [SD=7.1]; 2024: n=648, 71.6% female, mean age=27.0 [SD=7.2]) completed the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) online. The four PIDAQ dimensions (Dental Self-Confidence [DSC], Social Impact [SI], Psychological Impact [PI], and Aesthetic Concern [AC]) were scored on a 0 to 4 scale. Cross-country invariance measurement was not supported ($\Delta CFI = -0.03$); therefore, analyses were conducted separately by country. Two-way MANOVA (factors: year and sex) was used to compare PIDAQ scores.

RESULTS: No interaction between year and sex was found. In Finland, SI, PI, and AC scores were significantly higher in 2024 than in 2020, while DSC showed no difference (mean score [standard deviation] – SI: 0.6 [0.8] vs 0.4 [0.7], p=0.005, η_p^2=0.006; PI: 1.1 [1.0] vs 0.8 [0.8], p<0.001, η_p^2=0.010; AC: 0.9 [1.0] vs 0.6 [0.9], p=0.002, η_p^2=0.008; DSC: 1.8 [1.0] vs 2.0 [1.0], p=0.075). Finnish women reported higher SI and PI than men (SI: 0.5 [0.7] vs 0.4 [0.6], $p < 0.001$, η_p^2=0.006; PI: 1.0 [0.9] vs 0.7 [0.8], p=0.007, η_p^2=0.018). In Brazil, DSC increased in 2024 (2.2 [1.1] vs 2.0 [1.03], p=0.004, η_p^2=0.006), whereas SI, PI, and AC showed no significant changes (SI: 0.7 [0.8] vs 0.6 [0.8], p=0.120; PI: 1.0 [0.9] vs 1.0 [0.9], p=0.342; AC: 0.8 [1.0] vs 0.8 [1.0], p=0.948). No sex differences were observed for Brazilians.

CONCLUSIONS: Changes over time in PIDAQ scores were observed in both countries. Finland showed increased psychosocial impact and concern with dental appearance, whereas Brazil showed higher dental self-confidence. Effect sizes were small, reinforcing the need for follow-up studies to monitor potential trends. Persistent sex differences in Finland suggest continuing body pressure on women. Patient's subjective perception is a latent characteristic that may vary over time and should be systematically integrated into orthodontic treatment planning and research.

Abstract citation ID: cjag070.431

SP504 PRE-SURGICAL ORTHOPEDICS IN CLEFT LIP AND PALATE: A SCOPING REVIEW

Mariana McEvoy[1], Ana Catarina Machado[2], Anabela Baptista Paula[3], Inês Francisco[3], Francisco Vale[3]; *[1]Faculty of Medicine, University of Coimbra; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Coimbra, Portugal, [2]Faculty of Medicine, University of Coimbra, Coimbra, Portugal, [3]Faculty of Medicine, University of Coimbra; Institute of Orthodontics, Faculty of Medicine, University of Coimbra; Institute for Clinical and Biomedical Research, Faculty of Medicine, University of Coimbra; Environment, Genetics and Oncobiology Research Centre, University of Coimbra; Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra; Coimbra Academic Clinical Centre; Centre for Mechanical Engineering, Materials and Processes, University of Coimbra, Coimbra, Portugal*

AIM: Cleft lip and/or palate is a common craniofacial malformation with aesthetic, functional and psychosocial impacts. Treatment involves early surgery, and dentofacial orthopaedics is necessary to prevent jaw deformities caused by postoperative scar tissue. The purpose of this study was to map the pre-surgical dentofacial orthopaedic approaches reported in the literature for cleft lip and/or palate patients.

MATERIALS AND METHOD: A Scoping Review was conducted according to PRISMA-ScR guidelines, with protocol registration on OSF. A comprehensive search was performed in PubMed, Cochrane, Embase and Web of Science to identify clinical studies on presurgical orthopaedic interventions in infants with cleft lip and/or palate. Clinical studies describing the use of presurgical orthopaedic treatment in patients with cleft lip and/or palate were included. Two independent reviewers evaluated the articles and extracted the data, which were subsequently organized and presented in both narrative and meta-analytic formats.

RESULTS: The Scoping Review identified 207 studies fulfilling the inclusion criteria. As for the types of studies, most were clinical case reports, case series, and cohort studies, and most publications were published in The Cleft Palate-Craniofacial

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Journal. There has been an increase in the publication rate on this topic since 2012. Regarding the types of appliances used, Nasoalveolar Molding was the most frequently mentioned, followed by the Hotz and Latham plates. The evidence was heterogeneous, with reported benefits including approximation of alveolar segments, improved nasal aesthetics and facilitation of subsequent surgical procedures, while uncertainties remained regarding long-term maxillary growth effects. CONCLUSIONS: Despite heterogeneous methods, this Scoping Review shows that presurgical Nasoalveolar Molding therapy produces favourable short-term morphological changes, especially when started early, though well-controlled trials are needed to confirm long-term effects.

Abstract citation ID: cjag070.432
SP505 ASSESSMENT OF SMILE ATTRACTIVENESS IN PATIENTS WITH CLEFT LIP AND PALATE

Daniela Teixeira[1], Ana Santos[2], Catarina Nunes[3], Inês Francisco[3], Francisco Vale[3]; *[1]Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Coimbra, Portugal, [2]Faculty of Medicine, University of Coimbra, Coimbra, Portugal, [3]Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal; Institute for Clinical and Biomedical Research, Faculty of Medicine, University of Coimbra, Portugal; Environment, Genetics and Oncobiology Research Centre, University of Coimbra, Portugal; Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra, Portugal; Coimbra Academic Clinical Centre, Portugal; Centre for Mechanical Engineering, Materials and Processes, University of Coimbra, Coimbra, Portugal*

AIM: Facial attractiveness is influenced by the relative prominence of specific facial features, and interactions between individuals often highlight the mouth and eyes. This study aimed to evaluate the impact of orthodontic treatment on smile attractiveness in patients with cleft lip and palate, highlighting the role of the smile in perceived facial aesthetics.
MATERIALS AND METHOD: Patients with cleft lip and palate treated orthodontically at the Institute of Orthodontics of the Faculty of Medicine of the University of Coimbra were selected, and four standardized extra-oral photographs (smiling and at rest, pre- and post-treatment) were collected. Subsequently, individual facial elements were digitally isolated and compiled into standardized presentation slides. Nine lay evaluators assessed attractiveness using a Visual Analogue Scale across five separate sessions. Attractiveness scores for each facial feature were subjected to descriptive statistics analysis, mixed linear regression to determine the contribution of each facial element, Wilcoxon testing to assess pre–post treatment differences, and intraclass correlation coefficients for intra-observer agreement, all performed using IBM® SPSS® v28 with a significance level of 0.05.
RESULTS: Before orthodontic treatment, the skin was rated as the most attractive facial element, followed by the eyes, while the smile was considered the least attractive. After orthodontic treatment, the nose had the lowest mean score, and the smile exhibited the greatest improvement, increasing from a mean of 1.5 to 4.5 on the Visual Analogue Scale before and after treatment, respectively. Regression models identified the smile and skin as the strongest contributors to overall facial attractiveness.
CONCLUSIONS: In patients with cleft lip and palate who have not undergone orthodontic treatment, the smile is the least attractive facial feature. However, it demonstrates the greatest improvement following orthodontic treatment. These findings highlight the significant impact of orthodontic care on overall facial aesthetics in patients with cleft lip and palate.

Abstract citation ID: cjag070.433
SP506 COMPARISON OF TOOTH WIDTHS AND BOLTON RATIOS MEASURED ON PLASTER CASTS VERSUS DIGITAL MODELS: A PILOT STUDY

Melina Koukou, Nikolaos Kazanopoulos, Dimitrios Konstantonis, Dimitrios Vasileiou, Heleni Vastardis; *Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece*

AIM: The aim of this study was to assess the accuracy of tooth width measurements and the resulting Bolton ratios derived from digital casts analyzed with the Orthoanalyzer Software by 3Shape. These measurements were compared to those obtained from traditional plaster casts, which have been regarded as the gold standard in earlier research, utilizing a digital caliper.
MATERIALS AND METHOD: Plaster casts and digital models were obtained from 30 patients who met the inclusion criteria necessary for ensuring accurate measurements of tooth widths. These criteria included a full complement of teeth including the first molars, integrity of dental and periodontal tissues, and the absence of any dentofacial deformities or prior orthodontic treatment. The maximum mesiodistal dimensions of all teeth were measured on plaster casts using a digital caliper. For the digital models, these dimensions were calculated using the Orthoanalyzer software, which performs automatic segmentation of the teeth and computes their measurements. The agreement between Orthoanalyzer measurements and those obtained from plaster-cast calipers was quantified using the intraclass correlation coefficient with a two-way, absolute-agreement, single-measures specification (ICC(A,1)). This analysis also assessed intra- and inter-examiner errors. Statistically significant differences were determined using a paired t-test, with the significance level set at 0.05.
RESULTS: The Orthoanalyzer systematically overestimated mesiodistal tooth widths relative to the plaster-cast caliper reference (typically by 0.2 - 0.3 mm per tooth; larger on selected teeth). Because Bolton indices are ratios of sums, the upward shift tended to cancel between numerator and denominator, yielding small average differences (0.5 - 0.6 percentage points), yet only moderate overall agreement (ICC ≈ 0.6 - 0.7). In contrast, both intra-examiner and inter-examiner reliability for the caliper measurements were high (most ICCs > 0.9), indicating that the observed method disagreement stems primarily from the Orthoanalyzer workflow rather than measurement inconsistency of the reference (plaster-cast caliper).
CONCLUSIONS: The Orthoanalyzer software tends to systematically overestimate mesiodistal tooth widths, while the overestimation is less pronounced for Bolton ratios when compared to manual measurements obtained from plaster casts, which are considered the gold standard.

Abstract citation ID: cjag070.434
SP507 DIGITAL OCCLUSAL RECONSTRUCTION COMBINED WITH SEQUENTIAL CLEAR ALIGNER THERAPY FOR A COMPLEX SKELETAL CLASS II DIVISION 2 MALOCCLUSION WITH TMD AND SEVERE WEAR: A THREE-YEAR CASE REPORT

Yue Wang and Ying Chen; *Malo Clinic, Shanghai, China*

AIM: This case report aims to demonstrate a multidisciplinary strategy centered on a digital workflow, integrating electronic axiography, smile design, occlusal reconstruction, and clear aligner therapy, in the systematic management of a complex skeletal Class II division 2 malocclusion concurrently involving temporomandibular disorders (TMD), dental aesthetics, occlusal function, and periodontal health.
MATERIALS AND METHOD: An adult female was diagnosed with skeletal Class II, Angle Class II division 2 malocclusion, accompanied by TMD symptoms, severe full-arch wear, short roots, and periodontitis. Treatment proceeded in three phases: 1) Determining a therapeutic jaw position aimed at restoring the "ideal condylar position" based on electronic axiography data; 2) Conducting a virtual simulation for full-arch occlusal reconstruction integrated with digital smile design at this position; 3) Executing sequential clear aligner therapy with extraction of four first premolars according to the simulation, to precisely align the dentition, establish vertical dimension, and create space for final restorations.
RESULTS: Total active treatment time was 28 months, with a 3-year stability follow-up. TMD symptoms were completely resolved. CBCT revealed restored posterior condylar space and an average bone apposition of 0.97 mm at the condyles. Cephalometric analysis showed a 4.5 mm increase in lower anterior facial height and improved facial profile from concave to harmonious. Intraoral examination confirmed a stable, broad, functional occlusion with restored severe wear and stable periodontal condition. 3D model superimposition verified precise tooth movement from the therapeutic to the final occlusal position.
CONCLUSIONS: This case demonstrates that a digital workflow guided by the "ideal condylar position," integrating occlusal reconstruction, aesthetic design, and clear aligner mechanics, can successfully manage complex malocclusions involving multiple systems. This strategy enables precise, chain-controlled outcomes from joint stability and aesthetic enhancement to functional occlusion. The three-year stability offers an innovative protocol for multidisciplinary management of similar complex cases.

Abstract citation ID: cjag070.435
SP508 IMPACT OF MAXILLARY EXPANSION ON THE TEMPOROMANDIBULAR JOINT IN CHILDREN WITH CLEFT LIP AND PALATE

Ana Rodrigues[1], Catarina Oliveira[2], Catarina Nunes[2], Inês Francisco[2], Francisco Vale[2]; *[1]Faculty of Medicine, University of Coimbra; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Coimbra, Portugal, [2]Faculty of Medicine, University of Coimbra; Institute of Orthodontics, Faculty of Medicine, University of Coimbra; Institute for Clinical and Biomedical Research, Faculty of Medicine, University of Coimbra; Environment, Genetics and Oncobiology Research Centre, University of Coimbra; Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra; Coimbra Academic Clinical Centre; Centre for Mechanical Engineering, Materials and Processes, University of Coimbra, Coimbra, Portugal*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: Cleft lip and palate is frequently associated with posterior crossbite, a condition that may contribute to neuromuscular asymmetries and potential morphological adaptations of the mandibular condyles. This study investigated the effects of maxillary expansion on condylar position, angulation, and intercondylar distance in growing individuals with cleft lip and palate.
MATERIALS AND METHODS: Twenty-five growing individuals with cleft lip and palate who had undergone maxillary expansion were retrospectively included. Cone beam computed tomography scans obtained before (T0) and after expansion (T1) were analysed. Condylar position was assessed using the Pullinger and Hollender formula, while condylar angulation and intercondylar distance were quantified following standardized three-dimensional measurement protocols. Pre–post differences were evaluated with paired Student's t-tests, and the Benjamini–Hochberg procedure was applied to adjust for multiple comparisons. Agreement between timepoints was assessed using the iota coefficient.
RESULTS: Following maxillary expansion in children with cleft lip and palate, condylar angles and positions showed minor changes across sagittal, frontal, and axial planes, with movements of the right condyle posteroinferiorly and the left condyle anteroinferiorly. Condylar angles became more homogeneous in the sagittal plane, and a slight medial rotation was observed in the axial plane. Intercondylar distance significantly increased ($p<0.001$). Overall, condylar positions remained largely stable, with high agreement between measurements (kappa = 0.885).
CONCLUSION: In growing individuals with cleft lip and palate, maxillary expansion does not appear to induce significant changes in condylar position or angulation. Although the resulting occlusal and skeletal modifications may promote more physiologic neuromuscular function, no adaptive remodelling was observed in the temporomandibular joint.

Abstract citation ID: cjag070.436
SP511 DIGITAL EVALUATION OF THE EFFECTS OF COMBINED ORTHODONTIC-ORTHOGNATHIC TREATMENT ON MANDIBULAR FUNCTION IN PATIENTS WITH SKELETAL CLASS III MALOCCLUSION

Norbert Lang, Franziska Lang, Claudia Mertes, Rogerio Bastos Craveiro, Michael Wolf; *University Hospital RWTH Aachen, Aachen, Germany*

AIM: Combined orthodontic-orthognathic intervention is the preferred approach for treating severe skeletal anomalies and initiating functional rehabilitation. The objective of this study is to quantify changes in mandibular movement in surgical patients using digital three-dimensional jaw registration.
MATERIALS AND METHOD: The study included 21 patients with skeletal Class III malocclusion who underwent mono- or bimaxillary surgery. Measurements were taken after orthodontic decompensation and at the following defined postoperative time points: T1 (2–3 weeks), T2 (6 weeks), T3 (3–4 months), T4 (6–9 months) and T5 (12–15 months), in accordance with a specific treatment and rehabilitation protocol. Movement analysis was performed using the zebris JMA Optic digital three-dimensional jaw registration system. The maximum ranges of motion for mouth opening, protrusion, and laterotrusion were recorded and compared with those of a non-intervention control group.
RESULTS: Maximum mouth opening fully recovered to preoperative levels during the retention phase but remained reduced compared to the control group. Protrusion and laterotrusion, on the other hand, were significantly above baseline values and largely similar to the control values. Condylar stability and occlusal stability improved postoperatively.
CONCLUSIONS: Digital measurements have proven to be an accurate and reproducible method of objective evaluation. Initially, combined orthodontic–orthognathic treatment according to a specific protocol induces hypomobility, followed by functional recovery that exceeds the initial level. This process potentially reflects complex long-term adaptations which can be influenced by appropriate therapy. Early, targeted rehabilitation and long-term orthodontic retention should be used to support the postoperative phase.

Abstract citation ID: cjag070.437
SP512 PHOTOGRAPH AND CT DRIVEN REALISTIC 3D FACIAL RECONSTRUCTION FOR ORTHOGNATHIC PLANNING

Mariana Santos[1], Miguel Monteiro[2], Francisco Caramelo[3], Inês Francisco[4], Francisco Vale[4]; *[1]Faculty of Medicine, University of Coimbra; Institute of Orthodontics, Faculty of Medicine, Coimbra, Portugal, [2]Faculty of Sciences and Technology, University of Coimbra, Coimbra, Portugal, [3]Coimbra Institute for Clinical and Biomedical Research, Area of Environment Genetics and Oncobiology, Faculty of Medicine; Laboratory for Evidence-Based Sciences and Precision Dentistry; Centre for Innovative Biomedicine and Biotechnology; Clinical Academic Center of Coimbra; Institute of Integrated Clinical Practice, Faculty of Medicine; Laboratory of Biostatistics and Medical Informatics, Faculty of Medicine, Coimbra, Portugal, [4]Faculty of Medicine, University of Coimbra; Institute of Orthodontics, Faculty of Medicine; Institute for Clinical and Biomedical Research, Faculty of Medicine; Environment, Genetics and Oncobiology Research Centre; Laboratory of Evidence-Based and Precision Dentistry; Coimbra Academic Clinical Centre; Centre for Mechanical Engineering, Materials and Processes, Coimbra, Portugal*

AIM: Develop and evaluate a co-registration method that integrates CBCT data with 2D facial photographs to generate realistic three-dimensional facial reconstruction to use in orthognathic surgical planning.
MATERIALS AND METHOD: CBCT scans were acquired, 3D-rendered, and processed to segment soft tissues and isolate the external cranial surface. The CBCT volumes were further processed in MATLAB, including skin segmentation, 3D smoothing, and the generation of cinematic animations. A frontal 2D facial photograph of each subject was collected. These photographs were processed using facial-recognition algorithms, with extraction of 68 fiducial points and Delaunay triangulation to enable 2D–3D fusion through face-swapping and colorimetric mapping. A co-registration procedure was then performed to align the segmented CBCT-derived surface with the corresponding 2D facial photograph. Using this mapping, a photorealistic 3D facial model was generated that replicated the subject's facial features. To evaluate the quality and realism of the reconstructed models, seven orthodontists completed a structured survey assessing their perceptions of the 3D outputs.
RESULTS: The co-registration procedure successfully generated photorealistic three-dimensional facial models from CBCT data and frontal photographs. All seven orthodontists who evaluated the reconstructions reported that the resulting 3D models were realistic and of high quality. Survey responses indicated that the method effectively reproduced facial soft-tissue characteristics and offered clear potential for improving the predictability of orthognathic surgical planning.
CONCLUSION: The proposed co-registration method effectively integrates CBCT-derived craniofacial surfaces with 2D facial photographs to produce photorealistic three-dimensional facial reconstructions. Expert evaluations by orthodontists confirmed the high quality and clinical plausibility of the generated models, highlighting the method's potential to improve the accuracy and predictability of orthognathic surgical planning.

Abstract citation ID: cjag070.438
SP513 THE EFFECT OF ORTHODONTIC ANOMALIES ON THE MASTICATORY PERFORMANCE IN ADOLESCENTS IN NORTHEAST GERMANY; A CROSS-SECTIONAL EPIDEMIOLOGICAL ANALYSIS

Mhd Said Mourad[1], Christiane Pink[2], Karl-Friedrich Krey[3], Christian Splieth[4], Ahmad Al Masri[1]; *[1]Department of Orthodontics, Department of Pediatric Dentistry, University Medicine Greifswald, Greifswald, Germany, [2]Department of Restorative Dentistry, Periodontology and Endodontology, University Medicine Greifswald,, Greifswald, Germany, [3]Department of Orthodontics, University Medicine Greifswald, Greifswald, Germany, [4]Department of Pediatric Dentistry, University Medicine Greifswald, Greifswald, Germany*

AIM: Proper mastication is an integral characteristic of a well-functioning dentition. This study investigated the effect of orthodontic anomalies on the masticatory performance (MP) of adolescents.
MATERIALS AND METHODS: Cross-sectional data were collected from 2021–2023 during compulsory school dental examinations in Greifswald, Germany (ethical approval: BB 129/20). Orthodontic status was assessed by one of two calibrated examiners using a dental mirror and overbite ruler. Data were entered directly into Excel and exported to Stata. To minimize selection bias, adolescents with parental consent but without fixed appliances were allocated to the MP test via a randomization list recruiting 50% of the sample. MP was measured using the two-color chewing gum test (Hue-Check-Gum®) and digitally evaluated (ViewGum®, VOH 0–1 with 0 being the optimal color mixing). Regression coefficients with 95% confidence intervals were derived from adjusted multilevel models, and predictor relevance was quantified using the Wald χ^2 statistic minus its degrees of freedom.
RESULTS: A total of 5,888 adolescents (48.6% females) aged between 10-18 years had a dental and orthodontic examination (mean age 14.5 ±2). Among them, 1338 had consent for the MP test (13.9 ±1.9 years, 49.5% females). 34.1% of the study sample had an orthodontic anomaly and treatment need according to the German health insurance system (KIG≥3). The mean score of the VOH was 0.27 ±0.14. Regression analyses showed that having at least one orthodontic anomaly (KIG ≥ 3) was associated with reduced MP (B = 0.03; 95% CI: 0.01–0.04). Among specific anomalies, open bite had the strongest effect (B = 0.08; 95% CI: 0.03–0.14). Weaker associations were observed for buccal/lingual non-occlusion (0.04; 95% CI: 0.00–0.07), anterior spacing (0.03; 95% CI: 0.00–0.05), and posterior spacing (0.07; 95% CI: 0.00–0.13).

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

CONCLUSION: This cross-sectional epidemiological study confirms that orthodontic anomalies have a negative effect on MP reflected by poor mixing of the two-color chewing gums. Prospective longitudinal studies are recommended to confirm the beneficial effects of the orthodontic treatment on MP.
FUNDING: This study is part of the EFAFU project, which was funded by the German Federal Joint Committee (G-BA; 01VSF19047).

Abstract citation ID: cjag070.439
SP514 PATIENTS' UNDERSTANDING OF THE IMPORTANCE OF RETENTION IN HYPODONTIA. INTRODUCING A NEW 'RETENTION IN HYPODONTIA' PATIENT INFORMATION LEAFLET

Divya Pathak, Noreen Shaban, Priti Acharya; *Royal National ENT and Eastman Dental Hospitals, University College London Hospitals NHS Trust, London, United Kingdom*

AIM: To evaluate hypodontia patients' understanding of retention, introduce a retention-focused patient information leaflet (PIL), and assess its impact.
MATERIALS: Design: Quality Improvement Project (QIP) with two Plan-Do-Study-Act (PDSA) cycles, carried out at Eastman Dental Hospital in the United Kingdom. Based on previous research on patient information recall, a local standard was set that 90% of patients should understand the duration of retainer wear, retention regime before and after restorative treatment, consequences of poor compliance and actions required if retainers are lost or damaged during care or after discharge. A ten-item paper survey assessing these domains was developed, piloted, revised and distributed to 10 hypodontia patients who had completed active orthodontic treatment and were planned for prosthetic restoration of spaces (cycle 1). A patient information leaflet 'Retainers when you have Missing Teeth' was developed with a Flesch Reading Ease score of 90% and piloted with 5 orthodontic/restorative consultants and 3 hypodontia patients. The final leaflet was distributed to 10 hypodontia patients with a survey to evaluate the leaflet's effect (cycle 2).
RESULTS: Twenty patients completed the survey, 10 per cycle. In cycle 1, understanding of retention was substandard. Only 80% (n=8) were aware that retention is lifelong. Consequences of not complying with retainer wear pre-restorative treatment was not well understood with 20% (n=2) unaware that it may affect provision of restorative care. Understanding of post-restorative treatment retention was poor as 20% (n=2) were unaware that failure to wear retainers may lead to teeth moving, 30% (n=3) were unaware that spaces may open and 40% (n=4) failed to understand it could affect prosthetic teeth. 30% (n=3) incorrectly thought that if braces were needed following relapse, it would be offered at the hospital. Implementation of the patient information leaflet improved patient understanding to 100% (n=10) in all domains assessed. Most patients (85%, n=17) reported that a hypodontia-specific leaflet was useful, and their preferred format was email (70%, n=14).
CONCLUSIONS: Implementation of a patient information leaflet specific to retention in Hypodontia is effective in improving patient understanding of retention and can be a valuable tool in improving patient information recall.

