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ABSTRACTS

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ORAL PRESENTATIONS OF CONSEURO 2022

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Etching Methods/application Modes Effect on Clinical Performance of a Universal Adhesive

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Aim: To evaluate clinical performance of resin composite restorations placed with a universal adhesive used with different etching methods and application modes in non-carious cervical lesions (NCCLs) over an 18-month period.

Materials and Methods: Forty-one patients with at least five NCCLs participated in this study. A total of two hundred fifteen restorations were placed randomly according to different etching methods and application modes of a universal adhesive, Clearfil Universal Bond Quick; Group I; etch&rinse mode with phosphoric acid (ER-A), Group II; selective-etch mode with phosphoric acid (SLE-A), Group III; etch&rinse mode with laser (ER-L), Group IV; selective-etch mode with laser (SLE-L), Group V; self-etch (SE). Er,Cr:YSGG laser was used at 1.5W for enamel, 1W for dentin, 20Hz, 140μs pulse duration 65%air, 75%water. The resin composite, Clearfil Majesty ES-2 was placed by the same operator. Two experienced and calibrated examiners evaluated the restorations after one-week (baseline) and at 6, 12 and 18 months using modified USPHS criteria. Data was analyzed by chi-square and Cochran's-Q tests ($p<0.05$).

Results: The recall rate was 100% at 18-month. About retention, six restorations were lost (3 for ER-A, 1 for ER-L, 2 for SLE-L) creating no difference neither among etching methods nor application modes ($p>0.05$). SE group showed significantly higher discoloration than other groups at 18-month ($p<0.05$). In terms of marginal adaptation, no difference was detected among the etching methods ($p>0.05$) while SE group displayed worse scores than ER modes ($p<0.05$). Marginal discoloration rates were significantly different when baseline and 18-month evaluations were compared only in SE group ($p<0.05$). Comparing baseline and 18-month recall, statistically significant deterioration in margin adaptation were observed in all groups ($p<0.05$) except ER-A and ER-L ($p>0.05$).

Conclusion: Laser etching might be an alternative approach to conventional acid etching for universal adhesive applied in different modes. With regard to application modes higher discoloration was detected in SE group. Irrespective of etching methods, SE mode showed more marginal deterioration than ER mode.

Keywords: universal adhesive, clinical trial, laser etching, non-carious cervical lesions

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Burnout Syndrome Among Dentists in Turkey

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Aim: In this study, we examined the burnout levels of dentists working in Turkey and evaluated them according to gender, title, place of work and experience.

Materials and Methods: Dentists who work in Turkey are invited by e-mail or open invitation posts on social media to participate in this study. Our volunteers completed an online 23-question survey including gender, professional experience, workplace, title, and a 19-item Copenhagen burnout inventory. Only participants who answered all questions were included in the study. The burnout levels of the dentists participating in the study were statistically analyzed according to gender, title, experience, and workplace. All statistics were made using Sigmaplot 14 software. No normal distribution was observed in intragroup evaluations and the Kruskal-Wallis test was applied. In the groups with differences, Dunn's Method was applied with the recommendation of the program for dual evaluations.

Results: Survey response rate is 88%. The answers of a total of 477 dentists were considered valid. 238 of them (49,8%) carry the title of the general dentist (GD), 112 (23,4%) of them are specialists or PhD Degree, and 127 (26,6%) of them work as residents. While 275 (57,6%) of the participants were women, 201 (42,1%) were men. 173 (36,2%) of participants stated their professional experience as 0-5 years, 162 (33,9%) of them 5-10 years, 61 (12,7%) of them 10-15 years and 81 (16,9%) of them as 15 years and above. It was observed that 73.5% of them had high burnout scores. A statistically significant difference was found in the evaluations made according to the title and workplace

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(p<0,001, p<0,001; respectively). It was seen that experience and gender had no effect on burnout (p=0,921, p=0,206; respectively).

Conclusion: Almost 3 out of 4 dentists in Turkey have high level burnout. It has been predicted that patient burden may be closely related to burnout syndrome.

Keywords: burnout, dentists, title, workplace

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Dental Public Health Knowledge: A Descriptive Study from a Dental Faculty

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Aim: Dental public health is a specialization dealing with the diagnosis, prevention, and control of diseases and the development of oral health through the organized society efforts. The aim of this study was to determine the level of knowledge of the basic principles of dental public health (DPH) by the students of a dental faculty.

Materials and Methods: Hacettepe University Ethics Committee's approval and the permission from the Dean's Office were obtained. From all registered students (N=772), 228 (29.5%) participated in this descriptive study. The data were collected via a structured, pre-tested e-questionnaire between May-June-2021 and investigated as number and percentage distributions by using SPSS-20.0. Chi-Square test was used to check the significance of the differences; p value accepted as <0.05.

Results: Of the students, 62.7% were female. The students were asked what they have understood when they heard the term DPH; 53.1% stated as "the awareness of the society on oral and dental health", and 25.4% "oral health level of population". The proportion of correct knowledge of dental health practices that are not within the scope of primary health care services increases with the increasing grades (p≤0.001). 77.6% of the participants knew that the Governmental Health Insurance System partially covers the oral health expenses. 51.8% had no idea about evidence-based dentistry, with the decreasing proportions by grades. 38.2% had no idea about atraumatic restorative techniques. 62.3% was stated that they didn't read any WHO publication related to oral and dental health, which was statistically differing between the grades (p≤0.001).

Conclusion: The results indicated that the fifth-grade dental students mostly had better but not adequate knowledge about the basic dental public health topics. It is recommended that the dental public health issues need to be implemented to the formal schedule of dental students from first to fifth grade.

Keywords: public health, dentistry, prevention, students, knowledge

Pub No: OP-004

Assessment of Different Imaging Systems for Dental Plaque Scoring: an in-vivo Study

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Aim: The aim of the clinical study was to analyze the correlation between the dental plaque scores measured by different imaging systems.

Materials and Methods: Thirty volunteers between the age of 18-30, who visited Marmara University, Faculty of Dentistry whose DMFT scores were under 4, were included in the study. Dental plaque on anterior teeth's buccal surfaces of the volunteers were scored using different imaging systems after staining with a disclosing gel. The patients were divided into three groups. The groups were given two different herbal toothpastes (ginger and hemp) and a conventional toothpaste. Digital photography, intraoral digital scanning (iTero Elements 2) and FluoreCam were used for taking intraoral images. The Turesky Modified Quigley Hein Plaque Index (TMQHPI) was used for the clinical examination and the taken images. The correlations between the clinical examination and imaging scores were analyzed before and after using the toothpastes for 21 days. Shapiro Wilk Test and Pearson's correlation were performed using IBM SPSS Statistics V23 (IBM Co., Armonk, USA) (p<0.05).

Results: The lowest mean value was obtained in the clinical examination without disclosing gel method and the highest mean value was obtained in the FluoreCam method. The mean value of the clinical examination without disclosing gel was found to be lower than the clinical examination with disclosing gel method and intraoral digital scanning method. There was no significant difference between toothpastes before and after toothbrushing for all clinical imaging methods.

Conclusion: Staining of the plaque and the use of digital imaging systems have shown a positive effect in the determination of dental plaque. Intraoral imaging systems may be used as an alternative to supplement the shortcomings of conventional clinical indices for educating patients about plaque control and continued patient oral care. Herbal toothpastes are just as effective as conventional toothpastes in removing dental plaque.

Keywords: dental plaque, dental photography, intraoral digital scanning, fluorecam, turesky modified quigley hein plaque index

Pub No: OP-005

The Effect of Pre-Restorative 'Five-to-Five' Clear Aligner Therapy in Restorative Treatment Planning

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Aim: To evaluate the effect of 'five-to-five' clear aligner therapy (Invisalign®) in restorative treatment planning, in terms of minimally invasive dentistry.

Materials and Methods: Fifty random adult patients being treated with the Invisalign® system were included in this clinical study. ClinCheck®/6.0 3D treatment plan simulations were generated for both 'Express Package' (including 7 aligners) and 'Lite Package' (including 14 aligners) for each patient. The generated simulations and related clinical photographs were assessed by two different restorative dentistry specialists. Each specialist performed 3 different restorative treatment plans for the patients at the initial, at the end of the 7th aligner, and the end of the 14th aligner. Maxillary and mandibular teeth in the smile line were included for the restorative treatment planning. The evaluation criteria were; the estimated number of (1) restorations, (2) restoration surfaces, (3) preparations, (4) incisal edge inclusion, and also the need for (5) gingival leveling. IBM SPSS V23 software-generated Friedman test and Cochran's Q test were used for the statistical analyses. Deem significance was set at p=0.05.

Results: A positive and strong correlation was found between the two specialists for each of the three assessment periods (p<0.001). Estimated number of restorations [10[3-16) a] was significantly decreased after Express [6(0-14) b] and Lite Packages [4(0-8) c] (p<0.001). Estimated number of restoration surfaces [28.5(9-48) a] was significantly decreased after Express [15(0-42) b] and Lite Packages [9.5(0-24) c] (p<0.001). Estimated number of preparations [7(0-16) a] was significantly decreased after Express [3(0-10) b] and Lite Packages [0(0-4) c] (p<0.001). Number of incisal edge inclusion [10(3-16) a] was significantly decreased after Express [6(0-14) b] and Lite Packages [4(0-8) c] (p<0.001). The need of gingival leveling [26(52%) a] was significantly decreased after Express [20(40%) a] and Lite Packages [7(14%) b] (p<0.001).

Conclusion: Pre-restorative clear aligner therapy might provide a more minimally invasive restorative approach while reducing the number of estimated restorations. The 'five-to-five' application of 'Lite Package' was considered more effective than 'Express Package'.

Keywords: clear aligners, pre-restorative treatment, minimally invasive, treatment planning, invisalign

Pub No: OP-006

Volumetric Shrinkage of Injectable Resin Composites Assessed by Micro Computerized Tomography

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Aim: To evaluate the volumetric shrinkage of different injectable and paste-like resin composites using micro computerized tomography (μCT).

Materials and Methods: Sixty Eppendorf tubes (0,2 ml) were used to simulate a cavity. A fine tip marker was used to mark 2-mm depth from the bottom of the tubes. Two main groups comprised of injectable (inj) and paste-like (pst) composites were divided into three subgroups according to the brand (Clearfil (CL), Shofu (SH), GC (GC)) (n=10). Each mold was filled with a single increment of composite up to the marked line to obtain 2-mm thick composite. Before light-curing, a μCT unit was used to scan the tubes filled with composites. After scanning, composites were light cured from the bottom with a LED curing unit for 20 s. Tubes with polymerized composites were scanned with the μCT unit. For each specimen, volumetric shrinkage (%) was calculated using pre-polymerization and post-polymerization volume of the composites. Data were analyzed with 2-way ANOVA followed by Tukey's multiple comparison test (α=0.05).

Results: For all brands, injectable composites showed significantly higher shrinkage than those of their paste-like counterparts (p<0.001). The highest shrinkage was observed in SH-inj (3.187±0.130), lowest was observed in CL-pst (1.357±0.080). For the paste-like composites each brand had significantly different shrinkage (p<0.001) values that increased in the following order: CL-pst (1.357±0.080), GC-pst (1.503±0.096), SH-post (1.785±0.071). For the injectable composites, each brand had significantly different shrinkage values (p<0.001) that increased in the following order: GC-inj (2.060±0.052), CL-inj (2.203±0.115), SH-inj (3.187±0.130).

Conclusion: Volumetric shrinkage of injectable composites was higher compared to the paste-like composites.

Keywords: micro ct, polymerization shrinkage, injectable resin composites, flowable resin composites, volumetric shrinkage

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Evaluation of Proximal Contact Tightness of Posterior Composite Resin Restorations

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Aim: The purpose of this study is to evaluate the influence of matrix system on proximal contact tightness (PCT) of posterior composite resin restorations.

Materials and Methods: Standardized class II cavities (Occluso-distal "OD" and Occluso-mesial "OM") on first lower molar dentiform model teeth (Frasaco, GmbH, Germany) were prepared. Seventy-five teeth randomly assigned into three study groups and restored with direct resin composite (Charisma Topaz, Heraus Kulzer, Germany) using different matrix system; Gr-1: Ivory matrix (Hahnenkratt GmbH,

Germany), Gr-2: Omni matrix (Ultradent, USA), and Gr-3: Palodent V3 sectional matrix (Dentsply, USA). In all the groups, the matrix band was secured using a wooden wedge except for the Palodent group, following manufacturer's recommendations. All the prepared teeth were restored with resin composite mounted in a manikin head to simulate the clinical environment. PCT was measured using a custom-made tooth pressure meter designed by Faculty of Engineering (Ege University, Izmir). All data were statistically analyzed by ANOVA, and t- test ($p<0.05$).

Results: Validation of the PCT results has been performed with bitewing radiography. The contact surface area was measured by evaluating the pixel volume on histogram (CS5 Photoshop, Adobe, USA). The use of sectional matrices combined with separation rings resulted in statistically significantly tighter proximal contacts than when ivory systems were used ($p<0.05$). Mesial PCT scores in both Ivory matrix (PCTm: 90.78 ± 16,98N) and Omni matrix (PCTm: 157,09 ± 26,57N) are significantly higher when compared to distal contacts ($p<0.05$). Palodent matrix showed significantly tighter contacts on both mesial (PCTm: 238,12 ± 41,57N) and distal surfaces (PCTd: 232,35 ± 80,17) ($p>0.05$).

Conclusion: The use of sectional matrix systems and separation rings, resulted in tighter and wider proximal contacts when compared to traditional matrix systems in Class II resin composite restorations.

Keywords: resin composite, sectional matrix, contact tightness

Pub No: OP-008

Evaluation of Monomer Release of Bulk Fill Composite Resins with Extended Light Curing

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Aim: The aim of this study was to evaluate the effect of light curing time (20s/40 s) on BisGMA and TEGDMA monomer elution from four composite resins.

Materials and Methods: 16 groups were formed by using two medium solvents [distilled water (W) and 75%ethanol/water (E/W)], two polymerization time (20s/40s) and four different composite resins [Estelite BulkFill (EBF), Sonicfill BulkFill (SBF), Filtek BulkFill Flowable (FBFF) and Filtek Z250 (Z250)]. A total of 240 composite discs (5mm diameter, 4mm thickness) (n=15) were prepared in Teflon mold between transparent Mylar strips. The materials were polymerized for 20s or 40 s according to curing time group. Immediately after light curing, each material was immersed into storage medium contained in separate 1.5 ml of glass vials. 0.5 mL of medium solvent was collected for High Performance Liquid Chromatography (HPLC) analysis after 1,15 and 30 days. Comparisons between groups were made with the Kruskal Wallis and Mann Whitney U test. Friedman test was used for intragroup comparisons and Dunn test was used for pairwise comparisons ($p<0.05$).

Results: Increasing the polymerization time to 40 s, decreased the TEGDMA elution of EBF (13.96± 3.44), Z250 (7.62±0.84), SBF (4.70 ±1.51) groups into E/W medium, it also decreased the BisGMA release of FBFF (15,02±10,72), Z250 (114,80±77,53) and SBF (4,23±5,35) groups. In none of the composite groups BisGMA was detected in water medium ($p<0.05$). EBF showed the highest TEGDMA release into E/W in both 20s and 40s groups (30.53±5.28 and 13.96±3.44 respectively) ($p<0.05$). Among 20s polymerized groups, FBFF (333,63±87,45) showed the highest BisGMA release into E/W ($p<0.05$). Among 40s polymerized groups, EBF (280.79±133.77) showed the highest BisGMA release ($p<0.05$). BisGMA release was "Non-Detacable" for all composites in water medium.

Conclusion: Increasing the polymerization time, decreased the TEGDMA release of EBF, Z250, SBF composites. The BisGMA release of FBFF, Z250 and SBF composites was decreased with extended light curing. The highest TEGDMA release was observed in EBF in both polymerization times.

Keywords: elution, monomer release, bulk fill composite resin, hplc

Pub No: OP-009

The Effect of Gravity on Silver Nitrate Penetration on Flowable Bulk-Fill Composites

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Aim: The purpose of this study was to evaluate the silver nitrate penetration of different flowable bulk-fill composite resins against gravity by micro-ct.

Materials and Methods: Class II box cavities (n=100) in 4-mm depth were prepared and treated with Clearfil S3 Bond Plus (Kuraray Noritake Dental Inc., Okayama, Japan). Half of the specimens restored with gravity direction (G) while other half restored against gravity (AG) direction. Four flowable bulk-fill composite materials were evaluated: [Filtek Bulk Fill-FBR (3M Dental Products. St.Paul, USA), x-tra base-XTB (VOCO GmbH, Cuxhaven, Germany), Sonicfill-SCF (Kerr Corp., Orange, USA), Smart Dentin Replacement-SDR (Dentsply Caulk, Milford DE, USA), and one conventional flowable composite + paste-like composite [Clearfil Majesty Flow + Clearfil Majesty (Kuraray Noritake Dental Inc., Okayama, Japan)] were used, as control. Bulk-fill composite materials were applied as one layer (4mm) and conventional composites were applied as one horizontal layer (1 mm) and two horizontal layers (2mm + 1mm) to the cavities and each layer was cured with a LED unit. Silver nitrate penetration volume were evaluated by μCT and data analyzed using two-way analysis of variance (ANOVA) with a significance level at $p < 0.05$.

Results: The mean penetration volume / restoration volume rates (x10-5) and standard errors (x10-5) were; G-FBR (5.2-1.4), G-XTB (20.1-4.7), G-SCF (5.7-1.5), G-SDR (3.2-0.4), G-CMF (7.2-1.9), AG-FBR (7.1-1.3), AG-XTB (19.1-4.1), AG-SCF (6.6-1.0), AG-SDR (5.0-0.8), AG-CMF (11.9-3.4). There was no significant effect of gravity factor between tested specimens ($p>0,05$) but significant differences between different composite materials in both G and AG groups ($p<0,05$).

Conclusion: The role of gravity had not a significant effect on silver nitrate penetration of flowable bulk-fill restorative materials. Different bulk-fill materials showed different amount of penetration values with or without gravity effect.

Keywords: micro ct, gravity, bulkfill, silver nitrate penetration

Pub No: OP-010

Comparison of the Masking Ability of Opaque Resins Using Different Color Analysis Techniques

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Aim: The purpose of this study was to evaluate the masking ability of different type of opaquers with three different color analysis techniques.

Materials and Methods: To imitate the discolored tooth substrate, C4-colored composite (GC Europe, 8*2) was prepared by teflon molds. For the purpose of the current study different type of opaquers were selected: paste opaquer; PO (Universal Restorative, 3M ESPE), flowable opaquer; FO (Masking Liner, GC Europe). Opaque composite resins, (8*0,5) were layered on the substrate followed by the top layering with universal composite resin (3M Universal Restorative, 3M ESPE; 8mm*1mm). The analysis of the color was done using spectrophotometer (VITA Easyshade V; VITA Zahnfabrik) digital camera DSLR (Canon,700D) and smartphone attached with light correcting device (Smile Lite MDP; Smile Line). Digital images were evaluated with a software (Classic Color Meter, Apple Corp), which enables encompassing parameters in CIELab color space so that all the data could be compared within the groups. The statistical analyses were performed by Shapiro-Wilk, Kruskal-Wallis, Anova, Friedman, post-hoc Bonferroni test ($p<0,05$). The Bland-Altman analysis was performed to estimate an agreement interval.

Results: Regarding three color analysis methods; ΔL values revealed that PO+U group has the highest value while the lowest values were obtained by FO+U group. All three analysis techniques Spectrophotometer, Smile Lite MDP and Digital camera showed that both opaquer resins resulted an increased L* parameter and an increase in value of the final restoration color while the ΔE values were also increased in all layering techniques. ΔL, Δa, Δb values of final restorations exhibited similar pattern with all analysis's techniques. Regarding the ΔE values comparison, PO exhibited better masking efficiency than flowable opaquer ($p<0,05$).

Conclusion: Within all color analysis methods, color masking efficiency of the PO+U layering was found higher than FO+U group. Regarding the ΔE parameters of POU group a compatibility between the SPM and MDP analysis were exhibited.

Keywords: spm, smile lite mdp, digital photography, opaquer, masking ability

Pub No: OP-011

Effect of Ceramic Type, Thickness, and Aging on Color Stability of CAD/CAM Materials

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Aim: This in vitro study aimed to evaluate the color stability (CS) of different glass-ceramic CAD/CAM blocks in two different thicknesses after hydrothermal aging.

Materials and Methods: Four types of CAD/CAM blocks; lithium disilicate (IPS e.max CAD, Ivoclar Vivadent; E.MAX), leucite-reinforced (Initial LRF, GC; LRF), zirconia-reinforced lithium silicate (Celtra Duo, Dentsply; CD), and feldspathic (Cerec, Dentsply; CER) glass-ceramics were cut in 0.5mm and 1.00mm slabs (n=12 for each thickness). To represent dental hard tissues, a total of 96 resin composite discs (G-eanial, GC) were prepared in 2mm thickness. CAD/CAM slabs and resin composite substrates were luted with a light-cured resin cement (G-CEM; GC) and polymerized (VALO, Ultradent) according to manufacturer's instructions. Following storage in distilled water for 24 hours at 37°C, initial color measurements (E0) were evaluated with a spectrophotometer (CM-2600d, Minolta). Then all the specimens were exposed to hydrothermal aging between 5-55°C for 30000 cycles (SALUBRİS). Color measurements were repeated after every 10000 cycles (E1, E2, E3). Color differences (ΔE) were evaluated by CIEDE2000. Data were analyzed with three-way ANOVA and post hoc Tukey's tests ($p<0.05$).