Abstract citation ID: cjag070.440
SP516 EVALUATION OF THE RELATIONSHIP BETWEEN GINGIVAL PHENOTYPE AND DIFFERENT MALOCCLUSIONS AND VERTICAL GROWTH PATTERNS

Melisa Alkan Yaman, Dilara Kahraman, Nejat Erverdi; *Okan University, İstanbul, Turkey*

AIM: The aim of this study was to evaluate how gingival phenotype relates to sagittal malocclusions and vertical growth patterns, using standardized clinical measurements. Understanding how craniofacial morphology relates to gingival phenotype is clinically important in orthodontics, as thin gingival phenotypes are more prone to recession and reduced periodontal stability during and after tooth movement.
MATERIALS AND METHODS: This retrospective study included 53 systemically healthy individuals (39 female, 14 male, mean age 17.26 ± 5.73 years) with fully erupted maxillary and mandibular incisors and canines and no history of orthodontic treatment. Gingival phenotype was recorded for 636 teeth using the Colorvue Biotype probe by assessing the midpoint of the labial surface of each anterior tooth. Sagittal skeletal classification (Class I, II, III) was determined using lateral cephalometric measurements (ANB, maxillary depth, wits appraisal), while vertical growth patterns (Normal, low-angle, high-angle) were assessed using GoMe-SN and the sum of posterior angles. Statistical analyses included One-way ANOVA, Tukey HSD, chi-square tests, and Fisher-Freeman-Halton tests with significance set at $p<0.05$.
RESULTS: There was a significant difference in the distribution of gingival phenotypes among sagittal skeletal classes, particularly in the maxillary canines. Individuals with Class II malocclusion had a significantly higher prevalence of thin gingival phenotype (73.1%) compared with Class I (47.2%) and Class III (44.4%) (p=0.025). Gingival phenotype also differed significantly across vertical growth patterns (p=0.011), with normal (17.1%) and low-angle (17.7%) individuals showing a higher prevalence of thick phenotype than high-angle individuals (7.4%). Females exhibited a significantly higher prevalence of thin gingival phenotype compared to males (p=0.002).
CONCLUSIONS: Gingival phenotype shows significant variation across both sagittal and vertical craniofacial patterns, with Class II and high-angle individuals demonstrating greater susceptibility to thin gingival phenotype. These findings emphasize the importance of incorporating phenotype assessment into orthodontic diagnosis to support individualized treatment planning.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.441
SP517 THREE-DIMENSIONAL CHANGES IN NEWBORNS WITH CLEFT LIP/PALATE UNDERGOING NASOALVEOLAR MOLDING

João Matos[1], Ana Catarina Machado[2], Catarina Oliveira[1], Inês Francisco[3], Francisco Vale[3]; *[1]Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal, Coimbra, Portugal, [2]Faculty of Medicine, University of Coimbra, Portugal, Coimbra, Portugal, [3]Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal; Institute for Clinical and Biomedical Research, Faculty of Medicine, University of Coimbra, Portugal; Environment, Genetics and Oncobiology Research Centre, University of Coimbra, Portugal; Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra, Portugal; Coimbra Academic Clinical Centre, Portugal; Centre for Mechanical Engineering, Materials and Processes, University of Coimbra, Portugal, Coimbra, Portugal*

AIM: Cleft lip and/or palate is a common craniofacial malformation, and early surgical treatment can lead to the formation of scar tissue that contributes to maxillary deformities. To minimize these effects and modulate soft, skeletal, and cartilaginous tissues before cheiloplasty, palatoplasty, and rhinoplasty, pre-surgical dentofacial orthopedics performed within the first weeks of life has been proposed as a complementary intervention. This study aimed to critically analyze and describe the institutional clinical protocol applied in these cases.
MATERIALS AND METHOD: This retrospective clinical study, approved by the Ethics Committee (CE-063/2023), included five newborns with cleft lip and/or palate (1 female, 4 male) treated with pre-surgical dentofacial orthopedics using a nasoalveolar mold at the Institute of Orthodontics of the Faculty of Medicine, University of Coimbra. Intraoral scans were obtained between the 13th and 15th day of life, and the devices were secured with Steri-Strips and orthodontic elastics and monitored weekly until the patients underwent cheiloplasty at 3 months of age. The intraoral models were scanned before (T0) and after (T1) the pre-surgical dentofacial orthopedic intervention using a Carestream CS 3600 scanner. The morphological changes induced by the nasoalveolar mold, were evaluated in MeshLab using linear and angular measurements based on the anatomical landmarks defined in the studies by *Stöckli*, *Mazaheri* et al and *Nalabothu et al*.
RESULTS: The nasoalveolar molding successfully brought the alveolar segments closer in all patients, resulting in decreased GA–LA distances in unilateral clefts and improved symmetry in bilateral cases. Angular measurements indicated alterations in the spatial positioning of the maxillary segments, providing complementary information to the linear data. The varied responses observed highlight the complex morphology of the clefts and the interplay between premaxillary retraction, rotation, and growth.
CONCLUSIONS: The nasoalveolar mold promoted favorable morphological changes, namely, retraction of the premaxilla, centralization of the midline, and modulation of the nasal cartilages, reducing the need for secondary surgeries and contributing to better aesthetic, functional, and psychosocial development.

Abstract citation ID: cjag070.442
SP518 GINGIVAL RECESSION ASSESSMENT OF TWO LINGUALLY BONDED RETAINERS IN THE MANDIBULAR ANTERIOR TEETH- A 24-MONTH RETROSPECTIVE RANDOMIZED CONTROLLED TRIAL ANALYSIS

ABDULRAHMAN ALSHEHRI, BASIL KASSIR, ASHRAF AL-SAADI, NIELS GANZER, AGNETA KARSTEN; *Karolinska Institute, Stockholm, Sweden*

AIM: To compare whether two different bonded retainer materials differ in their influence on gingival recession (GR). Secondary factors, like patient age, sex, extraction therapy, and lower incisor inclination, were examined to assess their association with GR following orthodontic treatment.
MATERIALS AND METHODS: Eighty patients were randomly assigned to receive either a gold chain retainer (GCR) or a multistranded stainless-steel retainer

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

(MSSR). This retrospective, single-center and two-arm, parallel-group randomized controlled trial, evaluated GR associated with two different bonded retainers.

Digital cast analysis was conducted using the OnyxCeph® program for the changes in gingival levels of the lower anterior teeth from retainers bonding (T_0) till two years later (T_{24}). Secondary outcomes included the influence of demographic and treatment-related factors on GR. Lateral cephalograms were traced for mandibular incisor inclination at T_0 as a potential cofounder.

The Shapiro-Wilk test and histograms were used to evaluate normality. Levene's test measured variance homogeneity. Since the variables showed non-normal distributions and homogeneity of variance, the Mann-Whitney-U test was used to compare group differences.

RESULTS: Gingival level changes between T_0 and T_{24} revealed a low degree of GR between 0.2 mm and 1.5 mm for the GCR group and 0.1 mm and 1.0 mm for the MSSR group. Canines showed the highest amount of GR while the lateral incisors showed the least. However, there were no statistically significant differences between the two retainers' groups regarding the GR. Lower incisor inclination demonstrated a statistically significant association with GR in both groups ($p < 0.05$); proclination at T_0 beyond 100° was linked to an increased GR at T_{24}.

CONCLUSION: Both retainer materials provided comparable gingival levels during the first two years of retention with the highest recession in the mandibular canines and the lowest for the mandibular laterals. Nevertheless, excessive incisor proclination emerged as a relevant risk factor for GR across both groups. This study will be extended for up to five years to thoroughly examine long-term factors affecting GR in these two retainer groups.

Abstract citation ID: cjag070.443
SP519 APPROPRIATE CASE SELECTION FOR DENTAL AUTOTRANSPLANTATION

Caroline and Rosalind McElroy and Garner and Rosalind Garner; *William Harvey Hospital, Kent, United Kingdom*

AIM: To provide an overview of the indications and contraindications for dental autotransplantation. To present two cases of dental autotransplantation carried out at EKHUFT to illustrate the importance of case selection.

METHODS: a literature review was conducted to guide this overview of case selection. Case notes and radiographs of two cases of dental autotransplantation have been reviewed to gather information to explore how the patient motivation, medical history, donor tooth selection (including restorative and endodontic status), quality of the recipient site, orthodontic factors and surgical considerations can all influence the success of a case.

RESULTS: Dental autotransplantation has a high success rate and can provide a good management solution for poor prognosis teeth or hypodontia. However, appropriate case selection is imperative to the success of the cases. Dental autotransplantation is lengthy treatment for a patient and clinician to commit to and therefore patient motivation is at the heart of the success of autotransplantation cases. Patient motivation is fluid and challenging to measure; however, in its most rudimentary form may be illustrated through oral hygiene and continuation of treatment. We will explore the importance of the consent process to inform patient expectations for this lengthy treatment. Dental autotransplantation cases are largely carried out under general anaesthesia, and therefore, appropriate medical history plays a large role in case selection. Clinically, more favourable outcomes are noted when a donor transplant tooth has been chosen that facilitates atraumatic extraction and is between half to two two-thirds root development. We will explore how timing and waiting lists can present a challenge in such cases when success is dependent on providing treatment within an 'optimum' time window. A succinct outline of the properties of an 'ideal donor tooth' will be presented to aid case selection.

CONCLUSIONS: Case selection in dental autotransplantation cases is of utmost importance. The factors involved in case selection are wide-ranging from non-clinical factors such as patient motivation to factors that can be assessed on clinical examination. This presentation will provide a brief overview of the indications and contraindications illustrated by patient cases.

Abstract citation ID: cjag070.444
SP521 THREE-DIMENSIONAL ANALYSIS OF DENTAL ARCH FORM IN AN ADULT ORTHODONTIC POPULATION

Iro Eleftheriadi[1], Alexandros Papagiannis[2], Argyris N. Stassinakis[3], Christos Rahiotis[4], Iosif Sifakakis[1]; *[1]Department of Orthodontics, NKUA School of Dentistry, Athens, Greece, [2]Department of Orthodontics, NKUA School of Dentistry, Athens, Greece \ Department of Oral and Maxillofacial Diseases, University of Helsinki, Helsinki, Finland, [3]Hellenic Naval Academy, Athens, Greece, [4]Department of Operative Dentistry, NKUA School of Dentistry, Athens, Greece*

AIM: To compare three-dimensional dental arch shape characteristics in adults with Angle Class I versus Class II malocclusions using geometric morphometrics.

MATERIALS AND METHODS: Digital dental models from 200 untreated white adults (77 males, 123 females; mean age 24.9 ± 7.6 years) with permanent dentition and Angle Class I or II malocclusions were analyzed. For the morphometric analysis, 22 maxillary and 24 mandibular landmarks were digitized per model. Three-dimensional geometric morphometric analysis was applied, i.e., Generalized Procrustes superimposition and Principal Component Analysis, in order to obtain Procrustes shape coordinates and describe patterns of shape variability. Group shape differences were evaluated using permutation tests without replacement (10,000 iterations), and multivariate regression tested associations among arch shape with age and sex.

RESULTS: Significant shape differences were identified between Class I and Class II subjects in both arches (P=0.0011 for maxilla and P=0.0003 for mandible, 10000 permutations). Class I subjects exhibited a more labial position of maxillary incisors, greater mandibular intercanine width, and increased mandibular arch perimeter. In the maxilla, 6 Principal Components for Class I and 5 for Class II explained 65.9% and 71.9% of total variance, respectively. In the mandible, 6 PCs for Class I and 5 for Class II explained 62.4% and 57.9% of variance, respectively. Regarding sexual dimorphism, no statistically significant difference was observed in the shape of either the maxillary or mandibular dental arche in either subgroup (Class I maxilla: P=0.13, mandible P=0.20; Class II maxilla: P=0.86, mandible P=0.24). Age-shape correlation indicated no statistically significant findings for either subgroup (Class I: maxilla P = 0.68, mandible P = 0.53; Class II: maxilla P = 0.19, mandible P = 0.15).

CONCLUSIONS: Distinct shape differences in three-dimensional dental arch morphology were demonstrated between Angle Class I and Class II adult orthodontic patients. Geometric morphometrics provide precise and clinically relevant characterization of dental arch form.

Abstract citation ID: cjag070.445
SP522 ‡‡‡ CHANGES IN IOTN SCORES DURING WAITING LIST PERIODS

Cormac Cotter and Rhian Fitzgerald; *University College Cork, Cork, Ireland*

AIM: To determine how often and why IOTN scores change during waiting periods and how this affects patient eligibility for state funded orthodontic treatment. To identify if there is a need for reassessment protocols to ensure continued compliance with HSE (Health Service Executive) eligibility criteria before treatment commences.

MATERIALS AND METHOD: A retrospective clinical audit was conducted in Cork University Dental School and Hospital, reviewing the records of 100 consecutive patients assessed between 12/09/24-28/01/25. The gold standard was that 100% of patients met HSE eligability criteria when placed on the waiting list and when treatment began.

All patients had been seen by a specialist orthodontist and deemed eligible for HSE-funded treatment based on their initial IOTN score, and placed on a treatment waiting list. At the study time, these patients had reached the top of the waiting list and were seen in anticipation of commencing treatment. Updated IOTN Dental Health and Aesthetic Component scores were recorded. The initial and current scores were compared. All scoring clinicians had recently been calibrated in IOTN.

RESULTS: 100 consecutive patients were assessed. Average age at initial assessment was 11.3 years with treatment typically beginning approximately 4 years later at an average age of 15.1 years. 96% of patients were eligible for treatment at initial assessment, only 56% remained eligible at treatment start. Grade 5i showed the greatest variability: 24% of patients were initially classified as a 5i, this reduced to 11% at treatment start. Of those initially classified as a 5i, 67% had a different classification and 54% no longer qualified for treatment at treatment start. Similarly amongst patients initially graded as a 5a, 41% were reclassified to a 4a, reflecting improvements in overjet over the period.

CONCLUSIONS: Notable changes were revealed in IOTN classification between initial assessment and commencement of treatment. 42% of patients initally eligible no longer met the HSE treatment criteria, highlighting the dynamic nature of malocclusion. We plan to introduce interim reviews for patients, particularly those in high risk categories, i.e. 5i, to reassess treatment need, improve prioritization and ensure resources are directed to patients with the greatest treatment need.

Abstract citation ID: cjag070.446
SP523 MAXILLARY MIDPALATAL SUTURE MATURATION IN SYNDROMIC CRANIOSYNOSTOSIS: A RETROSPECTIVE COMPARATIVE PILOT STUDY

Özden Sırmacı[1], Can Arslan[1], Memet Özek[2], Derya Germeç Çakan[1]; *[1]Yeditepe University, Faculty of Dentistry, Department of Orthodontics, İstanbul, Turkey, [2]Acıbadem University, School of Medicine, Department of Surgical Sciences, Neurosurgery, İstanbul, Turkey*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: To evaluate maxillary midpalatal suture (MPS) maturation stages in patients with syndromic craniosynostosis and compare them with age- and sex-matched non-syndromic individuals.
MATERIALS AND METHODS: The cone beam computed tomography (CBCT) scans of 10 patients affected by syndromic craniofacial synostosis (5 patients with Apert syndrome, 3 patients with Pfeiffer syndrome, 1 patient with Crouzon syndrome, and 1 patient with Loeys-Dietz syndrome), with an average age of 11.77 ± 1.50 years (age range 10.0 to 14.4 years), were compared to CBCTs of 10 age- and sex-matched patients without any syndromes with an average age of 12.21 ± 1.89 years (age range 10.0 to 14.8 years). CBCT scans had been performed prior to maxillary expansion treatment. Midpalatal suture maturation stages were assessed using the Angelieri classification (Stages A-E) and evaluated by three calibrated orthodontists, independently. Maturational stages between syndromic and non-syndromic patients were compared with Mann-Whitney U test. Cohen's d effect size was calculated, and post-hoc power analysis was performed.
RESULTS: The groups were comparable in age ($p = 0.578$) and sex distribution (5 female/5 male in each group, $p = 1.000$). The syndromic group showed significantly more advanced MPS maturation (mean ± SD: 4.00 ± 0.47) compared to the non-syndromic group (2.80 ± 0.63) ($p < 0.001$). The effect size was large (Cohen's $d = 2.15$), with an observed power of 99.5%. In the syndromic group, 90% of patients showed closed or fused sutures (Stage D-E), whereas only 10% of control patients showed closed sutures. No syndromic patient demonstrated open sutures (Stage A-B), while 30% of controls had open sutures. The sex factor showed no significant difference.
CONCLUSION: Based on the differences in MPS maturation, syndromic craniosynostosis patients demonstrated significantly earlier midpalatal suture ossification compared to non-syndromic individuals. Care should be taken when planning maxillary orthopedics, such as rapid maxillary expansion, given the high frequency of early MPS fusion in these patients. CBCT evaluation of MPS is recommended before orthopedic treatment, and surgically assisted expansion may be necessary even in younger syndromic patients.

Abstract citation ID: cjag070.447
SP524 MAGNETIC RESONANCE IMAGING - BASED LONGITUDINAL ANALYSIS OF CRANIOFACIAL GROWTH IN 6- AND 12-YEAR-OLD PATIENTS WITH NEUROFIBROMATOSIS TYPE 1

Louis Hartmann[1], Mike Schneider[1], Barbara Novotna[2], Maja von der Hagen[2], Theodosia Bartzela[1]; *[1]Department of Orthodontics, Faculty of Medicine and University Hospital Carl Gustav Carus, Technische Universität Dresden, Dresden, Germany, [2]Division of Neuropediatrics, Faculty of Medicine and University Hospital Carl Gustav Carus, Technische Universität Dresden, Dresden, Germany*

AIM: This study aims to characterise craniofacial growth in patients with neurofibromatosis type 1 (NF1) aged 6-12 years using MRI-reconstructed cephalometry. It quantifies age-related transverse and sagittal growth changes and evaluates plexiform neurofibroma-related alterations or asymmetrical deviations from normative growth patterns that occur during this developmental period.
MATERIALS AND METHODS: Paired MRI scans from patients (9 male, 10 female) with NF1 were retrospectively analysed at ages 6 and 12 years. Three-dimensional datasets acquired with a 1.5-T scanner were used to digitise 30 cephalometric landmarks. Landmark identification was performed manually. Standardised lateral and posteroanterior cephalograms were reconstructed, and predefined linear and angular measurements were extracted. Growth changes between the two time points were assessed with paired t-tests ($p < 0.05$).
RESULTS: In the anteroposterior reconstructions, significant transverse growth occurred in inter-frontozygomatic distance (+6.06 mm), nasal cavity (+3.81 mm), and zygomatic width (+6.98 mm); all $p<0.05$. Lateral cephalograms showed significant increases in cranial base length (S-Ar), maxillary length (CoA), and mandibular ramus height (Ar-Go). Small but significant angular changes were observed in the SNA (−0.1°), SNB (+2.48°), NSL-NL (+1.46°), and NSBa (-0.08°) angles ($p<0.05$). A mild clockwise rotation of the zygomatic plane relative to the Frankfurt horizontal was also observed ($p<0.05$). Asymmetry progression was not statistically significant between the two time points.
CONCLUSIONS: Between 6 and 12 years of age, children with NF1 show predominantly age-appropriate transverse and sagittal craniofacial growth, with only mild asymmetries. The small angular changes in SNA and NSBa indicate stable maxillary position and cranial base flexure during this developmental period. These findings may support more accurate growth monitoring and orthodontic treatment planning in children with NF1. MRI-based cephalometry represents a reliable, radiation-free modality for longitudinal growth assessment and may help early detection of subtle asymmetrical or plexiform changes in this population.
Disclosure of interest: None declared.

Abstract citation ID: cjag070.448
SP525 REVERSAL OF MICROGRAVITY-INDUCED OSTEOBLAST SUPPRESSION ON TITANIUM BY B2-ADRENERGIC INHIBITION

TAKUMA SATO[1], Koki Hirano[2], Yoshihiko Sugita[3], Ken Miyazawa[2], Takahiro Ogawa[1]; *[1]Division of Regenerative and Reconstructive Sciences and Weintraub Center, School of Dentistry, University of California Los Angeles, Los Angeles, United States, [2]Department of Orthodontics, School of Dentistry, Aichi Gakuin University, Nagoya, Japan, [3]Department of Oral Pathology, School of Dentistry, Aichi Gakuin University, Nagoya, Japan*

AIM: Osteoblasts surrounding orthodontic anchor screws are continuously exposed to mechanical loading, and changes in this environment may influence peri-implant bone tissue and affect long-term implant stability. When mechanical loading is markedly reduced, such as in microgravity, cellular mechanotransduction may be altered and mechanically responsive signaling may be disrupted, leading to reduced osteoblast activity. Sympathetic β_2-adrenergic signaling also contributes to bone remodeling and is known to regulate osteoblast function, but its role under conditions of diminished mechanical stimulation has not been fully elucidated. Because the stability of orthodontic anchor screws relies heavily on the surrounding bone, clarifying the interaction between reduced mechanical loading and sympathetic signaling is clinically important. This study investigated whether selective β_2-adrenergic receptor blockade with butoxamine (BTX) can restore microgravity-induced suppression of osteoblast proliferation and differentiation on titanium surfaces, which represent a clinically relevant substrate.
MATERIALS AND METHOD: Rat bone-marrow–derived osteoblasts were cultured on titanium plates under either normal gravity or simulated microgravity (0.001 G) generated using a clinostat system. BTX was added to selectively inhibit β_2-adrenergic signaling. Cell proliferation was measured using a WST-1 assay, and osteoblast differentiation was evaluated by alkaline phosphatase (ALP) activity.
RESULTS: Simulated microgravity markedly reduced osteoblast proliferation and ALP activity on titanium surfaces, indicating impaired early-stage differentiation. BTX treatment effectively reversed these inhibitory effects. Under microgravity, BTX-treated cells exhibited proliferation and ALP levels close to those observed under normal gravity. These results demonstrate that β_2-adrenergic blockade can restore osteoblast proliferation and differentiation under microgravity conditions.
CONCLUSIONS: Selective β_2-adrenergic receptor inhibition attenuates microgravity-induced reductions in osteoblast proliferation and differentiation on titanium. These findings reveal an important interaction between sympathetic signaling and gravitational loading in regulating osteoblast behavior and suggest that targeting the β_2-adrenergic pathway may provide a new strategy for preserving peri-implant bone integrity when mechanical loading is compromised.

Abstract citation ID: cjag070.449
SP526 ACCURACY OF TRANSVERSE CHANGES IN PATIENTS TREATED WITH MONOLAYER VS. MULTILAYER CLEAR ALIGNERS: A RETROSPECTIVE CLINICAL COHORT STUDY

Carmine Ruggiero, Giorgio Oliva, Paola Iodice, Rosa Valletta, Vincenzo D'Antò; *University Federico II, Naples, Italy*

AIM: The aim of this study is to compare the accuracy of transverse expansion between a multilayer copolyester–thermoplastic elastomer (TPE) aligner material and a monolayer PETG foil.
MATERIALS AND METHOD: 92 adult non-extraction cases were treated with clear aligners made from TPE (46 patients; 90 models: 46 maxillary, 44 mandibular) or PETG foil (46 patients; 78 models: 40 maxillary, 38 mandibular), following the same protocol. STL models at T0 (baseline), T1 (virtual plan), and T2 (end of first series, 8.8 ± 2.2 months) were superimposed. Nine transverse variables were measured at gingival and cusp levels using point to point distance. Group homogeneity and between-material differences in accuracy were tested using Mann–Whitney U test and Benjamini–Hochberg correction ($\alpha = 0.05$).
RESULTS: Prescribed movements were comparable between groups (adjusted $p > 0.05$). No significant differences in accuracy were found between TPE and PETG foil (adjusted $p > 0.05$). Accuracy, defined as (T2−T0)/(T1−T0)×100, was higher at the cusp level (upper: 51.2–73.2%; lower: 62.1–76.9%) than at the gingival level (upper: 27.6–49.0%; lower: 44.6–64.7%). The most accurate movements were at upper first-premolar inter-cusp width (PETG accuracy: 68.9%; TPE accuracy: 77.5%) and lower intercanine cusp width (PETG accuracy: 73.3%; TPE accuracy: 80.4%). The least accurate were at upper and lower intermolar widths at the gingival margin (27.6% and 44.6%, respectively).

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

CONCLUSIONS: No statistically significant differences in accuracy were found between TPE and PETG foil for transverse expansion

Abstract citation ID: cjag070.450
SP527 *** FINITE ELEMENT ANALYSIS OF THREE BONE-SUPPORTED MAXILLARY EXPANSION DESIGNS AND THE EFFECT OF MODIFIED GLASSMAN OSTEOTOMY IN ADULT PATIENTS

Burçin Akan[1] and Fatih Atıcı[2]; [1]İzmir Katip Çelebi University, İzmir, Turkey, [2]Private, İzmir, Turkey

AIM: To compare stress distribution and displacement patterns generated by three different bone-supported maxillary expansion appliances in adults using finite element analysis (FEM), and to evaluate the additional effect of the Modified Glassman Osteotomy on these biomechanical outcomes.
MATERIALS AND METHODS: A three-dimensional craniofacial finite element model representing an adult patient with fully ossified maxillary sutures was constructed. Three expansion designs were simulated: a two-screw miniscrew-supported expander, a four-screw miniscrew-supported expander, and a hybrid expander supported by both miniscrews and teeth. Each design was activated to produce 5 mm of transverse expansion. Von Mises stress values and total displacement magnitudes were measured at craniofacial structures, miniscrews, and appliance components. A second simulation scenario incorporating the Modified Glassman Osteotomy was created to assess its influence on stress reduction and displacement symmetry. Material properties and boundary conditions matched those previously validated for craniofacial FEM studies. Comparative analyses were performed between appliances and between osteotomy and non-osteotomy scenarios.
RESULTS: In the non-osteotomy condition, all appliances generated the highest stress concentrations at the nasomaxillary, frontomaxillary, and zygomatic buttress regions. The two-screw design exhibited the greatest stress accumulation and the least skeletal displacement, with displacement vectors showing increased rotational tendency. The four-screw design produced more uniform stress distribution and greater parallel expansion, while the hybrid design exhibited the lowest miniscrew stress and the most favourable displacement pattern, with improved anterior–posterior symmetry. Implementation of the Modified Glassman Osteotomy substantially reduced cortical bone stress in all appliance types and increased total displacement, particularly in the posterior maxilla. Stress reduction was most pronounced in the pterygoid junctions and zygomatic buttresses. The hybrid expander demonstrated the greatest skeletal responsiveness after osteotomy, achieving the most homogeneous expansion pattern.
CONCLUSIONS: Bone-supported maxillary expansion appliances produce distinct biomechanical effects in adults. The hybrid design resulted in the most favourable balance between stress distribution and skeletal displacement, whereas the two-screw design showed the highest mechanical concentration and lowest orthopedic effect. The Modified Glassman Osteotomy effectively decreased resistance zones and enhanced maxillary expansion, especially posteriorly. These findings highlight the biomechanical advantages of combining skeletal anchorage with selective osteotomy in adults requiring transverse correction.

Abstract citation ID: cjag070.451
SP528 ‡‡‡ LONG TERM ORAL HEALTH EVALUATION IN TEENAGERS TREATED WITH CLEAR ALIGNERS UP TO ONE YEAR POST TREATMENT

Carolin Kredig[1], Irene Schmidtmann[2], Vanessa Knode[1], Thomas Drechsler[3], Christina Erbe[1]; [1]Department of Orthodontics University Medical Center at the Johannes Gutenberg-University, Mainz, Germany, [2]Institute of Medical Biostatistics, Epidemiology and Informatics of the Johannes Gutenberg- University Medical Center, Mainz, Germany, [3]Private Clinic, Wiesbaden, Germany

AIM: This long-term prospective study evaluated periodontal inflammation in adolescents receiving orthodontic treatment with clear aligners (Invisalign® Teen, Align Technology, San Jose, CA, USA). Key aims were to evaluate the detection of 11 periodontitis-associated marker bacteria, quantify active matrix metalloproteinase-8 (aMMP-8) levels in gingival crevicular fluid (GCF), and determine whether IL-1 polymorphism genotypes modulate periodontal health outcomes.
MATERIALS AND METHOD: Fifty adolescents (mean age 13.3 ± 1.8 years) were included. Gingival crevicular fluid was collected prior to, during and up to one year after completion of clear aligner treatment. Periodontal status was recorded using the Gingivitis Index (GI) and the Modified Quigley-Hein Index (MQH). Genotyping for IL-1 polymorphisms was performed. Mixed linear models and generalized linear models were applied to examine changes over time and associations among variables.
RESULTS: All IL-1 polymorphism genotype combinations occurred in the sample. No significant increase in periodontal inflammation or aMMP-8 concentrations was detected over the testing period. Marker bacteria from the red and orange-associated complexes remained low, whereas significant changes were seen in the orange and green complexes, particularly Capnocytophaga spp. ($p=0.0042$) and Fusobacterium spp. ($p=0.0365$). GI correlated significantly with aMMP-8 levels ($p=0.0017$), but no genotype effect on GI was observed. MQH showed associations with pathogens from the orange and green complexes, including Capnocytophaga spp. and Fusobacterium spp.
CONCLUSIONS: Clear aligner therapy in adolescents, even in individuals with an unfavorable genotype, does not lead to increased periodontal inflammation provided that oral hygiene is maintained at a high standard. Nonetheless, consistent periodontal surveillance together with ongoing oral hygiene instruction and reinforcement should remain integral to orthodontic care, particularly for adolescent patients.