Results: ΔE was significantly influenced by ceramic type ($p<0.001$), ceramic thickness ($p<0.001$), and aging ($p<0.001$). In 0.5mm LRF showed significantly higher CS than CER at 10000 cycles ($p=0.001$), while after 20000 and 30000 cycles CER presented significantly lower CS than LRF ($p<0.001$) and E.MAX ($p=0.008$). In 1.0mm thickness, there were no significant differences between the glass-ceramic materials after 30000 cycles ($p>0.05$). Only CER 0.5mm and 1.0mm showed statistically significant differences after 10000, 20000, 30000 cycles ($p=0.006$, $p<0.001$, $p<0.001$, respectively).

Conclusion: CS of glass ceramics were affected by ceramic type, ceramic thickness, and aging. Leucite and lithium disilicate reinforced glass-ceramics presented more CS than the zirconia-reinforced lithium silicate and feldspathic glass ceramic CAD/CAM blocks after aging. CS of the feldspathic glass ceramic CAD/CAM block was highly thickness dependent.

Keywords: ceramic veneer, color stability, hydrothermal aging, thickness, CAD/CAM materials

Pub No: OP-012

Long-Term Discoloration of a Nanofil Resin Composite: Effects of Whitening Dentifrices and Polishing-Systems

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Aim: The aim of this study was to evaluate the long-term effect of whitening toothpastes on the color change of a nanofil resin composite immersed in different drinks and polished with different polishing systems.

Materials and Methods: 126 disc-shaped specimens (8mm x 2mm) from nanofil resin composite (Filtek Ultimate) were manufactured using metal mold, stored in distilled water for 24 h at 37° C then divided into two groups and polished with 4-Step aluminum oxide discs (Meisinger) and 2-Step System Diamond Twister Polisher (Meisinger). The baseline color values (L*a*b*) of each specimen were measured using a spectrophotometer according to the CIEL*a*b* color scale.

Seven specimens from each group distributed according to immersion media: coffee, red wine and distilled water as a control. The specimens were kept in these beverages twice a day for 15 minutes and then brushed daily (120 cycles/day) using powered toothbrush (Oral B, 3D White) with whitening (Opalescence Whitening or Signal White) or regular (Colgate) toothpastes for a period of 3, 6 and 12 months. After each immersion and brushing, the color values of each specimen were remeasured, and the ΔE values were calculated. Data were analyzed by Multivariate ANOVA and Post-hoc Bonferroni tests at $p<0.05$.

Results: The specimens immersed in coffee and red wine showed significantly higher color change than clinically acceptable limit (ΔE >2.7) after 12 months ($p<0.001$). While Signal White caused significantly less color change only in the samples immersed in red wine in the 4-step polishing group ($p<0.05$), no significant differences were found between the other polishing, toothpaste and solution groups ($p>0.05$). 2-step polishing system caused significantly less color change than the 4-step polishing system ($p<0.05$).

Conclusion: Coffee and red wine caused significantly higher discoloration over 12 months evaluation period. 2-step polishing system exhibited less color change and whitening toothpastes did not show a significant long-term effect on discoloration.

Keywords: polishing systems, nanofil resin composite, whitening dentifrices

Pub No: OP-013

Evaluation of Color Stability of a Structural Colored Resin Composite

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Aim: The aim of this study is to compare the color stability of a structural colored resin composite (Omnichroma, OMC) with resin composites using pigments.

Materials and Methods: 3 different composite resin groups were formed by layering method, with the first layer consisting of an opaque resin, in order to minimize the misleading effect of the translucency of composite resins on color change values. 1- Filtek Ultimate (FU) A1Dentin+FU A1Body 2- Estelite Σ Quick (EQ) OA2+EQ A2; 3- EQ OA2+Omnichroma (OMC). Disc-shaped specimens of each composite resin group were soaked in distilled water for 24 hours (initial) then stained by soaking in coffee solution for 48 hours (staining) and brushed with a toothpaste at the end of the staining period (brushing). Color change values (ΔE) were calculated from the surfaces of the composite discs prepared with FU A1Body, EQ A2 and OMC, between the initial and staining and between the initial and brushing. One-way ANOVA and Tukey's post-hoc test was used for statistical analysis. ($\alpha = 0.05$).

Results: There was little, not statistically significant, difference between the post-staining and post-brushing ΔE values of the OMC samples. The group with the most color change after brushing was OMC. ΔE values of all coloration groups and OMC in the brushing group were higher than the clinically detectable limit of 3.3. The largest ΔE value after staining was found in the EQ group, and the difference between this value and the ΔE values of all groups was statistically significant. However, the lowest ΔE value was found in the EQ group after brushing.

Conclusion: After brushing, the ΔE values of FU and EQ samples were found to be less than 3.3, and the ΔE value of OMC was found to be high. EQ samples showed the most color change after staining with coffee and the least color change after brushing.

Keywords: color stability, composite resin, omnichroma

Pub No: OP-014

The Effect of Different Pretreatment Protocols on Repair Bond Strength of Resin Composite After Different Aging Times

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Aim: The aim of this study was to evaluate the effect of different pretreatment protocols on repair bond strength of resin composite aged that aged at different times.

Materials and Methods: 260 samples were prepared in a Teflon mold (4mm thickness x 5mm diameter) and randomly divided into two groups according to aging time (one month, twelve months) in an ultraviolet accelerated aging chamber. Each group is divided into five subgroups according to surface treatment: no treatment (Group I), adhesive application (Group II), roughening with 320 grit sandpaper (Group III), roughening with 320 grit sandpaper+CoJet application (Group IV), CoJet application (Group V). Then, all groups except no treatment, were divided into three subgroups. In Group I, silane + silane-free adhesive, in Group II, silaned universal adhesive and in Group III, silane-free adhesive was applied (n=10). Then, samples were repaired with Filtek Z250 (2mm thickness x 1 mm diameter) and shear bond strength test was performed. Failure types were examined under the light microscope and SEM images of one sample from each group were evaluated. Statistical analysis was performed with Kruskal Wallis and Mann Whitney U tests. Significance level was set at 0.05.

Results: Significant differences were observed between Group I and the surface treatment groups in all aged groups ($p<0.05$). It was observed that aging time had different effects on bond strength in all groups. No difference was obtained between the adhesive applications used in groups aged for one month ($p>0.05$), and the adhesive applications had different effects in groups aged for twelve months.

Conclusion: It was observed that the aging process affected the repair bond strength differently depending on the treatment protocols, and surface roughening increased bond strength. In addition, the application of adhesive increases the bond strength, but the choice of adhesive should be performed according to the method used in surface pretreatment protocol.

Keywords: surface treatments, repair, shear bond strength, resin composite

Pub No: OP-015

Effect of Glazing and Thermocycling on Surface Roughness and Microhardness of CAD/CAM Laminate Veneers

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Aim: The aim of this in vitro study was to evaluate the effect of thermocycling and glazing on surface roughness and Vickers microhardness of lithium disilicate, leucite reinforced and feldspathic glass-ceramic (Cerec) and composite (Cerasmart) CAD/CAM laminate veneers.

Materials and Methods: Maxillary right central plastic tooth of educational phantom jaw was used for the preparation of standard laminate veneers. Four types of CAD/CAM materials; lithium disilicate (E.max, Ivoclar), leucite reinforced (Empress, Ivoclar Vivadent), feldspathic glass-ceramics (Cerec; Sirona) and composite (Cerasmart; GC) (n:20 for each) in 1 mm² thickness was fabricated using digital impressions with an intraoral scanner (Cerec Omnicam, Sirona) from the prepared plastic tooth. Following glazing of glass-ceramic (Focus 2006 Furnice) and composite specimens (Ivoclar Vivadent Bluephase), all the specimens (n:20 for each) were subjected to 10000 cycles hydrothermal aging between 5-55°C (Salubrus). Surface roughness (Ra, μm) was evaluated with a surface profilometer (Perthometer, Mahr) and microhardness (HV) was measured with a microhardness tester (Micromet 5114, Buehler) at initial stage, after glazing and after aging. Data was analyzed by one way ANOVA and paired sample t-tests ($p<0.05$).

Results: Glazing significantly decreased Ra and HV of all CAD/CAM materials ($p<0.05$), while aging significantly increased Ra of Cerasmart and HV of all CAD/CAM materials ($p<0.05$).

Conclusion: Glazing decreases the surface roughness and microhardness of CAD/CAM milled laminate veneers. Compared to glass ceramics, composite CAD/CAM material is more prone to surface roughness increase after aging.

Keywords: cad/cam, surface roughness, microhardness, glazing, thermocycling

Pub No: OP-016

Surface Roughness and Gloss of Single-Shaded Composite Resins Polished with Different Wheel Systems

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Aim: This study aimed to evaluate the surface roughness and gloss of single-shaded composite resins polished with two different wheels systems.

Materials and Methods: Twenty-four-disc samples of 8x2mm (n=120) were prepared in plastic molds for Omnichroma (Tokuyama, Japan), Zenchroma (President, Germany), Essentia Universal (GC, Japan), Charisma Diamond One (Kulzer, Germany) and NeoSpectra (Dentsply, Germany; control). The discs were prepared under Mylar strips and glass slides and polymerized with an LED light-curing unit (Zenolite, President, Germany). One side of the samples was not polished and left as a Mylar strip control and the other was randomly polished with Twist Dia (TWD-Noritake, Japan) or Nova Twist (NOV-President, Germany). The finishers and polishers were both used dry for 30sec at 9000rpm speed on 1200grit silicon carbide paper grounded surfaces. The average surface roughness was determined with a profilometer (Mitutoyo SJ-301, Japan) and the gloss with a glossmeter (Glossmeter PCE-SGM60 Plus, USA). ANOVA, posthoc Tukey tests and Pearson correlation were used for statistical analysis ($p<0.05$).

Results: The smoothest surfaces were obtained with Mylar strips for all the groups ($p<0.05$). TWD and NOV polished surfaces were equally smooth. In TWD groups, the smoothest material was Omnichroma ($p<0.05$). In NOV groups, there was no difference among Omnichroma and Zenchroma groups. The highest gloss was observed with Mylar strips ($p<0.05$). In the TWD groups, Omnichroma, NeoSpectra, Zenchroma were glossier than Charisma Diamond One ($p=0.016$) and Essentia Universal ($p=0.004$). In the NOV groups, Omnichroma and NeoSpectra were the glossiest samples and Charisma Diamond One was the less glossy ($p=0.006$ and 0.000 respectively). There was no correlation of smoothness and gloss in none of the NOV groups and TWD groups except for Zenchroma ($p=0.003$).

Conclusion: A smooth and glossy surface could be obtained with Twist Dia and Nova Twist reduced-step polishing wheel systems on all the tested single-shaded composite resins.

Keywords: surface roughness, surface gloss, composite resin, single-shaded restoratives

Pub No: OP-017

Repair Bond Strength of Hybrid CAD/CAM Materials After Silane Heat Treatment with Laser

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Aim: 1. To investigate the effect of silane heat treatment with laser on the shear bond strength (SBS) of repaired hybrid CAD/CAM materials. 2. To evaluate the effect of different surface treatments on the SBS of repaired hybrid CAD/CAM materials.

Materials and Methods: Totally 60 hybrid CAD/CAM specimens (5x5x2 mm) (Cerasmart, GC Corp., Japan) were prepared and randomly divided into 6 groups according to the different surface treatments (n=10): Group ER: Er:YAG laser+silane (Monobond Plus, Ivoclar Vivadent, Lichtenstein), Group ER/SHT: Er:YAG laser+Silane heat treatment, Group B: Bur+silane, Group B/SHT: Bur+Silane heat treatment, Group HF: Hydrofluoric acid+silane, Group HF/SHT: Hydrofluoric acid+Silane heat treatment. Afterwards, a universal adhesive system (Clearfil Universal Bond Quick, Kuraray, Japan) was applied. Nanoceramic composite resin (Zenit, President, Germany) was bonded by a cylinder-shaped mold

(diameter:2.4 mm, height: 2mm). They were thermocycled for 10.000 cycles (5-55°C) and subjected to SBS test using a universal testing machine. Failure modes were examined with a stereomicroscope (25×). Scanning electron microscope (SEM) and 3D optic profilometer were used to evaluate the surface topography (n=2). The data were statistically analyzed by Mann Whitney U and Kruskal Wallis test ($p<0.05$).

Results: Regarding the surface treatments, Group ER (6.53±0,61MPa) showed significantly lower SBS than Group B (12.35±2,24MPa) and Group HF (9.40±1,18MPa ($p<0.05$). No significant differences in SBS were determined between Group B and Group HF ($p>0.05$). Regarding the silane heat treatment by laser, Group ER/SHT (6.81±0,95MPa) and Group B/SHT (7.05±1,41MPa) showed significantly lower SBS than Group HF/SHT (9.51±2,07MPa) ($p<0.05$). No significant differences in SBS were observed between Group ER/SHT and Group B/SHT ($p>0.05$). Besides, Group B/SHT showed significantly lower SBS than Group B ($p<0.05$).

Conclusion: Bur roughening and hydrofluoric acid etching positively affected the repaired bond strength. The activation of silane with ER:YAG laser was incapable to change the bond strength of repaired hybrid CAD/CAM materials.

Keywords: shear bond strength, cad/cam, silane heat treatment, ER:YAG laser

Pub No: OP-018

Effects of Universal Adhesives and Surface Treatments on Repair Bond Strength

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Aim: This study aimed to evaluate the effects of different universal adhesives and surface treatments on the repair bond strength between resin composites.

Materials and Methods: A total of 220 composite samples were divided into three groups according to the adhesive resin to be applied: 1) Scotchbond Universal, 2) G-Premio Bond, and 3) Peak Universal Bond. They were then divided into seven subgroups according to surface treatments (n = 10): A) air abrasion, B) air abrasion+silane, C) hydrofluoric acid, D) hydrofluoric acid+silane, E) air abrasion+hydrofluoric acid+silane, F) silane, and G) no surface treatment (negative control). After surface treatment, a repair composite was applied. Samples aged in the thermocycle were subjected to micro-tensile bond strength testing. Cohesive strength values of 10 non-aged composite blocks were used as a positive control. Kruskal–Wallis and one-way ANOVA tests were used for statistical evaluation. Fractured surfaces were evaluated using a scanning electron microscope.

Results: In Scotchbond Universal and G-Premio Bond, the mean micro-tensile bond strength value of the no surface treatment subgroup was significantly lower than that of the positive control. All subgroups of Peak Universal Bond showed similar values to the positive control.

Conclusion: While Scotchbond Universal and G-Premio Bond require mechanical roughening before adhesive application, Peak Universal Bond does not require any surface treatment.

Keywords: universal adhesives, resin composite, surface treatment, repair bond strength, micro-tensile test

Pub No: OP-019

Clinical Evaluation of Class II Restorations Made with Bulk-fill Restorative Materials

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Aim: The aim of this study is to retrospectively evaluate the clinical performance of bulk-fill restorative materials applied to class II cavities.

Materials and Methods: In the study, class II restorations which were restored with bulk-fill restorative materials in Restorative Dentistry Clinic of Selçuk University, Dentistry Faculty were determined from the records by using HIS (hospital information management system) automation program and the patients were called to the controls. Three of the bulk-fill materials used in our clinic (Equia Forte-EF, Tetric EvoCeram Bulk Fill-TBF and Filtek Bulk Fill Posterior Restorative-FBF) was evaluated. A total of 79 patients and 192 restorations were included in the study. Restorations were assessed according to modified USPHS criteria during the 6th, 12th and 24th months from the date of application. Chi-square test ($p <0.05$) was used for statistical analysis of the difference between the groups. The Cochran Q test ($p <0.05$) was used for the significance of the difference between the time-dependent changes in each group.

Results: Number of restorations at baseline: EF:66, TBF:65, FBF:61. After 24 months, 139 restorations were evaluated in 64 patients, 13 EF and 3 TBF restorations were lost, no loss was observed in FBF group. At the end of the second year, the cumulative retention loss was 24.5% for EF and 5.7% for TBF. There were clinically acceptable changes in composite resin restorations (TBF and FBF). In addition, no statistically significant difference was observed between the clinical performances of these materials in terms of all criteria ($p>0.05$). However, there was a statistically significant difference between the EF group and the TBF and FBF groups in retention criteria ($p<0.05$).

Conclusion: In this study, during a two-year follow-up period, the two bulk fill composite materials showed similar clinical performance; the high viscosity glass ionomer material showed lower survival rates.

Keywords: modified USPHS criteria, bulk-fill materials, high viscosity glass ionomer cement, universal adhesive

Pub No: OP-020

Investigation of 12-Month Clinical Performance of Self-Etch Adhesive with Two Different Contents Applied to Class V Cavities

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Aim: The aim of this study was to evaluate the 12-month clinical performances of two different one-step dentin adhesives that applied alone or with an additional hydrophobic resin layer to non-carious cervical lesions, according to FDI criteria.

Materials and Methods: 160 teeth in 31 patients included in the study were divided into 4 groups. Clearfil S3 Bond Plus in Group 1, Clearfil S3 Bond Plus and Heliobond in Group 2, G-Premio Bond in Group 3, G-Premio Bond and Heliobond applied teeth in Group 4 and they were restored with Clearfil Majesty ES-2 by a single operator. Restorations were evaluated after 1 week, 6, and 12 months of clinical use. The difference between the study groups was compared with Kruskal Wallis One-way analysis of variance and Dunn's multiple comparison test for variables that do not have a normal distribution. Differences between times/measurements/groups were evaluated using Friedman ANOVA and Tukey Post Hoc Test in continuous variables without normal distribution ($p<0.05$).

Results: After initial, 6, and 12 months of clinical use, there was no significant difference between the groups in terms of the surface luster, marginal staining, color match and translucency, esthetic anatomic form, fracture of material and retention, marginal adaptation, post-operative sensitivity, seconder caries and periodontal response parameters ($p>0.05$).

Conclusion: It was found that the difference in content between the adhesives and the application of additional hydrophobic resin had no significant effect on clinical performance. ''The present work was supported by the Research Fund of Istanbul University. Project No. 31778''

Keywords: adhesion, self-etch adhesive, clinical trial, additional hydrophobic resin, HEMA

Pub No: OP-021

Awareness of Pulmonologists Regarding the Asthma and COPD Medications' Impacts on Oral Health

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Aim: Asthma, usually starts in childhood and requires lifelong inhalation therapy, and chronic obstructive pulmonary disease (COPD), is generally seen in advanced ages, are respiratory diseases with an increasing prevalence in many countries. The aim of this study was to evaluate the pulmonologists' awareness regarding asthma and COPD medications' impacts on oral health.

Materials and Methods: Ethical approval was obtained from the PAU Non-Interventional Clinical Research Ethics Committee for the study (08.06.2021/ 60116787-020-60788). The questionnaire was delivered to 1078 physicians registered with the Turkish Thoracic Society on an online portal. The response rate was 12% with 126 physicians in the field of pulmonology. The questionnaire consisted of demographic information and questions about the effects of asthma and COPD medications on oral health. Chi-square test was used for statistical analysis ($p<0.05$).

Results: Of all participants, 77.8% were women, and 54% were working in university hospitals. While 9.5% of the physicians stated that they had received training on oral health before, their educational situation was effective in the answers to the question of drugs' possible effects on oral-dental health ($p=0.015$). In both situations, the highest response rate was "increased risk of oral candidiasis", followed by "increase in the number of microorganisms responsible for the dental caries" in the non-trained group (54.4%), and "adverse effect on periodontal health" in the trained group (55.6%). It was determined that 14.3% of the participants referred patients to dentist, and the effect of the institution on patient referral was significant ($p=0.004$). It was found that physicians working in training and research hospitals (55.6%) made more referrals than those working in other institutions.

Conclusion: Increasing the awareness of medical doctors about the relationship between systemic and oral diseases and their interaction with dentists is very important in terms of preventive dentistry.

Keywords: asthma, chronic obstructive pulmonary disease, oral and dental health, preventive dentistry

Pub No: OP-022

Replacement of Dental Restorations during COVID-19 Pandemics: A New Paradigm?

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Aim: COVID-19 Pandemic became a challenge for dental services. Circulars and recommendations were published by international and local authorities to minimize the infected aerosols and droplets since the beginning of COVID-19 Outbreak. The aim of this study was to analyze the distribution of restoration replacements delivered to children, adults, and elderly before and after the COVID-19 pandemic.

Materials and Methods: A data of Bursa Oral and Dental Health Training and Research Hospital, between January 2016- September 2021 were extracted and reviewed by procedure codes, age (0-17; 35-44; 65-74) gender, restorative treatment types (amalgam, composite, replaced amalgam, replaced composite). The results were presented as frequency and percentages. Categorical variables were compared using Pearson's chi-square test. Binary Logistic Regression was performed and the crude odds ratios (OR) along with their 95% Confidence Intervals (CIs) were reported. Statistical analyses were performed with IBM SPSS ver. 23.0 (IBM Corp. Armonk, NY)

Results: Total of 2.925.328 records were reviewed from Jan.2016-Sept.2021. Dental records (n=1.807.677) were filtered by type of treatment and final data consisted of 564.889 restorative treatments. A significant marked decrease detected during COVID-19 as the distributions of restoration replacements among all restorative treatments delivered to children, adults and elderly were 2.3%, 2.7%, 1.8% in 2016; 1.6%, 2.5%, 1.3% in 2017; 1.7%, 2.4%, 1.8% in 2018; 2.1%, 2.9%, 1.6% in 2019; %0.0, %0.1, %0.0 during COVID-19 before vaccination (2020) and %0.2, %0.5, %0.2 during COVID-19 after vaccination (2021) ($p<0.001$). According to the type of restoration and restorative materials, one-surface restorations (OR:1.54 95%CI 1.13-1.95; p=0.01) and amalgams (OR 1.96 95% CI 1.20-2.72; p=0.001) were more likely to be replaced.

Conclusion: As the distribution of replacements were consistent year by year, a sharp decrease during the COVID-19 pandemics may be explained by the paradigmal shift for teeth with replacement indication.

Keywords: dental restorations, replacement, restoration repair, covid-19

Pub No: OP-023

Microtensile Bond Strength of Universal Adhesives to Caries-Affected Dentin

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Aim: The aim of this in-vitro study was to compare the microtensile bond strength (μTBS; MPa) of two universal adhesives in self-etch mode with the gold standard two-step self-etch adhesive to sound (SD) and caries-affected dentin (CAD).

Materials and Methods: 27 extracted human third molars with occlusal caries were ground flat until dentin was exposed. Caries-infected dentin was removed with 600-grit SiC paper and CAD was identified using visual, tactile, and caries-detecting dye methods. Then the teeth were randomly divided into three groups (n=9) according to the tested adhesives; Clearfil SE Bond (CSE; Kuraray), Prime&Bond Universal (PBU; Dentsply, Sirona) and G-Premio Bond (GP; GC). All the adhesives were applied in self-etch mode and composite buildups were done with a micro-hybrid composite (Z250, 3M ESPE). Following storage for 24 h at 37°C in distilled water, the bonded specimens were sectioned into resin-dentin sticks and tested in a universal testing machine (Instron) at 0.5 mm/min. Data were analyzed using two-way ANOVA and post-hoc Tukey's tests ($p<0.05$).

Results: μTBS was significantly influenced by the type of the adhesive (p=0.0001) and the dentin substrate (p=0.0001). A significant interaction between the adhesive and dentin substrate was found (p=0.0001). Bonding to SD was significantly higher than to CAD for all the adhesives ($p<0.05$). CSE showed significantly higher μTBS to both SD (47.21±8.47) and CAD (27.40±6.90) than PBU and GP ($p<0.05$). No significant difference was found between PBU (20.22±7.95) and GP (16.65±5.61) in CAD (p=0.261), while GP showed significantly lower μTBS to SD (21.57±7.78) than PBU (34.26±9.8) (p=0.0001).

Conclusion: Regardless of the adhesive system, bonding to CAD was lower than bonding to SD. The gold standard two-step self-etch adhesive yielded higher μTBS to SD and CAD than the tested universal adhesives, while both universal adhesives showed similar bonding performance to CAD, in self-etch mode.

Keywords: caries-affected dentin, microtensile bond strength, universal adhesive

Pub No: OP-024

The Effect of Different Cavity Disinfectant And Adhesive Applications On Dentin Bonding Strength After Radiotherapy

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Aim: The aim of this study was to compare the bond strength of teeth treated with radiotherapy with two different adhesive systems after cavity disinfectants were applied (CHX, chitosan-containing agent).

Materials and Methods: Twenty-four newly extracted, non-carious human molar teeth were used. A total dose of 70.2 Gy was divided into 39 days of administration of 1.8 Gy using a linear radiation accelerator. The enamel tissue on the occlusal surface of the teeth was removed with a low speed rotating water-cooled cutting instrument to expose the dentin tissue to evaluate bond strength. The teeth were randomly divided into two main groups (n=12) as radiotherapy treated and non-radiated, and three subgroups (n=4) for disinfectant agent application (CHX, chitosan, control). The study was carried out as 12 subgroups (n=2) with a two-stage self-etch adhesive system (Clearfil SE Bond) or universal adhesive system (Clearfil Universal Bond Quick) application to each subgroup. Teeth were restored with composite resin after adhesive application. One hundred forty-four rod-shaped specimens with a cross-sectional area of 1x1 mm² were obtained with the cutting device from the teeth embedded in the acrylic blocks. A bond strength test was applied to the composite-dentin rods in a universal testing device.

Results: Among all groups, Group Clerafil SE Bond with no radiotherapy application and the chitosan-containing disinfectant agent was showed the highest bond strength (49.12±9.54), while Group Clearfil Universal Bond Quick with radiotherapy and disinfectant-free showed the lowest bond strength value (28.28±5.03). The highest bond strength values were obtained after the application of the chitosan-containing agent in all groups.

Conclusion: Within the limitations of this study, it was determined that radiotherapy application had a negative effect, and the use of disinfectant agents had a positive effect on the bond strength. These results need

to be supported by clinical studies in patients received radiotherapy to the head and neck region.

Keywords: radiotherapy, chitosan, chlorhexidine, microtensile, adhesive systems

Pub No: OP-025

Influence of Egcg Pretreatment on Immediate Bond Strength of a Universal Adhesive Cement

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Aim: Anti-proteolytic compounds are shown to have several benefits on dentin bond strength. This in vitro study aimed to investigate the effect of EGCG (green tea polyphenol) on the immediate dentin microtensile bond strength (μTBS) of universal adhesive cement.

Materials and Methods: Mid-coronal flat dentin surfaces were exposed from third molars and acid etched with 37% phosphoric acid for 15 s. After washing and air-drying, samples were randomly divided into test groups as following (n=30): (1) EGCG pretreatment+ bonding+cement, (2) EGCG pretreatment+cement, (3) Bonding+cement and (4) Control (only cement application). In experimental groups 1&2, dentin surfaces were agitated by EGCG solution for 60s and air-dryed. Adhesive bonding (Scotchbond Universal Plus, 3M ESPE) and cement (RelyX Universal, 3M ESPE) applications of the relevant experimental and control groups were done according to manufacturer's instructions. After 24 h, samples were sectioned to obtain 1.0 (± 0.3) mm2 micro sticks which were tested in a microtensile tester at a 0.5 mm/min crosshead speed. The failure patterns were also recorded. The bonding surfaces data were analyzed using Mann Whitney U, at a significance level of 5%.

Results: Results showed that there were no statistically significant differences among immediate μTBS values of the groups (Group1:53,52±18,11; Group 2: 51,32±15,15; Group 3: 50,26 ± 19,71; Group 4: 49,85±11,11) ($p>0.05$). Failure patterns were mostly adhesive in all of the groups.

Conclusion: Self-adhesive application of the adhesive cement (Control group) showed similar μTBS scores compared to other experimental groups. However, further investigations may be beneficial to analyze the effects of different concentrations of EGCG and compare other anti-proteolytic compounds under various artificial aging procedures as well.

Keywords: micro tensile bond strength, universal adhesive cement, dentin adhesion., egcg

Pub No: OP-026

Effect of Tomatine as MMP İnhibitor on Bond Strength of Sound and Eroded Dentine.

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Aim: This in vitro study aimed to evaluate the effect of tomatine, which is a novel matrix metalloproteinase inhibitor for dentistry, application on different types of dentine as a surface pretreatment on dentine bonding strength.

Materials and Methods: The dentine surfaces of extracted molars were flattened with a 600-grit SiC paper for a 1 min. Then, specimens (n=84) were divided into two groups according to type of dentine as sound (SD) and eroded (ED) (n=42). Molars in ED group were eroded by citric acid cycling. Each group was splited into three subgroups according to use of surface pretreatment agents (1,5 μM tomatine, n=14; 2% chlorhexidine (CHX), n=14; control (untreated), n=14). Buildups were incrementally constructed with microhybrid composite following three-step etch-and-rinse application. Specimens were sectioned into sticks, and then were subjected to microtensile testing (μTBS) after 24-h (n=7) or 6-month (n=7) of aging. Fracture surfaces were observed under a stereomicroscope (30x magnification). Data were analyzed by Student's t test (a= 0.05).

Results: Lower μTBS values were detected in ED group. After 24-h aging, CHX in both SD and ED groups showed lower μTBS values than the control group ($p=0.001$ and $p=0.061$ respectively). While CHX did not show a significant difference between 24-h and 6-month values in SD ($p=0.052$), the highest scores were determined in all subgroups with tomatine applications ($p<0.001$). Adhesive/mixed fracture type was observed more frequently than cohesive fractures in all subgroups.

Conclusion: Tomatine was found to be a more effective MMP inhibitor than chlorhexidine in maintaining bond strength values over time.

Keywords: adhesion, chlorhexidine, eroded dentin, matrix metalloproteinase, tomatine

Pub No: OP-027

Survival of Direct Restorations Using "Cention N" without Adhesive Resin: 3-Year Clinical Results

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Aim: This clinical trial evaluated the clinical performance of an alkasite material "Cention N" for Class I and Class II cavities without adhesive resin application.

Materials and Methods: Between 06.07.2015- 31.10.2015, 50 patients (30 females, 20 males, mean age: 28.8) referred to Department of Restorative Dentistry, Medipol University, Dental School, Istanbul,

Turkey, received 89 Class I and II restorations applied by two operators (CTRN: NCT02763085). After performing operative procedures, calcium hydroxide (Dycal, Dentsply Caulk) was placed in case of cavities with deep carious lesions. The powder and liquid of the material (Cention N, Ivoclar Vivadent AG) were mixed according to the manufacturer's recommendations. All restorations were made in bulk application and polished after the setting time of the material. The evaluation protocol was performed in consideration of the FDI criteria. For some parameters SQUACE was carried out by two independent calibrated observers. Qualitative data were expressed by count and percentage. Survival analysis was performed using Kaplan-Meier and the changes in the FDI parameters were analyzed (McNemar) (alpha= 0.05).

Results: Mean observation period was 39±2 months. In total, 71 fillings could be followed in 39 patients at 3-year recall. Hypersensitivity was observed in 9 cases that disappeared at the latest after 1 month. After three years, distribution of scores for surface luster demonstrated predominantly slightly dull surfaces but did not require any intervention. Eleven restorations were rated as failures at three years recall (retention loss: 9; partial fracture: 1; root canal treatment: 1) yielding to a survival rate of 93.2% and success rate of 84.5 %.

Conclusion: Based on the clinical observations over the 3 years follow-up period, Cention N, without application of adhesive resin, applied in bulk in load-bearing areas was acceptable in most of the cases but cavity preparations should be adapted to avoid retention loss especially in slot preparations.

Keywords: adhesion, cention n, clinical trial, dental materials, restorative materials

Pub No: OP-028

The Oral Carriage Of Staphylococcus Aureus In Asthma And COPD Patients

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Aim: Microbiota settling down in oral microecosystem is known as the main source of lung microbiome and has been associated with the occurrence and development of respiratory diseases like pneumonia, chronic obstructive pulmonary disease (COPD), lung cancer, cystic fibrosis lung disease and asthma. The aim of this study is to investigate the changes in salivary properties and oral carriage of Staphylococcus aureus, which is a risk factor for lung infections in patients with asthma and COPD using inhaler drugs.

Materials and Methods: In this study; 42 asthma, 42 COPD patients using inhaled corticosteroids, β-mimetic and anticholinergic drugs and 21 healthy controls were volunteered. Stimulated saliva samples were taken and salivary flow rates, buffering capacities and S. aureus counts were detected for each participant.

Results: Salivary flow rate and buffering capacity measurements of the cases did not show any statistically significant difference according to the groups ($p>0.05$). S. aureus carriage was found to be 8.65% in all participants, while this value was 7.14% in the patient group and 14.28% in the control group. So, the carriage rate was not statistically different between the groups. ($p>0.05$).

Conclusion: Within the limits of this study, asthma and COPD are not selective factors for oral S. aureus carriage but it should not be ignored that the prognoses of asthma and COPD may be affected by oral S. aureus carriage due to risk of respiratory infections.

Keywords: staphylococcus aureus, asthma, copd, oral carriage

Pub No: OP-029

Survival of İndirect Resin Composite Restorations with Proximal Box Elevation: 2-Year Clinical Results

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Aim: This clinical trial evaluated the clinical performance of posterior indirect resin composite (IRC) restorations with 'Proximal Box Elevation' (PBE).

Materials and Methods: Between 11.09.2018 - 16.01.2020, 47 patients (37 females, 10 males, mean age: 27.38) referred to Istanbul Medipol University, received 55 posterior IRC (SR Nexco, Ivoclar Vivadent AG) restorations (CTRN: NCT03832829). Large posterior defects with at least one or more cuspal coverage and deep cervical margin extending below cemento-enamel junction were included in the study. PBE was applied prior to preparation and impression making. IRCs were cemented using an adhesive cement (Variolink-N, Ivoclar). While one operator performed all restorations, two independent calibrated operators made the evaluations using FDI criteria. Restorations were scored (Scores 1-5) for surface staining, marginal staining, marginal gap, marginal fracture, marginal irregularities, seconder caries, marginal tooth integrity, surface lusture, color match and translucency, fracture of material and retention, occlusal wear, approximal contact point, patient view, tooth integrity, post-operative sensitivity. The

changes in the FDI parameters were analyzed using McNemar test (alpha= 0.05) and Kaplan-Meier.

Results: Fifty-four (98.1%), 52 (94.5%) and 49 (89 %) IRC restorations completed their follow up at 6, 12 and 24 months, respectively. Esthetic properties and marginal quality of the restorations were scored as excellent for most of the restorations. From the mechanical perspective, fractures did not receive any intervention (n=2) or repaired (n=5) except one case with multiple fractures which was replaced yielding to a survival rate of 97.9% and success rate of 87.7%.

Conclusion: Based on the clinical observations over the 2 years follow-up period, it can be stated that IRC restorations with the tested material (SR Nexco) are reliable options for the restoration of posterior cavities with extensive substance loss.

Keywords: adhesion, clinical trial, dental materials, ındirect resin composite, proximal box elevation

Pub No: OP-030

Resin Infiltration Versus Fluoride Varnish on Non-Cavitated Proximal Lesions: Randomized Controlled Trial

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Aim: The aim of this clinical study is to observe the difference between micro-invasive (resin infiltration) and non-invasive (fluoride varnish) treatment options on non-cavitated proximal lesion of the individuals having moderate to high risk of caries.

Materials and Methods: The study was a randomized controlled, prospective, and parallel designed clinical trial. Sixty adults were enrolled and randomly allocated 1:1 ratio to the treatment groups. Cariogram was used to assess the caries risk. Two calibrated examiners visually evaluated the severity and activity of the lesions by using the International Caries Detection and Assessment System (ICDAS) and Activity Assessment based on Nyvad, respectively. Radiographic scores of the lesions were performed on bite-wing radiographs by the same examiner. Gingival index was used to check the gingival condition of the patients at initial and control sessions. After examination, resin infiltration (Icon DMG, USA) was applied to thirty patients while fluoride varnish (Clinpro White Varnish, 3M ESPE, USA) to the other thirty. Follow-up time was 18 months with 6 months intervals.

Results: According to the Pearson Chi-Square test, there was no difference in the progression of the lesions which was applied resin infiltration or fluoride varnish (p=0.491). However, the lesion of a patient who received resin infiltration was observed to progress from E2 to D1 on bitewing radiograph.

Conclusion: Both resin infiltration and fluoride varnish yielded satisfactory results in the treatment of non-cavitated proximal lesions of the individuals having moderate to high risk of caries. This study was financially supported by the Scientific Research Foundation of Ege University with the project number: 18-DİŞ-004.

Keywords: microinvasive, non-invasive, non-cavitated, proximal lesions

Pub No: OP-031

Clinical Evaluation of Posterior Direct Restorations in Patients Attended to Clinic of Restorative Dentistry Department

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Aim: Restoration failures in the short term are important factors leading to early loss of teeth. Therefore, our study aims to analyze clinical performances and common failure reasons for posterior amalgam and composite restorations in patients who attended to our clinic of restorative dentistry department.

Materials and Methods: A total of 848 posterior direct restorations, 185 amalgams and 663 composites (unknown manufactures) were evaluated clinically for 360 patients who attended to our clinic from different Dental Health Services (DHS) and had their restorations placed without rubber-dam isolation less than 36 months ago. Restorations were classified as clinically acceptable or unacceptable using "Modified USPHS Criteria". Clinically unacceptable restorations: reasons for failure associated with the decision to repair, replace, or further restoration; it was evaluated under two headings as tooth and/or restoration fracture or incompatibility of anatomical form and contact and presence of secondary/residual caries. Data were statistically analyzed ($p<0.05$).

Results: 848 restorations; 78.2% were composite and 21.8% amalgam restorations. A total of 751(88.56%) restorations were successful, and 97 restorations were unsuccessful (11.43%). The restoration rate considered successful was 88.8% in composite; it was detected as 87.6% in amalgam restorations. The mean survival for composite and amalgam restorations was 15.6 and 14.76 months, respectively. It was observed that 37.1% of restorations made in DHSs and 2.39% of restorations made in our faculty clinics were unsuccessful. It was determined that failure was mostly due to "tooth and/or restoration fractures or incompatibility of anatomical form and contact" ($p<0.05$).

Conclusion: According to results of short-term clinical study; it was found that both posterior direct restorations had similar success rates. The most common cause of failure for both restorations was found to be "tooth and/or restoration fracture or incompatibility of anatomical form and contact". It is seen that clinical performance of posterior restorations is significantly affected by center where restoration is applied.

Keywords: composite, amalgam, clinical follow

Pub No: OP-032

Evaluation of Cytotoxic and Antibacterial Properties of Arginine-Graft Poly (HEMA) Nanoparticles Added Universal Self-Etch Adhesive

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Aim: To investigate the cytotoxic and antibacterial properties of universal self-etch adhesives containing Arg-graft-p(HEMA) nanoparticles at different concentrations.

Materials and Methods: Arg-graft-p(HEMA) nanoparticles were synthesized by the surfactant-free emulsion polymerization method. The characterization of nanoparticles was performed using ATR-FTIR and SEM. Nanoparticles were added into a universal self-etch adhesive (OptiBond Universal, Kerr Dental, Germany) to form 4 experimental adhesive groups with 5%, 10%, 15% and 20% concentrations. The adhesive group without Arg-graft-p(HEMA) (%0) was the control. The pH values of the adhesives were measured. Cytotoxicity of the adhesives on the L-929 cell line was evaluated by the cell culture-extraction method after they were applied to square dentin samples. The cytotoxic effects of the extracts were evaluated by reading the absorbance in the spectrophotometer following the MTT test. Antibacterial activities of the adhesives against S.Mutans and S.Sanguinis were evaluated by the disc diffusion method at the end of 48 hours. In the statistical analysis of the data, paired sample t-tests and independent sample t-tests were performed following the Shapiro-Wilk normality test ($p<0.05$).

Results: Spherical Arg-graft-p(HEMA) nanoparticles with a size of 175.5-254.1 nm were observed in the SEM. The pH values of the adhesive groups were measured as 2.55, 3.00, 2.98, 2.97 and 3.01, respectively, in order of increasing concentrations. The adhesive without Arg-graft-p(HEMA), reduced cell viability by 45% and continued to decrease with increasing concentration. The antibacterial effect of all adhesives with Arg-graft-p(HEMA) was significantly higher than that of the control group ($p<0.05$) and increased with the increase of Arg-graft-p(HEMA) concentration.

Conclusion: Arg-graft-p(HEMA) nanoparticles in the concentration range of 5-10% show high antibacterial activity with tolerable adverse effects on the cytotoxicity. The efficacy of different Arg-graft-p(HEMA) concentrations between 5% and 10% should be supported by further studies. A patent application has been filed for the use of Arg-graft-p(HEMA) nanoparticles in dental resin materials.

Keywords: universal self-etch adhesives, nanomaterial, bioactive resin, hema, arginine

Pub No: OP-033

Evaluating Cytotoxicity Of Dentin Bonding Adhesive Systems On Human Dental Pulp Stem Cells

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Aim: Dentin bonding adhesive systems (DBASs) should be biocompatible as they come into close and prolonged contact with vital dentin. The aim of this study was to evaluate and compare cytotoxic effects of different DBASs on human dental pulp stem cells (hDPSCs). Hypothesis of this study is DBASs will show different cytotoxic effects to different contact time periods.

Materials and Methods: Three DBASs were used that comprises rapid bond technology combining original MDP monomer with new hydrophilic amide monomers [Clearfil Universal Bond Quick (CUBQ), Kuraray Noritake Dental], self-reinforcing 3D monomer [Bond Force II (BFII), Tokuyama)], dual-cure property [Futurabond DC (FBDC), VOCO]. Three (n=3) samples were prepared for each group and polymerized with an LED light device (Valo Cordless, Ultradent). Samples' surface area was calculated according to ISO 10993-12:2012 standards (3cm2/ml). Samples were incubated in Dulbecco's modified Eagle's medium (DMEM) for 24 hours, 72 hours and 1 week time periods to obtain extracts. For control groups cells were cultured without DBA samples. Cell viability of filtered DBASs' sample extracts were measured using a cell proliferation detection kit (WST-1, Roche). Statistical analysis was performed using Two-way ANOVA and post-hoc (Duncan) test ($p<0,05$).

Results: At 24 and 72 hours statistically significant differences were evaluated between control and BFII, control and FBDC groups ($p<0.05$) while no differences between control and CUBQ groups ($p>0.05$). At 1 week statistically significant differences were found between control and experimental groups ($p<0.05$) while no differences between experimental groups ($p>0.05$). For CUBQ group, percentage of cell viability observed at 1 week (22.39 ± 3.80) was lower than 24 hours (98.48 ± 8.93) and 72 hours (94.26 ± 10.00), and statistically significant differences were found ($p<0,05$). Statistically significant difference was detected for BFII group over three-time interval ($p<0.05$). Lowest cell viability percentage was observed for FBDC group at 24 hours and the difference was statistically significant when compared with 72 hours and 1 week ($p<0.05$).

Conclusion: All DBASs showed different cytotoxic effects to different contact time periods. Careful use of DBASs especially in deep cavities and, if necessary, the application of a base material underneath can be recommended to clinicians.