Abstract citation ID: cjag070.452
SP530 CORRELATION OF GINGIVAL THICKNESS AND WIDTH OF KERATINISED GINGIVA AMONG VARIOUS TOOTH GROUPS. A CROSS SECTIONAL STUDY

Eleni Zafeiropoulou[1], Loukas Mpounatsos[1], Sotiris Papaioannou[1], Christos Katsaros[2], Dimitrios Kloukos[2]; [1]251 Hellinic Air Force Hospital, Athens, Greece, [2]University of Bern, Bern, Switzerland

AIMS: The aim of the current cross-sectional study was to compare different clinical methods for gingival thickness assessment in different tooth groups. Agreement, repeatability, and relationship with Keratinized Gingival Width (KGW) were also evaluated.
MATERIALS AND METHODS: GT and KGW records from 101 orthodontic patients were documented at maxillary and mandibular incisors, canines, first premolars and first molars (1,616 mid-facial sites). Gingiva was classified as thin or thick using Probe Translucency Test (PTT), while Transgingival Probing (TRG) and Ultrasound (US) provided quantitative GT measurements; KGW was measured with a periodontal probe. Receiver operating characteristic curves were used to evaluate TRG and US against PTT and to derive optimal cut-offs, and agreement between TRG and US was quantified.
RESULTS: Anterior, particularly mandibular anterior, teeth showed the highest "thin" frequencies and the lowest GT, whereas molars were predominantly "thick" and exhibited greater GT and KGW. Using PTT as reference, TRG showed moderate discrimination between thin and thick gingiva (AUC 0.69) with an optimal cut-off of 0.91 mm (TRG ≤ 0.91 mm indicating thin phenotype: sensitivity 0.63, specificity 0.65, accuracy 0.64). US performed similarly but better (AUC 0.71) with an optimal cut-off of 1.08 mm (US ≤ 1.08 mm: sensitivity 0.71, specificity 0.60, accuracy 0.64). US measurements closely tracked TRG, with a small positive bias of +0.1–0.15 mm and correlation ($r \approx 0.93$), and both methods showed parallel gradients in KGW. Subgroup analyses indicated that thin mandibular incisors represented a localized thin phenotype rather than a generalized condition.
CONCLUSIONS: PTT, TRG and US capture a common gingival phenotype and yield consistent anatomical patterns. US offers a non-invasive alternative method, and all three techniques demonstrate good reproducibility and accuracy for precise treatment planning.
Disclosure of interest: None declared

Abstract citation ID: cjag070.453
SP531 VIRTUAL TREATMENT PLANNING AND SKELETAL MAXILLARY EXPANSION

Hana Cukaj Ademi and Granit Cukaj; Private clinc, Prishtina, Kosovo

AIM: The aim of this study is to present a clinically applicable digital workflow for skeletal maxillary expansion, emphasizing virtual planning of mini-implant positioning, bone-based selection of insertion sites, and the use of a surgical guide to enhance procedural predictability in both pediatric and adult patients.
MATERIALS AND METHOD: The protocol included pediatric and adult patients with transverse maxillary deficiency. In children, mini-implant positioning was planned using lateral cephalometry only. Based on cephalometric evaluation of skeletal maturation and estimated bone availability, virtual planning of the implant sites was performed, followed by fabrication of a surgical guide. A 3D intraoral scan was taken to ensure proper adaptation of the guide and appliance.

In adults, CBCT imaging was used to assess the degree of palatal suture ossification, and anatomical limitations. CBCT also served to identify the optimal insertion sites for mini-implants. Using dedicated software, virtual planning of implant

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

position and a corresponding surgical guide were completed. A 3D-printed hybrid expander was then fabricated according to the planned implant locations.
RESULTS: Virtual planning improved anatomical assessment and selection of mini-implant sites in both age groups. The use of surgical guides facilitated controlled insertion, while 3D printing ensured appliance accuracy. Clinically, patients achieved favorable skeletal expansion with minimal dentoalveolar effects, and digital integration streamlined the overall workflow.
CONCLUSION: Virtual planning, combined with cephalometry or CBCT and guided appliance fabrication, enhances the predictability and efficiency of skeletal maxillary expansion. This digitally supported approach provides reliable implant positioning and contributes to stable skeletal outcomes.

Abstract citation ID: cjag070.454
SP532 EFFECTS OF MARAPLUS ON MANDIBULAR INCISOR INCLINATION AND POSITION IN SYMMETRIC CLASS II ADOLESCENTS: A RETROSPECTIVE COHORT STUDY USING PANCHERZ AND BJÖRK STRUCTURAL ANALYSIS

Victoria Walter[1], Volkan Özkan[1], Christian Per Rank[2], Silvia Silli[3], Björn Ludwig[4]; [1]F3Orthodontics, Kronberg, Germany, [2]Orthodontic Private Office, Svendborg, Denmark, [3]Orthodontic Private Office, Vienna, Austria, [4]Orthodontic Private Office, Traben-Trabach, Germany

AIM: To assess dental and skeletal effects on mandibular incisor position in adolescents with symmetric Class II malocclusion treated with the digitally designed MARAplus appliance. This retrospective cohort study applies both the Pancherz analysis and Björk's structural analysis to differentiate dentoalveolar compensation from skeletal adaptation.
MATERIALS AND METHODS: Thirty adolescents (mean age 13.9 years) with symmetric skeletal and dental Class II malocclusion were treated with MARAplus combined with multibracket appliances for an average of 8.7 months. Standardized lateral cephalograms at T1 and T2 were evaluated independently by two calibrated orthodontists using OnyxCeph^{3}™. Sagittal and dentoalveolar changes were quantified using the Pancherz analysis, while skeletal remodeling and mandibular structural displacement were assessed according to Björk. The combined dual-analysis framework allows explicit separation of skeletal versus dental contributions.
RESULTS: Preliminary findings show a mean IMPA increase of approximately 2–3°, incisor advancement of about 1–1.5 mm, ANB reduction of around 1°, and overjet reduction of 3–4 mm. Björk indicators suggest that roughly one-third of the sagittal improvement reflects skeletal change, with the remaining portion representing controlled dentoalveolar compensation. Incisor proclination remained within clinically acceptable limits for most patients.
CONCLUSION: MARAplus produces predictable sagittal correction with controlled incisor effects. The combined Pancherz–Björk analytical approach provides a more precise distinction between skeletal adaptation and dental compensation, offering enhanced diagnostic clarity compared to single-method evaluations.

Abstract citation ID: cjag070.455
SP533 ASSOCIATIONS OF GENETIC SEVERITY AND DISEASE ONSET ON CRANIOFACIAL MORPHOLOGY AND GROWTH IN YOUNG PATIENTS WITH MYOTONIC DYSTROPHY TYPE 1

Anna-Sofia Silvola[1], Clara Fontinha[2], Ville Vuollo[1], Stavros Kiliaridis[2]; [1]University of Oulu, Oulu, Finland, [2]University of Geneva, Geneva, Switzerland

AIM: Severity of myotonic dystrophy type 1 (DM1) is associated with CTG trinucleotide repeat length and the onset of the disease. The aim of this study was to investigate the associations of CTG repeats and disease onset with the craniofacial morphology and growth in young patients with DM1.
MATERIALS AND METHODS: The study group consisted of 25 young patients (13 females, 12 males; mean age 8.6 years, range 4.6–14.7 years), of whom 17 had congenital and 8 had childhood-onset DM1. CTG repeat length was evaluated by DNA analyses. Lateral cephalograms were taken at baseline (T1) and after 5 years (T2). The cephalograms were compared with normal standards of healthy individuals from the Michigan Growth Study, according to age and sex. Associations of CTG repeats and disease onset with craniofacial growth measures were examined using linear regression models.
RESULTS: Higher CTG repeat length had a statistically significant association with larger SNA angle, a more hyperdivergent craniofacial morphology (larger ML-NSL, ML-NL and gonial angle), and more proclined lower incisors at baseline and when the time points (T1 and T2) were combined. CTG repeat length was not associated with craniofacial growth changes during the follow-up period. Disease onset (congenital vs. childhood-onset) had no statistically significant association with craniofacial morphology or growth.
CONCLUSION: CTG repeat length in young patients with DM1 was associated with more prognathic maxilla, more hyperdivergent skeletal pattern. and more labially inclined lower incisors. These morphological features were observed at an early age, and it did not appear to worsen during growth.

Abstract citation ID: cjag070.456
SP534 ‡‡‡ ARTIFICIAL INTELLIGENCE IN AESTHETIC DENTISTRY: IS TREATMENT WITH ALIGNERS CLINICALLY REALISTIC?

Thomas Mourgues[1], Maria José Gonzaleez-Olmo[1], Luis Huanca Ghislanzoni[2], Cecilia Penacoba Puente[1], Martin Romero Maroto[1]; [1]University Rey Juan Carlos, Madrid, Spain, [2]University of Geneva, Geneva, Switzerland

Smile aesthetics have become a major focus in contemporary dental practice, highlighting the need for accurate orthodontic assessment and reliable treatment planning. Invisalign® SmileView™ (SV) is an artificial intelligence–based tool designed to simulate potential post-treatment smiles using aligners. This study aims to evaluate the clinical realism of SV simulations by analyzing whether the software proposes orthodontically feasible movements, whether it modifies the anatomical dimensions of the teeth, and whether its virtual outcomes conform to aesthetic criteria described in the literature. Additionally, the tool's capacity to align dental midlines with the facial midline was assessed.

A total of 51 participants were photographed with a social smile (T0), followed by an SV-generated simulation (T1). Standardized measurements were performed using calibrated digital software to assess smile width, vertical incisor exposure, mesiodistal tooth size, gingival display, and midline position. Realistic orthodontic thresholds from the literature were applied for the evaluation of tooth movement feasibility.

Results showed that SV simulated smile expansion in 58% of cases, with excessive transverse widening (>5 mm) occurring in only 8%. Vertical movements of the maxillary central incisors exceeded clinically predictable limits (>1.5 mm) in just 5.9% of subjects. Notably, SV systematically modified mesiodistal incisor dimensions: 51% of central incisors and 31.4% of lateral incisors underwent orthodontically acceptable enamel reduction, while 21.6% and 62.7%, respectively, required multidisciplinary restorative intervention due to increased tooth dimensions. SV consistently adjusted the central-to-lateral incisor proportion toward a ratio of 0.72, reflecting a standardized aesthetic target. Gingival display was minimally reduced, with larger improvements observed in subjects presenting a gummy smile. SV centered upper dental midlines in 77.9% of initially deviated cases, whereas predictability was lower for the lower arch.

In conclusion, SV generates simulations that generally align with realistic orthodontic outcomes, particularly in transverse expansion and vertical incisor movements. However, the software modifies tooth dimensions to meet aesthetic proportions, often implying restorative procedures beyond orthodontic treatment alone. While SV is a useful communication tool for illustrating potential smile improvements, clinicians should emphasize to patients that these simulations are not individualized treatment plans and may require multidisciplinary approaches to achieve the depicted aesthetic results.

Abstract citation ID: cjag070.457
SP535 MODIFIED ADHESIVE CONTAINING SILVER-DOPED BIOACTIVE GLASS NANOPARTICLES: EXAMINATION OF ENAMEL REMINERALIZATION AND EVALUATION OF THE INDUCTION OF OSTEOGENIC DIFFERENTIATION IN BONE MARROW–DERIVED MESENCHYMAL STEM CELLS

Konstantinos Ntinas[1], Athina Chatzigianni[2], Ioannis Tsamesidis[3], Xanthippi Chatzistavrou[4], Eleana Kontonasaki[2]; [1]Faculty of Medicine, School of Health Sciences, Aristotle University of Thessaloniki and Democritus University of Thrace, Thessaloniki, Greece, [2]Faculty of Dentistry, School of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece, [3]Faculty of Dentistry, School of Health Sciences, Aristotle University of Thessaloniki & Department of Biomedical Sciences, International Hellenic University, Thessaloniki, Greece, [4]Faculty of Chemical Engineering, School of Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece

AIM: The formation of white spot lesions is common among orthodontic patients with inadequate oral hygiene, due to the accumulation of dental plaque around orthodontic brackets, and is associated with the loss of part of the inorganic substrate of the enamel surface layer (demineralization). The use of advanced adhesive materials containing agents that induce tissue regeneration and promote enamel remineralization offers advantages during orthodontic treatment. The aim of this study was to investigate the biological properties of an orthodontic bracket adhesive material, laboratory-modified with bioactive glass nanoparticles enriched with silver ions (AgBG).

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

MATERIALS AND METHOD: Six extracted intact premolars were divided into an experimental and a control group to assess the enamel remineralization potential of a modified adhesive. In the experimental group the teeth were coated with an AgBG nanoparticle-modified adhesive primer and further immersed in a simulated body fluid (SBF) for fourteen days, according to established protocols. The specimens were then examined under a scanning electron microscope (SEM) to detect the formation of calcium phosphate deposits. Furthermore, the induction of osteogenic differentiation of bone marrow mesenchymal stem cells into osteoblasts was evaluated using Alizarin Red S (ARS) staining and alkaline phosphatase (ALP) activity measurement.
RESULTS: The incorporation of AgBG nanoparticles into the adhesive primer led to the formation of calcium phosphate deposits and to the induction of osteogenic differentiation, demonstrated by increased Alizarin Red staining at 21 and 28 days and increased ALP activity at 14 days, compared to the unmodified adhesive.
CONCLUSIONS: The results indicate the nanoparticle modified orthodontic adhesive ability to promote mineralization, highlighting its potential for further investigation as a clinical approach to manage white spot lesions.

Abstract citation ID: cjag070.458
SP536 PREVALENCE AND ASSOCIATED FEATURES OF MANDIBULAR CANINE IMPACTION AND TRANSMIGRATION IN A DENTAL HOSPITAL POPULATION

Nur Liyana Mohamad[1], Niall McGuinness[2], Finn Geoghegan[3], Aman Ulhaq[4]; *[1]The University of Edinburgh, Edinburgh, United Kingdom, [2]Edinburgh Dental Institute, Edinburgh, United Kingdom, [3]Trinity College Dublin, Dublin, Ireland, [4]York Hospital, York, United Kingdom*

AIM: This study aimed to determine the prevalence of mandibular canine impaction and transmigration within a dental hospital population in Scotland and explored their associations with gender, laterality, clinical presentation, and related pathologies.
MATERIALS AND METHODS: A retrospective review was undertaken using clinical records and panoramic radiographs of 1,877 patients referred to the Orthodontic Department at the Edinburgh Dental Institute between November 2019 and May 2024. Mandibular impacted and transmigrated canines were identified, and data were collected on age, gender, laterality, retained primary canines, and associated pathologies. The depth of canine impaction was assessed, and transmigrated canines were classified using Mupparapu's criteria (2002). Data were analyzed using descriptive statistics and the Chi-square test, with statistical significance set at $p < 0.05$.
RESULTS: Mandibular canine impaction was identified in 46 patients, with a prevalence of 2.45%, while transmigration was observed in 27 patients at a rate of 1.4%. Both conditions were more frequently observed in males; however, the gender difference was not statistically significant ($p = 0.41$). Impactions were more commonly found on the left side, whereas transmigration more often originated from the right, but laterality differences were not significant ($p = 0.27$). The majority of patients with either condition presented between 12 and 15 years of age, with Level A impaction being the most common impaction position, while Type 1 was the predominant pattern of transmigration. Retained primary canines were present in over half of the cases in both groups. Among associated pathologies, odontomas were most frequent in impaction cases (8.7%), while follicular enlargement was more commonly observed in cases of transmigration (11.1%).
CONCLUSION: The prevalence of mandibular canine impaction and transmigration was 2.45% and 1.4%, respectively. No statistically significant differences were observed between the two groups in terms of gender or laterality. These findings underscore the importance of radiographic assessment in adolescents presenting with retained primary canines to facilitate early identification and timely management of these developmental anomalies.

Abstract citation ID: cjag070.459
SP538 THE EFFECT OF ORTHODONTIC TREATMENT ON THE ORAL HEATH RELATED QUALITY OF LIFE OF PATIENTS WITH DENTAL AGENESIS

Madalina Haverals, Guy Willems, An Verdonck, Maria Cadenas de Llano-Pérula; *UZ Leuven, Leuven, Belgium*

AIM: To compare the Oral Health-related Quality of Life (OHRQoL) of two patient cohorts with and without dental agenesis assessed with the Child Perception Questionnaire (CPQ11-14) at three timepoints: start (T0), one year into (T1), and one month after completion (T2) of comprehensive orthodontic treatment.
MATERIALS AND METHOD: All patients seeking orthodontic treatment at our Department between 2009-2023 were invited to complete the CPQ11–14 at T0-T1-T2. Patients between 6-25 years-old with atleast one agenesis (excluding third molars) were retrospectively selected and divided into frontal and lateral agenesis. Age- and gender-matched patients constituted the control group. Patients with non-congenitally missing teeth and/or oral clefts were excluded. Total and domain-specific CPQ11–14 scores were calculated. Categorical and continuous variables were compared using Chi-square and independent T-tests respectively.
RESULTS: 60 patients with agenesis (37 females, 13.03±1.46 years) and 264 controls (140 females, 13.16±1.11 years) were included. Groups were demographically comparable, except for lateral agenesis, which included significantly more females than frontal agenesis at T0 ($p=0.034$) and T2 ($p=0.039$).

No significant differences in mean total (nor domain-specific) CPQ scores were detected between groups at any timepoint, except for 'Social-Function' where the CPQ scores of the control group were significantly lower (higher OHRQoL) than those of the agenesis group at T0 ($p=0.0080$).

In the control group, total and domain-specific CPQ mean score changes T0-T1 ($p<.0001$) and T0-T2 ($p<.0001$) were significant. This was not the case for the agenesis group, where T0-T1 differences were detected in 'Oral-Symptoms' ($p=0.0030$) and 'Emotional-Functions' ($p=0.0379$). Lateral agenesis seemed to have larger CPQ mean score T0-T1 changes in 'Oral-Symptoms' ($p=0.0003$) and 'Functional-Restrictions' ($p=0.0084$) than frontal agenesis.
CONCLUSIONS: Patients with agenesis presented worse baseline Social-Function OHRQoL than controls. Controls' OHRQoL significantly worsened during and improved after treatment. This was not the case in the agenesis group, where Oral-Symptoms worsened and Emotional-Functions improved during treatment. OHRQoL appears to fluctuate more markedly in patients without agenesis over the course of orthodontic treatment, whereas those with agenesis exhibit comparatively limited improvement by treatment completion—an outcome likely attributable to the absence of their definitive prosthetic restorations.

Abstract citation ID: cjag070.460
SP540 THREE-DIMENSIONAL EVALUATION OF THE DENTOALVEOLAR EFFECTS OF VARIOUS HABIT BREAKERS IN EARLY ANTERIOR OPEN BITE CASES

Arda Demir and Furkan Dindaroğlu; *Ege Universty, İzmir, Turkey*

AIM: This study aimed to three-dimensionally compare the dentoalveolar effects of different habit-breaking appliances in patients aged 6–13 years with anterior open bite, evaluating changes before treatment, at follow-ups, and end of the 6 months treatment.
MATERIALS AND METHODS: The study sample consisted of 45 patients treated with lingual spur, fixed tongue crib, or removable tongue crib appliances, evenly allocated into three groups (n=15). Sample size estimation was based on the parameter expected to show the greatest treatment-related change—overbite depth—and a clinically significant improvement was defined as 1.5 mm. Power analysis determined that 14 subjects per group were necessary to achieve 80% power at a significance level of $p<0.05$; therefore, 15 subjects were included per group to ensure adequate statistical strength. Pretreatment and post-treatment cephalometric and panoramic radiographs were collected from patient archives. Plaster models obtained at initial, 1 month, 3 months, and at the end of treatment were scanned using the 3Shape TRIOS 3 system and analyzed in Viewbox 4.0.
RESULTS: Significant increases in maxillary transverse dimensions were observed in all groups, with the greatest expansion achieved by the lingual spur ($p<0.001$). Sagittal measurements demonstrated posterior movement tendencies in the fixed crib group, whereas the spur group exhibited forward positional changes ($p<0.05$). Arch length increased in all groups, most prominently with the spur appliance. Overbite, initially negative in all subjects, improved significantly throughout treatment, with the fixed crib showing the most substantial correction. Overjet decreased earlier in the fixed group, while the removable group showed later improvement. Palatal volume increased across all groups, with lingual spur producing the largest volumetric gain ($p<0.001$). Cephalometric outcomes revealed appliance-specific effects: SNB increased in the spur group, ANB decreased in spur and removable groups. Incisor angulations showed distinct directional changes depending on appliance type.
CONCLUSIONS: All habit-breaking appliances effectively contributed to open bite correction; however, each demonstrated unique dentoalveolar advantages. The lingual spur produced the most substantial transversal and volumetric changes, the fixed tongue crib achieved the strongest overbite improvement, and the removable crib generated moderate yet stable alterations.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Abstract citation ID: cjag070.461
SP542 RELATIONSHIP BETWEEN THE SAGITTAL POSITION OF POGONION AND THE TUBERCULUM SELLA–WING POINT–G POINT ANGLE IN INDIVIDUALS WITH SKELETAL CLASS II MALOCCLUSION

Şeyda Canbaz Cevik and Sena Açıkgöz Yakşi; *afyonkarahisar health sciences university, afyonkarahisar, Turkey*

AIM: The aim of this study was to asses the relationship between the TWG angle, a newly introduced cephalometric parameter, and the Pogonion–NB (Po–NB) distance in patients with skeletal Class II malocclusion.
MATERIALS AND METHOD: 150 patients' radiographs were scanned retrospectively, and 66 patients diagnosed with skeletal Class II malocclusion based on SNA, SNB and ANB angle were included in the study group. Only patients with available pre-treatment lateral cephalometric radiographs were included. Patients were divided into three groups according to the Po–NB distance:

G1: Po–NB < 1 mm
G2: 1 mm < Po–NB < 3 mm
G3: Po–NB > 3 mm

All cephalometric measurements were done using two different software programs (NemoCeph and AudaxCeph) to check the consistency of measurements. The relationship between the TWG angle (°) and the Po–NB distance (mm) was statistically analyzed.
RESULTS: We used one-way ANOVA to assess the differences in TWG values among the three groups.Statistically significant difference was found between the groups ($p < 0.001$). This finding indicates that grouping by Po–NB distance significantly influences the TWG angle. To determine exactly which groups accounted for these differences, Tukey HSD post-hoc analysis was ran. This analysis clearly showed statistically significant differences in all group comparisons: Group G1 had significantly lower TWG values than both Group G2 ($p<0.001$) and Group G3 ($p<0.001$). Furthermore, Group G2 showed significantly lower TWG values than Group G3 ($p=0.048$). When examining the group means, the TWG values progressively increased from G1 (97.66) to G2 (103.28) and G3 (105.17).
CONCLUSIONS: The findings show a strong relation between the TWG angle and the sagittal position of the pogonion, as reflected by the Po–NB distance. An increase in the Po–NB distance is accompanied by a corresponding increase in the TWG angle. These results suggest that the TWG angle may be affected by variations in pogonion position, which may reduce the reliability of this parameter. Therefore TWG angle should not be solely relied upon. Further studies involving larger samples with different kind of skeletal patterns are necessary to clarify the clinical applicability and diagnostic validity of the TWG angle.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.462
SP544 CBCT TIMING AND AVAILABILITY IN THE TREATMENT PLANNING OF IMPACTED AND ECTOPIC CANINES

Shirley Cox, Neha Shah, Abdullah Albash, Yi Wen Qin; *Barts Health, The Royal London Hospital, London, United Kingdom*

AIM: To examine the existing cone beam computer tomography (CBCT) imaging pathway in a tertiary dental hospital. To improve patient outcomes by promoting the timely and justified requests for CBCT scans and reports to support the treatment planning of impacted and ectopic canines.
METHOD: A retrospective analysis of a cohort of patients attending the impacted canine clinic was conducted from March 2025 – September 2025. The clinic was a multi-disciplinary (MDT) service held between the orthodontics and oral and maxillofacial surgery departments. The data collected assessed if a CBCT scan had already been requested at the point of referral to the MDT clinic. Whether a report was present to support treatment planning, and if the case ultimately required CBCT imaging in addition to 2D radiographs. The data was then correlated to appointment attendance outcomes and presented qualitatively.
RESULTS: Out of the 61 patient encounters reviewed, a proportion of cohort (21.7%) did not require CBCT, highlighting the value of selective rather than routine 3D imaging. On the other hand, 16.7% of the cohort required CBCT that had not been requested prior to attending the clinic, resulting in additional imaging referrals and delayed treatment planning. Ultimately, 30 out of the 61 patient encounters had existing CBCT and required this for treatment planning, but over 1/3 (36.7%) of patients lacked a report, limiting the ability of the team to produce a definitive treatment plan. This highlights the importance of timely radiology reports on maintaining patient treatment pathways. Patient-initiated cancellations and missed appointments were also observed that also contributed to delays.
CONCLUSION: These findings support existing guidance that 2D radiographs remains sufficient for straightforward impactions, whilst 3D imaging is important in complex treatment cases. The study highlights that the selection of cases for timely CBCT is important for accurate treat plans. Therefore, standardising a criterion to guide clinicians to identify cases who would require a CBCT would be useful. Alongside with the development of more AI supported CBCT reporting software may reduce delays, improve consistency and support decision making in MDT impacted canine services.