Keywords: cytotoxicity, human dental pulp stem cell, dentin bonding adhesive systems, cell viability, cell proliferation (wst-1)

Pub No: OP-034

Effects of The Newly Developed Bleaching Gel on Tooth, Gingiva, 8-OHdG Levels

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Aim: This study aimed to comparatively evaluate the influence of newly developed bleaching gel (TiO2-chitosan, 6% HP) on tooth structures.

Materials and Methods: The study included five groups and was performed on 60 Wistar rats (n=12). The groups are as follows: Group 1, LED-activated bleaching with Whiteness HP gel; Group 2, Laser-activated bleaching with Whiteness HP gel; Group 3, LED-activated bleaching with newly developed gel; Group 4, Laser-activated bleaching with the newly developed gel; Group 5, control. In all study groups except control, bleaching gel was applied to the left upper jaw. Before sacrification of rats, an intracardiac blood sample was taken to measure 8 OHdG levels. All gingival blood flow rates were taken using a laser doppler flowmetry. The rats were killed at either 2nd or 30th days (n = 6). Pulp tissue reactions were scored as follows: 1, no or few inflammatory cells and no reaction; 2, <25 cells and a mild reaction; 3, between 25 or 125 cells and a moderate reaction; 4, 125 or more cells a severe reaction. ANOVA and LSD tests were used to evaluate the normally distributed data while Kruskal-Wallis and Dunn tests were used for non-normally distributed data. $p < 0.05$ was considered significant.

Results: After bleaching, a temporary increase in gingival blood flow and 8-OHdG levels was observed in all groups ($p>0.05$). Groups 3 and 4 showed lower inflammatory compared to Groups 1 and 2, considering all tissue sections ($p<0.05$). Most samples in Group 3 and Group 4 showed few inflammations, while in the pulp tissue, necrotic areas were observed in Group 1 and Group 2.

Conclusion: The newly developed bleaching gel may cause few inflammatory changes on pulp tissue and slightly side effects on the gingiva. These outcomes can provide positive approaches to clinicians.

Keywords: titanium dioxide, chitosan, histopathology, hydrogen peroxide, 8-ohdg level

Pub No: OP-035

Evaluations of Effectiveness and Cytotoxicity of The Experimental Bleaching Gel

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Aim: This study evaluated the influence of newly developed bleaching gel (TiO2-chitosan, 6% HP) cytotoxic effects and bleaching efficiency.

Materials and Methods: The study was carried out with four groups to evaluate bleaching efficiency. The groups are as follows: Groups; Group 1, LED-activated bleaching with Whiteness HP gel; Group 2, Laser-activated bleaching with Whiteness HP gel; Group 3, LED-activated bleaching with newly developed gel; Group 4, Laser-activated bleaching with the newly developed gel; while for evaluation of cytotoxicity there were three groups as follows: Groups; Group 1, Whiteness HP gel; Group 2, The newly developed gel; Group 3, control. The cytotoxic effect was assessed in 60 fibroblast samples obtained from Wistar rat gingiva, while the color changes were evaluated with CIEDE2000 on 60 samples obtained from bovine teeth. Tooth color was measured with a spectrophotometer Before bleaching, and 7th, 14th, 30th days, three months after bleaching, respectively. The cell viability was analyzed using methyl tetrazolium assay (MTT). Cytotoxicity assessment criteria were performed as follows; 1. not cytotoxic for >90%2. slightly cytotoxic for 60–90%3. moderately cytotoxic for 30-59%, 4. severely cytotoxic for <30%. ANOVA and LSD tests were used for normal distributions, while Kruskal-Wallis and Dunn tests were used for non-normally distributions in independent variables. $p < 0.05$ was considered significant.

Results: According to the initial color, effective bleaching was observed in all groups ($p<0.05$). Group 2 showed a higher value of color change than the other groups. The newly developed bleaching gel did not cause cytotoxicity for cytotoxic evaluation, while Whiteness HP gel showed a cytotoxic effect on fibroblasts ($p<0.05$).

Conclusion: The combination of 6% HP, chitosan, and TiO2 appears to constitute a promising material for bleaching efficiency with no cytotoxicity

Keywords: cytotoxicity, chitosan, titanium dioxide, ciede 2000, hydrogen peroxide

Pub No: OP-036

Wear Resistance of Paste-like Bulk-fill Composite Resins

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Aim: The purpose of this study was to evaluate the wear resistance of paste-like bulk-fill composite resins and conventional paste-like composite resin after simulated mastication.

Materials and Methods: The in vitro 2-body wear resistance of 6 dental composite materials was assessed and compared with the wear resistance of human enamel. Five paste-like bulk-fill composite materials [Filtek Bulk Fill Posterior Restorative-FBR (3M Dental Products. St.Paul, USA), x-tra fill-XTF (VOCO GmbH, Cuxhaven, Germany), Sonicfill-SCF (Kerr Corp., Orange, USA), Admira Fusion X-tra-AFX (VOCO GmbH, Cuxhaven, Germany), Tetric EvoCeram Bulk Fill-TEB (Ivoclar Vivadent AG., Schaan, Liechtenstein), and one conventional paste-like composite [Clearfil Majesty Posterior-CMP (Kuraray Noritake Dental Inc., Okayama, Japan)] as control, were used. Bulk-fill composite materials were applied as one layer and conventional composites were applied as two horizontal layers into the cylindrical Teflon molds (height: 4 mm, diameter: 4 mm and each layer was cured with a LED unit (SDI Radii Plus, SDI Limited, Australia) according to the manufacturers' instructions. Specimens were subjected to a wear test in a dual axis chewing simulator (Esetron chewing simulator, Ankara, Turkey) with load at 1.6 Hz for a total of 120,000 chewing cycles. Subsequently, samples were scanned using a CAD/CAM three-dimensional scanner (Trios 4, 3Shape, Copenhagen, Denmark). Wear volume of specimens calculated by MeshLab (v2021.07) software. Mean and

standard error (SE) of surface loss volume analyzed using one-way analysis of variance (ANOVA) with a significance level at $p < 0.05$.

Results: The mean wear volume(mm3) and standard errors of tested materials were FBR (0.3465-0.1103), XTF (0.9879-0.1479), SCF (0.4989-0.1339), AFX (0.9040-0.1694), TEB (0.8167-0.06822), CMP (0.6472-0.1542) and enamel (0.1466-0.02155). There was significant difference between tested specimens ($p<0.05$).

Conclusion: Wear resistance of paste-like bulk-fill composite resins were significantly different. When compare with enamel; FBR, CMP, SCF were more resistant to wear then other paste-like bulk-fill composite resins.

Keywords: bulk fill, two-body wear, wear resistance

Pub No: OP-037

Microhardness Evaluation of Different Resin Luting Materials Polymerized through CAD/CAM Blocks

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Aim: This in-vitro study aimed to evaluate the Vickers microhardness (HV) of flowable composite (F), micro-hybrid composite (MC), and dual-cure resin cement (DC) polymerized through 3 mm thick polymer-infiltrated, composite, and feldspathic CAD/CAM blocks.

Materials and Methods: Polymer-infiltrated (Enamic, Vita; VE), composite (Cerasmart, GC, CS) and feldspathic (Cerec, Sirona; CE) CAD/CAM blocks (n: 9 for each) were sectioned into 3mm thick slabs. The intaglio surfaces of CS slabs were sandblasted, while VE and CE slabs were etched with HF acid. A total of 156 disk-shaped specimens from three different resin luting materials (n: 52 each); F (G-aenial Universal Flo; GC), MC (G-aenial; GC) and DC (Linkforce; GC) were placed into Teflon molds and polymerized (Demi Ultra, Kerr) in a dark chamber through the prepared CAD/CAM slabs according to manufacturer's instructions. A total of 39 specimens (n: 13 in each resin luting material) were light cured without placing the CAD/CAM slabs and served as control groups. After storage in distilled water at 37°C for 24 hours, HV of all the specimens was evaluated (Buehler). Data were analyzed using two-way ANOVA and post-hoc Tukey tests ($p<0.05$).

Results: HV was significantly influenced by the type of CAD/CAM block ($p<0.001$) and the resin luting material ($p<0.001$). A significant interaction between CAD/CAM and resin luting materials was found ($p<0.001$). When polymerized through the CAD/CAM blocks, HV of all the resin luting materials was significantly decreased ($p<0.05$). The resin luting materials did not show any significant HV difference through VE, while MC presented similar HV polymerized through all the tested CAD/CAM blocks ($p>0.05$). MC yielded significantly higher HV than F and DC through CE and CS ($p<0.05$).

Conclusion: All the resin luting materials showed similar microhardness performance when polymerized through the polymer-infiltrated CAD/CAM block. Micro-hybrid composite can be equally polymerized through polymer-infiltrated, composite, and feldspathic CAD/CAM blocks and can be considered as a luting material for indirect adhesive restorations.

Keywords: resin luting, microhardness, CAD/CAM

Pub No: OP-038

Fracture Resistance of Teeth with Simulated External Cervical Resorption Cavities Repaired with Different Materials

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Aim: This study aimed to evaluate the fracture resistance (FR) of teeth with simulated external cervical resorption (ECR) cavities repaired with different materials.

Materials and Methods: Eighty human permanent maxillary anterior teeth were selected and shaped with Protaper Next system up to X3 (30/.07). Standard ECR cavities were prepared 2 mm below the cementoenamel junction on the coronal third and the buccal surface of the root (Patel classification system as 2Bp class). The root canals were obturated with AH Plus and gutta-percha using cold lateral condensation technique. The resorption area was restored with (1) a nanohybrid composite resin; (2) a high viscosity GIC Equia Forte Fill; (3) Biodentine; (4) Biodentine+ nanohybrid composite resin; (5) MTA; (6) MTA+ nanohybrid composite resin. The access cavities (Black I) were restored permanently with a nanohybrid composite resin. Then the roots were mounted vertically in self-cure acrylic resin blocks 1 mm below the ECR cavities. Acrylic blocks were positioned in a Universal Testing Machine at a 135° angle to the long axis of the roots at a crosshead speed of 5 mm min-1 until failure occurred. The force when the fracture occurred was recorded in Newtons. The mode of failure was also analyzed.

Results: Among the tested groups, the highest FR was observed in Biodentine group, while the lowest was in Equia group ($p < 0.05$). No significant results were observed among composite, Biodentine+composite, MTA+composite, and MTA ($p > 0.05$). The positive control group showed statistically lower FR and negative control group showed statistically higher FR results than all groups ($p < 0.05$).

Conclusion: Biodentine may be a preferable material for repairing of ECR cavities. Adding a composite layer on MTA and Biodentine did not improve the resistance of the bioactive material against fracture.

Keywords: external cervical resorption, fracture resistance, bioactive endodontic cements

Pub No: OP-039

Evaluation of Mechanical Properties of Alternative Filling Materials Containing Glass Ionomers

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Aim: The aim of this in vitro study is to evaluate the mechanical properties of alternative filling materials containing glass ionomers.

Materials and Methods: In our study, compressive strength, water absorption, water solubility, microhardness, and roughness values of high viscosity (EQUIA Forte HT GC), conventional high viscosity (Fuji IX GP capsule), resin modified (Fuji II LC Capsule and Nova Glass LC), conventional (Nova Glass F) glass ionomer cements were tested. (n=10). One sample from each group was subjected to atomic force microscopy (AFM) and scanning electron microscope (SEM) examinations to examine the surface properties of the material. Data were analyzed by one-way ANOVA and post hoc Tukey test.

Results: Fuji II LC capsule and Nova Glass LC groups were statistically like each other ($p>0.05$) and showed a statistically significantly higher compressive strength value than the other groups ($p<0.05$). Fuji II Capsule and Nova Glass F showed significantly higher water absorption values than the other groups ($p>0.05$). Fuji II LC Capsule group showed higher water solubility value than all tested groups ($p<0.05$). Equia Forte HT, Fuji IX Gp Extra Capsule and Fuji II LC Capsule groups showed similar and higher microhardness values compared to the other groups ($p>0.05$). Equia Forte HT and Nova Glass LC groups showed lower roughness values than Fuji II LC Capsule and Nova Glass F groups ($p<0.05$). The obtained AFM and SEM images are consistent with the roughness findings measured by the profilometer.

Conclusion: The physical and mechanical properties of the tested materials differed. For glass ionomer cements to be used safely as permanent restorative materials, the properties of these materials need to be improved.

Keywords: compressive strength, glass ionomer, microhardness, roughness

Pub No: OP-040

Surface Roughness of Nanoceramic Composite and Giomer with Different Finishing and Polishing Systems

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Aim: This in vitro study aimed to evaluate the effects of different finishing and polishing systems on the surface roughness of nanoceramic composite and giomer.

Materials and Methods: Nanoceramic composite (Ceram-X Spheretec One, Dentsply Sirona) and giomer (Beautifill II, Shofu Inc.) were investigated. 120 disc-shaped specimens (diameter:4 mm, height: 2 mm) were prepared using Teflon mold and divided into 6 groups according to the finishing and polishing system: 1) Mylar strip (control), 2) diamond bur, 3) diamond bur+OptiDisc (Kerr Corp), 4) diamond bur+OptiDisc+Occlubrush (Kerr Corp), 5) diamond bur+OptiDisc+Diapolisher paste (GC Europe), 6) diamond bur+OptiDisc+Enamel Plus Shiny paste (Micerium S.p.A). (n=10). The surface roughness (Ra, μm) was measured by contact profilometry. Scanning electron microscopy (SEM) was used to evaluate the surface morphology. Two-way ANOVA and Bonferroni test were used for statistical analysis ($p<0.05$).

Results: Regarding the finishing and polishing systems, for nanoceramic and giomer, respectively, diamond bur (0.651 ± 0.075 and 0.645 ± 0.084) showed significantly highest surface roughness than other groups($p<0.05$). Besides, diamond bur+OptiDisc (0.167 ± 0.039 and 0.193 ± 0.038) exhibited similar surface roughness to diamond bur+OptiDisc+Occlubrush (0.120 ± 0.025 and 0.204 ± 0.036) ($p>0.05$). For nanoceramic composite, diamond bur+OptiDisc (0.167 ± 0.039), diamond bur+OptiDisc+Occlubrush (0.120 ± 0.025), diamond bur+OptiDisc+Diapolisher (0.087 ± 0.028) and diamond bur+OptiDisc+Enamel Plus Shiny (0.126 ± 0.057) showed similar surface roughness($p>0.05$). For giomer, diamond bur+OptiDisc+Diapolisher (0.105 ± 0.017) and diamond bur+OptiDisc+Enamel Plus Shiny (0.092 ± 0.030) showed significantly lower surface roughness than other groups($p<0.05$). Regarding the restorative materials, for diamond bur+OptiDisc+Occlubrush, nanoceramic composite (0.120 ± 0.025) showed significantly lower surface roughness than giomer (0.204 ± 0.036) ($p<0.05$). The SEM observations confirmed the surface roughness measurements.

Conclusion: The polishing paste did not cause any significant effect on the surface roughness of nanoceramic composite while it reduced the surface roughness of giomer.

Keywords: polishing paste, surface roughness, giomer, nanoceramic, scanning electron microscope

Pub No: OP-041

Effect of Wheel Polishing Systems On Roughness and Gloss Of Restorative Flowable Materials

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Aim: This study aimed to evaluate the surface roughness and gloss of reinforced restorative flowable composite resin materials polished with two different wheel systems.

Materials and Methods: Twenty-four-disc samples of 8x2mm (n=96) were prepared in plastic molds for each group with G-aenial Universal Injectable (GC, Japan), Omnichroma Flow (Tokuyama, Japan), Clearfil Majesty Flow (Kuraray, Japan) and NeoSpectra (Dentsply, Germany) as a control group. The discs were prepared under Mylar strips and glass slides and polymerized with an LED light-curing unit (Zenolite, President, Germany) for 40 sec on both sides. One side of the samples was not polished and left as a Mylar strip control and the other sides were randomly polished with Twist Dia (TWD-Noritake, Japan) or Nova Twist (NOV-President, Germany). The finishers and polishers were both used dry for 30sec at 9000rpm speed on 1200 grit silicon carbide paper grounded surfaces. The average surface roughness was determined with a profilometer (Mitutoyo SJ-301, Japan) and the gloss with a glossmeter (Glossmeter PCE-SGM60 Plus, USA). ANOVA, posthoc Tukey tests and Pearson correlation were used for statistical analysis ($p<0.05$).

Results: The smoothest surfaces were obtained with the Mylar strips for all the groups ($p<0.05$). TWD and NOV polished surfaces were equally smooth except for the control NeoSpectra group. The highest gloss was observed in Mylar strip groups ($p<0.05$). In the TWD polished groups, no difference in gloss was noticed while in NOV polished groups, Clearfil Majesty Flow had superior gloss ($p<0.05$) than the other materials. There was no correlation of smoothness and gloss in NOV groups and only for G-aenial Universal Flow in the TWD groups ($p=0.15$).

Conclusion: A smooth and glossy surface on all the tested flowable composite resin materials could be obtained with both Twist Dia and Nova Twist reduced step polishing wheel systems.

Keywords: surface roughness, surface gloss, restorative flowable, composite resin

Pub No: OP-042

Impact of Microabrasion Treatment on the Staining Susceptibility of Enamel: An In Vitro Study

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Aim: This study evaluates the staining susceptibility of enamel after microabrasion, which was performed using different clinical protocols.

Materials and Methods: Two hundred and ten extracted bovine incisors were used in this study. The teeth were randomly divided into five groups of 42 teeth each (n = 42), including Group 1: control (no treatment), Group 2: microabrasion, Group 3: microabrasion + fluoride polishing, Group 4: macroabrasion (fine-grid-diamond bur) + microabrasion, and Group 5: macroabrasion (fine-grid- diamond bur) + microabrasion + fluoride polishing. The groups were then randomly divided into the following two subgroups for discoloration procedures: coffee and distilled water (n = 21). Spectrophotometric evaluation was determined at baseline and on the 1st, 7th, 14th, and 28th day of the staining period. Statistical analysis was performed using repeated measures ANOVA and the post hoc Bonferroni test at a significance level of 0.05.

Results: The greatest color change was observed in Group 2 specimens, which were immersed in coffee solutions. The color change values for Group 3, Group 4, and Group 5 specimens, which were immersed in distilled water, were higher than those for Group 1 specimens ($p<0.05$). The fluoride polishing + enamel microabrasion treatment groups (Group 3 and Group 5) exhibited greater resistance to color change than the matched non-fluoride polishing groups (Group 2 and Group 4) ($p<0.05$).

Conclusion: The teeth that underwent enamel microabrasion treatment and were polished with fluoride gel became more resistant to color change.

Keywords: color change, fluoride polishing, microabrasion

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Color Changes of One-Shade Resin Composites

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Aim: The aim of our study is to measure the color changes of one-shade composite resins when exposed to common drinks such as tea, cola and coffee.

Materials and Methods: In our study, Omnichroma, Vitrra Unique, A'chord and Charisma composite resins were used. Composite resins were placed in stainless steel molds with a depth of 2 mm and a diameter of 5 mm (n=10). 10 specimens were immersed in tea, 10 specimens in coffee, 10 specimens in cola and 10 specimens were immersed in distilled water in an incubator at 37˚C for 14 days. Color measurements were performed at the beginning, 24 hours, and 14 days of the study. Color values were measured using a CIE L*a*b* system with a spectrophotometer device (Vita Easyshade Advance 4.0, Vita Zahnfabrik, Bad Sackingen, Germany). The data for L*a*b, translucency and CR were analyzed by one-way ANOVA and Tukey's test.

Results: The greater color change was observed in the tea and coffee groups, and the least color change was seen in the control group. After 14 days, the highest color change was observed in the Charisma + Coffee group ($\Delta E00 = 7$), and the least color change was observed in the Omnichorma + Water group ($\Delta E00 = 0.9$). Transparency and contrast ratio changed in all groups and the least change was in the Omnichroma control group ($\Delta CR=0.02$ and $\Delta TP=0.2$).

Conclusion: Significant differences were found in the color changes of the composites after immersion in various beverages. The color variations were significantly different depending on the beverage in which the ingredients were dipped. The initial contrast ratio was markedly different among the tested materials.

Keywords: translucency, contrast ratio, resin composite, color changes, one-shade

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Remineralization Potential of Moringa Oleifera on Initial Enamel Lesions

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Aim: To evaluate in vitro effect of experimental herbal toothpaste containing Moringa Oleifera on remineralization of initial caries lesions.

Materials and Methods: 84 enamel samples from extracted human molar teeth were prepared. Initial microhardness, DIAGNOdent Pen

(Kavo), FluoreCam (Daraza), and ultrasound (Novascope 4500, Harisonic, Staveley NDT) measurements were recorded. Samples were immersed in demineralization solution (pH=4.7, 37°C, 72 hours) and randomly divided into 7 groups (n=12). Experimental toothpaste containing Moringa Oleifera extract (M), Moringa Oleifera extract and fluor (MF), hemp extract (H), a conventional toothpaste (S) containing Novamin (Sensodyne, Repair and Protect) and herbal oils (Moringa Oleifera oil (MO) and hemp oil (HO)) were applied on tooth surfaces using an electric toothbrush (Oral B, Cross Action toothbrush replacement head, Procter&Gamble) for 1 minute 3 times a day for 1 week in an in vitro pH-cycling model. One group was set as control. Measurements were repeated after demineralization and remineralization stages. Data were analyzed statistically using ANOVA, Kruskal Wallis H, and Friedman tests ($p<0.05$).