Abstract citation ID: cjag070.463
SP545 PREDICTABILITY OF ORTHODONTIC TOOTH MOVEMENT USING INVISALIGN CLEAR ALIGNERS

Osman Bilal Kandaz and Sibel Biren; *Istanbul Kent University Faculty of Dentistry Department of Orthodontics, Istanbul, Turkey*

AIM: This study aims to evaluate the predictive accuracy of Invisalign clear aligners in determining treatment outcomes.
MATERIALS AND METHOD: In this retrospective study, STL data from 10 patients treated with Invisalign aligners were analyzed to compare predicted and achieved outcomes. A total of 280 teeth from ten maxillary and ten mandibular arches were measured. The teeth were evaluated by comparing pre- and post-treatment measurements of Mesiodistal Translation (MDT), Buccolingual Translation (BLT), Vertical Translation (VT), Angulation, Inclination, and Rotation. Predicted outcomes were obtained from the Invisalign ClinCheck platform, while actual outcomes were derived from intraoral scans taken before the refinement phase. All measurements were evaluated using Geomagic Control X software, and statistical comparisons between predicted and achieved movements were performed using parametric tests, with significance set at $p < 0.05$.
RESULTS: Across the maxillary and mandibular arches, the accuracy of predicted tooth movements varied by tooth type and movement dimension. Most molars and premolars showed significant discrepancies in vertical translation, inclination, or rotation, while mesiodistal and buccolingual translations were generally more accurate. Canines and central incisors demonstrated the highest alignment between predicted and achieved movements, with no significant differences in most parameters. In contrast, lateral incisors frequently showed discrepancies in vertical or buccolingual movements. Overall, the findings indicate that certain movements—particularly vertical translation, inclination, and rotation—are less predictably expressed with Invisalign aligners.
CONCLUSION: Invisalign predictability varies by tooth type and movement, with high accuracy in simple translations but reduced reliability in vertical, rotational, and inclination movements. Clinicians should anticipate lower precision in these complex movements.

Abstract citation ID: cjag070.464
SP546 AN ASSESSMENT OF READABILITY OF ORTHODONTIC LEAFLETS: FIXED APPLIANCES AND RETAINER LEAFLETS

Bahar Gharooni-Dowrani[1], Nikou Gharooni-Dowrani[2], Ali Payam Sattarzadeh[2]; *[1]Guys Hospital, London, United Kingdom, [2]Luton and Dunstable, Luton, United Kingdom*

AIMS: Our aims in this project were to review the readability of two leaflets used routinely in our Orthodontic department. This was to ensure these leaflets were as user friendly as possible and had clear instructions for all patients undergoing fixed appliance therapy and retainer use to minimise queries and problems arising during and after Orthodontic treatment.
MATERALS AND METHODS: 40 patients were randomly selected who had been treated with fixed appliances and 40 patients who had received retainers in the period of January 2022-December 2023. We assessed the readability of our current leaflets using the Flesch readability scale. Based on this assessment, we modified our current practice in accordance with the Flesch readability scale and produced leaflets with better scores. We then asked the patient groups whether they preferred the existing leaflets or the modified leaflets.
RESULTS: After analysis of the data, it became clear there were many improvements that could be made to the current leaflets that were being used. After such modifications, 95% of fixed appliance patients and 92.5% of retainer patients preferred the modified leaflet and stated it was easier to understand. These patients stated the advice presented was clearer, thus suggesting they are more likely to follow the instructions provided and use the appliance in the intended manner.
CONCLUSION: This project has highlighted an oversight and the use of measuring tools to assess readability provided a better insight for how patients may view

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

our leaflets. Having thorough and clear written information and advice is a crucial part of patient care to ensure that patients are aware of what they are to do throughout and after their Orthodontic treatment. This improvement may minimise breakages of appliances, extended treatment times, reduction in relapse as well as minimising emergency appointments. This aspect of patient care must not be ignored and relevant research and audit is integral to ensure continued development and maximise outcomes for patients. This project has lead to the uptake of a complete departmental review of all leaflets provided to patients.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.465
SP548 IS BONE DENSITY LINKED TO MAXILLARY CANINE IMPACTION? A RETROSPECTIVE ANALYSIS

Catarina Oliveira[1], Raquel Travassos[2], Francisco Caramelo[3], Inês Francisco[2], Francisco Vale[2]; *[1]Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal, Coimbra, Portugal, [2]Faculty of Medicine, University of Coimbra, Portugal Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal Institute for Clinical and Biomedical Research, Faculty of Medicine, University of Coimbra, Portugal Environment, Genetics and Oncobiology Research Centre, University of Coimbra, Portugal Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra, Portugal Coimbra Academic Clinical Centre, Portugal Centre for Mechanical Engineering, Materials and Processes, University of Coimbra, Portugal, Coimbra, Portugal, [3]Coimbra Institute for Clinical and Biomedical Research, Area of Environment Genetics and Oncobiology, Faculty of Medicine; Laboratory for Evidence-Based Sciences and Precision Dentistry; Centre for Innovative Biomedicine and Biotechnology; Clinical Academic Center of Coimbra; Institute of Integrated Clinical Practice, Faculty of Medicine; Laboratory of Biostatistics and Medical Informatics, Faculty of Medicine, Coimbra, Portugal*

AIM: Maxillary canine impactation has been associated with several etiological factors, namely anatomical factors such as bone density. Therefore, this study was undertaken to quantitatively assess and compare bone density in individuals with impacted maxillary canines and those with normally erupted maxillary canines, through analysis of panoramic radiographs. Simultaneously, the study aimed to develop a diagnostic tool to assist clinicians in predicting canine impaction and in optimizing orthodontic traction planning.
MATERIALS AND METHOD: This retrospective and exploratory study evaluated panoramic X-ray of patients with at least one impacted maxillary canine (study group) and patients without impaction (control group). Five regions of interest (ROIs) were selected, and seven variables were extracted from the pixel intensity values within each ROI: mean, standard deviation, and the 5th, 25th, 50th, 75th, and 95th percentiles. Image analysis was performed using ImageJ® software and a custom program developed in Matlab®. The reproducibility of the measurements was analysed using the intraclass correlation coefficient, considering a significance level of 0.05. The mean differences between the groups were tested using the Mann-Whitney test, and the discriminatory ability was evaluated using the ROC curve. To determine whether the classification problem was separable, a principal component analysis was also performed. A logistic regression model was fitted using the selected principal components as independent variables. All statistical analyses were performed in R v1.4.2.
RESULTS: 58 were included, of whom 29 had maxillary canine impaction (34.5% with bilateral impaction and 65.5% with unilateral impaction) and 29 were in the control group. Reproducibility testing indicated excellent agreement, as intraclass correlation coefficients surpassed 0.9 for most variables. Three components were derived from principal component analysis, which suggested that the groups did not separate completely. A logistic model incorporating these components showed statistical significance ($p = 0.052$) for $\alpha = 0.10$, accounting for 11.8% of the variance observed.
CONCLUSIONS: Assessment of pixel intensity in panoramic radiographs offers enough information to differentiate patients with impacted maxillary canines from those without.

Abstract citation ID: cjag070.466
SP550 TREATMENT OUTCOMES OF CLASS 2 MALOCCLUSION WITH TOTAL ARCH DISTALIZATION USING INFRAZYGOMATIC CREST SCREWS

Erdal Bozkaya, Alihan Ozdemir, Sema Yuksel; *Gazi University Dental Faculty, Ankara, Turkey*

AIM: The aim of this study was to evaluate the skeletal,dental and soft-tissue changes after total maxillary arch distalization using infrazygomatic crest (IZC) miniscrews followed by fixed orthodontic treatment in patients with moderate Class II malocclusion.
MATERIALS AND METHOD: Twenty-nine patients (20 females, 9 males; mean age: 15.48 ± 2.81 years) underwent fixed orthodontic treatment combined with IZC miniscrew–assisted distalization. After the levelling of maxillary dental arch IZC screws (2 mm × 12 mm) were inserted between the maxillary first and second molars, applying ∼300 g of force with elastomeric chains. Lateral cephalograms were taken before (T1) and at the end of orthodontic treatment (T2). Paired t test and Wilcoxon test was used to compare the changes with treatment ($p<0.05$).
RESULTS: The mean treatment duration was 2.40 ± 0.86 years. Skeletal measurements showed a significant increase in the SN/OP angle (1.67°) while no significant change was observed in the mandibular plane angle. In the dentoalveolar measurements, maxillary first molars were distalized (–2.59 mm), intruded (–0.52 mm), and tipped distally (1.71°). Maxillary incisors were retruded (–1.16 mm), while mandibular incisors demonstrated proclination (L1-NB: +0.66 mm). Overjet and overbite were reduced by 2.33 mm and 1.28 mm, respectively. Upper lip retrusion (–0.88 mm) indicated favorable soft tissue changes.
CONCLUSIONS: Total maxillary arch distalization using IZC miniscrews followed by fixed orthodontic treatment is an effective and reliable non-extraction approach for Class II correction. Controlled molar distalization was achieved with minimal distal tipping, while the associated intrusion of the maxillary molars renders this technique particularly advantageous for patients requiring vertical control.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.467
SP551 A TWO-CYCLE AUDIT OF THE TREATMENT PATHWAY FOR OBSTRUCTIVE SLEEP APNOEA MANAGED WITH MANDIBULAR ADVANCEMENT SPLINTS

Sohaim Alajmi and Ama Johal; *Queen Mary University of London, London, United Kingdom*

AIM: To evaluate the effectiveness and efficiency of the treatment pathway for patients with obstructive sleep apnoea (OSA) managed with mandibular advancement splints (MAS).
METHODS: A retrospective two-cycle audit was conducted at the Orthodontic Sleep Apnoea Clinic, Royal London Hospital. Cycle 1 included 50 patients (July 2023–July 2024), and Cycle 2 included 50 patients (July 2024–July 2025). Data collected for both cycles included referral date, first consultation/records appointment, MAS fit date, review date, and reasons for unsuitability. Standards assessed were: referral-to-consultation within 18 weeks, MAS fit within 3–4 weeks after records, and review within 3 months.
RESULTS: Cycle 1 demonstrated significant delays. The mean referral-to-consultation interval was 11 months, consultation-to-fit averaged 3 months, and MAS-to-review averaged 10 months, all exceeding standards. Seventeen patients were unsuitable for MAS: poor oral hygiene/periodontal instability (13/17), ongoing restorative/orthodontic treatment (3/17), or multiple crowns/implants (1/17). Contributing factors included booking inconsistencies (7 cases) and patient non-attendance (6 cases). Following Cycle 1, interventions included increasing clinic capacity, improving clinician–reception booking communication, prioritising new patients and those awaiting MAS fit, and reinforcing referral criteria to ensure dental fitness prior to referral. Cycle 2 showed measurable improvement. Waiting time intervals shortened across all stages, booking-related errors decreased, and fewer patients were lost to follow-up. The number of unsuitable referrals also reduced, reflecting clearer referral guidance and better pre-screening.
CONCLUSION: Cycle 1 revealed substantial deviation from departmental standards. Targeted service changes led to improved pathway efficiency in Cycle 2. Ongoing monitoring and sustained clinic capacity are required to maintain and further optimise the MAS treatment pathway for OSA patients.

Abstract citation ID: cjag070.468
SP552 REDUCED ORAL FUNCTION IN PATIENTS WITH CRANIAL MANIFESTATION OF GIANT CELL ARTERITIS – A PRELIMINARY ANALYSIS

Sarah Frederike Achterrath[1], Simon Michael Petzinna[2], Valentin Sebastian Schäfer[2], Bert Braumann[1], Teresa Kristin Kruse[1]; *[1]University of Cologne, Faculty of Medicine and University Hospital Cologne, Department of Orthodontics, Cologne, Germany, [2]Clinic of Internal Medicine III, Oncology, Hematology, Rheumatology and Clinical Immunology, University Hospital Bonn, Bonn, Germany*

AIM: Giant cell arteritis (GCA) is the most common primary vasculitis, characterized by autoimmune-mediated inflammation of medium- and large-sized vessels. Distinct phenotypes are being recognised, with cranial and non-cranial GCA considered as separate disease entities. This study aimed to analyse whether parameters of oral function differ between disease types of giant cell arteritis.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

SUBJECTS AND METHODS: Patients with GCA were cross-sectionally enrolled at the Division of Rheumatology, University Hospital Bonn, between October and December 2025. Clinical assessment and multimodal imaging with vascular ultrasound (axillary, subclavian, superficial temporal arteries including their frontal and parietal branches) was performed. Subsequently, patients were classified as having cranial or extra-cranial GCA. Oral function measures included maximum bite force, maximum tongue pressure, and tongue pressure endurance, assessed alongside potential confounders (e.g. age, sex, and number of teeth). Associations between oral function, GCA type and confounders were evaluated using multiple linear regression models in a preliminary statistical analysis.
RESULTS: We included 54 patients with GCA (24 females and 30 males; mean age 73.6 ± 9.9 years). The mean time since diagnosis was 332.6 ± 176.4 days, three patients exhibited clinically active disease. Patients with cranial GCA (n = 41) demonstrated lower maximum bite force (409.5 ± 228.0 N) compared with the extra-cranial group (n = 13) (575.9 ± 176.1 N). Tongue pressure endurance was also reduced in cranial GCA (25.8 ± 11.9 s vs. 41.4 ± 19.8 s). In contrast, maximum tongue pressure showed only minor differences between types (34.4 ± 11.6 kPa vs. 37.6 ± 9.0 kPa). In multiple linear regression models, cranial involvement was independently associated with lower maximum bite force (β = -127.5, p = 0.033) and reduced tongue pressure endurance (β = -14.5, p = 0.004). No significant association was observed between phenotype and maximum tongue pressure (p = 0.63).
CONCLUSION: This study is the first to investigate oral function in a cohort of GCA patients. The cranial GCA phenotype was associated with diminished bite force and reduced tongue pressure endurance. Our findings suggest that oral functional measures may serve as potential phenotypic biomarkers in GCA.

Abstract citation ID: cjag070.469
SP553 EFFECT OF EARLY CROSSBITE CORRECTION ON MAXILLARY CANINE POSITION

Yana Popova and Victoria Gurgurieva; *Medical University, Sofia, Bulgaria*

AIM: To evaluate the effect of unilateral posterior crossbite in the early mixed dentition on the position and angulation of the maxillary permanent canine on the affected side, and to assess the extent of positional improvement following early correction using a removable palatal expansion plate with occlusal bite blocks.

Unilateral posterior crossbite in the mixed dentition commonly arises from transverse maxillary deficiency and is frequently associated with a functional mandibular shift toward the crossbite side. If left untreated, this condition may contribute to asymmetric skeletal development, progressive occlusal instability, and impaired transverse growth of the maxilla. These alterations may influence the developing maxillary canine germs, affecting their spatial orientation and eruption pathway. Early intervention is therefore recommended to restore symmetry and minimise future complications in canine development.
MATERIALS AND METHODS: The study sample consisted of 12 patients in the early mixed dentition presenting with unilateral posterior crossbite. All subjects were treated with a removable palatal expansion plate incorporating occlusal bite blocks until normal transverse relationships were achieved. Panoramic radiographs taken pre- and post-treatment were used to assess changes in the position of the maxillary permanent canines.

Three angular measurements and two linear measurements, together with one structural parameter, were recorded bilaterally to compare the affected and unaffected sides. Pre- and post-treatment values were analysed to determine positional improvement. All measurements underwent statistical evaluation.

Normality was assessed using the Shapiro–Wilk test. Paired t-tests or Wilcoxon signed-rank tests were performed depending on distribution. Effect sizes (Cohen's d) and 95% confidence intervals (CI) were calculated. Bonferroni correction was applied for multiple comparisons (adjusted $\alpha \approx 0.0083$). All primary endpoints remained significant after Bonferroni adjustment.
CONCLUSION: Unilateral posterior crossbite in the early mixed dentition is associated with altered position and angulation of the maxillary permanent canine on the affected side. Early transverse correction using a removable expansion plate results in measurable improvement in canine spatial development. These findings support early intervention not only to restore functional occlusion but also to prevent potential complications in maxillary canine eruption and alignment.

Abstract citation ID: cjag070.470
SP554 MODIFIED ADHESIVE CONTAINING SILVER-DOPED BIOACTIVE GLASS NANOPARTICLES: EVALUATION OF ANTIMICROBIAL ACTIVITY AND ASSESSMENT OF THE BOND STRENGTH BETWEEN ENAMEL AND ORTHODONTIC BRACKETS

Konstantinos Ntinas[1], Athina Chatzigianni[2], Athanasios Christodoulou[2], Xanthippi Chatzistavrou[3], Eleana Kontonasaki[2]; *[1]Faculty of Medicine, School of Health Sciences, Aristotle University of Thessaloniki and Democritus University of Thrace, Thessaloniki, Greece, [2]Faculty of Dentistry, School of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece, [3]Faculty of Chemical Engineering, School of Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece*

AIM: The accumulation of microbial plaque around orthodontic brackets in individuals with inadequate oral hygiene often leads to the formation of white spot lesions. The use of bracket bonding materials incorporating agents with bacteriostatic properties offers advantages during orthodontic treatment. The aim of this study was to investigate the biological properties of an orthodontic bracket adhesive material, laboratory-modified with bioactive glass nanoparticles enriched with silver ions (AgBG).
MATERIALS AND METHOD: Thirty extracted intact premolars were used and stored in a 1% Chloramine-T solution. The teeth were embedded in acrylic resin. Metal orthodontic brackets were bonded using an adhesive primer (Transbond™ XT Light Cure Adhesive) and an adhesive paste (Transbond™ XT Light Cure Adhesive Paste). The sample was divided into an experimental group, in which the adhesive primer was modified with 2% AgBG nanoparticles, and a control group where a non-modified adhesive was applied. Enamel-bracket bond strength was measured using a tensile and compression testing machine (Instron 3344, Norwood, MA, USA). The antimicrobial activity of the modified material against *S. aureus* was evaluated by preparing disc-shaped specimens and performing a Colony-Forming Unit (CFU) assay.
RESULTS: Our study showed that the incorporation of AgBG nanoparticles into the adhesive primer resulted in a reduction in the number of *S. aureus* colonies compared to the control group. The enamel-bracket bond strength appeared to be comparable between the experimental and control samples, with no statistically significant difference ($p<0.05$).
CONCLUSIONS: The antimicrobial activity imparted by AgBG nanoparticles to the bracket adhesive is evident, highlighting its potential for further investigation for clinical use against white spot lesions, without significantly affecting the material's bond strength.

Abstract citation ID: cjag070.471
SP555 OSTEOGENIC EFFECTS OF L-PRF MEMBRANES ON CHICK EMBRYO FEMUR

Inês Francisco[1], Raquel Travassos[1], Catarina Oliveira[1], Maria Helena Fernandes[2], Francisco Vale[1]; *[1]Institute of Orthodontics, Faculty of Medicine, University of Coimbra; Coimbra Institute for Clinical and Biomedical Research (iCBR), Area of Environment Genetics and Oncobiology (CIMAGO), Faculty of Medicine, University of Coimbra; Laboratory for Evidence-Based Sciences and Precision Dentistry, University of Coimbra; Clinical Academic Center of Coimbra (CACC), Hospitais da Universidade de Coimbra; Centre for Materials and Processes (CEMMPRE), Advanced Production and Intelligent Systems (ARISE), Department of Mechanical Engineering, University of Coimbra; Centre for Innovative Biomedicine and Biotechnology (CIBB), University of Coimbra; Laboratory of Biostatistics and Medical Informatics (LBIM), Faculty of Medicine, University of Coimbra., Coimbra, Portugal, [2]Laboratory for Bone Metabolism and Regeneration, Faculty of Dental Medicine, University of Porto; LAQV/REQUIMTE, University of Porto., Porto, Portugal*

AIM: Bone regeneration is essential in oral and maxillofacial defects, but it is highly complex because it involves tissues of different origins. This study aimed to investigate the angiogenic and osteogenic potential of leukocyte and platelet-rich fibrin (L-PRF) membranes using an ex vivo embryonic chick femur model, assessing their effects through direct or indirect contact.
METHODS: Peripheral blood from a healthy donor was collected and processed to obtain L-PRF membranes. Membranes were characterized via scanning electron microscopy and histological staining (H&E, Masson's trichrome). Angiogenic activity was evaluated using the chorioallantoic membrane assay. For osteogenic assessment, embryonic chick femora were cultured ex vivo for 11 days in three conditions: control (no L-PRF), indirect contact, and direct contact with L-PRF. Mineralization and bone development were quantified via microcomputed tomography (μCT) and histochemical staining (Alcian blue and Sirius red). Morphometric parameters were analyzed statistically using the Shapiro-Wilk test for normality, followed by One-Way ANOVA with Tukey's post-hoc tests for normally distributed data, or Kruskal-Wallis tests for non-parametric data.
RESULTS: Chorioallantoic membrane assays demonstrated enhanced vascularization and vessel sprouting near L-PRF membranes. μCT analysis revealed increased mineralization in femora exposed to L-PRF, with the direct contact group showing significantly higher bone volume compared to control and indirect contact groups. Histochemical staining confirmed enhanced collagenous matrix deposition and trabecular organization in the direct contact group. Mineralized nodules were observed within L-PRF membranes, suggesting ectopic osteogenic activity.
CONCLUSION: L-PRF membranes exhibit substantial angiogenic and osteogenic potential, promoting bone development in the ex vivo chick femur model. Direct

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

contact with L-PRF significantly enhances mineralization and matrix organization, highlighting its promise as a regenerative adjunct in bone tissue engineering and oral-maxillofacial reconstruction.

Abstract citation ID: cjag070.472
SP558 GENDER DISTRIBUTION IN ORTHODONTIC AUTHORSHIP: A 10-YEAR ANALYSIS OF FOUR LEADING JOURNALS (2014–2023)

Cedric Schmid[1], Sara EslamiDr.[1], Vincent Kober[2], Babak SayahpourPD Dr.[1]; *[1]Department of Orthodontics, Johann-Wolfgang Goethe University, Frankfurt, Germany, [2]Department of Restorative Dentistry, Johann-Wolfgang Goethe University, Frankfurt, Germany*

AIM: To investigate gender-specific patterns of authorship in orthodontic scientific literature over ten years, focusing on authorship position (first, co-, last author), temporal trends, journal-related differences, regional patterns within Germany, and the potential impact of the COVID-19 pandemic.
MATERIALS AND METHODS: A retrospective bibliometric analysis was conducted on 22,034 articles published between 2014 and 2023 in four orthodontic journals: American Journal of Orthodontics and Dentofacial Orthopedics (AJO-DO), European Journal of Orthodontics (EJO), Progress in Orthodontics (Progress), and The Angle Orthodontist (Angle). Authorship was categorized by position (first, co-, last author) and gender. Time trends, journal comparisons, and (for German-affiliated authors) state-level differences were assessed. Differences between journals were tested statistically (significance level $p < .05$).
RESULTS: Across the full period, male authors were overrepresented in all authorship positions, most notably in leading roles (first- and last authorship). Nevertheless, female participation increased slightly over time, particularly among first and co-authors: female first authorship rose from 32.7% (2014) to 36.0% (2023), and female co-authorship from 27.5% to 29.0%. The COVID-19 period did not correspond to a decline; instead, results suggest a turning point with increased visibility of female authors from 2021/2022 onwards, consistent with the typical time lag between study planning and publication. Significant journal differences were observed ($p < .001$): female first-author proportions were highest in EJO (40%), followed by Angle (36%), AJO-DO (30%), and Progress (20%). In Germany, marked state-level variation was found (e.g., Hesse 47.7%, Bavaria 45.7% vs. North Rhine–Westphalia 20.5%, despite the highest output $n = 151$).
CONCLUSIONS: Orthodontic authorship from 2014–2023 shows persistent gender imbalance, particularly in senior/leading positions, alongside a modest upward trend in female participation. Differences between journals and heterogeneous patterns within Germany indicate that structural and local factors likely shape academic visibility. The post-pandemic increase in female representation highlights opportunities for targeted measures to further advance gender equity in orthodontic research.

Abstract citation ID: cjag070.473
SP559 SERVICE EVALUATION COMPARING ORTHODONTIC TREATMENT QUALITY AND EFFICIENCY IN 2014 VS 2024 ACROSS DIFFERENT OPERATOR GROUPS AT NEWCASTLE DENTAL HOSPITAL

Jitesh Jassal and Andrea Glover*; Newcastle Dental Hospital, Newcastle upon Tyne, United Kingdom*

AIM: To compare orthodontic treatment efficiency and effectiveness across operator groups between 2014 and 2024 within Newcastle Dental Hospital, evaluating treatment duration, Peer Assessment Rating (PAR) score improvement and PAR percentage reduction.
MATERIALS AND METHODS: A retrospective evaluation was conducted using anonymised orthodontic datasets for all patients whose treatment concluded in 2014 and 2024. A total of 366 cases in 2014 and 430 in 2024 were identified. External cases were excluded (2014: 10; 2024: 10). Further exclusions included incomplete PAR scoring and unidentifiable start or end dates (2014: 16; 2024: 4), resulting in 340 assessed cases in 2014 and 416 in 2024. PAR scores were obtained from pre- and post-treatment study models, with missing information retrieved from clinical notes, archived models or photographic records. Operator groups were split as Specialty Registrar - StR (Group 1), Associate Specialist/Therapist (Group 2), Senior Registrar post-CCST - FTTA (Group 3) and Consultant (Group 4). Treatment duration, PAR improvement and PAR percentage reduction were compared across groups.
RESULTS: In 2014, Group 1 (n=6) demonstrated a mean duration of 970 days with PAR improvement 28.2 and 89.9% reduction. Group 2 (n=151) averaged 812 days with PAR improvement 20.9 and 69.7% reduction. Group 3 (n=46) recorded 813 days with PAR improvement 19.9 and 67.2% reduction. Group 4 (n=137) averaged 927 days with improvement 22.0 and 73.5% reduction.
In 2024, Group 1 (n=18) delivered the shortest duration (630 days) with PAR improvement 23.1 and 80.2% reduction. Group 2 (n=77) averaged 1,029 days with PAR improvement 21.4 and 65.1% reduction. Group 3 (n=28) achieved the highest improvement (27.6) with duration 914 days and 78.2% reduction. Group 4 (n=293) had the longest duration (1,266 days) with PAR improvement 22.2 and 68.5% reduction.
CONCLUSIONS: Although PAR outcomes improved across the datasets, treatment times increased, with a rise in mean duration from 858 days to 1171 days. Consultants treated more patients, and had longer durations of treatment. Trainees treat simpler cases, and this is not always reflected by PAR scores. The small cohort of StR patients in 2014 may skew comparisons, and StRs in 2014 vs 2024 were at different stages of training.

Abstract citation ID: cjag070.474
SP561 WHAT FACTORS INFLUENCE THE DURATION OF ORTHODONTIC TRACTION IN IMPACTED MAXILLARY CANINES? A SYSTEMATIC REVIEW AND META-ANALYSIS

Raquel Travassos[1], Inês Francisco[1], Daniela Basto[2], Francisco Caramelo[3], Francisco Vale[1]; *[1]Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal; Institute for Clinical and Biomedical Research, Area of Environment, Genetics and Oncobiology Research Centre, Faculty of Medicine, University of Coimbra, Portugal; Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra, Portugal; Coimbra Academic Clinical Centre, Portugal; Centre for Mechanical Engineering, Materials and Processes, University of Coimbra, Portugal, Coimbra, Portugal, [2]Faculty of Medicine, University of Coimbra, Portugal, Coimbra, Portugal, [3]Faculty of Medicine, University of Coimbra, Portugal; Institute for Clinical and Biomedical Research, Area of Environment, Genetics and Oncobiology Research Centre, Faculty of Medicine, University of Coimbra, Portugal; Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra, Portugal; Coimbra Academic Clinical Centre, Portugal; Centre for Innovative Biomedicine and Biotechnology, University of Coimbra, Portugal; Laboratory of Biostatistics and Medical Informatics, Faculty of Medicine, University of Coimbra, Portugal, Coimbra, Portugal*

AIM: The maxillary canine, the second most commonly impacted tooth (1–3% prevalence), is vital for aesthetics, occlusion, and arch development. Orthodontic traction is preferred over extraction, making accurate prediction of treatment duration essential. This systematic review and meta-analysis intends to identify the factors that influence the duration of orthodontic traction in impacted maxillary canines.
MATERIALS AND METHOD: This systematic review and meta-analysis was drawn up in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis guidelines. The literature search was carried out in the following databases: Medline (through PubMed), Web of Science (all databases), Embase, Cochrane, OpenGrey Europe and ProQuest. The risk of bias of studies included was assessment using the RoB2 tool for randomized controlled clinical trials and the ROBINS-I V2 tool for non-randomized controlled clinical trials.
RESULTS: Of the 1156 studies collected from all the databases, 43 studies were included in qualitative analysis and 24 in quantitative analysis after removal of duplicates and application of eligibility criteria based on titles, abstracts and full texts screening. Patient-related factors, such as alpha angle, vertical height and sector, were most frequently reported as being associated with the duration of orthodontic traction. Other factors, including patient age and sex, the position and location of the impacted canine and the type of orthodontic treatment, were reported less consistently and remain subject to controversy regarding their actual influence on treatment duration.
CONCLUSIONS: Several patient-related and treatment-related factors were associated with the traction duration of impacted maxillary canines. An increased alpha angle, greater vertical height and a sector position closer to the midline were associated with longer treatment duration.

Abstract citation ID: cjag070.475
SP562 ASSOCIATION BETWEEN TRAUMATIC OVERBITE AND PERIODONTAL CONDITION IN THE NORTHERN FINLAND BIRTH COHORT 1966

Joonas Karhi, Antti Tiisanoja, Linnea Närhi, Elisa Tervahauta, Anna-Sofia Silvola*; University of Oulu, Oulu, Finland*

AIM: The aim of this study was to investigate whether traumatic overbite is associated with deepened periodontal pockets and increased alveolar bone loss in an adult population.
MATERIALS AND METHODS: The study population ($n = 1,027$) was obtained from a 46-year follow-up study of the Northern Finland Birth Cohort 1966 (NFBC1966). The presence of traumatic overbite was determined by analyzing digital 3D dental

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

models. Periodontal condition was assessed by using the number of sites with deepened periodontal pockets (≥ 4 mm) and level of alveolar bone loss (≥ 2 mm and ≥ 3 mm of bone loss) measured from dental panoramic tomographs (DPTs). Prevalence rate ratios (PRR) and 95% confidence intervals (95% CI) were estimated using negative binomial regression models.
RESULTS: In this study population, subjects with traumatic overbite had fewer surfaces with bone loss of 2 mm or more in the maxillary teeth ($p = 0.024$). In either the unadjusted analyses or the adjusted regression analyses, no statistically significant associations were observed between traumatic overbite and periodontal condition.
CONCLUSION: Traumatic overbite was not clearly associated with increased periodontal pocket depth or alveolar bone loss at a population level.

Abstract citation ID: cjag070.476
SP563 ‡‡‡ *** PRESERVATION OF ORAL FUNCTION UNDER SIMULATED MICROGRAVITY: FINDINGS FROM THE NASA SENSORIMOTOR COUNTERMEASURES STUDY

Teresa Kruse[1], Neele K Knieps[1], Laura de Boni[2], Anna G Barbe[3], Bert Braumann[1]; [1]*University of Cologne, Faculty of Medicine and University Hospital Cologne, Department of Orthodontics, Cologne, Germany,* [2]*Institute of Aerospace Medicine, German Aerospace Center, Cologne, Germany,* [3]*University of Cologne, Faculty of Medicine and University Hospital Cologne, Polyclinic for operative Dentistry and Periodontology, Cologne, Germany*

AIM: Since the beginning of human spaceflight, research has focused on the physiological effects of weightlessness on the human body. Besides the loss of muscle and bone mass in microgravity, fluid shifts toward the head cause facial edema, commonly referred to as “puffy face”. Understanding the impact on oral function is essential, as impaired chewing and swallowing could increase the risk of malnutrition during long-duration missions. The 6° head-down tilt (HDT) bed rest model is considered the gold standard for simulating the physiological stress of microgravity. This study aimed to analyze longitudinal changes in oral function within NASA’s Sensorimotor Countermeasures Study.
SUBJECTS AND METHODS: Oral function was assessed by measuring bite force and tongue pressure, endurance, and chewing coordination. To induce fluid shifts toward the head, 23 healthy subjects (32 ± 6 years, 28 ± 2 teeth) participated in an analog simulation for weightlessness featuring a body position in 6° head-down tilt, including bed rest for 60 days at the German Aerospace Center. Measurements were taken seven days prior to HDT (Baseline Data Collection, BDC-7), on days 31 and 57 of HDT (HDT31 and HDT57), and six days post-tilt recovery (R+6). Bite force, tongue pressure, and endurance levels were recorded using the T-Scan©/I-Scan© system and an IOPI© device. Chewing coordination during bolus formation was evaluated using Hue-Check Gum© to quantify the mixing of two differently colored gums.
RESULTS: Oral function remained stable throughout the HDT period and after the recovery phase (R+6). No signs of functional impairment in biting, chewing, or tongue performance were detected. Median values and standard deviations of all parameters showed only minor fluctuations over time. Differences in bite force, tongue pressure, endurance, and bolus processing between BDC-7, HDT31, HDT57, and R+6 were statistically insignificant ($p > 0.05$).
CONCLUSION: This study demonstrates that oral function remained unaffected despite substantial fluid shifts in the head, which in some participants led to facial edema or even papilledema. Masticatory muscles appear highly resistant to external stressors, likely because consistent masticatory loading is maintained even during prolonged immobilization or spaceflight.

Abstract citation ID: cjag070.477
SP564 EFFICACY OF ORTHODONTIC AND CONVENTIONAL TOOTHBRUSHES IN ORTHODONTIC PATIENTS WITH CLEFT LIP AND PALATE

Ana Araújo[1], Sara Marques[2], Raquel Travassos[3], Inês Francisco[3], Francisco Vale[3]; [1]*Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal, Coimbra, Portugal,* [2]*Faculty of Medicine, University of Coimbra, Portugal, Coimbra, Portugal,* [3]*Faculty of Medicine, University of Coimbra, Portugal; Institute of Orthodontics, Faculty of Medicine, University of Coimbra, Portugal; Institute for Clinical and Biomedical Research, Faculty of Medicine, University of Coimbra, Portugal; Environment, Genetics and Oncobiology Research Centre, University of Coimbra, Portugal; Laboratory of Evidence-Based and Precision Dentistry, University of Coimbra, Portugal; Coimbra Academic Clinical Centre, Portugal; Centre for Mechanical Engineering, Materials and Processes, University of Coimbra, Portugal., Coimbra, Portugal*

AIM: Patients with congenital cleft lip and/or palate malformations frequently exhibit disturbances in craniofacial growth as well as dental anomalies that may predispose them to increased bacterial plaque accumulation. Such conditions can compromise effective oral hygiene and impair natural cleansing mechanisms provided by saliva and the tongue. The present study aimed to evaluate and compare the efficacy of plaque removal between an orthodontic toothbrush and a conventional toothbrush in orthodontic patients with cleft lip and/or palate.
MATERIALS AND METHOD: Participant enrolment took place at the Institute of Orthodontics, Faculty of Medicine, University of Coimbra, and included cleft lip and/or palate individuals undergoing treatment with bimaxillary fixed orthodontic appliances. Participants were randomly allocated into two groups: the experimental group, instructed to use an orthodontic toothbrush, and the control group, using a conventional toothbrush. Plaque accumulation was assessed using a modified Silness and Loe Plaque Index, while periodontal status was evaluated through the Papillary Bleeding Index. Brushing time was also recorded. All assessments were performed at two evaluation points: T0—baseline examination and initial documentation; and T1—reassessment undertaken after a one-month follow-up period.
RESULTS: The final sample comprised 15 participants (8 females and 7 males). In the control group, overall plaque levels decreased from T0 to T1 (mean 1.81 to 1.57). Conversely, the experimental group demonstrated diminished oral hygiene performance, with mean plaque index values rising from 1.06 to 1.33, except in two patients. Papillary bleeding index values decreased in both groups at T1, with the lowest mean observed in the control group. Brushing duration increased from T0 to T1 in both groups.
CONCLUSIONS: Regular reinforcement of oral hygiene instructions and motivational strategies appears to enhance adherence to effective toothbrushing practices, resulting in reductions in both plaque accumulation and gingival bleeding indices. Under the conditions of the present study, the conventional toothbrush demonstrated superior efficacy in plaque removal compared with the orthodontic toothbrush.

Abstract citation ID: cjag070.478
SP565 IMPACT OF ORAL PROBIOTICS ON ORAL HEALTH AND HALITOSIS IN ORTHODONTIC PATIENTS TREATED WITH ALIGNERS VS CONVENTIONAL FIXED APPLIANCES: A RANDOMIZED CLINICAL TRAIL

GEORGIOS VASOGLOU[1], GERASSIMOS ANGELOPOULOS[1], DIMITRIOS KLOUKOS[2], NIKOLAOS PANDIS[3], IOSIF SIFAKAKIS[1]; [1]*National and Kapodistrian University of Athens, School of Dentistry, Department of Orthodontics, 2 Thivon str., 11527 Goudi, Athens, Greece, ATHENS, Greece,* [2]*1.Department of Orthodontics and Dentofacial Orthopedics, School of Dental Medicine, University of Bern, Freiburgstrasse 7, CH-3010 Bern, Switzerland 2.Department of Orthodontics and Dentofacial Orthopedics, 251 Hellenic Air Force & VA General Hospital, 3 P. Kanellopoulou str., 11525 Athens, Greece, ATHENS, Greece,* [3]*Department of Orthodontics and Dentofacial Orthopedics, School of Dental Medicine/Medical Faculty, University of Bern, Freiburgstrasse 7, 3010 Bern, Switzerland; private practice, Corfu, Greece, ATHENS, Greece*

BACKGROUND: Halitosis is primarily caused by oral microbiota dysbiosis, exacerbated by orthodontic appliances that promote plaque retention. Probiotics offer a
potential non-invasive strategy to rebalance oral flora and reduce volatile sulfur compounds (VSCs), but their clinical effectiveness remains underexplored in orthodontic contexts.
OBJECTIVES: The aim of this randomized controlled trial (RCT) was to determine the effect of oral probiotics containing Lactobacillus Salivarius Oral S1 on plaque and gingival indices as well as on halitosis in patients treated with orthodontic brackets vs. aligners.
METHODS: In this 2-center parallel group, placebo-controlled RCT, 59 patients with fixed appliances and 59 patients treated with Invisalign™ aligners were randomly allocated to probiotic or placebo groups. The intervention was 1 month course of probiotics, compared to placebo. The primary outcome was the Modified Plaque Index (PI-M) and the secondary outcomes were the Gingival Index (GI) and the levels of the volatile sulfur compounds [VLC i.e. H_2S, CH_3SH, $(CH_3)_2S$], all measured at baseline (T0), after 1 month of intervention (T1), and 2 months after discontinuation of the probiotics (T2).
RESULTS: Significant differences in the primary outcome were observed between groups (Coef., 95% CI and p-value): aligner–placebo vs. aligner–probiotics -0.06 (-0.10 to -0.01), $p = 0.01$; aligner–placebo vs. bracket–placebo: 0.10 (0.06 to 0.15), $p < 0.01$; aligner–placebo vs. bracket–probiotics: 0.08 (0.03 to 0.12), $p < 0.01$. Moreover, significant reductions in GI, H_2S and total VSCs were observed at T1 in the probiotic groups ($p<0.01$). Fixed appliance users exhibited higher baseline scores for all outcomes. Probiotic use was particularly effective in this group, with notable improvements in plaque control, gingival health, and halitosis reduction. Partial relapse occurred by T2, suggesting that benefits mostly diminish after intervention cessation.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

CONCLUSIONS: Administration of oral probiotics for one month significantly improved periodontal health and reduced halitosis in orthodontic patients, especially in those with fixed appliances.

Abstract citation ID: cjag070.479
SP566 UNDERSTANDING AXIETY REACTIONS TO AUDIOVISUAL INFORMED CONSENT IN ADOLESCENT ORTHODONTIC CARE: A PILOT STUDY

Lærke Stage Nielsen[1], Mette Schmidt[1], Lene Vase[2], Peter Stoustrup[1]; [1]*Aarhus University, Section of Orthodontics, Department of Dentistry and Oral Health, Aarhus University, Vennelyst Blvd. 9, Aarhus, Denmark,* [2]*Aarhus University, Department of Psychology and Behavioral Science, Aarhus University, Bartholins Allé 11, 1350, 316, Aarhus, Denmark*

AIM: 1)To investigate whether a standardized audiovisual informed-consent procedure induces elevated anxiety (State and Trait Anxiety) in adolescents prior to orthodontic treatment, and 2) to examine whether baseline Pain Catastrophizing is associated with elevated anxiety responses.
MATERIALS AND METHODS: We prospectively recruited adolescents aged 12–18 years undergoing initial orthodontic assessment. Participants completed validated questionnaires at three time points: 1) at the first consultation (T1), 2) immediately after receiving standardized audiovisual risk information (T2), 3) and at appliance placement (T3). Questionnaires included the Spielberger State–Trait Anxiety Inventory for Children (STAIC-1/2) and the Pain Catastrophizing Scale (PCS). Normality was assessed using the Shapiro–Wilk test. Changes in State Anxiety (STAIC-1) were analyzed using repeated-measures ANOVA, whereas Pain Catastrophizing (PCS) and State Anxiety (STAIC-2) were examined using Cuzick's non-parametric trend test. Linear regression models assessed associations between baseline Pain Catastrophizing or Trait Anxiety and State Anxiety at T2. Subgroup analyses explored psychological differences between adolescents whose State Anxiety increased versus decreased following risk information.
RESULTS: Thirty-one participants were included. Pain Catastrophizing Scale remained stable across all time points. State Anxiety showed a small overall decline from T1 to T3, with a significant reduction between T1 and T3. Trait Anxiety demonstrated no consistent temporal change. Higher baseline Pain Catastrophizing was modestly associated with higher State Anxiety at T2 ($\beta = 0.32$, $p = 0.046$; $R^2 = 0.13$), while baseline Trait Anxiety showed a stronger association ($\beta = 0.44$, $p = 0.0004$; $R^2 = 0.36$). Subgroup analyses revealed no baseline psychological differences across any of the questionnaires between adolescents who increased versus decreased in State Anxiety at T2; however, those who increased exhibited higher concurrent State and Trait Anxiety at T2.
CONCLUSIONS: Standardized audiovisual informed consent did not increase State Anxiety at the group level. However, a distinct subgroup of adolescents showed a rise in State Anxiety immediately after receiving the information. Trait Anxiety was the strongest predictor of this response, whereas Pain Catastrophizing had limited influence. These findings suggest that audiovisual informed consent is generally safe, but patients with higher situational anxiety may require additional support during information delivery.

Abstract citation ID: cjag070.480
SP567 CORROSION RESISTANCE OF NANOCOATED ARCHWIRES USING COMBINED METHODS OF CATHODIC ARC EVAPORATION AND MAGNETRON SPUTTERING

Bojana Ilić[1], Bozana Petrovic[1], Jelena Marinkovic[1], Jelena Filipovic[1], Jana Ilic[2]; [1]*Institute of Nuclear Sciences "VINCA", Belgrade, Serbia,* [2]*Health Center, Banjaluka, Bosnia and Herzegovina*

AIM: The nitinol archwire have been used in orthodontics due to unique mechanical properties, but chemically or microbiologically induced corrosion may limit their save application. When exposed to the oral environment and constant pH and temperature changes or food or product abrasions, the release of Ni occurs, resulting in various health implications. Using the nanotechnology, it is possible to modify the surface of the nitinol archwires in order to decrease of Ni release without influencing the mechanical properties. The aim of this investigation was to enhance corrosion resistance and introduce antibacterial properties to nitinol archwires by coating them with titanium nitride doped with copper using combined methods of cathodic arc evaporation and magnetron sputtering.
MATERIALS AND METHOD: The deposition of the nanocoatings was confirmed by X-ray diffraction and Fourier transformed infrared spectroscopy. The wettability of investigated archwires was assessed on a homemade device with CCD detector using deionised water. The thicknesses of nanocoating was estimated using scanning electron microscopy. Inductively coupled plasma optical emission spectrometry was used to measure the ion release. The cytotoxicity of investigated archwires was analysed using Neutral red assay. Antibacterial effects were tested against bacterial strains *Streptococcus mutans* and *Enterococcus faecalis*.
RESULTS: Physicochemical characterization revealed well-designed nanocoatings with the presence of TiN phase with incorporated Cu, with spherical particles (20-170 nm). The water contact angles measurements showed good hydrophobic properties of nanocoatings. Statistically lower Ni release was showen both in water and acidic solution regarding the nanocated archwires ($p < 0.05$). The release of Ti was constant during the time in the case of nanocoated archwires, contrary to NiTi archwires ($p < 0.05$). The release of Cu was the highest in case of nanocoated archwires and decreased during time ($p < 0.05$). The relative cell viability was the highest in 7-day eluates of nanocoated archwires ($p < 0.05$). The most evident decrease in antibacterial growth was notices against *Streptococcus mutans* in the case of nanocoated archwires ($p < 0.05$).
CONCLUSIONS: With the respect to ion release analysis and biological properties, the nanocoated archwires may be considered as a good candidate for further clinical investigations.

Abstract citation ID: cjag070.481
SP568 SKELETAL AND DENTOALVEOLAR EFFECTS OF FIXED MANDIBULAR ADVANCE APPLIANCES IN GROWING PATIENTS

Joudi Nasan, Ana Sanchez, Ali Azari Mehr, Tawfiq Hijazi, Marcela Ferrer Molina; *universidad catolica de valencia, Valencia, Spain*

AIM: to evaluate the skeletal, dentoalveolar, and profile effects of treatment with the BioBite Corrector in cases of Class II malocclusion in growing patients.
MATERIALS AND METHOD: This quasi-experimental clinical study included a total of 13 growing patients (CVMS 3) with Class II malocclusion and mandibular retrognathism, treated with the BioBite Corrector (Dentsply Sirona®) as a fixed functional appliance. Participants were selected based on specific inclusion criteria. Skeletal, dental, and profile effects of the appliance were evaluated using various angular and linear parameters in digital lateral cephalometries and through the Pancherz cephalometric method. Records were collected before the start of orthodontic treatment (T1) and at the end of treatment (T2). All participants were treated with MBT pre-adjusted prescription appliances. Statistical analysis was performed using a paired t-test to compare individual mean changes in each treatment category.
RESULTS: sagittal correction of Class II malocclusion was primarily achieved through dentoalveolar changes in the mandible, particularly due to incisor proclination and mesialization of the lower molar after treatment. Despite these changes, there was a significant difference in the ANB angle, indicating a decrease in SNA without changes in SNB, suggesting that the effects were mainly due to skeletal restriction of the maxillary.
CONCLUSIONS: the BioBite Corrector was effective in correcting Class II malocclusion primarily at the dentoalveolar level, with no evidence of skeletal changes based on the results obtained from Pancherz superimposition. Furthermore, no improvement was observed in the facial profile.

Abstract citation ID: cjag070.482
SP570 ‡‡‡ DEEP LEARNING-BASED AUTOMATED DETECTION OF PERMANENT MAXILLARY CANINE ECTOPIC ERUPTION IN MIXED DENTITION PANORAMIC RADIOGRAPHS

Serena Incerti Parenti, Alessandro Maglioni, Giorgio Tsiotas, Luciano Bononi, Giulio Alessandri Bonetti; *University of Bologna, Bologna, Italy*

AIM: This study aimed to develop a novel deep learning framework for automated early detection of permanent maxillary canine ectopic eruption on mixed dentition panoramic radiographs by objectively quantifying canine inclination to the midline (α angle) and determining mesiodistal crown position according to established Ericson and Kurol criteria.
MATERIALS AND METHOD: A retrospective dataset of 250 panoramic radiographs from patients aged 6-13 years in mixed dentition was collected and divided into training (80%), validation (10%), and test (10%) subsets. Expert orthodontists annotated all deciduous and permanent teeth and traced maxillary canine long axis, midline reference, and sector division lines based on Ericson and Kurol classification. A two-stage architecture was developed: first, a YOLOv11 detection model, pretrained on 650 adult radiographs from a publicly available dataset and fine-tuned on the pediatric cohort, localized and classified all dental elements as previously described; second, a novel convolutional neural network trained on cropped canine regions estimated α angle through regression analysis and determined mesiodistal crown position through five sector classification. Performance metrics included mean average precision (mAP) for detection and classification, mean

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

absolute error (MAE), root mean square error (RMSE), and explained variance for angular measurements, with 95% confidence intervals (CI).
RESULTS: As previously reported, the YOLOv11 model achieved $mAP_{0.5}$=0.963 [95% CI: 0.944-0.983] for detection and $mAP_{0.5}$=0.890 [95%CI: 0.857-0.923] for segmentation. The novel α-angle quantification demonstrated MAE=1.66° and RMSE=2.39° with explained variance of 0.972, showing highest accuracy in the clinically critical 15-30° range, where an accurate evaluation of the ectopic eruption risk is of the utmost importance. Mesiodistal sector classification correctly identified canine position in 94% of cases.
CONCLUSIONS: This automated framework successfully integrates mixed dentition recognition with objective quantification of established ectopic eruption predictors, achieving clinically acceptable accuracy for both angular and sector-based assessments. By standardizing radiographic measurements, the system may facilitate large-scale early screening, reduce diagnostic variability, and enable timely implementation of interceptive strategies. Prospective multicenter validation is warranted to confirm clinical impact.

Abstract citation ID: cjag070.483
SP576 ‡‡‡ BRAND-SPECIFIC DIFFERENCES IN THE CYTOTOXICITY OF CLEAR ALIGNER MATERIALS

Catarina Nunes[1], Inês Francisco[1], Catarina Mestre[2], Mafalda Laranjo[3], Francisco Vale[1]; *[1]1. Faculty of Medicine, Institute of Orthodontics, and Laboratory for Evidence-Based Sciences and Precision Dentistry, University of Coimbra, Coimbra, Portugal. 2. Faculty of Medicine, Coimbra Institute for Clinical and Biomedical Research (iCBR), Area of Environment Genetics and Oncobiology (CIMAGO), University of Coimbra, Coimbra, Portugal. 3. Faculty of Medicine, Institute of Biophysics, University of Coimbra, Coimbra, Portugal. 4. Clinical Academic Centre of Coimbra (CACC), Coimbra, Portugal. 5. Center for Innovative Biomedicine and Biotechnology (CIBB), University of Coimbra, Coimbra, Portugal. 6. Centre for Mechanical Engineering, Materials and Processes (CEMMPRE) and Advanced Production and Intelligent Systems (ARISE), University of Coimbra, Coimbra, Portugal., Coimbra, Portugal, [2]2. Faculty of Medicine, Coimbra Institute for Clinical and Biomedical Research (iCBR), Area of Environment Genetics and Oncobiology (CIMAGO), University of Coimbra, Coimbra, Portugal. 3. Faculty of Medicine, Institute of Biophysics, University of Coimbra, Coimbra, Portugal. 5. Center for Innovative Biomedicine and Biotechnology (CIBB), University of Coimbra, Coimbra, Portugal., Coimbra, Portugal, [3]2. Faculty of Medicine, Coimbra Institute for Clinical and Biomedical Research (iCBR), Area of Environment Genetics and Oncobiology (CIMAGO), University of Coimbra, Coimbra, Portugal. 3. Faculty of Medicine, Institute of Biophysics, University of Coimbra, Coimbra, Portugal. 4. Clinical Academic Centre of Coimbra (CACC), Coimbra, Portugal. 5. Center for Innovative Biomedicine and Biotechnology (CIBB), University of Coimbra, Coimbra, Portugal., Coimbra, Portugal*

AIM: Clear aligner therapy has rapidly expanded in orthodontic practice, yet its widespread use has progressed faster than the scientific evaluation of its biological safety. Because aligners remain in prolonged contact with the oral environment, assessing the cytotoxic potential of their constituent materials is essential. This study aimed to evaluate and compare the cytotoxic effects of five commonly used clear aligner materials—ClearCorrect, Invisalign, Spark, SureSmile and Essix PLUS—on several cell lines to assess their in vitro cytotoxicity and safety.
MATERIALS AND METHODS: Three cell lines (MRC-5, 3T3-L1 and Vero) were exposed to conditioned media obtained from the clear aligner materials. Cytotoxicity was assessed using the MTT assay. Cell cycle distribution, viability, mechanisms of cell death and morphological changes were analysed with flow cytometry and optical microscopy. Descriptive and inferential statistical tests were applied with a significance level of 5%.
RESULTS: Invisalign and Spark demonstrated the greatest cytotoxicity, with significant reductions in cell viability and marked alterations in cell cycle distribution, particularly in Vero cells. Essix PLUS showed lower cytotoxicity when thermoformed, suggesting that manufacturing processes may influence safety. Morphological observations confirmed apoptosis and necrosis as the predominant mechanisms of cell death. Consistently across cell lines, Spark and Invisalign also produced the most substantial reductions in metabolic activity—falling below the 70% viability threshold in MRC-5 and 3T3-L1 cells—while ClearCorrect and Essix PLUS frequently allowed partial metabolic recovery over time, indicating lower cytotoxic potential.
CONCLUSIONS: Clear aligner materials presented distinct cytotoxicity profiles, with Invisalign and Spark exhibiting the strongest cytotoxic effects, whereas Essix PLUS showed reduced cytotoxicity under specific conditions. These findings highlight the impact of material composition and production processes on biocompatibility.