Results: According to FluoreCam data, lesion size decreased most in S (-1.85) following MF (-1.32) and increased most in HO (0.62), meanwhile MO (9.4), H (8.79) and MF (8.54) demonstrated more mineral intake ($p<0.001$). The lowest microhardness values were obtained from herbal oils (HO (238.58±10.01), MO (246.92±10.66)) ($p<0.001$). Herbal toothpastes showed similar results to conventional one (290.5±9.63). The highest mean microhardness value was recorded in MF (291.58±9.46). Regarding Diagnodent Pen scores, H (6.17±1.27) and S (6.25±1.06) showed more lesion regression, while HO showed less (11.42±2.61) ($p<0.001$). According to ultrasound evaluation, S (1.48±0.29) showed best remineralization. Herbal toothpastes showed similar results ((1.38-1.4) ±0.1). MO and HO results were insufficient ((1.33-1.31) ±0.08) ($p=0.034$).

Conclusion: Experimental herbal toothpastes showed similar results to conventional one. The application of herbal oils was not effective. A combination of Moringa Oleifera with fluor showed superior results among herbal toothpastes.

Keywords: herbal toothpaste, remineralization, fluorescence, moringa oleifera, hemp

Pub No: OP-045

The Effectiveness of Fluoride Varnish in Preventing Erosion: an In Vitro Study

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Aim: The aim of this in vitro study was to evaluate the effect of fluoride varnish against acid erosion of enamel.

Materials and Methods: Nine teeth were cut with water cooled low speed diamond separator. Two windows (2x3 mm) were formed on the middle third of the buccal surfaces of the samples and the remaining parts were covered with acid-resistant nail polish. Fluoride varnish (5% NaF; Polimo, Imicryl, Konya, Turkey) was applied to one of the two windows in each tooth sample, and the other window was used as a control. Using separate containers, samples were immersed in cola drink (20ml/sample, pH 2.6, Coca-Cola, Ankara, Turkey) at room temperature for 5 minutes with gentle shaking (Duomax 1030, Heidolph). Afterwards, the samples were kept in 20 ml of artificial saliva for 1 hour. This pH cycle was repeated 6 times a day for 24 days. The surface properties of the samples were examined under a scanning electron microscope, the ratios of Ca, P, C, O, F, Mg and Na were determined, and the Ca/P ratio was calculated. Enamel surfaces were evaluated descriptively and analytically using Attenuated Total Reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR), Scanning Electron Microscopy (SEM), and Energy Dispersive X-ray spectroscopy (EDS). Statistical evaluation was made with the Mann-Whitney U test.

Results: ATR-FTIR analysis revealed a similar composition in carbonates and phosphates for control and fluoride varnish groups, which showed no significant differences in their spectral profiles ($p>0.05$). According to the EDX analysis, no significant difference was found between the fluoride varnish and the control group ($p>0.05$). SEM analysis did not highlight significant changes in the enamel microstructure of control and fluoride varnish groups.

Conclusion: Fluoride varnish alone is not sufficient to protect enamel surfaces against tooth erosion.

Keywords: enamel, erosion, fluorine

Pub No: OP-046

Evaluating the Effects of Different Remineralization Agents on Initial Enamel Lesions In Vitro

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Aim: Disruption of the demineralization–remineralization balance could activate the development of initial enamel lesions. Extrinsic assistance is needed to remineralize enamel lesions. The aim of this study was to evaluate the effects of fluoride varnish, enamel matrix proteins derivative, and experimental bioactive glass (BAG) on remineralization of initial enamel lesions in vitro.

Materials and Methods: Artificial initial caries lesions were developed on fifty human enamel samples using demineralization solution (pH 4.5, 37°C, 96 hours). Samples were randomly assigned to 5 groups (n=10): I-Fluoride varnish (Enamelast), II-Experimental BAG + 37% phosphoric acid (PA), III-Enamel matrix proteins derivative (EMPD, Emdogain) +Ethylenediamine-Tetraacetic-Acid (EDTA), IV-EMPD+37% PA, V-Control (untreated). All remineralization agents were applied with pH cycling for 7 days. The samples were scanned by optical coherence tomography (OCT) at baseline, demineralization, and after pH cycling. Lesion depths were measured using image analysis software (ImageJ). Lesions were evaluated using surface microhardness (SMH) and two fluorescence methods (FluoreCam® and DIAGNOdent Pen (DDPen)). The data were statistically analyzed by Kruskal Wallis, Friedman, and Wilcoxon tests ($p<0.05$).

Results: According to OCT results, fluoride varnish was found to be the most effective agent in reducing lesion depth ($p=0.005$). Depending on SMH results, all agents increased the surface hardness values after pH cycling. No significant difference was found among fluoride varnish, BAG, and EMPD+PA groups. And these microhardness values were significantly higher than EMPD+EDTA and control groups ($p<0.001$). According to the DDPen score criteria, all groups showed lower scores compared with the control group ($p<0.001$), however,

no significant difference was found among the remineralization agent groups. In FluoreCam assessment, size and intensity values of all treated groups showed improvement. However, there was no significant difference between the treatment groups in terms of FluoreCam-size measurements (p=0.186).

Conclusion: BAG and EMPD+PA has a remineralization capacity as much as fluoride varnish. EMPD+PA showed better microhardness and lesion intensity results than EMPD+EDTA.

Keywords: remineralization, bioactive glass, enamel matrix proteins, optical coherence tomography, fluorescence

Pub No: OP-047

Acetylation Pattern and Cytokine Secretion in Teeth with Deep Dentine Caries

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Aim: The purpose of this study was to determine how healthy pulp tissue and deep dentine caries teeth responded to inflammation, changes in gene transcription, and levels of cellular cytokine release.

Materials and Methods: For our research, we used Healthy Pulp (HP) (n=20) and deep dentin caries (Affected Pulp) (AP) (n=20) in our study. RT-qPCR analysis was performed on 10 samples from each group, and western blot analysis was performed on 10 samples from each group. RT-qPCR was used to look at the mRNA expression levels of acetylated H3, TLR2, and IL-6 cytokines. TBP was used as a "reference gene" to make sure other genes were in the same range. The levels of the acetylated H3 protein, TLR2, IL-6, and IFN-gamma cytokines were examined using Western blot analysis. The Independent T-Test was used to make a comparison statistical group in HP and AP.

Results: To summarize our findings, we discovered that the IL6 and H3 genes were highly expressed in affected pulp (AP), whereas TLR2 was higher expression in healthy pulp (HP) tissue. TLR2 and IFN-gamma proteins were found to be released at higher levels in AP than in HP tissue, but IL-6 and acetylation of H3 gene protein were found to be released at higher levels in healthy pulp tissue. According to the outcomes of the RT-PCR analysis, there was no statistically difference in the findings of the mRNA expressions of the marker genes studied between the AP and HP groups. Western blot results of acetylated H3 gene proteins were statistically higher in the AP group than in the HP group ($p<0.05$). Other cytokine levels did not differ statistically significant between the groups ($p>0.05$).

Conclusion: The current findings shed light on changes in cytokine secretion and epigenetic mechanisms associated with inflammation in teeth with deep dentin caries that have not reached the endodontic treatment limit.

Keywords: deep dentine caries, epigenetic modifications, acetylation, inflammation, inflammatory cytokines

Pub No: OP-048

Evaluation of Shear Bond Strength of Different Universal Bondings Incorporating 0.5% Chlorhexidine

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Aim: Collagen degradation, which occurs because of the activation of matrix metalloproteinase (MMP) enzymes at the adhesive resin-dentin interface, decreases the dentin bond strength. The use of MMP inhibitors prevents this decrease and creates a more stable connection. In this study, the shear bond strength (SBS) of different universal bondings with 0.5% chlorhexidine was evaluated.

Materials and Methods: In this study, 90 non-carious extracted human molar teeth were used. Flat dentin surfaces were created in the occlusal region by cutting the teeth in the coronal axis. Experimental bondings were prepared by adding chlorhexidine (0.5%) to different universal bondings (Single-Bond-Universal, 3M ESPE, USA; Nova Compo-B PLUS, IMICRYL, TRY; All Bond Universal, BISCO, USA). The specimens were divided into 6 groups to be restored by control or experimental bondings. Bondings were applied according to their instructions and restored with their own brand's composites (Filtek™ Ultimate,3M ESPE, USA; Nova Compo C, IMICRLY, TRY; AELITE™ All-Purpose Body, BISCO, USA). Cylindrical composite rods with a diameter of 3 mm were formed on the dentin surface. The samples were kept in water for 1 day. The SBS test was applied at a rate of 1 mm/min. in the Instron device. The obtained data were compared with the way Anova test (p=0.05).

Results: Among the control groups of bondings, Single Bond Universal (SBU) has the highest SBS data and All-Bond Universal (ABU) group has the lowest. Only statistical difference was observed between SBU and ABU in control groups. When the control groups were compared with their own experimental groups, no statistical difference was observed. A decrease in SBS data was observed in all experimental groups compared to control groups. Among the experimental groups, the SBU has the highest SBS data and the lowest is the ABU group. A statistical difference was observed only between NCP and SBU in the experimental groups.

Conclusion: Addition of 0.5% chlorhexidine as MMP inhibitor into universal bondings did not statistically decrease the SBS.

Keywords: chlorhexidine, dental adhesion, shear bond strength

Pub No: OP-049

The Effect of Different Application Modes of a Universal Adhesive on the Shear Bond Strength of Current Pulp Capping Materials

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Aim: The aim of this study was to investigate the effect of a universal adhesive system applied in different modes on the shear bond strength (SBS) of current pulp capping materials (PCMs; Biodentine,

Septodont; BioCal-CAP, Harvard; TheraCal LC, Bisco; ApaCal ART, Prevest).

Materials and Methods: Biodentine, BioCal-CAP, TheraCal LC and ApaCal ART were applied to the slots with an inner diameter of 5 mm and a height of 2 mm in acrylic blocks in accordance with the manufacturer's instructions. The initial hardening time of 12 minutes was applied for Biodentine while the other PCMs were light cured. Afterwards, samples of each PCM were divided into 2 subgroups (n: 10) for different adhesive modes. In the total-etch mode (TE-M), acid-etching was applied to the samples before adhesive procedures. Then Clearfil Tri-S Bond Universal adhesive (Kuraray) application was performed. In the self-etch mode (SE-M), the universal adhesive was applied without acid-etching and then a resin composite (Estelite Posterior, Tokuyama) was applied on the samples and light-cured. SBS tests were conducted using the Universal Tensile-Compression System (Instron 3382, USA). The data were analyzed by using a 2-way ANOVA.

Results: In both application modes, Biodentine showed lower SBS (14.1 MPa for TE-M and 10.7 MPa for SE-M) than the other groups ($p<0.05$). Although ApaCal ART showed higher SBS in the TE-M (34.3 MPa) than SE-M (26.3MPa; $p<0.001$), Biodentine (14.1; 10.7 MPa), BioCal-CAP (25,5; 24,3 MPa) and TheraCal LC (18,3; 23.2 MPa) did not show significant differences between different modes, respectively ($p>0.05$).

Conclusion: According to the limited findings of this study, BioCal-CAP, TheraCal LC and ApaCal ART that are light-cured PCMs showed higher SBS for both application modes than Biodentine that was hardened for initial period. Moreover, these current PMCs showed higher SBS than clinically acceptable, they could provide a significant advantage for the completion of upper resin restorations in the same visit.

Keywords: pulp capping, universal adhesive, shear bond strength, biodentine, theracal

Pub No: OP-050

Evaluation of Shear Bond Strength of Self-Adhesive Composite Resins to Dentin

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Aim: Our study aims to examine the shear bond strength (SBS) of 4 different self-adhesive composite resins and a conventional composite to dentin, in vitro.

Materials and Methods: Dentin surfaces were exposed by cutting the occlusal surfaces of the prepared samples with a low-speed saw. The occlusal surfaces of the teeth were sanded with 600-grit silicon carbide paper. From the prepared samples, 9 groups were formed with 6 samples in each group (n=6). Composite resins were applied to the dentin surfaces with a diameter of 3 mm and a height of 2 mm, and the teeth were kept in distilled water for 24 hours. Then, 5000 cycles of thermal cycle were applied to the samples at 5-55 °C (±2 °C). After the thermal cycle, each sample was tested in a universal test device with a head speed of 0.5 mm/min shear force. The differences of bond strength values were evaluated with ANOVA. Pairwise comparisons were made by Tukey post-hoc test. Analyses were carried out by the SPSS (Statistical Package for the Social Sciences) (Ver:22.0) with a $p<0.05$ significance level.

Results: When the values of the self-adhesive composite resin groups without adhesive application were compared in pairs, the difference between Constic (3,22 ± 1,39) and Fusio liquid (6,34 ± 1,40), Vertise (7,86 ± ,81), and Surefil One (6,67 ± 1,18) was significant ($p<0.05$). When the values of the adhesive applied composite resin groups were compared in pairs, the difference between Filtek Z250 (20,45 ± 4,55) and Constic (14,55 ± 3,34), Fusio liquid (12,21 ± 1,96), Vertise (13,75 ± 1,94), and Surefil One (11,71 ± 1,40) was significant($p<0.05$), while the difference between the other groups was insignificant.

Conclusion: Although the bond strength of self-adhesive composites is clinically sufficient, the combined use of these composites with adhesive systems will give more positive results in terms of dentin bonding values.

Keywords: shear bond strength, self-adhesive composite, composite restorations

Pub No: OP-051

Effect of Different Finishing Polishing Procedures on Shear Bond Strength of Composite Resins

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Aim: The aim of this investigated study was to evaluate the effect of different finishing and polishing strategies on resin bond strength to dentin tissue.

Materials and Methods: 144 freshly extracted human upper incisor teeth was used in the study. The roots were removed with diamond bur under water coolant from cemento enamel junction. Uniform dentin surface was obtained with 1200 grits silicon carbide abrasives under water coolant. The samples were randomly distributed to 9 group. A two-step self-etch adhesive resin was applied to dentin surface. Nanohybride composite resin was placed with a 4 mm diameter 4 mm deep plastic mold incrementally and polymerized with LED light curing unit. The upper 1mm of resin composites was signed and removed with different finishing and polishing strategies as follows; group 1: control, group 2,3,4, and 5: black, green, red and yellow diamond burs were used; group 6, 7, 8 and 9: coarse, medium, fine and extra-fine aluminium oxide discs were used respectively. All samples were stored in distilled water at 36,5 C for 24 hours. Shear bond strength test was obtained with an universal testing machine at 1mm/min crosshead speed. The data was recorded. Statistical analyze was performed at SPSS 26.0 programme.

Results: Data were analyzed by one-way Anova. Statistically different results were observed between groups and within bur used groups ($p<0,05$). No statististically different results were observed within disc used groups, ($p\geq0,05$)

Conclusion: The size of the bur grit used during finishing polishing procedures adversely affect the bond strength of composite resins to dentin.

Keywords: bond strength, composite, finishing

Pub No: OP-052

Evaluation of the Masking Ability of a Universal Composite Using Digital Shade Selection Methods

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Aim: The present study aimed to evaluate the masking ability of a universal resin composite by comparing the magnitude of color difference (ΔE) among 3 digital shade selection methods.

Materials and Methods: A C4-colored composite disc (8*2 mm) was prepared by Teflon molds to imitate the discolored tooth structure, at the base. Universal composite resin (3M Universal Restorative, 3M ESPE) specimens were generated with a hole diameter of 8 mm and thickness of 1mm. Color measurements were evaluated and enrolled by the following digital devices: A spectrophotometer (VITA Easyshade V; VITA Zahnfabrik), a digital camera (700D, Canon), and a smartphone attached with a light correcting device (Smile Lite MDP; Smile Line). CIELAB values of the specimens were determined, and all digital photographs were evaluated with software (Classic Color Meter, Apple Corp) which encompasses parameters of CIELab color spectrum. After calculating the ΔL Δa Δb ΔE values, statistical analyses were performed by Shapiro-Wilk, Kruskal Wallis, Anova, Friedman and post-hoc Bonferroni tests at a significance level of 5%.

Results: It was determined that the ΔL, Δa, Δb and ΔE values obtained from various shade selection methods were statistically significant ($p<0.05$). While the ΔE values of the universal composite resins obtained with Smile Lite MDP were the highest, the value obtained with the digital camera was the lowest. Regarding the final colors obtained from all shade selection methods, the highest L* parameter (Value) was found in the Smile Lite MDP groups.

Conclusion: L* values obtained with a digital camera were lower than the spectrophotometer and the smartphone with MDP methods while the images taken were also darker. Within the comparison of the color masking ability of various shade selection methods, the highest redness ratio was observed by the groups of digital cameras, while the highest yellowness ratio was obtained by the photos of the smartphone with MDP device.

Keywords: masking ability, digital camera, spectrophotometer, light correcting device, color difference.

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Colour Matching Ability of Four One Shade Universal Resin Composites: a Spectrophotometric Analysis

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Aim: This study aimed to evaluate the colour matching ability of four one shade universal composite resins on five different shades of acrylic teeth using a spectrophotometer.

Materials and Methods: The resin composites tested were Omnichroma (Tokuyama, Japan), VitraUnique (FGM, Brazil), Zenchroma (President Dental, Germany) and Essentia Universal (GC, Japan). Five different shades (B1, A2, C2, A3.5, D3) of acrylic central incisor teeth were chosen for each group. Twenty-five specimens were made for each brand of resin composite. Round shaped cavities (1.5mm diameter and 1.5mm deep) were prepared on the buccal middle third of the acrylic incisors. The resin composites were inserted and polymerized with an LED curing unit for 20 seconds (ZenoLite, President Dental). The colour of the teeth and the restorations were taken under daylight on a grey background with a spectrophotometer (SpectroShade Micro, Milan, Italy) and the mean changes of the L*a*b* values in each group were expressed as ΔE values. The threshold for ΔE was taken as 3.3. Statistical analyses were performed with ANOVA and Tukey's post-hoc test ($p<0.05$).

Results: On B1 shaded teeth, Omnichroma, Zenchroma and Essentia Universal have an acceptable colour difference ($p<0.05$). On A2 shaded teeth, although detectable, Omnichroma has the best match ($p<0.05$). Zenchroma has a perfect colour matching ability on C2 shaded teeth with a 1,33 ΔE value ($p<0.05$). On A3.5 shaded teeth; all the resin composites had detectable colour differences but Essentia Universal had the best result with a 4,05 ΔE value. Zenchroma and Essentia Universal had a perfect colour matching ability on D3 shaded teeth ($p<0.05$).

Conclusion: Although manufactured to match all the Vita shades, it was concluded that the colour match of the tested one shaded universal resin composites differed from brand to brand and regarding the different shades of the acrylic teeth.

Keywords: colour match, one shaded composites, spectrophotometer, resin composite

Pub No: OP-054

Effect of Staining And Bleaching on Color, Translucency, Whiteness İndex of Composite Resins

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Aim: The objective of this in vitro study was to evaluate color stability, translucency parameter (TP), and whiteness index (WI) of finished and unfinished composite resins after staining and bleaching.

Materials and Methods: Twenty specimens (10-mm diameter x 2-mm thickness) were fabricated using Teflon molds with mylar strip from two different composite resins (Filtek Z350XT [FZ], 3MESPE; G-ænial A'CHORD [GA], GC). Each composite resin group was randomly divided into two subgroups: finished&polished [F] (Soflex Discs and Spiral Wheels, 3MESPE) and unfinished [UF] (n=10).

Following the baseline color measurement using a spectrophotometer (Vita Easyshade V, Vita Zahnfabrik), the samples were immersed in daily refreshed coffee solution for 6 days at 37ºC (3.6 gr/300ml, Nescafe Classic, Nestle). Then, all specimens were subjected to bleaching-15 minx3- using 40% H_2O_2 (Opalescence Boost, Ultradent). CIE L* a* b* parameters against black, white, gray backgrounds were recorded at baseline (T0), after staining (T1), and bleaching (T2). The values were used to calculate color changes (ΔE00), TP, and WI. Data were statistically analyzed Two-way ANOVA and posthoc Bonferroni tests ($p<0.05$).

Results: All samples showed clinically unacceptable color changes (ΔE00>3.3). After the staining in the UF subgroup FZ (ΔE00=18.2±3,8) exhibited significantly higher ΔE00 values than GA (ΔE00=11.47±3.91) while no significant difference was evident after bleaching ($p=0.196$). Baseline TP and WI values of the composite resins were higher than those of stained and bleached. In F subgroup, FZ revealed significantly higher TP and WI values than GA at TO and T2, while it was only significant at T0 in UF ($p<0.05$).

Conclusion: The composite resins showed similar color change to bleaching while translucency parameter and whiteness index exhibited to be material dependent. Bleaching procedure caused an increased color change and whiteness index but decreased translucency. Finishing&polishing had a significant effect on translucency at baseline, staining and whiteness index at bleaching.

Keywords: bleaching, color stability, translucency parameter, whiteness index, composite resin

Pub No: OP-055

The Effect of Different Polishing Methods on the Coloring of Composites

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Aim: The aim of this in vitro study is evaluating the effect on the coloring of different types of composites polished with different methods.

Materials and Methods: In this study, standard size (2x8mm) discs were prepared from Filtek Z550 Nano Hybrid Universal [(HC), 3M ESPE, St. Paul, MN, USA] and Filtek Ultimate Universal Restorative-Enamel [(EC) Enamel, 3M ESPE, St. Paul, MN, USA] composites (n=10). Each restorative resin group was randomly divided into 4 subgroups, and each group was polished with different systems (Zenit Flex and Identoflex) with and without water and kept in distilled water for 24 hours. The samples were kept in coffee in an incubator at 37 °C for 7 days for coloring. The coloration was evaluated using a digital spectrophotometer (Vita Easy Shade, Germany) before and after immersion coffee. The color change value, Delta E (ΔE), was calculated. Data were analyzed by one-way ANOVA and post hoc Tukey's test. P value of less than 0.05 was considered statistically significant for all tests. In the measurement of coloration change, it was obtained by evaluating ΔE value over 3.3.