Abstract citation ID: cjag070.484
SP577 ‡‡‡ VALIDATION OF THE POLISH VERSION OF THE MALOCCLUSION IMPACT QUESTIONNAIRE (MIQ) INDICATES LIMITED PSYCHOMETRIC PERFORMANCE

Justyna Molczyk-Sieńczak, Urszula Zajda, Marta Gibas-Stanek, Piotr Fudalej; *1Department of Orthodontics, Jagiellonian University, Kraków, Poland*

BACKGROUND: The Malocclusion Impact Questionnaire (MIQ) was developed to evaluate how malocclusion affects oral health–related quality of life (OHRQoL) among British adolescents aged 10 to 16 years. The preliminary evaluation of the Polish version (MIQ-PL) revealed limitations in its psychometric performance.
AIM: To conduct an extended validation of MIQ-PL using a larger sample of Polish adolescents.
SUBJECTS AND METHOD: 120 children (54 boys) with a mean age of 11.95 years (SD=1.57, range: 10–16) participated in the study. They were asked to complete the Polish version of the (MIQ-PL) before the initiation of orthodontic treatment. The severity of malocclusion was evaluated on 3D scans of the dental arches using the Peer Assessment Rating (PAR) Index and on intra-oral photographs using the Aesthetic Component of the Index of Orthodontic Treatment Need (AC-IOTN). Internal consistency of the MIQ-PL responses was analyzed using Cronbach's alpha, and intraclass correlation coefficients (ICCs) were used to determine method error in PAR and AC-IOTN scoring. Correlation analyses were conducted to assess the association between PAR and AC-IOTN scores and the MIQ global question 1 (MIQ_{GQ1}), MIQ global question 2 (MIQ_{GQ2}), and the MIQ overall score (MIQ_{OS}).
RESULTS: MIQ-PL showed high internal consistency (Cronbach's alpha = 0.91), while PAR and AC-IOTN scoring demonstrated excellent reproducibility (ICCs > 0.9). Mean MIQGQ1, MIQGQ2, and MIQOS values were 1.6 (SD = 1.0), 1.1 (SD = 1.1), and 8.2 (SD = 6.7), respectively. Mean PAR and AC-IOTN scores were 18.0 (SD = 9.6) and 4.2 (SD = 2.1). Correlations between PAR and MIQ scores were weak (r = 0.06–0.14), and correlations between AC-IOTN and MIQ scores were similarly weak (r = 0.004–0.16). A significant positive association was observed between MIQ scores and age.
CONCLUSIONS: The findings suggest that malocclusion severity has only a weak impact on OHRQoL in Polish adolescents aged 10–16 years. However, the effect of malocclusion on perceived quality of life appears to increase with age, indicating that older adolescents may experience greater psychosocial impact.

Abstract citation ID: cjag070.485
SP578 THE ACCURACY OF A DIGITIZED INDIRECT BONDING PROTOCOL: A CLINICAL STUDY

Emma McShane[1], Conal Kavanagh[2], Finn Geoghegan[3], Padhraig S Fleming[1]; *[1]Dublin Dental University Hospital, Dublin, Ireland, [2]Conal Kavanagh Orthodontics, Galway, Ireland, [3]Specialist Orthodontist Practice, Dublin, Ireland*

AIMS AND OBJECTIVES: Indirect bonding (IDB) traditionally involved the placement of fixed appliances onto physical casts which were subsequently transferred to the dentition via a transfer tray. Advances in digitized planning allows treatment software to be used to plan bracket position. This permits ideal bracket positioning and is associated with greater positioning accuracy, reduced chair time and increased patient comfort. The aim of this study is to evaluate the accuracy of the final attachment position relative to the virtual planned prescription, to evaluate the specific nature of any identified discrepancies and to quantify positional differences based on tooth location.
MATERIALS AND METHODS: This prospective study involved consecutive patients in a private, specialist orthodontic practice. Ethical approval was obtained from Faculty of Health Sciences, Trinity College Dublin. Participants included individuals over the age of 13 years requiring fixed appliance therapy on a non-extraction basis. A digital scan was obtained of the malocclusion pre-treatment. Bracket position was planned using OnyxCeph TM software, and a customized transfer tray was used to transfer brackets to the patients dentition. A standardized IDB protocol was performed by a single clinician and a digital scan was obtained directly following bonding. Following sample size estimation, 59 arches were available for analysis.
RESULTS: Planned and final attachment position casts were superimposed using OnyxCeph TM software. Linear differences (slot position and occluso-gingival position) were measured in millimetres, and angular differences (torque, tip and rotation) were measures in degrees. Paired *t-tests* were used to assess discrepancies between planned and final positions. Results showed greater inaccuracies in angular parameters. Linear discrepancies were more frequently seen in posterior teeth (premolars and molars), whereas angular differences are more common in canines,

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

with linear differences not exceeding +2.01mm and angular differences ranging from -0.8-7.7°.
CONCLUSION: Indirect bonding proposes many advantages for the clinician, with technological advances constantly evolving its efficiency. This study aimed to assess the accuracy of digitized indirect bonding. Results showed greater errors in angular positional differences than linear and posterior teeth less accurate than anterior teeth.

Abstract citation ID: cjag070.486
SP579 THE EFFECT OF ORTHODONTIC TREATMENT ON MASTICATORY EFFICIENCY: A SYSTEMATIC REVIEW

Maria Anna Sakki, Angeliki Granika, Miltiadis Makrygiannakis, Georgios Kanavakis; *School of Dentistry National and Kapodistrian University of Athens, ATHENS, Greece*

AIM: To evaluate the available literature regarding the effect of comprehensive orthodontic treatment with fixed appliances on objectively assessed masticatory efficiency.
MATERIALS AND METHODS: Unrestricted searches of seven databases (PubMed, Scopus, ProQuest Dissertations and Theses, the Cochrane Central Register of Controlled Trials, the Cochrane Database of Systematic Reviews, Web of Science, and Google Scholar) was conducted from inception until August 2025, using predetermined search strategies. Risk of bias was assessed with the ROBINS-I tool. Clinical studies evaluating masticatory performance in human subjects before and after orthodontic treatment were included. Extracted data included treatment modality, assessment method (particle size analysis, mixing ability tests, bite force measurements), sample characteristics and quantified outcomes.
RESULTS: Four studies met the inclusion criteria and comprised the final sample. These studies used a variety of methods to assess masticatory performance and reported improvements measured by: colorimetric analysis using spectrophotometry (molar extinction coefficient increased by 42.5%), a silicone tablet test (masticatory efficiency index increased by 47.6%), particle size analysis using test food (median particle size decreased by 24.4%), and a peanut-chewing efficiency test based on pre- and post-chewing weight differences (efficiency increased by 28.2%). However, due to substantial heterogeneity among the studies, a meaningful meta-analysis could not be performed. Risk of bias assessment using ROBINS-I revealed that all studies were affected by confounding factors that were not fully accounted for.
CONCLUSIONS: Orthodontic treatment with fixed appliances appears to positively influence masticatory efficiency, although the level of improvement differs depending on malocclusion type, treatment approach, and assessment method. Although orthodontic therapy is associated with improvements in chewing efficiency, robust, high-quality prospective studies are needed to confirm these findings and better delineate the effects of orthodontic interventions.

Abstract citation ID: cjag070.487
SP580 MALOCCLUSION AND ORTHODONTIC TREATMENT IN SCHOOL CHILDREN WITH INTELLECTUAL DISABILITY

KAROLINA Gerreth, Alicja Hoffmann-Przybylska, Piotr Przybylski; *Poznan University of Medical Sciences, Department of Risk Group Dentistry, Poznan, Poland*

AIM: There is relatively scarce data in the medical literature regarding orthodontic problems in individuals with intellectual disability. Therefore, the aim of this study was to analyze the prevalence of the malocclusion among students attending special-care schools and to evaluate the proportion of patients undergoing othodontic treatment.
MATERIAL AND METHODS: The study included a group of students (children, teenagers, and young adults) with intellectual disability (mild, moderate, severe or profound) and chronic systemic diseases, aged 6 to 23 years (mean age $\pm$ SD = 4.3$\pm$4.6 years). Participants attended six special-care schools in Poznan, Poland. The research project comprised a clinical examination of the student's occlusion and a sociomedical assessment involving their parent or legal caregiver. The questionnaire concerned history of dental treatment of students, including orthodontic therapy. Statistical analysis was performed using the Mann-Whitney test, Kruskal-Wallis test, Dunn's test, chi-square test and Fisher's exact test in R (version 4.1.1), with a significance level set at $p<0.05$.
RESULTS: Moderate or severe malocclusion was observed in 50.67% of all participants. Statistical analysis showed that malocclusion was significantly more prevalent among students with severe or profound intellectual disability ($p<0.001$). Among individuals with mild intellectual disabilities, 19.57% had previously undergone orthodontic treatment, while 13.04% were currently receiving such therapy. Similar trends were observed for students with moderate disability. The lowest proportion of individuals who had undergone orthodontic treatment (13.04%) was noted in the group with severe or profound disability.
CONCLUSIONS: Clinical study revealed a high prevalence of malocclusion among students with intellectual disability attending special-care schools in Poznan. The results of socio-medical survey conducted among parents/legal caregivers indicate that only a portion of the studied population of children, adolescents, and young adults received orthodontic treatment.

Abstract citation ID: cjag070.488
SP581 DENTO-SKELETAL EFFECTS OF THE LEAF EXPANDER (LE) IN SLOW MAXILLARY EXPANSION (SME): A RAPID REVIEW

Joanna Gibińska - Styła[1], Aleksandra Kicińska[2], Kamila Adamczyk[2]; *[1]NOZO Karmelicka, Cracow, Poland, [2]NZOZ Ortodoncja, Cracow, Poland*

AIM: This rapid review aimed to synthesise current evidence regarding the effectiveness and dento-skeletal outcomes of the Leaf Expander (LE) as a protocol for slow maxillary expansion (SME) in growing patients.
MATERIALS AND METHOD: A systematic search of the PubMed database was conducted up to November 2025 using the keyword "Leaf Expander". Inclusion criteria followed a simplified PICO framework: growing patients (P), treated with LE (I), compared with untreated controls or rapid maxillary expansion (C), reporting dento-skeletal outcomes (O). From 24 initial results, 13 studies met the eligibility criteria. Three authors independently performed screening and data extraction. Extracted variables included transverse maxillary and mandibular changes, skeletal effects, dental side effects and patient tolerance. Methodological quality was evaluated with simplified Joanna Briggs Institute checklist.
RESULTS: Across studies, LE consistently produced significant transverse maxillary expansion. In comparison with untreated controls, LE resulted in increases of approximately +5 to +7 mm in upper intercanine width and +3 to +6 mm in intermolar width depending on dentition, together with an increase of about +3 mm in arch perimeter. Mandibular intermolar width showed minimal or no change.Compared with rapid maxillary expansion (RME), LE produced similar intermolar gains, while RME generated slightly greater increases in intercanine width and anterior skeletal nasal–maxillary widening; however, these differences typically remained below thresholds of clinical significance (<1.5 mm). Posterior skeletal expansion was comparable between LE and RME.

LE also produced consistent downward displacement of the maxilla and mandible relative to untreated controls. CBCT studies confirmed measurable skeletal widening, especially posteriorly, whereas RME produced greater anterior widening. LE showed superior control of dental side effects, demonstrating less buccal tipping of permanent molars and preservation of buccal bone thickness when anchored on deciduous molars. Palatal analyses revealed increases in surface area and transverse widening without significant changes in vault height. Reported outcomes primarily reflected short- to mid-term follow-up (7–12 months), with limited data on long-term stability.
CONCLUSIONS: Leaf Expander is an effective, well-tolerated appliance for correcting transverse maxillary deficiency in growing patients. It provides transverse changes comparable to RME while producing fewer dentoalveolar side effects and not requiring patient compliance.

Abstract citation ID: cjag070.489
SP582 ETHICAL AND BIOETHICAL ASPECTS OF ARTIFICIAL INTELLIGENCE APPLICATIONS IN ORTHODONTICS: A SYSTEMATIC REVIEW

Maria Zyli[1], Maria K. Chorianopoulou[2], Miltiadis A. Makrygiannakis[3], Eleftherios G. Kaklamanos[4], Alexandra K. Papadopoulou[5]; *[1]Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece, [2]Practical Philosophy and Medical Ethics, School of Philosophy, National and Kapodistrian University of Athens, Athens, Greece, [3]School of Dentistry, European University Cyprus, Nicosia, Cyprus, [4]School of Dentistry, Aristotle University of Thessaloniki, Thessaloniki, Greece, [5]Division of Orthodontics, University Clinics of Dental Medicine, Faculty of Medicine, University of Geneva, Geneva, Switzerland*

AIM: The aim of this study was to investigate the ethical challenges associated with the integration of artificial intelligence (AI) into orthodontic diagnosis, treatment planning and patient monitoring. The review examined current AI uses in orthodontics and evaluated their ethical issues related to reliability, transparency, data protection, autonomy, and clinical responsibility.
MATERIALS AND METHOD: A systematic search was conducted in five electronic databases (PubMed, Scopus, Embase, Web of Science, Cochrane) until November 2025. The research strategy combined terms related to artificial intelligence, orthodontics and ethics. A total of 70 records were identified. After removing duplicates,

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

51 records were screened by title and abstract while full-text assessment was performed for 38 reports. Eligible articles concerned orthodontic applications of AI that explicitly addressed ethical, bioethical or deontological issues.
RESULTS: A total of 29 studies were included for qualitative assessment. The included studies demonstrated that AI contributes substantially to orthodontics, particularly through automated cephalometric landmarking, skeletal maturity assessment, three-dimensional image segmentation and remote treatment monitoring. Despite progress in AI models, issues remain regarding algorithmic bias, population variability, lack of transparency in deep learning, and insufficient validation reducing clinician oversight. The ethical challenges highlighted in the included studies were mainly associated with data privacy and security, the need for algorithmic transparency, challenges in achieving meaningful informed consent, questions regarding clinical accountability and the risk of biased outcomes when underlying data are not representative of diverse patient populations.
CONCLUSIONS: Artificial intelligence represents a valuable supportive tool in contemporary orthodontic practice, complementing, rather than replacing, clinical expertise. Its effectiveness relies on high-quality training data. Current regulatory frameworks, such as the European AI Act, emphasize the necessity of human oversight in clinical decision-making and the obligation for safe, transparent and accountable algorithmic use in healthcare. Ethical and effective integration of AI into orthodontic practice requires ongoing validation, practitioner's accountability and strong data governance. The future lies not in the replacement of the orthodontic specialist, but in a collaborative human-AI model that improves patient care, protects privacy and promotes high-quality treatment.

Abstract citation ID: cjag070.490
SP583 PRECISION ATTACHMENTS - A REMOVABLE ALTERNATIVE FOR FIXED BANDED APPLIANCES

Sarah Fligelstone, Kristian Davies, Charlotte Eckhardt; *Swansea Bay UHB, Swansea, United Kingdom*

AIM: Banded palatal appliances such as quadhelices, transpalatal arches (TPAs) and rapid maxillary expanders (RMEs) often require removal and re-cementation during adjustments, consuming chairside time and materials. A novel precision-attachment design was developed to enable repeated activation or interchange without band removal.
MATERIALS AND METHOD: Conventional designs are fully soldered to the band and cemented using glass ionomer adhesives. In this redesign, the palatal component is detachable, allowing activation or replacement (e.g., conversion from RME to TPA). Two tubes welded to the band act as female components, engaging male vertical posts on the palatal device via friction fit. The clinical and laboratory workflow for construction and fitting is described.
RESULTS: The appliance allowed secure removal and reinsertion of the active component without affecting stability or cementation. Chairside adjustments were achievable without debanding or re-cementation, and sequential switching between expansion and retention appliances was feasible using the same banded unit.
CONCLUSIONS: Transforming a fully soldered appliance into a removable system through precision attachments improves clinical efficiency and patient experience, particularly when sequential or staged interventions are required.

Abstract citation ID: cjag070.491
SP584 FINITE ELEMENTE ANALYSIS (FEA) OF THE BRACKET-ENAMEL-INTERZONE (BEI) DURING SHEAR-OFF DEBONDING

Petra Julia Koch[1], Andreas Staude[1], Ron Shahar[2]; *[1]Department of Prosthodontics, Geriatric Dentistry and Craniomandibular Disorders, CharitéCenter for Oral Health Sciences CC3, Charité – Universitätsmedizin Berlin, corporate member of Freie Universität Berlin and Humboldt-Universität zu Berlin, Berlin, Germany, [2]Laboratory of bone biomechanics Koret School of Veterinary Medicine The Robert H. Smith Faculty of Agriculture, Food and Environment The Hebrew University of Jerusalem, Jerusalem, Israel*

AIM: During orthodontic treatment with fixed appliances, brackets are temporarily bonded to the enamel surface so that an inserted orthodontic wire transfers directional forces to the tooth's periodontal ligament, applying loads in the surrounding bone and inducing bone remodeling and tooth movement. Bracket bonding must therefore remain intact throughout the entire active treatment period, yet still allow easy and safe removal without damaging the enamel at the end of the treatment.

This study aims to assess the stresses and strains developing in different bracket-enamel-interzones (BEI) when applying the clinically common shear-off debonding technique.

MATERIALS AND METHODS: Bovine teeth were bonded with different ceramic brackets and bonding materials. To simulate shear-off debonding, the samples were prepared to fit into an in-situ mechanical tester (Novi CT Rig 200N, NoviTom, Grenoble, France). A blade was constructed for shearing the brackets off in tensile mode. Micro-CT scans were then performed at different load conditions with an EasyTom S 150kV device (RX Solutions, Chavanod, France): before applying load (0 N), in a state with intermediate load (40 N), and after the bracket was debonded (120 N). The resulting 3D data were used to create Finite Element (FE) models of the different systems and the recorded load/distance curves were used to quantify the ultimate debonding force.
RESULTS: In-situ loading of the bracket-enamel-interzone in the micro-CT makes it possible to relate the debonding force to the various interzone structures. FE analysis yields the 3D distribution of deformations and stresses in the entire system, and particularly in the bracket-enamel-interzone. These results allow identification of the areas of strain concentration, which would likely be the location of initiation of debonding.
CONCLUSIONS: FE models can be used to assess the consequences of various bracket-bonding material combinations as well as force locations and magnitudes. These findings facilitate the identification of the safest bracket–bonding material combinations when applying the shear-off debonding technique.

Abstract citation ID: cjag070.492
SP585 ORTHODONTIC INTRUSION IN ADULTS: A CASE REPORT DEMONSTRATING PERIODONTAL RECOVERY

Ellen Vink[1], Ayesha Mohamed[1], Alessia Gheorghe[1], Farooq Ahmed[1], Walid Anwar[2]; *[1]Northwick Park Hospital, London, United Kingdom, [2]Glasgow Dental Hospital, Glasgow, United Kingdom*

AIM: To describe an adult orthodontic-periodontal case treated with orthodontic intrusion with pre-adjusted edgewise appliances, highlighting radiographic evidence of increased alveolar bone height following controlled orthodontic intrusion.
MATERIALS AND METHOD: A 60-year-old patient presented with secondary localised moderate periodontal bone loss following stabilised periodontal therapy. Pre-adjusted upper and lower fixed appliances were placed. Controlled true intrusion of the maxillary incisors was delivered using light forces with progressive second order wire bends. Oral hygiene thresholds and periodontal stability were confirmed at each visit. Standardised periapical radiographs and intraoral scans were taken pre and post-treatment. Radiographic bone height was measured from the cemento-enamel junction to the alveolar crest which shows an improvement.
RESULTS: After 14 months, true intrusion was achieved. Radiographic assessment demonstrated an estimated reduction of 1.5mm in the distance between the cemento-enamel junction and the alveolar crest across the intruded incisors, indicating gain in alveolar bone height. Periodontal probing depths remained stable, with no sites showing increased mobility or clinical attachment loss. The gingival margin level improved, and black triangle decreased. No signs of root resorption were observed radiographically.
CONCLUSIONS: This case provides clinical evidence of controlled orthodontic intrusion, performed in a periodontally stable adult using light forces, may be associated with radiographic signs of an increase in vertical bone height, and improved periodontal parameters. The case was managed in accordance with principles outlined in contemporary literature stating that intrusion on a reduced but healthy periodontium may have beneficial periodontal effects when monitored carefully.

Abstract citation ID: cjag070.493
SP588 A COMPARATIVE ASSESSMENT OF THREE DIFFERENT FACE SCANNERS VERSUS DIGITAL CALLIPER FOR LINEAR MEASUREMENTS; A PROSPECTIVE CLINICAL STUDY

Kelly Billiaert[1], Mustafa Al-Yassari[1], Nikolaos Pandis[2], Gregory S. Antonarakis[1], Alexandra K. Papadopoulou[1]; *[1]Division of Orthodontics, University Clinics of Dental Medicine, University of Geneva, Geneva, Switzerland, [2]Department of Orthodontics. University of Bern, Bern, Switzerland*

AIM: The aim was to investigate the agreement in performing linear measurements in pre-marked faces using a digital calliper over those performed on the same faces scanned with three different face scanners namely 3dMD, RayFace and Shinning 3D.
MATERIALS (OR SUBJECTS) AND METHOD: Twenty young adult volunteers, 20-30 years old, were scanned between September to November 2025. Reference points located either in the facial midline (pronasale-pr, subnasale-sn, upper lip central philtrum-ul, pogonion-pog) and bilaterally right-r and left-l (alar-al, cheilion-ch, trichion-tr) were marked on the faces using a surgical pen of 1mm diameter tip.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

Eight linear measuremnts (pr-pog, sn-ul, chr-chl, alr-all, trr-alr, trl-all, sn-chr, sn-chl) were performed with a digital calliper directly on the faces and on their 3D scans using OnyxCeph software. The comparisons were calculated using a Bayesian random effects hierarchical model with variable bias across methods, a method by participant and participant by replicate interaction. Four chains, 200000 iterations, 100000 burnin and a posterior sample of 4000 observations were used. Conversion formulas among methods were produced and scatter plots with 95% prediction intervals-PIs per measurement. A clinically acceptable threshold was set as -1 to +1 mm for the differences between methods. The ICC was applied to measure reliability within each method. All analyses were conducted using the MethComp package in R.
RESULTS: The ICC ranged between 0.952-0.99. The mixing of the chains was appropriate, supporting the validity of estimations. All differences were below the 1mm threshold except for pr-pog and trl-all between calliper and RayFace with the later overestimating the outcomes. Pr-pog was 69.73(4.65) mm for calliper and 72.64(95% PIs: -3.60 to 3.60) mm for RayFace. Trl-all was 85.70(6.15) mm for caliper and 87.06(95%PIs: -2.54 to 2.54) mm for RayFace with the corresponding differences being 2.91mm for pr-pog and 1.36mm for trl-all.
CONCLUSIONS: 3dMD, RayFace and Shinning 3D face scanners provide acceptable values compared to digital callipers for linear measurements in pre-marked faces with clinically significant differences limited to outcomes that their reference points are located at greater distances from each other.

Abstract citation ID: cjag070.494
SP589 ‡‡‡ CONTEMPORARY ORTHODONTIC ALIGNER THERAPY - CHANGES AND CHALLENGES IN ORTHODONTIC PRACTICES REPORTED BY MEMBERS OF THE SLOVENIAN ORTHODONTIC SOCIETY

KRAVANJA Sanda LAH; *Dental Center dr. Lah Kravanja, Bovec, Slovenia*

AIM: was to examine and evaluate how orthodontists, members of Slovenian Orthodontic Society (SOS) tackled new conditions and strategies following orthodontic aligner therapy (OAT). New technologies have posed changes in conditions and workflow challenges to orthodontic teams to cope with. Recent reports suggest that Orthodontic Aligner Therapy (OAT) represents one third of orthodontic practice caseload, with shifting demographics, patient preferences and awareness of OAT. The interest in specialization of orthodontics among graduates of dental medicine and inclusion in national public health system were also observed.
SUBJECTS AND METHODS: All active SOS members, working either in public or private practices, were invited to participate in online survey. They filled in questionnaires at T0 (start) and at T1 (1 year later). Questions adressed workflow and treatment changes, appointment schedule and lenght, digital procedures implementation: scanning, inoffice printing, remote screening, teleorthodontics, dental monitoring, staff training. Data about interest in orthodontic specialization among dental graduates and changes in national public health system were collated and analysed using SPSS programme.
RESULTS: In survey participated 49 active orthodontists, aged 30-75 years. Results confirmed that patient preferences and lifestyle needs have made AOT the primary choice when seeking orthodontic care in private adult clients. Most important challenges followed by shift from traditional orthodontics to AOT were: favorable conditions, feeding and oral hygiene, aesthetic appearance for patients, and transition to digitized procedures, remote consultations, monitoring and teleorthodontics for orthodontists. Interest for specialization among young graduates and exit of specialists from public services are on the rise.
CONCLUSIONS: Many orthodontic practices have to alter clinical workflows to meet patient needs. The future of AOT brings challenging promises for clinicians and patients. Many OAT methods allow key treatment planning and visualization of end result. This Beginning with End in Mind allows clinicians to enhance their treatment plans and optimize smile aesthetics. Fundamentals of orthodontic examination, diagnosis, treatment planning, biomechanics combined with clinical competency, experience and compliance remain pillars of successful orthodontic treatment. A careful understanding of technology coupled with clinical-based evidence is very important. Appropriate measures to retain young orthodontic specialists in national public services should be prepared and adopted.

Abstract citation ID: cjag070.495
SP590 ‡‡‡ HOW BARTYPE APPLICANES CORRECT CLASS II MALOCCLUSIONS - A PILOT STUDY

Sachin Chhatwani[1], Björn Ludwig[2], Babak Sayahpour[3], Stephan Christian Möhlhenrich[4], Gholamreza Danesh[1]; *[1]University of Witten/Herdecke, Witten, Germany, [2]University of Saarland, Homburg/Saar, Germany, [3]University of Frankfurt, Frankfurt am Main, Germany, [4]Radboud UMC, Nijmwegen, Netherlands*

AIM: The aim of this study was to evaluate the dentoalveolar effects of bartype appliances (Carriere Distalizer, Henry Schein Orthodontics Inc., Carlsbad, USA) in the treatment of Class II malocclusions, focusing on lower incisor inclination, maxillary molar rotation, sagittal molar position, and space creation in the premolar region.
MATERIALS AND METHODS: Thirteen patients with Class II malocclusion were retrospectively analysed. Digital model superimposition was used to measure rotational changes of the maxillary first molars (mesiobuccal cusp to midline angle) and linear space creation between 16/15 and 26/25. Cephalometric analysis assessed lower incisor inclination (L1/MeGo) and sagittal molar position (U6/PtV) at T0 and T1. Paired t-tests were applied for angular and cephalometric variables. Independent t-tests were used for the evaluation of space changes.
RESULTS: Lower incisors showed a significant proclination (2.74° ± 3.88°, $p = 0.026$). A bodily distalisation of the maxillary first molars was not detected (−0.24° ± 2.01°, $p = 0.67$). Significant molar rotation was observed bilaterally, with 1.92° ± 2.24° on the left ($p = 0.009$) and 1.88° ± 1.82° on the right ($p = 0.003$). Space creation was measured as 0.82 ± 1.00 mm between 16/15 and 0.99 ± 0.89 mm between 26/25. Mean treatment duration was 5.9 ± 3.8 months.
CONCLUSIONS: Bartype appliances produced significant rotational changes of the maxillary first molars and measurable space creation in the maxillary arch, together with proclination of the lower incisors. A bodily distalisation effect was not confirmed. These findings indicate that rotational rather than translational molar movement represents the primary mechanism of Class II correction with this appliance design.