Results: There were significant differences between ΔE value of the composite groups before and after immersion coffee ($p<0.05$). All groups of HC and only EC group with Zenith flex wet polishing showed significantly higher ΔE values than the other groups ($p<0.05$). The mean delta E values of all groups were higher than the 3.3 value, which is perceived by the eye.

Conclusion: Although EC groups showed lower ΔE values in both with and without water polishing with Identoflex and non-water polishing with Zenith Flex, all composite groups showed unacceptable color changes in different polishing methods.

Keywords: coloration, composite polishing, delta e, disk

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Pub No: PP-001

Combining Artificial Intelligence and Resin Infiltration for Proximal Caries Detection is cost-effective

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Aim: Artificial intelligence (AI) was shown to support caries detection on bitewings, while the treatments and long-term costs emanating from any detection needs to be considered, too. We assessed the cost-effectiveness of proximal caries detection and its combination with resin infiltration or restorative treatment of early lesions.

Materials and Methods: U-Net, a fully convolutional neural network was trained, validated, and tested on 3293, 252 and 141 bitewing radiographs. Lesions were sub-grouped initial lesions (E1/E2/D1, presumed non-cavitated, receiving caries infiltration or restorations if detected) and advanced lesions (D2/D3, presumed cavitated, receiving restorations if detected). A Markov simulation model allowed to assess the sequels of false positive and negative detections (with and without AI) and the subsequent treatments over the lifetime the of patients. A German mixed-payers' perspective was taken. Our health outcome was tooth retention years. Costs were measured in Euro 2020. Monte-Carlo-microsimulations, univariate and probabilistic sensitivity analyses were conducted.

Results: AI showed an accuracy of 0.80, which was higher than that of dentists' (mean: 0.71 (min-max: 0.61-0.78), $p<0.05$). AI was significantly more sensitive than dentists (0.75 versus 0.36 (0.19-0.65; $p=0.006$), but not more specific (0.83 versus 0.91 (0.69-0.98; $p>0.05$)). If combining AI with resin infiltration for early lesions, it was more effective (tooth retention for a mean 64 (2.5-97.5%: 61-9´65) years) and less costly (298 (244-367) Euro) than assessment without AI (62 (59-64) years; 322 (257-394 Euro) in >77% of simulations. If, however, combining AI with restorative treatment even for early lesions, it was more costly and less effective.

Conclusion: The higher sensitivity of AI for early lesions requires appropriate management.

Keywords: artificial intelligence, caries detection/diagnosis/prevention, computer simulation, decision-making, economic evaluation

Pub No: PP-002

Seven-Year Evaluation of Two Low-Shrinkage Composite Resins in Occlusal Cavities Prepared by Er, Cr: YSGG Laser or Bur

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Aim: The aim of this study was to evaluate two low-shrinkage composite resins (silorane-based and methacrylate-based) in occlusal cavities prepared by Er, Cr: YSGG laser or conventional diamond bur after 7 years.

Materials and Methods: Eighteen patients with 4 similar-sized occlusal carious lesions were included to the trial. Groups were as follows: LS-SL: laser preparation + Filtek Silorane (3M-ESPE); BR-SL: bur preparation + Filtek Silorane; LS-KL: laser preparation + Kalore (GC); BR-KL: bur preparation + Kalore (GC). Seventy-two cavities were restored according to the manufacturers' instructions by one experienced operator. Randomization was done using a table of random numbers. All the restorations were examined by two previously calibrated evaluators who were blinded to the restorative procedures, according to the FDI criteria at baseline and at 1, 2, 3, 4, 5, 6 and 7 years. At least 85% of intra-examiner and inter-examiner agreement was mandatory before starting the assessments. Pearson chi-square test and Mc Nemar's test were used for statistical analysis at a significance level of 0.05.

Results: The recall rate was 88.8% at 7 years and the retention rates for all groups were 100%. After 7 years, no significant differences were detected among the groups, regarding marginal adaptation, marginal staining, surface staining, color match, translucency, postoperative sensitivity and recurrence of carious lesions. Significant changes were seen for marginal adaptation, marginal and surface staining at 7-year examinations for all groups when compared to baseline.

Conclusion: Laser and bur preparation techniques showed similar longevity for restorations. The two low-shrinkage composite systems tested were both clinically acceptable after 7 years.

Keywords: laser, low-shrinkage composite resin, clinical

Pub No: PP-003

Thirty-six Month Clinical Evaluation of a Bulk-fill and an Incremental Resin Composite Restoration

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Aim: The aim of this study was to compare the clinical performance of a bulk-fill and an incremental resin composite in 2-surface restorations.

Materials and Methods: Twenty-eight participants received 80 2-surface restorations in two randomly assigned 2-surface cavities with at least one bulk-fill resin composite [FB] (Filtek Bulk Fill Posterior, 3M ESPE) and one incremental resin composite [FU] (Filtek Ultimate Universal, 3M ESPE). The same universal adhesive system was used according to the manufacturers' instructions for all restorations. The restorations were blindly evaluated by two calibrated examiners at baseline, 6, 12, 24 and 36 months using modified USPHS criteria. The comparison of the two restorative materials for each category was performed with the chi-square test (α=0.05). The baseline scores were compared with those at the recall visits using the Cochran Q-test followed by McNemar's test.

Results: Recall rate was 60.7% after 36 months. Seven FB restorations (25.9%) and five FU restorations (19.2%) exhibited bravo for marginal adaptation ($p > 0.05$). Twenty-one restorations (77.8%) at FB and 23 (88.5%) restorations at FU group showed alpha score ($p > 0.05$) for marginal discoloration after 36 months. Two restorations (7.4%) at FB group exhibited bravo score for color match and no significant differences were seen between groups. All the restorations showed alpha score for surface texture, post-operative sensitivity, and secondary caries. No statistical differences were found among the tested composite resins for any criteria evaluated ($p > 0.05$). McNemar's test showed a significant change marginal discoloration in both groups ($p = 0.009$, $p=0.001$) and marginal adaptation ($p = 0.001$).

Conclusion: The bulk-fill and incremental resin composite demonstrated similar performances after 36 months in 2-surface cavities.

Keywords: bulk-fill, clinical, resin composite

Pub No: PP-004

Three-Year Clinical Outcome of a Novel Self-Adhesive-Restorative Versus Conventional Bulk-Fill-Composite in Posterior Teeth

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Aim: To evaluate the clinical performance of a novel, tooth-colored, self-adhesive bulk-fill restorative (SABF, 3M) compared to a conventional bulk-fill composite (Filtek One, 3M; FOBF) for permanent direct occluso-proximal restorations. The null hypothesis was that both materials perform equally regarding survival and clinical properties.

Materials and Methods: In this prospective randomized split-mouth study, 30 patients received one SABF and one FOBF posterior restoration each. A universal adhesive (Scotchbond Universal, 3M) was applied in self-etch mode before application of FOBF. SABF was applied without any adhesive. Restorations were evaluated

(FDI-criteria) by two blinded examiners at baseline (BL), 6-month, 12-month, 24-month and 36-month. Non-parametric statistical analyses, $\chi 2$-tests (α=0.05), error-rates method and survival-analyses were conducted.

Results: 29 out of initially 30 patients (21-58 years; 21 females) with at least one restoration under risk were available at the 36-months recall. The survival rate was 97% for both materials (one restoration with secondary caries per group). All other restorations revealed clinically acceptable FDI-scores (excellent good; satisfactory) for all criteria at all timepoints. Error-rates method revealed a significant difference between materials in terms of esthetic properties, but not regarding functional and biological properties. Considering esthetic properties, both materials yielded clinically acceptable FDI-scores (mainly excellent-1 and good-2) only, with FOBF performing significantly better than SABF in criteria surface luster (A1, $p<0.001$), marginal staining (A2b, $p=0.008$) and color match and translucency (A3, $p<0.001$). Over time, marginal staining (A2b, $p<0.001$) and marginal adaptation (B6, $p<0.001$), deteriorated significantly for both materials.

Conclusion: The null hypothesis could not be rejected. Both materials performed similarly regarding survival and clinical properties within 36-month of clinical service. SABF exhibited less favorable but clinically fully acceptable esthetic properties compared to FOBF. Over an observation period of 3 years, the novel, self-adhesive bulk-fill restorative showed clinically satisfying results.

Keywords: clinical study, self-adhesive bulk-fill, posterior, composite, adhesive

Pub No: PP-005

Clinical Evaluation of Different Dental Composite Restorations: 3 Years

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Aim: The aim of this study is to retrospectively evaluate the 3-year clinical performance of class II restorations made using six different dental composite materials in patients who were treated at Selcuk University Faculty of Dentistry Restorative Dentistry Clinic.

Materials and Methods: In this study, it was planned to evaluate the restorations made with routinely used dental composite materials in patients aged 18-25 years who applied to our clinic due to class II caries. Evaluation of 86 restorations (Gaenial anterior kompozit (GC Corporation, Tokyo, Japan)(11), Tetric N-Ceram Bulk Fill kompozit (Ivoclar, Vivadent)(11), Clearfil Photo Posterior (Kuraray Noritake, Tokuyama, Japan)(18), AELITE All-Purpose Body (Bisco, USA)(12), Ceram.X ShpereTEC One (Dentsply, Sirona)(23), Nova Compo (Imicryl)(11)) on 48 patients who came for control; The clinical examination was completed according to the modified USPHS criteria (marginal adaptation, marginal color change, surface texture, color change, marginal integrity, anatomical form, and postoperative sensitivity) in three steps, including intraoral photographs and radiographs.

Results: In the restorations evaluated, 1 filling in Geanial Anterior Composite restorations, 1 filling in Clearfil Photo restorations, and 2 fillings in Nova Compo restorations were replaced due to loss of retention. Restorations made with other composite materials exhibited Alpha scores in terms of retention criteria. Acceptable color change was observed in 39% of the restorations. B score was observed in marginal adaptation at a rate of 21%. In terms of other evaluated criteria, all restorative materials were found to be 89% successful (A score) in terms of postoperative sensitivity and secondary caries follow-up, and no statistical difference was observed between them.

Conclusion: The clinical performance of all restorations made with dental composite material included in this study was evaluated and the restorations were considered successful at the end of 3 years due to the dominant Alpha and Bravo scores in terms of modified USPHS criteria.

Keywords: composite, modified USPHS criteria, retrospective study

Pub No: PP-006

Evaluation of Tooth-Bleaching Activation Protocols Assisted by Diode Laser and LED: 18-Month Follow-Up

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Aim: The aim of this clinical trial was to compare tooth-bleaching activation protocols assisted by diode laser and LED in terms of bleaching efficacy in a split-mouth design over an 18-month period.

Materials and Methods: Thirty-five participants with sound and vital anterior teeth were included in this study. Patients with caries and restoration, whose canines were lighter than A2 according to the Vita Classical Scale, were not included. A bleaching gel containing 35% HP (Whiteness HP, FGM) was applied according to the manufacturer's instructions. One of the right/left hemi-arcs of each patient received diode laser-assisted bleaching (940nm, EpicX, Biolase), while the other side received LED-assisted bleaching (Radii Plus, SDI). Color measurements were assessed by a blinded examiner. The colorimetric evaluation was determined using two different shade guides; Vita Classical, 3D Master Bleach Guide scales, and a spectrophotometer in terms of ΔEab, and ΔE00. Color differences (ΔSGU, ΔEab, ΔE00) were calculated between the baseline, and immediately afterwards, 48 hours, 1 week, 1-, 6-, 9-, and 18-months after. Tooth sensitivity was evaluated by the Visual Analog Scale (VAS). Statistical analyses were performed by analysis of variance in repeated measurements for color changes. Friedman and Wilcoxon tests were used for tooth sensitivity analyses ($p<0.05$).

Results: The 18-month recall rate was 77.1%, while other recall rates were 100%. After 18 months, there were no statistical differences among the diode laser and the LED activation protocols for shade guides, ΔEab and ΔE00 ($p>0.05$). Only at 6-month recall, the color difference with diode laser activation was statistically higher than LED activation for ΔEab and ΔE00 ($p<0.05$). At the end of 18 months, none of the patients had permanent tooth sensitivity complaints.

Conclusion: Both activation protocols produced similar bleaching efficacy and clinically acceptable color changes which were maintained after 18 months.

Keywords: in-office bleaching, color science, tooth bleaching, diode laser, LED

Pub No: PP-007

Color Stability of New Generation High Filling Flowable Composite Resins

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Aim: The aim of this study is to evaluate the color stability of highly filled flowable composite resins.

Materials and Methods: Three flowable (GC Essentia HiFlo (HiFlo), GC Essentia LoFlo (LoFlo), GC G-aenial Universal Injectable (G-aenial)), and one microhybrid composite resin (GC Essentia Universal (EU) (Control Group)) were used to evaluate color stability. Disc-shaped samples were prepared by placing the composite resins whose color stability was to be evaluated on an opaque composite resin (Estelite Σ Quick (EQ) OA2). Samples of each composite resin group were kept in distilled water for 24 hours (initial). They were then stained (staining) by soaking it in a coffee solution for 48 hours. At the end of the discoloration period samples were brushed with toothpaste using an electric toothbrush. (brushing). Color measurements were made from the surfaces of the composite discs prepared with HiFlo, LoFlo, G-aenial and EU at the initial, satining and brushing periods. Color change values (ΔE) were calculated using the initial-staining and initial-brushing values. Analyses were performed by one-way ANOVA and Tukey HSD tests. p values less than 0.05 were considered to be statistically significant.

Results: After coloration, the lowest ΔE values were found in the G-aenial group, and the highest ΔE values were found in the EU group. For the coloration groups, only the difference between these two composite resins was statistically significant. The lowest ΔE values were found in the LoFlo group after brushing, and there was a statistically significant difference between this value and the ΔE values after brushing and after satining of all groups. In HiFlo and Gaenial groups, ΔE values after brushing were higher than ΔE values after staining.

Conclusion: The color stability of the flowable composite resins after staining and after brushing were not worse than a microhybrid composite resin.

Keywords: color, color stability, flowable composite resin, tooth brushing

Pub No: PP-008

In Vitro Comparison of the Efficacy of Treatment Methods of White Spot Lesions

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Aim: The aim of this study is to compare the efficacy of different remineralizing agents used in remineralization therapy.

Materials and Methods: In our study, 260 maxillary and mandibular incisors were used. After the 4x4 mm area determined on the vestibule surfaces of the samples was isolated by sticking a label, the remaining surfaces were painted with acid-resistant nail varnish. Fluoride varnish, APF gel, CPP-ACPF, toothpaste and the combined use of these agents with Er:YAG laser were applied for remineralization of the teeth. Microhardness testing, color measurement, SEM images and EDX analysis were used to evaluate the efficacy of remineralizing agents. Evaluations were repeated four times: at baseline, after demineralization, after application of remineralizing agents, and after final demineralization. Data was statistically analysed with One Way ANOVA ($p<0.05$).

Results: In the microhardness analysis, the highest value after remineralization was measured in the APF and CPP-ACPF groups, and the highest value after the final demineralization was measured in the APF group ($p<0.05$). In SEM examinations, it was determined that the morphological structure of the enamel surfaces changed after remineralization. As a result of the color analysis, it was observed that the color of the tooth changed above the acceptable limit after demineralization and remineralization. In the EDX analysis, the highest increase in calcium was seen in the group in which CPP-ACPF was applied after Er:YAG, the highest fluorine increase was in the group that was applied APF after Er:YAG, and the highest increase in phosphorus was in the group that was applied Er:YAG after CPP-ACPF.

Conclusion: According to the data obtained within the limits of this study, it was seen that the Er:YAG laser could be an alternative in the treatment of remineralization. Data have been obtained showing that the efficacy of other agents we use increases when they are used in combination with Er:YAG.

Keywords: CPP-ACPF, Er:YAG laser, fluorine, remineralization

Pub No: PP-009

In-vitro Investigation of The Bond Strength Between Different Indirect Resin Composite Materials and Different Types of Bonding Systems

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Aim: This study aims to evaluate shear bond strength (SBS) of indirect composite resins luted with two different adhesive resin cements to dentin and microhybrid composite resin surface.

Materials and Methods: In this study, totally 192 cylindrical indirect composite resin samples (3x3mm) were prepared from Gradia (GC, Japan), Ceramage Body (Shofu Inc, Japan), Tescera ATL (Bisco, USA), and Lava Ultimate (3M ESPE, Germany). They were divided into two groups: Half of the samples were bonded to 32 pieces molar dentin surface and the others were bonded to 32 pieces disc-shape prepared (5mmx2mm) Z250 (3M ESPE) microhybrid composite resin surface. Also, two subgroups were formed by using two different luting cements which were RelyXUltimate resin cement (Total etch system with Scotchbond Universal Etch (3M ESPE) and Single Bond Universal (3M ESPE)) and RelyX U200 (3M ESPE) Self-Adhesive resin cement. They were subjected to shear bond strength testing. Data were analyzed

using Shapiro Wilk's test, Mann-Whitney U test, and Chi-Square test with a significance level of $p<0.05$.

Results: There is a statistically significant difference in SBS of indirect restorative materials ($p<0.05$). For dentin surfaces, Ceramage luted with RelyXUltimate showed highest strength and Ceramage luted with RelyXU200 showed the lowest strength ($p<0.05$). For Z250 microhybrid composite surface, TesceraATL luted with RelyXUltimate showed the highest strength and Lava Ultimate luted with RelyXU200 showed the lowest strength ($p<0.01$).

Conclusion: Within the limitations of this study, we can say that bond strength is influenced by the brand of the laboratory composite resins, and preference of total-etch applied adhesive resin cements may provide a better bond strength than a self-adhesive resin cements. ``This work was supported by the Istanbul University Scientific Research Projects, Id: 36980"

Keywords: resin composite, adhesive resin cement, shear bond strength

Pub No: PP-010

3-year Outcome and Wear Analysis of Two Different Nanohybrid Composite Resin Materials

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Aim: To compare the clinical performance of an ormocer-based and a nanohybrid composite in a split-mouth clinical trial for 3-year. The tested null hypotheses were there are no differences in clinical performances (1) and occlusal wear behavior (2) among tested materials.

Materials and Methods: 25 patients were treated in the Department of Cariology and Operative Dentistry at the Dental School Lingotto, University of Turin. Each patient received 4 class II restorations with similar sizes and depths: 2 Admira Fusion and 2 Tetric Evo-Ceram. At 3-year follow-up, patients were recalled and evaluated by two calibrated operators, following SQUACE and FDI criteria. For the evaluation of occlusal surface wear at baseline and at recall examination, an impression with polyvinylsiloxane was taken and then scanned with digital acquisition system (D700, 3Shape) at maximum resolution. Digital models in .stl format were analyzed for 3D wear between t0 and t1 (Geomagic Studio and Qualify 12, 3D Systems). Restoration characteristics, including the number of unacceptable restorations, failures, and complications, were described with descriptive statistics using percentages of the overall number of samples. ANOVA test was used to analyse 3D wear.

Results: The SQUACE criteria were better in Admira Group compared to the Tetric Group. However, any criteria worse than Alpha2 score were not observed in any restorations. Considering FDI criteria, a difference is observed in "Surface texture and discoloration" and "Esthetic Integration" criteria. Tetric showed a worse surface texture than Admira, but Admira showed a worse esthetic integration. Regarding wear analysis, ANOVA test showed a significant influence of the factor "tooth", with molars showing greater linear as well as volumetric wear than premolars ($p=0.0002$). The materials did not show a significant difference in linear and volume wear after 3-year follow-up.

Conclusion: The initial null hypothesis were partially rejected since tested materials showed different clinical behavior after 3-year of function.

Keywords: ormocer, nanohybrid composite, clinical trial, occlusal wear

Pub No: PP-011

Can Dental Appearance Have an Impact on Social Life and First Impression?

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Aim: To determine whether deviations in dental aesthetics influence on how people are perceived by others and if there is a difference in this perception by dentists and laypersons living in the city of Izmir/Turkey.

Materials and Methods: Headshot photographs of one female (F) and one male (M) person were taken in a professional studio and saved digitally. On the first and second photographs, teeth were digitally enhanced to represent "improved dental aesthetics" (F1, M1). On the third photograph only the shape (F2) and on the fourth only the color (M2) of the teeth was altered to represent "the poor smile perception". Randomly chosen participants (100 laypersons/100 dentists) were asked to answer a questionnaire about one of the four photographs. Three-options scale was used in the questionnaire and the answers were statistically analyzed by Chi square test ($p<0.05$).

Results: The most remarkable region of the face, regarding the first impression, was found to be the teeth (75%). Contributors who answered the questions according to F1 and M1 pictures (63%) think that the people look healthy whereas only 31% of those who answered the questions according to F2 think the same for the person in the photograph ($p<0.05$). 75% of the answers revealed a correlation between healthy teeth and a beautiful smile, while 96% of the dentists stated that "poor dental aesthetics" and "beautiful smile" cannot be linked. Discolorations on teeth caused more negative impact than the shape anomaly regarding social impact criteria and no difference between the laypersons and the dentists were found.

Conclusion: 1-Regardless of poor or improved dental appearance, teeth were the first area that attracted attention.2-Healthy teeth are linked to a beautiful smile. 3-Tooth color influences how people are perceived by laypersons.

Keywords: dental appearance, first impression, social life

Pub No: PP-012

Evaluation of the Charcoal Containing Toothpastes on the Color Stability of Resin Composites

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Aim: Evaluating the effect of brushing with charcoal-based whitening toothpastes on the color change of composite resins discolored with coffee.