Abstract citation ID: cjag070.496
SP591 CYTOTOXICITY OF THREE ORTHODONTIC BAND ADHESIVES USED AS OCCLUSAL BITE RAMPS DURING SIMULATED CHEWING

Dhuha Alshaikh[1], Agneta Karsten[1], Rugile Jakaviciute[2], Jan .T Samuelsen[2]; *[1]Karolinska Institutet, Stockholm, Sweden, [2]Nordic institue of dental materials, Oslo, Norway*

Cytotoxicity of Three Orthodontic Band Adhesives used as Occlusal Bite Ramps during Simulated Chewing

Dhuha Alshaikh[1], Rugile Jakaviciute[2], Jan T. Samuelsen[2], Agneta Karsten[1] [1] Division of Orthodontics, Department of Dental Medicine, Karolinska Institutet, Sweden [2] Nordic Institute of Dental Materials (NIOM), Oslo, Norway

AIM: To evaluate the cytotoxic potential of three orthodontic band adhesives used as occlusal bite ramps in orthodontic treatment following simulated mechanical wearing.
MATERIALS AND METHODS: Transbond™, Ultra Band-Lok™, and BracePaste™ were evaluated using standardized discs cured under controlled conditions, and subjected to simulated chewing. Extracts were filtered and applied to PJ49 fibroblasts at 0%, 50%, and 100% for 24 hours. MTT (3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide, viability test) absorbance values were blank-corrected, normalized to the corresponding control, and analyzed using Welch's t-tests ($p < 0.05$). Viability below 70% was classified as cytotoxic according to ISO 10993-5.
RESULTS: Ultra Band-Lok™ showed the most favorable biocompatibility, with all filtered and unfiltered extracts maintaining viability above 70% and no statistically significant reductions. BracePaste™ exhibited a concentration-dependent decrease in viability, with several conditions falling below 70%, though none reached statistical significance due to variability between replicates. BracePaste™ produced the strongest cytotoxic response; most filtered and all unfiltered extracts reduced viability below 70%, and the 50% filtered extract showed a statistically significant decrease ($p = 0.03$). Pairwise comparisons revealed no statistically significant differences between the three materials under matched conditions.
CONCLUSION: UBL was non-cytotoxic, with all extracts remaining above the 70% ISO threshold and no significant reductions in viability. BP showed decreases in viability that frequently fell below 70%, but variability between replicates prevented these effects from reaching statistical significance, making its cytotoxicity suggestive but not confirmed. TB produced the strongest cytotoxicity, with most extracts well below 70% and a statistically significant reduction in viability for the 50% filtered extract, indicating a true cytotoxic effect.

Overall, UBL was clearly non-cytotoxic, BP showed possible but unconfirmed cytotoxicity, and TB showed confirmed and consistent cytotoxicity under the tested conditions.

Abstract citation ID: cjag070.497
SP592 ‡‡‡ DIGITAL VERSUS CONVENTIONAL ARTICULATION: A COMPARATIVE ANALYSIS OF OCCLUSAL PARAMETERS AND CONTACT PATTERNS

Ufuk Demir[1], Hande Biçeroğlu Demir[1], Stephan Christian Möhlhenrich[2], Gholamreza Danesh[3], Sachin Chhatwani[3]; *[1]Orthodontic private practice, Istanbul, Turkey, [2]Raboud UMC, Nijmwegen, Netherlands, [3]University of Witten/Herdecke, Witten, Germany*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

AIM: The aim of this study was to compare occlusal parameters and contact characteristics obtained from a digitised conventional facebow-mounted articulator with those produced by a fully virtual articulation workflow using the Axioprisa system, and to assess the level of agreement between both methods.
MATERIALS AND METHODS: Wax bite registrations were performed according to Roth (power centric) from 40 patients were used to mount maxillary and mandibular models conventionally. These mounted models were then digitised for occlusal evaluation. In parallel, the same bite registrations were used in a fully virtual articulation workflow provided by the Axioprisa system (SAM Präzisionstechnik, Gauting, Germany). Minimum tooth distance (MTD), overjet, overbite, the number of occlusal contacts and the resulting contact patterns were recorded for both workflows. Normality was assessed using the Shapiro–Wilk test. Depending on distribution, paired t-tests or Wilcoxon signed-rank tests were applied ($\alpha = 0.05$). A post-hoc power analysis assuming a medium effect size (Cohen's $d = 0.5$) and a sample size of 40 yielded a statistical power of 0.87.
RESULTS: MTD was significantly greater in the fully virtual workflow (-0.056 ± 0.210 mm) compared with the digitized conventional articulation (-0.091 ± 0.167 mm; $p < 0.001$). Overbite was significantly smaller in the virtual workflow (1.71 ± 2.11 mm) than in the digitized conventional workflow (1.85 ± 2.05 mm; $p = 0.008$). Overjet showed no significant difference between methods (3.97 ± 1.78 mm vs. 3.94 ± 1.72 mm; $p = 0.633$). The number of occlusal contacts did not differ significantly (2.75 ± 1.68 vs. 3.10 ± 1.57; $p = 0.166$). Identical occlusal contact patterns were found in 8 of 40 cases (20%), indicating limited agreement between workflows.
CONCLUSIONS: The fully virtual workflow generated lower interpenetration values than the digitized conventional articulation, which may reflect differences in digital surface alignment. However, the limited correspondence of contact patterns and also similarities of overjet and overbite values, indicates sensitivity to registration and processing steps and highlights method-dependent variation. Further research is required to validate virtual articulation workflows and to clarify their reliability and clinical applicability.

Abstract citation ID: cjag070.498
SP593 MAXILLARY PROTACTION USING SKELETAL PLATES IN CLASS III GROWING PATIENTS. IS IT WORTH THE HYPE? A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

Alexandra K. Papadopoulou[1], Maria Zyli[2], Spyridon N. Papageorgiou[3]; *[1]Division of Orthodontics, University Clinics of Dental Medicine, University of Geneva, Geneva, Switzerland, [2]Department of Orthodontics, School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece, [3]Clinic of Orthodontics and Pediatric Dentistry, Center for Dental Medicine, University of Zurich, Zurich, Switzerland*

AIMS: To evaluate the effect of skeletal plates inserted either in the maxilla, the mandible or both for Class III correction through maxillary protraction compared to conventional rapid maxillary expansion (RME) and facemask (FM) in growing Class III patients.
MATERIALS AND METHODS: Unrestricted searches were performed in seven databases for studies on Class III correction with skeletal plates published until November 2025. After duplicate study selection, data extraction, and risk of bias assessment according to the Cochrane guidelines, random-effects network meta-analyses (mean differences [MD] or standardized mean differences [SMD] with 95% confidence intervals [CI]) were conducted followed subgroup/sensitivity analyses at 5%.
RESULTS: Out of 2393 publications, 22 studies (30 publications) with 672 treated growing patients were included. Four Class III correction protocols using skeletal plates were identified: (i) infrazygomatic plates - symphyseal plates - elastics –i.e. bone-anchored maxillary protraction (BAMP); (ii) infrazygomatic plates - facemask (IZYG-FM); (iii) nasal plates - facemask (NAS-FM), and (iv) RME - symphyseal plates - elastics (RME-SYMPH). Compared to RME-FM, bone-anchored Class III correction did not exhibit significant different effects in terms of SNA and U1-PP. Nevertheless, RME-SYMPH was associated with significantly greater improvement in ANB (MD 2.35; 95%CI 0.03 to 4.66) while BAMP and NAS-FM with significant reductions in SN-MP (SMD -2.39; 95%CI -3.78 to -1.01 and MD -2.26; 95%CI -4.41 to -0.11, respectively). As far as maxillary length (Co-A) is concerned, all three methods with maxillary plates (BAMP, IZYG-FM, and NAS-FM) were associated with statistically significant benefits compared to RME-FM (MD 2.51; 95%CI 1.64 to 3.39 / MD 1.04; 95%CI 0.25 to 1.82 / MD 1.04; 95%CI 0.51 to 1.57, respectively). All treatments, including conventional RME-FM, were superior to no treatment. However, many included studies were non-randomized and therefore prone to bias.
CONCLUSIONS: Based on existing evidence, plate-anchored Class III correction resulted in mandibular counter-clockwise rotation and greater maxillary advancement compared to conventional (RME-anchored) maxillary protraction. However, future well-designed studies could significantly affect both the direction and strength of the results, since uncertainty exists due to limited samples and methodological shortcomings.
Disclosure of interest: None declared

Abstract citation ID: cjag070.499
SP595 SURGICAL EXPOSURE OF IMPACTED MAXILLARY CANINES IN LEEDS DENTAL INSTITUTE – A RETROSPECTIVE TWO-CYCLE AUDIT

Sara Butt, Rosie Fletcher, Adam Jones, Cian Lowney; *Leeds Dental Institute, Leeds, United Kingdom*

AIM: To evaluate the success of surgical exposures of impacted maxillary canines for orthodontic treatment at Leeds Dental Institute (LDI) and assess compliance with the local standard of a re-exposure rate below 5%.
MATERIALS AND METHOD: A retrospective two-cycle audit was conducted in the Orthodontic and Oral Surgery departments at LDI, UK. Cases were included if they involved surgical exposure of maxillary canines followed by orthodontic treatment at LDI. Cases referred for exposure by specialist orthodontists and treated subsequently in specialist practice were excluded. Paper and electronic referral letters, clinical notes, clinical letters, and radiographs were reviewed to identify the teeth exposed, surgical technique used, post-operative review timing, complications, and degree of ectopia. Descriptive statistics were used for analysis. The agreed standard was a re-exposure rate of <5%.
RESULTS: Cycle 1 and Cycle 2 assessed 12-month periods from 1 May 2016–30 April 2017 and 1 June 2023–31 May 2024, respectively. Fifty-eight cases were identified in Cycle 1 and 24 in cycle 2. Re-exposure was required in 6 cases (10%) in cycle 1 and 2 cases (8%) in Cycle 2. The most common indication for re-exposure in both cycles was mucosal coverage. Debonding of gold chains contributed to additional failures in cycle 1, but the issue was completely resolved in cycle 2 following the transition from chemically cured to light-cured composite for bonding. Most canines requiring re-exposure were palatally positioned: 87.5% in cycle 1 and 100% in cycle 2. Post-operative review timing by the orthodontist improved between cycles; for the cases requiring re-exposure, only 1 case (16%) was reviewed within 14 days in cycle 1, whereas both cases (100%) were reviewed within 7 days. Neither cycle met the <5% re-exposure standard.
CONCLUSIONS: Mucosal coverage was the predominant cause of failure of surgical exposures. Improved bonding techniques appeared to reduce gold-chain debonding between cycles. Earlier review may contribute to early identification of complications. Despite improvements, the re-exposure rate in both cycles remained above the locally agreed standard, indicating the need for further refinement of surgical and post-operative protocols.

Abstract citation ID: cjag070.500
SP596 *** FLUCTUATING FACIAL ASYMMETRY AND SELF-PERCEIVED FACIAL ATTRACTIVENESS

GEORGIOS VASOGLOU[1], NIKOLAOS GKANTIDIS[2], DEMETRIOS HALAZONETIS[1], GEORGIOS KANAVAKIS[1]; *[1]Department of Orthodontics and Dentofacial Orthopedics, National and Kapodistrian University of Athens, Greece, ATHENS, Greece, [2]Department of Orthodontics and Dentofacial Orthopedics, University of Bern, Switzerland, BERN, Switzerland*

AIM: To investigate the relationship between fluctuating facial asymmetry and self-perceived facial attractiveness in young adults.
MATERIALS AND METHOD: The study population consisted of 366 white, young adults (219 females and 147 males). Three dimensional facial images were obtained using a stereophotogrammetric system under standardized conditions and digitized using Viewbox software. Digitization was performed using a semi-automatic method and each facial image was described using 1021 landmarks and semi-landmarks. A Procrustes Superimposition was performed in order to transform space coordinates into shape coordinates and allow for shape analysis using Geometric Morphometrics (GMM). Shape coordinates were reduced into Principal Components (PCs) of shape, which were used in all further analyses to describe facial shape. To study fluctuating asymmetry, the original shape configurations were first mirrored and re-labeled for landmark correspondence. These perfectly symmetric images were used to study the symmetric component of facial variation in the population. Asymmetry was quantified by calculating vector differences between the original and symmetric facial configurations in shape space. The average asymmetry across all individuals represented directional asymmetry (DA). In order to calculate fluctuating asymmetry (FA), directional asymmetry was first subtracted from the shape vectors of original images. The magnitude of FA was then calculated as the square root of the sum of squared shape vectors. Symmetric variation and variation in FA were studied with plots and visualized through morphings of facial

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

configurations. The association between FA and self-perceived facial attractiveness was assessed with univariate regression models. A type-1 error of 5% was assumed for all statistical analyses.
RESULTS: The Procrustes distance between the average symmetric and the average original faces was 0.0041 (P<0.001) in females and 0.0043 (P<0.001) in males indicating significant total asymmetry. The average DA was 0.0038 in males and 0.0034 in females, while average FA was 0.0114 in males and 0.0113 in females. FA was not associated to self-perceived facial attractiveness ($P_{females}$= 0.92 and P_{males}=0.69).
CONCLUSION: Fluctuating asymmetry does not affect self-perceived facial attractiveness. Given that FA is a measure of developmental stability in humans, the results do not support a developmental background for facial attractiveness.

Abstract citation ID: cjag070.501
SP597 COMPARATIVE ANALYSIS OF MASTICATORY MUSCLES ACTIVITY AND MANDIBULAR KINEMATICS IN PATIENTS WITH TEMPOROMANDIBULAR DISORDERS AND SOMATOSENSORY TINNITUS

Margherita Donelli, Silvia Romano, Federica Di Berardino, Henri Albert Didier, Alberto Caprioglio; *University of Milan Statale, Milan, Italy*

AIM: Temporomandibular disorders (TMD) and tinnitus frequently coexist, however the mechanisms linking somatosensory tinnitus (ST) with masticatory muscle dysfunction remain still unclear. Neurophysiological interactions between mandibular posture, muscle activity and auditory pathways have been proposed. The aim of the present study was to compare masticatory muscle activity and mandibular kinematics in TMD patients with and without ST using surface electromyography (sEMG) and kinesiography.
MATERIALS AND METHODS: A total of 105 patients (mean age 50.49 ± 11.7 years) diagnosed with TMD, according to the diagnostic criteria for Axis I temporomandibular disorders (DC/TMD), were enrolled and divided into two groups: 53 with ST (ST group) and 52 without ST (w/o-ST group). The activity of the masseter and anterior temporalis muscles in habitual rest position was recorded using sEMG, following standardized sensory and kinesiological procedures. Mandibular trajectories were analysed before and after transcutaneous electrical nerve stimulation (TENS). Lateral displacement and resting muscle activity were classified as abnormal when exceeding validated thresholds (≥0.4 mm lateral deviation; ≥2.8 μV for temporalis, ≥2.3 μV for masseter). Each subject received an abnormality score (1–5) based on the number of muscles exceeding thresholds. Variance homogeneity was tested with Levene's test, and mean scores were compared using an independent t-test.
RESULTS: More than 60% of patients with ST presented physiological resting muscle activity, whereas nearly 60% of those without ST showed higher abnormality scores (3–5). Mean abnormality values differed significantly between groups (1.58 ± 0.95 for the ST group vs. 2.38 ± 0.99 for the w/o-ST group). After confirming variance homogeneity, the independent t-test demonstrated a significant difference ($p = 0.0001$) with a large effect size (Cohen's $d = 0.82$).Kinesiographic analysis showed abnormal lateral mandibular displacement (≥0.4 mm) for all participants across both groups.
CONCLUSIONS: This study highlights a clear neuromuscular distinction between TMD patients with and without ST. Those with ST demonstrated more physiological muscle behaviour at rest, suggesting a different functional adaptation of the masticatory system. These results reinforce the need for objective, instrument-based assessments to improve diagnostic accuracy and guide multidisciplinary management strategies for both TMD and tinnitus.

Abstract citation ID: cjag070.502
SP599 TEMPORARY ANCHORAGE DEVICE SUPPORTED MAXILLARY EXPANSION: CLINICAL EVIDENCE AND DETERMINANTS OF SKELETAL AND DENTAL OUTCOMES

Alexandros Antonopoulos, Antonios Dafereras, Ioannis Lyros; *National and Kapodestrian University of Athens, Athens, Greece*

AIM: To summarise recent clinical evidence on temporary anchorage device (TAD) supported maxillary expansion, identify predictors of success, and describe clinical determinants of skeletal versus dental outcomes in adolescents and adults.
MATERIALS AND METHODS: A focused literature search was conducted using PubMed, Google Scholar and the Cochrane Library for studies published between 2018 and 2025. Search terms included TAD, MARPE, micro-implant assisted expansion, skeletal expansion, and maxillary transverse deficiency. Eligible studies comprised clinical trials, cohort studies and CBCT-based evaluations reporting dental or skeletal outcomes. Studies involving surgical expansion were excluded unless used for comparison. The selected evidence was reviewed descriptively with emphasis on identifying common clinical trends and factors influencing skeletal and dental responses.
RESULTS: Evidence from recent clinical studies consistently shows that TAD supported expanders achieve a greater skeletal contribution and significantly reduced dental tipping compared with conventional tooth borne appliances. In adult patients, midpalatal suture opening remains achievable in a substantial proportion of cases, although success declines with increasing age and sutural interdigitation. CBCT evaluations demonstrate measurable increases in basal bone width, palatal vault transverse dimension and nasal cavity width. Clinical outcomes are influenced by factors such as implant number, vertical and anteroposterior positioning, appliance rigidity and force distribution. Contemporary studies also report improved efficiency and comfort when customised or digitally fabricated frameworks are used. Complications are generally mild, most commonly related to implant stability or soft-tissue irritation.
CONCULSIONS: TAD supported maxillary expansion is a predictable and a less invasive than the surgically assisted expansion treatment option for selected adolescents and adults. Appropriate case selection, accurate implant placement and an understanding of clinical determinants are essential for maximising skeletal effects while minimising dental side effects. Further high-quality prospective research is needed to refine indications and optimise treatment protocols.

Abstract citation ID: cjag070.503
SP601 ‡‡‡ THREE-DIMENSIONAL ANALYSIS OF THE OROPHARYNGEAL AIRWAY IN ADULTS WITH OBSTRUCTIVE SLEEP APNOEA VERSUS CONTROLS USING AN ARTIFICIAL INTELLIGENCE MODEL

Nikolaos Gogolas[1], Miltiadis A. Makrygiannakis[2], Joseph Bouserhal[3], Athanasios E. Athanasiou[1], Eleftherios G. Kaklamanos[4]; *[1]School of Dentistry, European University Cyprus, Nicosia, Cyprus, [2]School of Dentistry, National and Kapodistrian University of Athens, Athens, Greece, [3]Dental School, Boston, Boston, United States, [4]School of Dentistry, Aristotle University of Thessaloniki, Thessaloniki, Greece*

AIM: To compare three-dimensional (3D) oropharyngeal airway morphology derived from artificial intelligence–based cone-beam computed tomography (CBCT) segmentation between adult males with obstructive sleep apnoea (OSA) and controls, and to examine associations of age, body mass index (BMI), and apnoea–hypopnea index (AHI) with airway variables.
MATERIALS AND METHODS: This cross-sectional study included 18 men with OSA and 23 male controls. All underwent CBCT in an upright, awake position. An artificial intelligence platform automatically segmented the craniofacial complex and the airway, generating stereolithography files. After standardised 3D orientation, the oropharyngeal airway region was isolated. Oropharyngeal airway volume, minimal axial area, surface area, and centroid size were calculated. Group differences were assessed with the Mann–Whitney U test. Multiple linear regression analyses evaluated the effects of age, BMI, and AHI on morphometric variables within each group.
RESULTS: Age did not differ significantly between groups, whereas BMI was higher in the obstructive sleep apnoea group than in controls ($p < 0.001$). No statistically significant between-group differences were detected in oropharyngeal airway volume, minimal axial area, surface area, or centroid size. In the OSA group, the regression model for centroid size was significant ($R^2 = 0.55$), with age ($p = 0.019$) and AHI ($p = 0.014$) showing positive associations, while BMI showed no effect ($p = 0.62$). For volume, minimal axial area, and surface area, no significant models were identified. In the control group, age and BMI were not associated with any airway variables.
CONCLUSIONS: In adult males, static 3D oropharyngeal measurements from artificial intelligence–based segmentation of CBCT scans in the upright, awake state did not distinguish OSA patients from controls. The positive association between centroid size, and age and the apnoea–hypopnea index, in the OSA group highlights the multifactorial nature of disease pathophysiology. This study also affirms the practical value of AI-automated segmentation as a tool for 3D airway analysis within a clinical research environment.

Abstract citation ID: cjag070.504
SP603 MAXILLARY ARCH WIDTH IN CHILDREN WITH UNILATERAL CLEFT LIP AND PALATE TREATED WITH TWO DIFFERENT SURGICAL PROTOCOLS

Emanuela Bis[1], Agnieszka Świątkowska[2], Margareta Budner[3], Agnieszka Lasota[2]; *[1]Doctoral School of the Medical University of Lublin, Lublin, Poland, [2]Department of Jaw Orthopedics Medical University of Lublin, Lublin, Poland, [3]Clinic of Jaw Orthopedics University Dentistry Center of Medical University of Lublin, Lublin, Poland*

AIM: According to many reports, early surgical treatment of patients with unilateral cleft lip and palate (UCLP) may be responsible for the maxillary deficiency. The presented observational study aimed to compare the width of the maxillary arch in patients with UCLP who underwent surgical treatment with two different protocols.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

MATERIAL AND METHODS: The anterior and posterior width of maxillary arch was measured on digital models using Pont's measurements in two groups of patients with UCLP (16 girls, 23 boys; mean age 9.6 years). First group consisted of 16 children after one-stage lip and palate repair at the age of 6 months and secondary alveolar bone graft between the ages 2 and 3. Second group contained 23 children after two-stages surgical protocol: lip surgery at the age of six months and palate repair at the age of 2,5. In the second group alveolar bone grafting was completed over a period of 7-9 years of age. In both examined groups there was no history of previous orthodontic maxillary expansion. The database and statistical research were based on Statistica 9.1 computer software (StatSoft, Poland). Differences between the two groups were assessed using the Student's t-test (significance level of $p<0.050$).
RESULTS: Patients after two-stage surgical treatment achieved slightly larger dimensions of the maxillary arch width compared to patients after one-stage surgery, but differences were statistically insignificant. There was a greater range of maxillary widths measurements in the children treated with two - stages protocol especially concerning anterior arch dimension.
CONCLUSIONS: Both different surgical treatment protocols in patients with UCLP provided comparable treatment outcomes in terms of maxillary arch width. Early secondary alveolar bone graft did not negatively influenced the width of maxillary arch.

Abstract citation ID: cjag070.505
SP607 BEYOND THE BITE: THE CRITICAL ROLE OF THOROUGH RADIOGRAPH ANALYSIS IN IDENTIFYING AN INCIDENTAL OSTEOMA

Laura Huang and Gavin Power; *East Kent Hospitals University Foundation Trust, Ashford, United Kingdom*

AIM: The aim is to highlight the importance of thorough analysis of radiographs taken at orthodontic appointments through a case report of an incidental finding of an osteoma on a lateral cephalogram at an orthodontic review appointment.
SUBJECTS AND METHOD: Osteomas are benign, non-cancerous bone tumours commonly found in the skull or paranasal sinuses. The clinical signs depend on the size and location of the osteoma. While some are asymptomatic, some cause symptoms such as headaches, sinus infections, and breathing difficulties. If left untreated, some osteomas can continue to grow and result in cranial complications and vision impairment.

A 12-year-old patient presented to the Orthodontic Department at William Harvey Hospital following a referral by his GDP. He had a class III skeletal base and class III incisor relationship, mainly due to maxillary hypoplasia. An OPG and lateral cephalogram radiographs were taken, showing no abnormalities. A plan was made to monitor growth and review again. The patient was reviewed 15 months later and a lateral cephalogram was taken to assess growth. There was little change in his skeletal pattern; however a radiopaque lesion was spotted in his ethmoid sinus.
RESULTS: A CT scan was requested which showed an osteoma of the right anterior ethmoid air cells. He was promptly referred to ENT and diagnosed with a 15x15mm right anterior frontal-ethmoidal recess osteoma. The osteoma was removed via functional endoscopic sinus surgery from which the patient recovered well. The patient ultimately opted not to proceed with orthodontic treatment.
CONCLUSION: This case demonstrates the vital part that Orthodontics plays in a patient's overall health that spans further than assessing the malocclusion. If this patient had not attended their orthodontic review appointments, the asymptomatic osteoma may well have remained undetected. At the rate the osteoma was growing, it likely will have become a giant osteoma (>30mm) by the time it was diagnosed and put the patient at greater risk of a serious complication. It is a stark reminder how important is it for orthodontic clinicians to thoroughly assess and analyse radiographs taken as they may be the first indication that there is an abnormality.

Abstract citation ID: cjag070.506
SP608 HAAS EXPANDERS ALTER ORAL MICROBIOTA IN ADOLESCENTS: A CASE–CONTROL ANALYSIS WITHIN A PROSPECTIVE COHORT

Elisabeth Santigli[1], Doris Ortner[2], Marlene Lindner[1]; *[1]Medical University Graz, Graz, Austria, [2]Private Office Santigli, Gleisdorf, Austria*

BACKGROUND: Orthodontic expanders modify the oral ecological environment and may influence microbial community composition and diversity. While bonded acrylic expanders in children have been associated with reduced microbial diversity, the effects of HAAS expanders in adolescents remain insufficiently characterized.
MATERIALS AND METHODS: Nineteen adolescents treated with HAAS expanders and nineteen age- and sex-matched controls were monitored at four timepoints: baseline (t−1), treatment initiation (t0), appliance removal after four months (t+), and two weeks post-removal (t+1). Subgingival and buccal mucosal samples underwent 16S rRNA sequencing (V1–V3). Alpha diversity (Shannon), beta diversity (Bray–Curtis PERMANOVA), and differential taxonomic associations (MaAsLin2) were assessed.