Materials and Methods: Ninety disc-shaped composite specimens (2x8mm) in shade A1 were prepared of Charisma Topaz (Kulzer) and Harmonize Enamel (Kerr). Baseline color measurements of all samples were determined by using a spectrophotometer (Vita Easyshade®V) after thermocycling (10.000-cycles, 20sec dwell time). Color measurement was repeated after immersion in coffee solution for 6 days. Following staining process specimens were divided randomly into 9 groups (n=10). Each one of the eight groups brushed for 1h with different charcoal-containing toothpastes (Colgate; Eyüp Sabri Tuncer (EST); Herbatech; İpana; Prof Saracoglu (PS); Rocs; Signal; White Glo (WG)), and the control group was brushed for 1h without toothpaste. Color measurements were done for the third time. The data were analyzed using ANOVA and Tukey HSD tests (α=0.05).

Results: Statistically significant differences were detected between the L and ΔE values according to the composite type ($p<0.001$); while the mean L and ΔE values were 2.18 and 3.07 for Topaz; -0.41 and 2.32 for Harmonize. The average ΔE value of the PS group was 2.58, and the average value of the WG group was 3.44. While the mean value of the WG group (3.44) did not differ compared to EST (3.07) and the control group (2.9), it was higher than the other groups.

Conclusion: Under the limitations of this study, brushing with the charcoal-containing toothpastes have a whitening effect on Topaz and Harmonize composites that are visibly discolored in coffee. They may be preferred for removing coffee staining after 6 month brushing.

Keywords: charcoal-containing toothpastes, coffee staining, resin composites, spectrophotometer

Pub No: PP-013

Investigation of Roughness, Permeability and Bacterial Adhesion of Dentin Treated with Different Desensitizers

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Aim: In vitro evaluation of the roughness, permeability and bacterial adhesion of dentin surfaces on which various desensitizing methods are applied.

Materials and Methods: In this study, 5% NaF varnish (Enamelast), CPP-ACP (MI Paste plus), Er,Cr:YSGG laser (Waterlase, Biolase) and diode laser (Biolase) were used alone or in combined forms. One hundred and eight dentin blocks of 5×5×3 mm were prepared from the buccal parts of the bovine incisor's root dentin and divided into nine groups according to the desensitization method applied. Surface roughness (SR) was measured with a profilometer. To produce pellicle, dentin samples were coated with artificial saliva and mucin. S. mutans and S. mitis suspensions were added to the samples coated with pellicle. Bacterial suspensions were incubated at 37°C in an atmosphere of 5% CO_2 for 24 hours. Bacterial counts were determined as x108 ml CFU (Colony Forming Unit). Bacterial adhesions were visualized using a confocal laser scanning microscope. Dentin permeability was determined using Image J program after imaging with SEM. Statistical analysis was performed using one-way ANOVA and Tukey HSD multiple comparisons ($p<0.05$).

Results: The control group, in which no desensitizing method was applied, showed the lowest SR values ($p<0.05$). Except for the CPP-ACP+Er,Cr:YSGG and CPP ACP+Diode groups, the surface roughness change of all groups was statistically significantly higher than the control ($p<0.05$). However, there was no significant difference between the groups in the numbers of both S. mutans and S. mitis on the samples ($p>0.05$). The number and diameter of open dentinal tubules of all groups was lower than the control. ($p<0.05$).

Conclusion: Higher surface roughness did not create a significant difference between the groups in the adhesion of S. mutans and S. mitis. In addition, all desensitizing methods applied showed differences in the number and diameter of open dentinal tubules compared to the control group.

Keywords: dentin sensitivity, surface roughness, bacterial adhesion, dentin permeability, lasers

Pub No: PP-014

The Effect of Mouthrinses on Surface Roughness of Different Resin-Based Composites: An in-Vitro Study

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Aim: The aim of this study was to evaluate the effect of five different mouthrinses on the surface roughness of four different composites.

Materials and Methods: Sixty discs (2x6mm) of each of the following materials were prepared: I-Flow, Tetric N Ceram, Tetric N Flow, Clearfil Majesty Esthetic. The discs were polished with Tdv Praxis and stored in artificial saliva during 24 h at 37 °C. They were divided into 6 subgroups (n= 10), and exposed to the following mouthrinses (12h, 37 ºC) ; Colgate plax, Listerine cool mint, Sensodyne Cool&Fresh, Klorex Plus, Meridol and distilled water. The profilometer was used to determine the surface roughness (Ra) of each sample. The surface roughness of each sample was measured and exposed to the mouthrinses again (24h, 37ºC) and then measured again. Statistical analyses of the data were performed via Repeated Measures ANOVA and Bonferroni tests.

Results: In general, a significant difference was found between the 12-24 hours measurement averages ($p<0.05$). There was no significant difference between 12-24 hours measurement averages on the basis of composites and the basis of mouthrinses ($p>0.05$). It was also found

that there was no significant difference between the 12-24 hours measurement averages on the basis of the composite mouthrinse cross ($p>0.05$). There was an increase in the surface roughness of all samples exposed to mouthrinses. However, this increase was not significant in I-flow composite ($p>0.05$). While the roughness change in flowable bulk fill and flowable nanofil composite was not significant between 12-24 hours ($p>0.05$), this change became significant in Meridol and Sensodyne in bulk fill restorative composite and nanohybrid composite ($p<0.05$).

Conclusion: Mouthrinses effected the surface roughness of resin composites differently depending on the content of the mouthrinse, the chemical properties of the composite and the time applied.

Keywords: resin based composite, surface roughness, chlorhexidine, mouthrinse, meridol

Pub No: PP-015

Bond Strength Assessment of A Self-Adhesive Resin Cement to Resin Nanoceramic CAD/CAM Blocks after Different Surface Treatments

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Aim: The purpose of this study was to detect the bond strength of a self-adhesive resin cement on resin nanoceramic CAD/CAM blocks after different surface treatments.

Materials and Methods: Sixty specimens were prepared from different CAD/CAM blocks (Lava Ultimate [L], Cerasmart [C]). Specimens from each group (n=30) were divided into 3 treatment groups (n=10): (1) No treatment [N], (2) Hydrofluoric acid (8%) for 60 s [H], (3) Sandblasting with 50-µm aluminium oxide [S]. A cylinder-shaped resin cement (RelyX U200, 3M ESPE) was placed on resin nanoceramic surfaces and light cured using Teflon tubes. After thermal cycling, shear bond strength was tested, and failure modes were examined. The failure load (N) was divided by the cross-sectional area (mm^2) of the cylindrical composite to calculate the shear bond strengths (MPa). The shear bond strength data exhibited a normal distribution according to the Levene's test; therefore, a two-way analysis of variance and Tukey's post hoc test were used for statistical analysis ($p<0.05$).

Results: The highest bond strength was exhibited at Lava Ultimate group with hydrofluoric acid treatment [12.2 MPa] followed by Cerasmart group with hydrofluoric acid treatment [11.8 MPa], but there was no significant difference ($p<0.05$). Cerasmart group with no treatment [7.2 MPa] showed the lowest shear bond strength followed by Lava Ultimate group with no treatment [7.4 MPa], however there was no significant difference between groups ($p<0.05$). All the specimens in no treatment groups showed adhesive failure. Cohesive failures were mostly observed at Lava Ultimate group with hydrofluoric acid treatment (30%). Mixed failures were seen mostly at Lava Ultimate groups with hydrofluoric acid treatment and sandblasting (LH: 40%, LS: 40%).

Conclusion: Sandblasting and hydrofluoric acid treatments to resin nanoceramic blocks were effective at increasing bond strength of self-adhesive resin cement to both resin nanoceramic blocks.

Keywords: CAD/CAM, resin cement, surface treatment

Pub No: PP-016

Effects of Two Tablets, a Whitening and a Conventional Toothpaste on Enamel in Terms of Surface Roughness and Microhardness

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Aim: The aim of this in vitro study was to compare the effects of a conventional toothpaste, a whitening toothpaste and two toothpaste (charcoal and orange) tablets on surface roughness and microhardness of human enamel.

Materials and Methods: Forty specimens were prepared from human permanent incisor teeth. Specimens were randomly divided into 4 groups (n=10): CT: Colgate Total (Colgate-Palmolive Company), Opalescence Whitening toothpaste (Ultradent), TB-C: T-brush Charcoal toothpaste tablet (Serra Dermokozmetik ve Medikal Ürünler), TB-O: T-brush Orange flavored toothpaste tablet. The specimens were brushed using soft power toothbrushes (Oral-B, Frankfurt, Germany) with horizontal tooth brushing technique by one researcher. Hundred and sixty-eight cycles of brushings were performed to simulate a 12-week treatment period of two daily brushings (brushing twice daily for 1 min). A contact type profilometer was used to measure surface roughness (Ra) and Vicker's hardness tester was used for the changes in microhardness (VHN). Data were analyzed by One-way ANOVA, Wilcoxon Sign Rank test and pairwise t-tests ($p<0.05$).

Results: An increase in surface roughness was found in all groups after brushing ($p<0.05$). Groups exhibited similar surface roughness changes after brushing. Microhardness values increased significantly in all toothpaste groups after brushing. CT group significantly exhibited higher microhardness change than other groups after brushing ($p<0.05$).

Conclusion: Brushing with tablet toothpastes, a whitening toothpaste and a regular fluoridated toothpaste presented similar results for surface roughness. The increase in microhardness after brushing was higher at regular fluoridated toothpaste group than other experimental groups.

Keywords: toothpaste, surface roughness, microhardness

Pub No: PP-017

Non-Allergy-Related Findings in 687 Patients Complaining on Adverse Effects from Dental Materials

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Aim: The prevalence of adverse effects from dental materials is low. In previous studies on 500 and 625 patients from our special consultation on suspected adverse effects from dental materials, only 12% or 14% of the patients had allergies causative for the reported complaints, whereas

numerous dental and orofacial findings with relevance for the complaints could be diagnosed. The aim of the present study was to investigate a cohort expanded to 687 patients for non-allergy-related findings (dental/orofacial findings, but also findings related to known general diseases or medications) with relevance for the subjective complaints.

Materials and Methods: 687 patients visiting our special consultation on suspected adverse effects from dental materials between December 1998 and September 2021 were characterized retrospectively with respect to age and sex distribution, subjective complaints, allergies (results from patch testing), dental/orofacial findings, and findings related to known general diseases and medications with relevance to their subjective complaints.

Results: The cohort of 687 patients comprised 81% women (median age 58 years). The most frequent complaints were burning mouth (44.1%), taste irritations (28.5%), and dry mouth (23.7%). Allergies to dental materials with relevance for the complaints were diagnosed in 11.9%. Relevant dental/orofacial findings (e.g., functional symptoms, orofacial diseases, and tooth- or plaque-related findings) were diagnosed in 58.4%. Findings related to known general diseases (mainly related to mental/behavioral disorders, diabetes mellitus or disorders of the thyroid gland) or medications (mainly from hypertensives and psychotropic drugs) were found in 28.7% or 21.0% of the patients. In 15.1%, no objective finding could be diagnosed explaining the complaints expressed by the patients.

Conclusion: The present study shows that dental/orofacial findings as well as findings related to known general diseases and side-effects from medications occur more frequently than allergies as possible causes for subjective complaints described by the patients suspecting adverse effects from dental materials.

Keywords: dental materials, adverse effects, allergy, orofacial disease, general disease

Pub No: PP-018

ATR-FTIR Models to Study Polymerization and Composition of Universal Adhesives

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Aim: To assess the chemical composition, ratios of main components and polymerisation kinetics of two commercial multimodal universal adhesive systems, using attenuated total reflectance Fourier-transform infra-red spectroscopy (ATR-FTIR) models.

Materials and Methods: Two universal bonding systems – Clearfil Universal Quick (CFU) and Scotchbond Universal (SBU) were tested. Monomer composition was assessed using ATR-FTIR (Spectrum One, Perkin-Elmer, UK). A semi-quantitative model based on Beer-Lambert law assumptions was built using Microsoft Excel Tools 16.56 for Mac. Component ratios were modelled using summed spectra of solvents (water, ethanol), methacrylate monomers (HEMA, Bis-GMA, TEGDMA, UDMA and 10-MDP), and fillers, each multiplied by varying fractions. Filler load and spectra were obtained following their separation from the adhesives through gravimetric analysis (n=3). ATR-FTIR was used to assess polymerisation kinetics of both formulations at 37ºC, with 20 s light curing (LED 800 mW/cm², n=3). The cured spectra were subtracted to the uncured spectra, giving rise to difference spectra that highlight differences in peaks. TimeBase v. 3.1.4 (Perkin-Elmer, MA, USA) was used for data processing. Statistical analysis was performed using SPSS 26.0 (α=0.05; IBM Corporation, Armonk, NY, USA).

Results: SBU and CFU showed complex mixtures, with both having Bis-GMA as a bulk monomer, and HEMA in varying amounts (10% CFU vs. 25% in SBU). Differences in functional monomers and solvents were also found. CFU was confirmed to be water-based (10%) whilst SBU had a co-mixture of water/ethanol (15/10%). The highest final degree of conversion (%) was registered for SBU, showing 87±1%, while CFU attained 83±1%, statistically significant (T-test, $p<0.05$). Difference spectra confirmed an acrylamide polymerisation reaction in CFU, different to that of SBU.

Conclusion: Component ratios, rates of polymerisation and final DC were largely material dependent. ATR-FTIR is a very useful, rapid, and easy technique to identify relative levels of main components in liquid mixtures while quantifying reactions such as light-activated polymerisation.

Keywords: ATR-FTIR, dental adhesive, free-radical addition polymerization, universal adhesive

Pub No: PP-019

A Finite Element Analysis of The Behavior of The Restored Tooth During Polymerization and Chewing

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Aim: Analyze the behavior of a patient's second maxillary molar during polymerization and mastication. Observe the effects of size and shape variations of mesio-occluso-distal (MOD) composite restoration.

Materials and Methods: A maxillo-mandibular model was constructed after segmentation of the different anatomical parts from a patient cone beam acquisition. A MOD cavity with a direct composite restoration was simulated on tooth 17. Different configurations have been tested with a variation in cavity width or walls angles with undercut (80°) and draft-angles (100°). A thermal expansion coefficient of 0.001 was included for the composite and its polymerization shrinkage was simulated by a thermal stress during a temperature reduction of 1°C during an additional cooling step. On the other hand, the mandibular motion recorded with the Modjaw® system was included in the model to produce contact between the teeth. The Von Mises stresses during polymerization and chewing were analyzed in finite element analyses.

Results: The stresses appeared during polymerization and did not change during mastication for all the materials, with the exception for the enamel which supported the mastication stresses. The widening of the cavity did not result in an increase in stress if the wall angles were undercut. The configuration with a draft-angle generated an increase in dentine stresses. The location of the dental contact on the adhesive limit of the restoration during the mastication caused a very significant increase in stresses on the edges of the adhesive and the composite.

Conclusion: The occlusal enamel supports the globality of chewing constraints; its loss generates a much greater concentration of stress on the underlying structures that are initially only stressed by polymerization. Locating the dental contact on the adhesive joint can result in the loss of the sealing of the restoration or loss of the complete restoration.

Keywords: modjaw, mandibular kinematics, direct restoration composite, polymerization shrinkage stresses, finite element analysis

Pub No: PP-020

Influence of Sample´ Geometry on the Mechanical Properties of Polymer-Based Cad/Cam Restorative Materials

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Aim: To assess the influence of the sample' geometry on the mechanical properties (flexural strength, flexural modulus, modulus of resilience) of 10 polymer-based CAD/CAM restorative materials.

Materials and Methods: The materials studied were Brava (FGM Dental), Grandio-Block (Voco), Shofu Block (Shofu), Cerasmart 270 (GC Dental Products), Brilliant Crios (Coltene), Tetric-CAD (Ivoclar Vivadent), Katana Avencia (Kuraray Noritake), Lava Ultimate (3M ESPE), Mazic (Normon), and Estelite P-Block (Tokuyama Dental). Sample were prepared with highly polished surfaces in rectangular plate ($14 \times 12 \times 1$ mm³) or bar (14 x 4 x 1 mm³) geometries (n=10). The bars and plates were subjected to a 3-point flexural test on a 12-mm span with a crosshead speed of 0.5 mm/min.

Results: The mean flexural strength of the tested materials ranged from 132.98 ±16.90 MPa (Shofu Block) to 216.48 ±25.67 MPa (Grandio-Block). The mean flexural modulus ranged from 10.36 ±0.85 GPa (Shofu Block) to 20.42 ±1.43 GPa (Grandio-Block). The mean modulus of resilience ranged from 0.74 ±0.16 MPa (Lava Ultimate) to 1.50 ±0.28 MPa (Tetric-CAD). The material factor had a significant effect on the mean flexural strength ($p<.001$), flexural modulus ($p<.001$), and modulus of resilience ($p<.001$) of the tested sample. Bar sample presented higher flexural strength and modulus of resilience than plate ones ($p<0.05$).

Conclusion: It becomes clear from our results that the sample geometry effect render very different nominal flexural strength and modulus of resilience values when testing polymer-based CAD/CAM materials, which invalidates comparisons of results from studies that use different methodologies. A proper analysis is therefore mandatory on the basis of the Weibull theory.

Keywords: cad-cam resin composite, three point flexural test cad-cam resin composite, mechanical properties cad-cam materials, cad-cam dentistry, different sample geometries

Pub No: PP-021

Fracture Toughness of Adhesive Interfaces to Human Dentin

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Aim: For in-vitro investigations of dentin adhesives, microtensile bond strength or shear bond strength tests are commonly used. A shortcoming of both methods is the lack of controlled crack origin. Bond strength testing using a fracture mechanics approach with controlled crack propagation, might be an alternative. The aim of this study was to apply the fracture mechanics' principles to adhesive dentin interfaces using the chevron-notched beam (CNB) method and determine KIc-fracture-toughness.

Materials and Methods: 60 Enamel-dentin blocks (4x3mm) were cut from extracted human third molars and distributed to 4 groups (n=15). The blocks outer surfaces were adhesively pretreated and placed into a silicone mold (25x4x3mm) with the dentin part in the center. The rest of the mold was filled with composite. The specimen were centrally notched following the CNB-method. The notch was then split with a thinner cutting disc. The split surfaces of the respective halves were treated with a dentin adhesive (FuturabondU, FuturabondM, SolobondM, SolobondPlus, VOCO). The so pretreated halves were luted together with flowable composite and light cured, resulting in the final CNB-specimens (n=15 per adhesive). The specimens were stored in distilled water for 24h prior to fracture-toughness measurement. Statistical analysis was performed by one-way ANOVA followed by Games-Howell post hoc test ($\alpha=.05$)

Results: There were no significant differences ($p>.05$) in KIc fracture-toughness [MPa*m^1/2] between FuturabondU (0.84±0.07), SolobondM (0.87±0.06) and SolobondPlus (0.89±0.1). Only FuturabondM (0.51±0.04) had a statistically significant lower KIc compared to the other dentin adhesives.

Conclusion: Within the limits of this study, the principles of fracture mechanics could be applied to adhesive interfaces using the CNB-method, with relatively low standard deviations. This method seems to be an promising alternative to microtensile bond strength or shear bond strength testing.

Keywords: fracture toughness, adhesion

Pub No: PP-022

Mechanical Behavior of a Bonded Overlay Interface Under Load: A FEA Study

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Aim: Different materials and cements have been proposed for overlay restorations in the last decade. The present study aimed to better understand the mechanical behavior of an overlay interface under load through finite element analysis (FEA).

Materials and Methods: A lower molar was endodontically treated, restored with an overlay restoration after build-up and then scanned with micro-CT (Skyscan 1172, Bruker) and segmented (Mimics 24.0) in the following volumes: enamel, dentin, restorative material, cement, build-up material. The volumes were optimized for FEA and exported in a simulation software (LS Dyna). Three different restorative materials were tested: Lithium Disilicate (DL), Cubic Zirconia (CZ), Reinforced Composite (RC). Two cements were tested for each restorative material: dual-cure resin cement (DR) and flowable composite (FC). After simulating shrinkage stress of resin materials, accordingly to manufacturer data, the model was loaded axially and horizontally with a sphere. Shear and tensile stresses were recorded, and color-maps were created to better understand stress distribution at the adhesive interface.

Results: All tested scenarios showed similar shear and tensile stress distribution at the cement interface. However, RC showed a significantly better distribution (lower peak stresses) compared to other materials. This might be due to the mechanical properties like the ones of tested cements, that create a homogeneous force distribution. The greatest shear stresses were located at the interproximal boxes of the preparation, above all when ceramic materials were tested.

Conclusion: Having a homogeneous combination of materials might significantly improve the tooth-restoration complex mechanical resistance to loads, above all at the adhesive interface, with subsequent better clinical prognosis. Further studies are necessary to confirm the obtained results when cyclic fatigue is simulated.

Keywords: finite element, overlay, micro-ct, adhesive dentistry, interfaces

Pub No: PP-023

The Repair Bond Strength of Newly Polymerized Composite Resin

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Aim: To evaluate the effect of different surface conditioning on the immediate repair bond strengths of newly polymerized a composite resin.

Materials and Methods: A resin composite (Ceram.X SphereTEC one) was photopolymerized by placing it in prepared cylindrical cavities in auto-polymerized polymethylmethacrylate. It was then roughened with a diamond bur, washed, dried and divided into nine groups: (1) 37% orthophosphoric acid (Etch), (2) Single Bond Universal Adhesive (SBU), (3) Prime Bond Universal Adhesive (PBU), (4) Clearfil SE Bond Primer + Adhesive (SEPA), (5) Clearfil SE Bond Adhesive (SEA), (6) 37% orthophosphoric acid and Clearfil SE Bond Adhesive (Etch + SEA), (7) OptiBond XTR Adhesive (OBA), (8) Gc Modeling fluid (ML), (9) No conditioning (NC). The same resin composite was bonded onto the substrates. As the control group (Control), another group without roughening and conditioning between the composite resin layers was used. Shear force was applied to the interface on a universal testing machine. Analyses was performed by one-way ANOVA and Tukey HSD tests. P values less than 0.05 were considered to be statistically significant.