Results.: Mucosal alpha diversity increased following oral hygiene standardization and declined during HAAS exposure, with recovery after appliance removal (Shannon: 2.70→3.75→3.49→2.94; $p = 0.019$). Subgingival alpha diversity showed an inverse non-significant trend. Beta diversity demonstrated pronounced treatment-associated shifts in subgingival communities, with distinct clustering at t+ and t+1 in the HAAS group (PERMANOVA $p \leq 0.0002$), whereas mucosal communities exhibited more moderate temporal variation. Subgingivally, HAAS exposure was associated with enrichment of anaerobic genera including Prevotella, Atopobium, Alloprevotella, and Dialister, alongside reductions in Actinomyces, Rothia, Capnocytophaga, and Neisseria (all $p < 0.05$), indicating a transient dysbiosis-like profile. Mucosal microbiota remained dominated by Firmicutes (>60%) but demonstrated partially reversible shifts in Neisseria, Alloprevotella, and Haemophilus.
CONCLUSIONS: HAAS expanders significantly modulate subgingival and mucosal microbiota in adolescents, inducing transient dysbiosis-like changes that largely resolve following appliance removal. These findings support that orthodontic expansion exerts temporary ecological pressure on the oral microbiome.
Keywords: orthodontic appliances, HAAS expander, oral microbiome, adolescents, 16S rRNA sequencing, microbial diversity

Abstract citation ID: cjag070.507
SP610 A MULTICENTRE TWO-CYCLE AUDIT OF PATIENTS' FITNESS FOR COMBINED ORTHODONTIC-ORTHOGNATHIC SURGICAL TREATMENT

Saarah Juman[1], Billie-Jean Rainey[2], Chris Johnston[1], Andrew McBride[1], Emer Byrne[2]; *[1]The School of Dentistry, Belfast, United Kingdom, [2]Altnagelvin Area Hospital, Derry, United Kingdom*

AIM: This audit aimed to improve patient readiness and prevent delays in starting pre-surgical Orthodontic treatment by addressing modifiable pre-treatment risk factors in those presenting from the Orthognathic waiting list.

The objectives were to determine the prevalence and nature of pre-treatment challenges in patients presenting from the Orthognathic waiting list and to reduce delays in starting pre-surgical orthodontics by implementing recommendations to improve patient readiness and streamline the treatment pathway.
MATERIALS (OR SUBJECTS) AND METHOD: This prospective two-cycle audit across two Northern Ireland Hospital Orthodontic Departments, was conducted over a six-month period (February - August 2025). Consecutive patients attending to commence treatment after having reached the top of an Orthognathic waiting list were included. A standardised proforma captured data on GDP registration and attendance, smoking/vaping status, BMI>30, oral hygiene, presence and severity of caries, periodontal disease and BPE scores. Active caries was defined as any clinically visible or radiographically confirmed lesion. Descriptive statistics were used to quantify the prevalence of these pre-treatment challenges against the standard that 100% of patients should be dentally fit, caries-free, periodontally stable, non-smokers and under regular GDP care before starting pre-surgical Orthodontics.
RESULTS: Among 50 patients, 44% had an elevated BMI and 12% reported smoking or vaping. Although 88% were registered with a GDP, 64% attended irregularly. Active caries was present in 56% of patients, while periodontal disease was uncommon, with 92% (n=46) recording BPE scores of 0–2. Overall, a high burden of modifiable pre-treatment risk factors was present at the point of recall.
CONCLUSIONS: Over half of patients reviewed were not suitable to begin pre-surgical orthodontics, representing a significant inefficiency in the Orthognathic pathway. Patients who have already waited substantial periods could have used this time to optimise their readiness and avoid delays to starting Orthodontic treatment and wasting clinical appointments. A two-stage optimisation process involving sending automated reminder letters at waiting-list entry and again six months before review was introduced. A re-audit is planned to assess the impact.

Abstract citation ID: cjag070.508
SP611 ‡‡‡ DEVELOPMENT AND EVALUATION OF AN ARTIFICIAL INTELLIGENCE MODEL FOR FACIAL ATTRACTIVENESS EVALUATION FOR ORTHODONTIC APPLICATIONS

Platon-Timotheos Perdikaris[1], Miltiadis A. Makrygiannakis[1], Apostolos Ntokos[2], Eleftherios G. Kaklamanos[3]; *[1]School of Dentistry, European University Cyprus, Nicosia, Cyprus, [2]Independent Scholar, Athens, Greece, [3]School of Dentistry, Aristotle University of Thessaloniki, Nicosia, Cyprus*

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

ABSTRACT

AIM: Artificial intelligence (AI) has shown growing potential in orthodontics, offering opportunities to enhance the objectivity of facial and smile aesthetic assessment. Despite advancements in machine learning–based aesthetic evaluation, specialized tools tailored for orthodontic clinical contexts remain limited. This study aimed to develop and validate a convolutional neural network (CNN) model capable of predicting facial attractiveness scores in Caucasian individuals.
MATERIALS AND METHOD: A subset of the SCUT-FBP5500 V2 dataset containing Caucasian subjects (750 male and 750 female) was used, each annotated with human-rated continuous beauty scores (1–5). A ResNet-50 architecture pretrained on ImageNet served as the model backbone. The model was trained with the Adam optimizer (learning rate 0.001) and Mean Squared Error loss, for up to 100 epochs. Stratified splits of 70% training, 10% validation, and 20% testing were created based on beauty score and sex. Data augmentation (resizing, random horizontal flipping, color jittering, tensor conversion) was applied to the training images, while the validation and test sets underwent only resizing. Experiments were conducted on a Linux system with an NVIDIA RTX 2080 GPU, using TensorFlow 2.19.0 and Keras 3.10.0. Model performance was evaluated using Mean Absolute Error (MAE) and Mean Squared Error (MSE) across the entire test set, sex subgroups, and beauty-score quintiles.
RESULTS: The model demonstrated strong predictive performance on the test set, achieving an MAE of 0.218 and an MSE of 0.075. Sex-specific evaluation showed similar results, with slightly better accuracy for male faces (MAE 0.212) than for female faces (MAE 0.225). The model achieved its highest accuracy in the human-rating range of 2.517–2.76 (MAE 0.11), corresponding to the most densely represented portion of the dataset. Error increased toward the rating extremes where fewer samples were available.
CONCLUSIONS: The CNN model closely approximated human perception of facial attractiveness and demonstrated excellent predictive accuracy. These findings support the potential of AI-based tools to provide objective aesthetic evaluation in orthodontics. Future work should expand training to more diverse populations to improve model generalizability and clinical applicability.

Abstract citation ID: cjag070.509
SP612 3D–2D REGISTRATION: AN INNOVATIVE METHOD FOR 10-YEAR LONG-TERM ASSESSMENT OF ORTHODONTIC POSITIONAL CHANGES

Humeyra Unsal, Cristina Vento Bosch, Gregory Stylianos Antonarakis, Stavros Kiliaridis; *Department of Orthodontics, Dental School, University of Geneva, Geneva, Switzerland*

AIM: To develop a workflow that converts plaster models into fully digital datasets suitable for accurate superimposition with lateral cephalometric radiographs, thereby enhancing the diagnostic value of historical patient records to measure tooth eruption over time.
MATERIALS AND METHOD: Patient records from a university orthodontic clinic spanning the 1985–2015 period were retrospectively screened, to include finished orthodontic cases with a 10-year post-treatment follow-up. The final retrospective cohort consisted of 36 patients who possessed complete 2-year (T1) and 10-year (T2) post-treatment follow-up records, consisting of lateral cephalograms and plaster models. Maxillary models and lateral cephalograms at both T1 and T2 were analyzed using the OnyxCeph^{3}™ specialized software. The plaster maxillary models from T1 records were digitized using a high-resolution scanner obtaining 3D surface files (STL format). These digital models were then imported into the software, and maxillary depth was measured on all 3D models to ensure data consistency. Each digitized maxillary model was subsequently calibrated and superimposed onto the corresponding lateral cephalogram using a structured registration protocol on the incisal edge of the maxillary central incisor, and the mesiobuccal cusps of the maxillary right and left first molars. To assess the error of the method, the whole procedure was repeated on 12 randomly selected cases one month after the initial measurement session. The systematic and random errors between the two measurement sessions were evaluated using paired t-tests and the Dahlberg formula respectively.
RESULTS: The workflow enabled accurate superimposition of digitized maxillary models with lateral cephalometric radiographs. This integration improved visualization of long-term dentoalveolar changes. The method was feasible, reproducible, and yielded diagnostic information not accessible from analog records alone. No systematic error was detected, and the random error was calculated to be no more than 0.8mm.
CONCLUSIONS: Superimposing maxillary digital models onto cephalograms using stable dental landmarks is a reliable method to evaluate long-term vertical eruptive changes. This hybrid digital–radiographic workflow provides a valuable tool for longitudinal assessment of dentoalveolar changes due to growth, aging, and treatment-related adaptation.

Abstract citation ID: cjag070.510
SP613 AN AUDIT ON THE REQUESTING AND REPORTING OF FACIAL COMPUTED TOMOGRAPHY AND CONE BEAM COMPUTED TOMOGRAPHY RADIOGRAPHS IN JOINT ORTHODONTIC, RESTORATIVE AND ORAL & MAXILLOFACIAL SURGERY PATIENTS

Francine Jones, Rosheen Fatima, Brijesh Patel; *Great Ormond Street Hospital for Children, NHS Foundation Trust, London, United Kingdom*

AIM: The audit assessed four domains: (1) Whether the type of radiograph requested was the same as that taken; (2) The waiting time between request and exposure; (3) The justification for the radiograph (4) Whether a report was completed and if this was of sufficient detail.
MATERIALS (OR SUBJECTS) AND METHOD: Retrospective audit of 45 consecutive patients referred for either Facial Computed Tomography (CT) or Cone Beam CT (CBCT). SEDENTEX-CT 2011 guidelines were used and an agreed standard of 90% was set for reporting and completion of scan within 6 weeks of request. Data was collected regarding patient demographics, justification, percentage of radiographs with a report of sufficient detail and lastly the waiting times involved. Data was collected from 45 patients.
RESULTS: Of the 45 scans completed, the most common reasons for justification were implant planning (24%) and localisation of an impacted canine (24%). On average, the wait time was 14-days from referral to exposure, with just over half of patients having the scan on the same day. Two-thirds of patients (76%) had a report completed by the Referring Consultant, with only 14% being of sufficient detail for the field of view (FOV) taken. All radiographs taken matched the referral type requested. However, two of the scans completed did not have their field of view sufficiently reduced as per request.
CONCLUSIONS: The waiting time for either CBCT or Facial CT was well within the 6-week target. All imaging requests had appropriate justification criteria. However, the completion of a radiographic report of sufficient quality fell short of the agreed standard. The accuracy of reporting both facial CT scans and CBCTs is dependent on clinician experience and training received. Our audit highlights the need for further collaborative working with our Consultant Radiologists when reporting both CBCTs with large FOV and Facial CT scans.
PREVIOUSLY PUBLISHED ABSTRACT: no

Abstract citation ID: cjag070.511
SP614 ‡‡‡ *** SELECTING SCREWS: AN OVERVIEW OF THE KEY FEATURES OF COMMON TEMPORARY ANCHORAGE DEVICES IN UK ORTHODONTICS

Unyime-Abasi Inyang[1] and Naeem Adam[2]; [1]*Queen Elizabeth Hospital, King's Lynn, United Kingdom,* [2]*Leeds Dental Institute, Leeds, United Kingdom*

AIM: To guide clinicians in selecting optimal temporary anchorage devices (TADs) by comparing six leading systems used in the UK, focusing on design features, strengths and limitations for clinical application.
MATERIALS AND METHOD: A comparative review of six widely used TAD systems: Aarhus, Benefit, Infinitas, OrthoEasy, Tomas and VectorTAS was conducted. Each system was assessed for material composition, dimensions, head design, abutment compatibility and clinical applications using manufacturer data and published literature.
RESULTS: Titanium alloy predominates for its biocompatibility and corrosion resistance. All systems are self-drilling, though pre-drilling may be required in dense cortical bone. Screw diameters range from 1.3 - 2.3 mm and lengths from 6 - 14 mm, with stability influenced by cortical thickness, bone density and insertion angle. A minimum diameter of 1.6mm and circumferential clearance of 0.5 - 0.75 mm from adjacent roots is recommended, root divergence may be necessary.

Across the six systems, each offers design features that extend or limit clinical utility. Variations in head design allow attachment of different auxiliaries and Aarhus employs a specialised driver to support precise inter-radicular placement. Larger diameters of 2mm or more are used in extra-alveolar sites as seen in the Benefit system. Benefit and OrthoEasy systems also incorporate internal channels for attachment of abutments using a retaining screw, while Tomas offers a snap-fit mechanism with its hexagonal head. Infinitas and VectorTAS systems do not include abutments which limits the range of appliances that can be used with them.
CONCLUSIONS: TADs have transformed orthodontic biomechanics by enabling complex movements with minimal patient compliance. Selection should align with anatomical constraints, clinical needs and future treatment scope. Systems that support diverse abutment options and integrate readily with digital workflows offer the greatest flexibility and modern value. This review synthesises current

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

evidence to guide clinicians in making informed choices that enhance treatment efficiency and expand the range of achievable orthodontic outcomes.

Abstract citation ID: cjag070.512
SP615 DIAGNOSIS OF SUSPECTED PAEDIATRIC OSAHS. ANALYSIS AND PREDICTABILITY OF ANATOMICAL AND FUNCTIONAL CHARACTERISTICS.OBSERVATIONAL STUDY

Maribel Lopez Zamora, Ana Sanchez, Ali Azari Mehr, Tawfiq Hijazi, Marcela Ferrer Molina; *universidad catolica de valencia, valencia, Spain*

AIM: To detect patients of school and preschool age with suspected OSAHS based on the PSQ.
MATERIAL AND METHODS: Observational, descriptive and prospective study, with a sample size of 191 patients of pediatric age up to 16 years. All of them completed the pediatric sleep questionnaire (PSQ), and a functional analysis and an orthodontic study were performed. The data were analyzed using descriptive statistics and inference, with a significance level of 95%.
RESULTS: Despite the fact that in the literature reviewed there are characteristics of skeletal class II and hypertrophic tonsils in patients with OSAHS, we observed that there is no significant difference when compared with healthy patients, but there will be a tendency towards skeletal and occlusal characteristics of skeletal class II. Oral breathing, asthma and degree of collapsed nares are predictive factors for suspected OSAHS.
CONCLUSION: Orthodontists are able to make a prediction of suspected OSAHS with the additional help of the pediatric sleep questionnaire, relating it to the anatomical and functional characteristics of the patient.

Abstract citation ID: cjag070.513
SP618 *** CONDYLAR ASYMMETRY AND MENTON DEVIATION IN ADULTS WITH DIFFERENT SKELETAL SAGITTAL PATTERNS

İrem Apohan[1], Ferabi Erhan Özdiler[2], Meyra Durmaz[1]; *[1]Ankara University, Ankara, Turkey, [2]Cyprus Health and Social Sciences University, Guzelyurt, Cyprus*

AIM: The aim of this study was to examine the relationship between skeletal sagittal pattern and mandibular asymmetry in adult patients using two-dimensional radiographic measurements, and to compare the frequency of asymmetry among skeletal Class I, Class II and Class III groups.
MATERIALS AND METHOD: The sample consisted of 192 adult patients (≥18 years) with no history of craniofacial syndromes, trauma or previous orthodontic/orthognathic treatment. Sagittal skeletal pattern was determined on lateral cephalometric radiographs according to Steiner analysis (ANB angle), and subjects were divided into skeletal Class I, II and III. Vertical skeletal pattern was assessed with the SN–GoGn angle and classified as hypodivergent, normodivergent or hyperdivergent. Transverse mandibular asymmetry was evaluated on posteroanterior cephalograms by a modified Grummons analysis; menton deviation from the facial midline was recorded and scored as “asymmetry present” or “absent”. Condylar–ramal vertical asymmetry was assessed on panoramic radiographs using two symmetry indices (SI1, SI2) calculated according to Kjellberg et al., with cut-off values of ≥93% (IS1) and ≥90% (IS2) for symmetry. Categorical variables were compared between skeletal classes using chi-square tests (α=0.05).
RESULTS: The distribution of vertical skeletal patterns differed significantly among sagittal groups (p=0.019). Hyperdivergent pattern was most frequent in Class I (56.3%) and Class II (59.4%) and less common in Class III (35.9%), whereas hypodivergent pattern was relatively more frequent in Class III (28.1%) than in Class I (15.6%) and Class II (18.8%). Menton asymmetry was present in 43.8% of Class I, 26.6% of Class II and 35.9% of Class III patients, with no significant difference between groups (p=0.126). According to SI1, condylar–ramal asymmetry was found in 46.9% of Class I, 68.8% of Class II and 59.4% of Class III subjects (p=0.042). For SI2, asymmetry rates were 48.4%, 65.6% and 59.4% in Classes I, II and III, respectively (p=0.137).
CONCLUSIONS: Mandibular asymmetry was frequent in all skeletal classes. Although menton deviation did not differ significantly between groups, Class II patients showed a higher frequency of condylar–ramal asymmetry according to Kjellberg indices, underscoring the value of combining panoramic and cephalometric assessments when evaluating mandibular asymmetry.

Abstract citation ID: cjag070.514
SP619 *** THE EFFECT OF ATTACHMENT DESIGN,MOVEMENT PATTERNS, AND TORQUECOMPENSATIONS ON POSTERIOR DENTALMOVEMENT DURING MAXILLARY EXPANSION.A SYSTEMATIC REVIEW

Anna GIL WHITTFIELD, Antonio CLAVERIA GUTIERREZ, Clara GUINOT BARONA, Alicia LANUZA GARCIA, Marcela FERRERMOLINA; *Universidad Católica de Valencia, Valencia, Spain*

AIM: This systematic review analyzes the biomechanical impact of attachment design, movement sequencing, and torque compensation on posterior tooth movement during maxillary expansion with clear aligners.
MATERIALS (OR SUBJECTS) AND METHOD: Seven in-vitro finite element studies were included. The QUIN Tool assessed bias. Variables included attachment type, size, location, movement sequencing (simultaneous vs. alternating), and torque compensation.
RESULTS: Most studies showed that rectangular attachments, especially when larger, improved torque control and reduced buccal tipping by enhancing root movement. Two studies, however, found increased inclination with deep palatal attachments or certain configurations. Alternating movement improved anchorage and the movement eciciency, and torque compensation promoted bodily movement.
CONCLUSIONS: Attachment design, torque compensation, and movement sequencing acect posterior biomechanics with aligners. While most evidence supports their use for root control, some setups may worsen inclination. Clinical research is needed to confirm these findings.

Abstract citation ID: cjag070.515
SP621 STUDY ON THE RELIABILITY OF THE IMPA AS A CRITERION FOR PERIODONTAL STABILITY. A SYSTEMATIC REVIEW

Andres Roman, Antonio Claveria, Clara Guinot, Tawfiq Hijazi, Marcela Ferrer Molina; *universidad catolica de valencia, valencia, Spain*

AIM: To assess the relationship between IMPA values and the level of gingival recessions and bone loss in mandibular incisors, and to identify and analyze other factors that may influence periodontal stability.
MATERIAL AND METHODS: A comprehensive search was conducted in databases such as PubMed, WOS, Google Scholar, Cochrane, and Scopus up to March 29, 2024. Clinical studies with cephalometric analyses and complementary assessments, such as CBCT, were included. The quality of the studies was evaluated using the ROBINS-I tool. Out of a total of 1,890 records, 10 studies met the inclusion criteria.
RESULTS: Among the reviewed studies, the average increases in the IMPA angle varied depending on the intervention and the study group. Some results showed clinically significant changes in bone and periodontal support, while others found no relevant correlations. Additionally, the studies identified additional risk factors, such as gingival biotype and hygene. A thin biotype was associated with a higher risk of gingival recession, regardless of changes in the IMPA angle.
CONCLUSION: The results of the reviewed studies do not establish a consistent or significant relationship between IMPA angle values and the development of gingival recessions or bone loss in mandibular incisors. However, the studies identified various factors influencing periodo

Abstract citation ID: cjag070.516
SP622 IMPACT OF SURFACE ROUGHNESS AND THERMAL CYCLING ON MICROBIAL ADHESION TO THERMOFORMED AND 3D PRINTED RETENTION APPLIANCES

Ilayda CELIK[1], Pelin ACAR ULUTAS[1], Duygu OCAL[2]; *[1]ALTINBAS UNIVERSITY, FACULTY OF DENTISTRY, DEPARTMENT OF ORTHODONTICS, ISTANBUL, Turkey, [2]ANKARA UNIVERSITY, CEBECI RESEARCH AND APPLICATION HOSPITAL, ANKARA, Turkey*

AIM: The aim of this in vitro study was to compare biofilm formation on thermoformed and three-dimensional (3D) printed retention materials and to evaluate the effect of thermal aging on microbial adhesion and surface properties.
MATERIALS AND METHOD: Retention appliances were fabricated using four distinct thermoformed materials (Zendura, Duran, Easy Vac, Vivera) and three different 3D

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026

printing resins (Graphy, KeySplint, Dental LT Clear). Disc-shaped specimens (6mmx1mm) derived from these appliances were subsequently inoculated with six microbial strains: *Streptococcus mutans, Staphylococcus aureus, Staphylococcus epidermidis, Candida albicans, Candida krusei,* and *Candida orthopsilosis.* Thermal aging was conducted over 5,000 cycles (5–55°C). Surface roughness parameters (Sa,Sq,Ssk,Sku,Sz,Sp,Sv) were analyzed via optical profilometry pre- and post-cycling. Biofilm formation was assessed at 24 and 48 hours for bacterial strains and at 48 hours for Candida species, after which density was quantified via spectrophotometry. Data distribution was verified via Shapiro-Wilk and Levene tests with Welch ANOVA applied for non-compliant data. Pearson coefficients evaluated the relationship between roughness and biofilm density.

RESULTS: Surface roughness varied significantly depending on the manufacturing technique, with 3D-printed appliances exhibiting higher values than thermoformed ones ($p<0.05$). Thermal cycling increased roughness across all groups ($p<0.05$). Biofilm levels rose significantly at 48 hours ($p<0.05$), with S. epidermidis and C. albicans showing the highest accumulation. Generally, 3D-printed resins (particularly Graphy and Formlabs) promoted greater biofilm formation than thermoformed materials. Notably, Graphy displayed the highest S. epidermidis adhesion under thermal cycling conditions ($p<0.001$), while without thermal cycling S. mutans accumulation was highest on 3D-printed resins at 24 hours ($p<0.001$). Material composition and thermal aging significantly influenced surface properties and microbial adhesion.

CONCLUSION: Retention appliance material significantly influenced microbial adhesion, with 3D-printed resins exhibiting higher roughness and biofilm formation than thermoformed options. Furthermore, thermal aging increased biofilm accumulation, indicating that aging conditions facilitate colonization. These findings highlight that material composition and surface integrity are critical determinants of appliance hygiene.

Abstract citation ID: cjag070.517

SP625 ‡‡‡ *** DEVELOPMENT OF A VIRTUAL ORTHODONTIC ADVICE PATHWAY IN A COMMUNITY DENTAL SERVICE

Jing Zhao[1], Dayna Rosenthal[2], James Tomson[2], Hemant Patel[3], Armaana Ahmad[2]; *[1]Medway NHS Foundation Trust, Kent, United Kingdom, [2]Whittington Health NHS Trust, London, United Kingdom, [3]Angle House Orthodontics, London, United Kingdom*

INTRODUCTION: Timely and appropriate orthodontic input is essential in the management of compromised first permanent molars (cFPMs), where treatment decisions are highly time sensitive. Traditional referral pathways within community dental services are often associated with long waiting times, limited access to specialist advice, and inconsistent referral quality. To address these challenges, a virtual Rapid Orthodontic Advice Request (ROAR) pathway was introduced to improve access to specialist orthodontic support and optimise patient management.

AIM: This service evaluation aimed to assess the utilisation, effectiveness and perceived value of the ROAR pathway, and to compare outcomes before and after the introduction of specialist paediatric dental pre-screening.

MATERIALS AND METHODS: A retrospective service evaluation was conducted over two time periods: July 2021 to June 2022 (pre-screening phase) and February 2023 to November 2023 (post-screening phase). Data collected included patient demographics, clinical diagnosis, referrer type, advice response times, management outcomes and onward referral patterns. An anonymised online questionnaire was distributed to referring clinicians and orthodontic advisors to explore user experience, perceived educational value and impact on clinical decision-making.

RESULTS: Sixty-seven referrals were analysed in the first evaluation period and forty-seven in the second. In the pre-screening phase, 100% of cases received orthodontic advice within 10 days, with cFPMs accounting for approximately 70% of referrals. Following implementation of paediatric dental pre-screening, only 43% of cases required orthodontic input, demonstrating a substantial reduction in inappropriate referrals. Although the maximum response time increased to 32 days in the second phase, overall pathway efficiency improved through better triage and case selection. Clinician feedback was strongly positive, with all respondents who had experience of both models reporting improved clarity of referral criteria, increased confidence in case selection, and enhanced interdisciplinary communication.

CONCLUSION: The ROAR virtual advice pathway improved access to specialist orthodontic support and promoted more appropriate, timely management of children with cFPMs. The addition of paediatric dental pre-screening further enhanced pathway efficiency, reduced unnecessary referrals, and supported clinician education. This integrated, virtual multidisciplinary model represents a scalable and sustainable approach to improving care pathways for complex paediatric dental conditions in community settings.

Abstract citation ID: cjag070.518

SP628 *** MANAGEMENT OF DEEP BITE AND MAXILLARY CANINE ERUPTION WITH CLEAR ALIGNERS IN A GROWING PATIENT

Renata Carreiro[1], Rodrigo Nunes[2], Carolina Nunes[2], Carla Leite[2]; *[1]Federal Fluminense University, Niteroi, Brazil, [2]FAIPE, Nova Friburgo, Brazil*

AIM: To demonstrate early vertical control and space management with clear aligners to facilitate the eruption of an impaired maxillary canine during growth.

MATERIALS AND METHODS: ClearCorrect clear aligners were used for interceptive orthodontic treatment. The digital setup included 23 active stages with two-week wear protocol. Maxillary expansion (3 mm), anterior bite ramps, posterior extrusion (0.5 mm), upper incisor intrusion (0.5 mm), root torque control, and interproximal reduction (0.4 mm upper; 1.4 mm lower) were digitally planned. Virtual extraction of primary tooth 53 was performed to allow space opening.

Customized attachments were positioned on incisors and premolars for root control and improved biomechanics. Digital monitoring of treatment progression was performed through sequential ClearPilot evaluations. Panoramic radiographs, intraoral photographs and clinical examinations were used to confirm the eruption path of tooth 23 and occlusal changes.

After completion of the first aligner series, a refinement protocol was designed with updated 3D digital models to optimize canine eruption and finalize vertical and rotational corrections. No fixed appliances or auxiliary devices were used.

CONCLUSIONS: Clear aligners were effective in early management of deep bite and impaired eruption of the maxillary left canine in a growing patient. The refinement phase played a crucial role in optimizing the eruption path of tooth 23 and finalizing occlusal goals, demonstrating that sequential aligner protocols can be a valid interceptive treatment alternative without the need for fixed appliances.

Downloaded from academic.oup.com/ejo/article/48/6/cjag070/8923607 by Gazi University user on 09 November 2026