Results: The order of bond strength values (in Mpa) of the groups from largest to smallest: Control (36.6 Mpa), SEPA (34.2), SEA (31.6), OBA (31.5), ML (30.9), SBU (28, 6), PBU (26.1), Etch+ SEA (5.1), NC (20.2), Etch (19.3). The difference between bond strength values of NC and control, Etch and control, Etch and SEPA groups was found to be statistically significant.

Conclusion: In the immediate repair of composite resins, the highest bond values were obtained in groups where the adhesive resin was applied separately between the layers, rather than simultaneously with the primer. Acid etching before the adhesive resin reduced the bond strength.

Keywords: nonoceramic composite, composite resin repair, surface conditioning, Immediate repair

Pub No: PP-024

A 3-Year Clinical Follow-up Results of Four Direct Pulp Capping Materials

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Aim: This study aimed to evaluate the clinical performance of $Ca(OH)_2$, Biodentine, MTA and TheraCal LC in cariously exposed mature permanent teeth for three-year after treatment.

Materials and Methods: In this follow-up study, patients who applied to the Restorative Dentistry clinic due to caries symptoms, and were randomly applied pulp capping treatment using different pulp capping materials $Ca(OH)_2$, Biodentine, MTA and TheraCal LC) on the pulp that was exposed during caries removal were included. Among these patients, a total of 94 patients between the ages of 18-45, who had no systemic health problems and had approximately equal number of patients in each pulp capping material group were included. The patients in Group 1, 2, 3 and 4 were treated with $Ca(OH)_2$ (Kerr, USA) (n=25), MTA (Angelus, Brasil) (n=25), TheraCal LC (Bisco Inc,USA) (n=22) and Biodentine (Septodont,France) (n=22), respectively.The patients were recalled for clinical evaluation after 1, 3, 6, 12 months, 2-year and 3-year. Presence of spontaneous pain, percussion, and postoperative hypersensitivity, and tooth vitality were recorded. The vitality tests were done by both cold (Endo Ice, Coltene/Whaledent, Switzerland) and electric pulp tests (Digitest II, Parkell, USA). The Chi-Square and Fisher Exact tests were used for statistical analysis ($p<0,05$).

Results: According to the 3-year clinical and radiographic examination results, Biodentine (80,7%) and MTA groups (78.4%) were better than Theracal LC (73.1%) and $Ca(OH)_2$ (70.4%) groups. There were no statistically significant differences between success rates of materials ($p>0,05$).

Conclusion: After 36-month follow-up, both MTA and Biodentine were found to be successful materials for direct pulp coating in permanent teeth, but the success rates of all materials decreased. However, long-term clinical follow-up is needed to evaluate the success of these direct pulp capping materials used in our study.

Keywords: biodentine, direct pulp capping, calcium hydroxide, mta, theracal lc

Pub No: PP-025

Microtensile Bond Strength Comparison of Double Layer Application of Universal Adhesives with a Two-Step Universal Adhesive

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Aim: The aim of this in-vitro study was to compare the effect of the double-layer application on microtensile bond strength (μTBS; MPa) of mild (Futurabond U, Voco, and Prime&Bond Universal, Dentsply) and intermediately strong (G-Premio Bond, GC) one-step universal adhesives to a two-step intermediately strong universal adhesive (G2 Bond; GC) to dentin.

Materials and Methods: 28 non-carious human third molars were ground flat with 180-grit SiC paper to expose mid-coronal dentin, and smear layer on dentin was standardized 600-grit SiC paper. Then the teeth were randomly assigned into seven groups (n:4); Futurabond U single layer (FB), Futurabond U double layer (FBDL), G-Premio Bond single layer (GP), G-Premio Bond double layer (GPDL), Prime&Bond single layer (PB), Prime&Bond double Layer (PBDL) and G2 Bond Universal (G2). Adhesives were applied in self-etch mode according to the manufacturer's instructions; however, in double-layer groups not light-cured between the layers. 4 mm composite build-ups were performed with Filtek Z 250 (3M, ESPE). After storage in distilled water at 37 C for 24 h, teeth were sectioned into beams (1x1mm) and subjected to μTBS test using a universal testing machine (Instron; 0.5mm/min). Data were analyzed using two-way ANOVA and Tukey's multiple comparison tests ($p < 0.05$).

Results: μTBS was significantly affected by the adhesives and their application modes ($p < 0.05$). Double layer application significantly increased the μTBS of universal adhesives ($p < 0.05$). FB and GP showed significantly lower μTBS than PB and G2 ($p = 0.0001$), while no significant difference was found between PB and G2 ($p = 0.854$), and FB and GP ($p = 0.998$). PBDL showed significantly higher μTBS than FBDL, GPDL ($p = 0.0001$), and G2 ($p = 0.029$) while no significant difference was found between FBDL and GPDL ($p = 0.117$).

Conclusion: Double layer application increased the μTBS of one-step universal adhesives to dentin. μTBS of the intermediately strong two-step universal adhesive outperformed one-step universal adhesives except for PB.

Keywords: microtensile bond strength, double application, dentin bonding, universal adhesive

Pub No: PP-026

Radiotherapy Effects on Novel Restorative Materials' Properties

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Aim: To evaluate the effect of radiotherapy on roughness (Ra), hardness (VHN) and flexure strength (FS) of a nanohybrid universal resin composite, a universal nano-ceramic resin composite, a bulk-fill resin composite and a glass hybrid restorative.

Materials and Methods: Twelve disc-shaped specimens (15 mm diameter and 2 mm high) and 24 bar-shaped specimens (25×2×2 mm) were fabricated according to the manufacturers' directions from four restoratives; a nanohybrid universal resin composite-Harmonize; a universal nano-ceramic restorative-CeramX SphereTEC one; a bulk-fill resin composite-Tetric EvoCeram Bulk Fill and a glass hybrid restorative-Equia Forte HT. The baseline Ra was assessed with a profilometer and the VHN was determined using a Vickers hardness tester. Three readings per disc-shaped specimen were taken for Ra and VHN prior to radiotherapy. After baseline measurements, specimens were irradiated at a dose of 2Gy per fraction for 5 days/week for 7-week to a total dose of 70Gy. Radiotherapy (RT) was performed in a hospital environment using a linear accelerator. Following radiotherapy, Ra and VHN measurements were repeated. After half of the bar-shaped specimens were also subjected to same radiotherapy protocol (n=12), all radiotherapy exposed and unexposed bar-shaped specimens were subjected to three-point bending for FS measurement using a universal testing machine (cross-head speed:1 mm/min). Repeated measure ANOVA was used for analyzing Ra and VHN and two-way ANOVA for the FS. Pairwise comparisons were tested using Bonferroni test ($p < 0.05$).

Results: Radiotherapy didn't cause any significant difference on surface roughness ($p > 0.05$) except Equia Forte HT that showed higher Ra values after RT ($p < 0.05$). While the hardness of Harmonize group was increased, the rest of the materials showed significantly decrease in their VHN after radiotherapy ($p < 0.05$). Regarding the FS, no influence was found for all restoratives after RT ($p > 0.05$) except for Harmonize. Radiotherapy caused a significant decrease on FS of Harmonize ($p < 0.05$).

Conclusion: Radiotherapy effects on Ra, VHN and FS were found to be restorative material dependent.

Keywords: radiotherapy, restorative materials, roughness, microhardness, flexure strength

Pub No: PP-027

Effect of In-office Bleaching on Surface Properties of Resin Composites

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Aim: This in vitro study aimed to evaluate the effect of in-office bleaching procedure on the surface roughness and microhardness of nano-ceramic (CeramX, Dentsply) and micro-hybrid (G-aenial, GC) resin composites.

Materials and Methods: A total of 40 composite specimens, 20 from each restorative material, 2 mm in thickness, and 10 mm in

diameter, were prepared using Teflon molds and polymerized according to the manufacturers' instructions (Demi Ultra; Kerr). Then the surfaces of the specimens were standardized with 1200-grit silicon carbide paper under water cooling (Buehler) and then polished with a series of aluminum oxide discs (OptiDisc, Kerr) for 30 seconds each to simulate clinical conditions. Following storage in distilled water at 37°C for 24 h, surface roughness (Ra, μm) of the specimens was evaluated with a profilometer (Perthometer, Mahr) while microhardness (HV) was evaluated with a microhardness tester (Micromet 5114, Buehler). After 35% hydrogen peroxide (HP) bleaching gel application (Whiteness HP, FGM) for a total of 45 minutes (3x15 minutes), Ra and HV values of all the specimens were remeasured. Ra and HV data were then analyzed by two-way ANOVA with repeated measures and t-tests with bleaching and composite type as independent variables ($\alpha = 0.05$).

Results: Bleaching significantly increased Ra and significantly decreased HV of G-aenial and CeramX ($p<0.05$). While there were no significant differences between both types of composites in terms of roughness change ($p>0.05$), G-aenial showed significantly more HV change compared to CeramX ($p<0.05$).

Conclusion: In-office bleaching application affected the surface roughness and microhardness of nano-ceramic and micro-hybrid resin composites. The microhardness of the nano-ceramic composite was less affected by the bleaching agent than the micro-hybrid composite.

Keywords: surface roughness, microhardness, bleaching, resin composite

Pub No: PP-028

Cytotoxic Effects of Pediatric Restorative Materials Dust on Human Bronchial Epithelial Cells

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Aim: The finishing and polishing processes of direct restorations produce particles (<5 μm) which can penetrate deep into the lungs. The null hypothesis of this study was that "Pediatric restorative materials do not have cytotoxic effects on human bronchial epithelial cells."

Materials and Methods: Human bronchial epithelial cells (BEAS-2B, ATCC) were seeded in 6-well culture dishes in culture media (RPMI 1640, Gibco) containing 12.5-, 50- and 400 μg/ml dust from three commercial restorative materials; bulkfill glass hybrid (Equia Forte HT), polyacid modified composite resin (PMCR, Dyract XP) and composite resin (Gaenial Posterior) for 24 hours. Cell proliferation and viability was assessed with an automated device (Vi-cell, Beckman Coulter). Data were analyzed with one-way ANOVA and Tukey test was applied for multiple comparisons. The level of significance was set to $p < 0.05$.

Results: Proliferation rate was significantly inhibited in cells exposed to composite resin dust (0.4 ± 0.04, 0.34 ± 0.03, 0.33 ± 0.04 x 106 for 12.5-, 50- and 400 μg/ml doses, respectively) compared to the controls (0.53 ± 0.03x106) ($p=0.005$ for 12.5 μg/ml and $p<0.0001$ for 50- and 400 μg/ml doses, respectively). Cell proliferation significantly decreased in 400 μg/ml PMCR treated groups (0.36 ± 0.02 x 106) ($p=0.0003$). Bulkfill glass hybrid significantly inhibited proliferation and cell viability in 50- and 400 μg/ml doses ($p<0.0001$). Cell viability decreased with increasing doses of composite resin dust ($91.13 \pm 1.10\%$, $88.17 \pm 1.00\%$ and $80.73 \pm 2.12\%$ for 12.5-, 50- and 400 μg/ml doses, respectively), although only significant in 400 μg/ml group ($p<0.0001$).

Conclusion: Null hypothesis was rejected and it was demonstrated that restorative material dust causes severe cytotoxicity on human bronchial epithelial cells. Bulkfill glass hybrid was found to be the most toxic pediatric restorative material to human airways in high doses. Funding: This study was supported by The National Scientific and Technological Research Council of Turkey (SBAG-121S933).

Keywords: pediatric restorative materials, composite resin, PMCR, bulkfill glass hybrid, cytotoxicity

Pub No: PP-029

Effect of Whitening Toothpaste on Surface Roughness of 3D – PRINTED Temporary Crown Materials

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Aim: Aim of this study was to evaluate the effect of a whitening toothpaste on surface roughness of different 3D-printed and a dual-cure composite temporary crown materials.

Materials and Methods: A total of 30 disc shaped temporary crown materals (n:10 each) were used in the study. 3D printed resins (Temp-Print; GC and Optiprint; Asiga) were produced using a dental 3D printer (Asiga-MAX) while the dual-cure composite material (TempSmart, GC) was produced according to the manufacturer's instructions. All the specimens were prepared 6mm in diameter and 3mm thickness. Then the surfaces of the specimens were finished with 600-grit SiC paper and Optiglaze (GC) was applied and light cured for 5 minutes in a curing unit (LabolightLV-III/GC). Following polymerization, the specimens were placed in an ultrasonic bath for 10 minutes. Initial surface roughness (Ra,μm) of the specimens was measured with a proflometer (Mahr Perthometer-M1). The specimens were then brushed with an electric brush (Genius-9000; CrossAction Oral-B) using a whitening toothpaste (2in1; 25-mg, Colgate) for 2 minutes. Then the surface roughness of the specimens were remeasured. Data were statistically analyzed with one-way ANOVA and paired sample t tests ($p<0.05$).

Results: There were no significant differences between the initial Ra values among the different temporary crown materials ($p>0.05$). Brushing with the whitening toothpaste significantly increased Ra of all the materials ($p<0.05$) though there were no significant differences between the Ra values among the 3D printed and dual-cure composite temporary crown materials ($p>0.05$).

Conclusion: Whitening toothpaste increased the surface roughness of 3D-printed and dual-cure composite temporary crown materials, however plaque accumulation threshold value 0.20 μm was not reached.

Keywords: temporary crown materials, toothpaste, surface roughness

Pub No: PP-030

Influence of Different Powered Toothbrush Heads on Surface Roughness of Temporary Crown Materials

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Aim: This in vitro study aimed to evaluate the effect of different electric brush heads on the surface roughness of different temporary crown materials.

Materials and Methods: Four different temporary crown materials were used (n=20). Temp-Print (GC) and Optiprint (Asiga) resins were produced from dental-3Dprinter (Asiga-MAX) and Dentalon-plus (Kulzer) and TempSmart (GC) resins were produced according to manufacturer's instructions (8mm in diameter,3mm thickness). Specimens were finished with 600-grit SiC paper, then Optiglaze (GC) was applied on all the specimens, light cured for 5 minutes in a curing unit (LabolightLV-III, GC) and then the specimens were placed in a ultrasonic bath for 10 minutes. Initial surface roughness (Ra, μm) of the specimens was evaluated with a profilometer (Mahr Perthometer-M1). Then the specimens in each group were randomly divided into two groups according to the electric tooth brush head (Oral-B Genius-9000; CrossAction or 3D-White). Following brushing of the specimens with Sensodyne-Pronamel (25-mg, for 2 minutes), surface roughness in each group was remeasured. Data were statistically analyzed with two-way ANOVA and post hoc Tukey's tests ($p<0.05$).

Results: Ra of the temporary crown materials was increased by brushing however it was not influenced by the type of temporary crown material or type of the electric brush head ($p>0.05$). There were no significant differences between the initial Ra values among the tested materials ($p>0.05$). Brushing with CrossAction or 3D-White did not result in statistically significant difference between temporary crown materials ($p>0.05$).

Conclusion: Brushing increases the surface roughness of 3D-printed and temporary crown materials however surface roughness of the materials did not exceed the bacterial adhesion thereshold, therefore the clinical use of all the tested electric toothbrush heads was found suitable for brushing the temporary crown materials.

Keywords: temporary crown materials, surface roughness, toothbrush heads, profilometer

Pub No: PP-031

Bleaching Effect of Conventional and Nanohydroxyapatite-Enriched Hydrogen Peroxide Bleaching Systems: A Preliminary Study

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Aim: With the development of nanotechnology, nanoparticles have been frequently used in the production of dental materials. Increasing demand for dental bleaching treatments has led manufacturers to produce bleaching systems containing nano-hydroxyapatite (nHA). The aim of this study was to evaluate the bleaching efficacy of a conventional bleaching procedure compared to newly manufactured hydrogen-peroxide (HP) bleaching techniques loaded with nHA-particles. H0 hypothesis: The bleaching efficiency of the conventional bleaching agent is higher than that of the bleaching agents containing nHA.H1 hypothesis: As the HP concentration of the bleaching agents increases, the bleaching effect will increase.

Materials and Methods: Twenty bovine incisor teeth samples were divided into four groups (n=5): (1) 40% HP (Opalescence Boost, Utah, USA); (2) 6%HP-nHA agent (Biowhiten, Istanbul, Turkey); (3) 18%HP-nHA agent (Biowhiten); and (4) 35%HP-nHA agent (Biowhiten). Bleaching systems were used in accordance with manufacturers' instructions as per three sessions of 20 minutes each. Before and after each treatment, the tooth color was measured with a spectrophotometer (SpectroShade Micro, MHT S.P.A., Milan, Italy). Each measurement was repeated three times. The mean changes of the L*a*b* values in each group were expressed as ΔE and were analyzed with ANOVA and Tukey's post-hoc test.

Results: After bleaching, all the treatments demonstrated significant improvements in tooth shade ($p<0.05$). No differences were observed between the bleaching efficacy and ΔE values of all groups except for 6%HP-nHA agent ($\Delta E=3.5$) and 18%HP-nHA agent ($\Delta E=5.2$) groups ($p=0.05$). The ΔE values were significantly higher in the 18%HP-nHA agent groups compared to 35%HP-nHA agent and conventional 40% HP groups without nHA ($p>0.05$).

Conclusion: We can conclude that, despite having a lower HP concentration, all the nanohydroxyapatite-enriched hydrogen peroxide bleaching agents had similar efficacy as to conventional bleaching treatments. Thus, low concentrations of hydrogen peroxide-containing bleaching products may be the first choice when patient safety is concerned.

Keywords: nanohydroxyapatite-enriched hydrogen peroxide, bleaching, hydrogen peroxide, tooth shade

Pub No: PP-032

Effect of Fiber Type, Accelerated UV Aging and Composite Thickness on Optical Properties

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Aim: To evaluate the effect of different fiber types, composite thicknesses and accelerated UV aging on optical properties of fiber reinforced composites (FRC).

Materials and Methods: The 120 samples were prepared as composite discs of 3 different thicknesses (2,3 and 4 mm) supported by three different FRC materials. While the fibers types were polyethylene (Ribbond-THM), glass (EverStick-C&B) and quartz (QuartzSplint-UD), control group prepared without fiber (n=10). In FRC groups, the fibers placed in the middle of the composite samples. Color measurements (L, a, b, C, h values) of the samples were made before and after the UV-aging using a colorimeter. TP00 and ΔE00 values were calculated

according to the CIEDE00 color scale. Two-wayANOVA posthoc Bonferroni test and one-wayANOVA posthoc Tukey in data analysis; Paired-sample t-test was used to evaluate time-dependent changes ($p < 0.05$).

Results: The effect of fiber and composite thickness on ΔE00 and TP00 values was found statistically significant (p=0.00). There was no difference in TP values between the 2mm-thick polyethylene group and the control group (TP1: p=0.12; TP2: p=0.48). Fiber groups, except for the glass group, showed lower TP00 values than the control group. At 3 and 4 mm, the effect on the translucency of the fiber disappeared. After UV aging, ΔE00 values were found above the acceptable threshold value (AT: 1.8) at all thicknesses with polyethylene fiber. After aging, L values and TP00 values were lower and b values were higher in all groups.

Conclusion: Fiber type, composite thickness and accelerated aging process affected optical parameters. When the composite thickness is low, polyethylene and quartz fiber can be recommended; however, the high ΔE value of polyethylene fiber should not be ignored. Fiber type and composite thickness should be evaluated together for a successful aesthetic FRC restoration. Acknowledgment: This study was supported by Karadeniz Technical University ProjectNo.2020.8642

Keywords: accelerated aging, translucency, color stability, ciede2000, fiber reinforced composite

Pub No: PP-033

Investigation of Two-Body Wear Resistance of Thermoviscous Bulk-Fill Composite Resin with Antagonist CAD/CAM-Block

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Aim: In the oral environment, composite resins are exposed to mechanical forces caused by natural teeth or dental restorations as an antagonist. As a result of the increase in mechanical forces, wear occurs on the surface of the composite resin and the mechanical properties of the composite decrease, negatively affecting its long-term clinical success. The aim of this study is to compare the wear resistance of thermoviscous bulk-fill composite (BFC) material against CAD/CAM composite block (CB) and steel ball (SB).

Materials and Methods: Sixteen 4x10mm disc-shaped VisCalor-Bulk (VOCO) composites were prepared by using VisCalor-Dispenser (VOCO) and polymerized for 20sec with VALO (Ultradent). 4 different grain sized aluminum finishing discs (Bisco) were used for finishing and polishing, then they were immersed in distilled water at 37°C for 24 hours. Specimens were randomly dived into 2 sub groups (n=8) according to antagonist materials as; Group1-Tetric-CAD (CB) (Ivoclar Vivadent) and Group2-SB. BFC specimens were subjected to two-body wear tests (120,000 cycles, 49N) in the chewing simulator (C-S-4; SD-Mechatronik Company). Samples were scanned before and after loading using a laser scanner (LAS-20, SD Mechatronic) to analyze vertical and volume loss. A random sample selected from each group was evaluated under scanning electron microscope. Data were analyzed with Shapiro-Wilk and Sample T tests (p=0.05).

Results: The average volume-loss (mm^3) of SB (0.34±0.24) and CB (0.09±0.10) were statistically different from each other (p=0.017). There was no significant difference (p=0.411) between average vertical-loss (mm) values of SB (0.16±0.05) and CB (0,19±0,07).

Conclusion: Considering the limitations of this study, significant result could not be obtained in terms of the wear rate of the CAD/CAM and steel ball on the thermoviscous composite. Therefore, thermoviscous composite as an antagonist may be both preferred under natural tooth and CAD/CAM composite resin restorations.

Keywords: bulk-fill composite resins, cad/cam, thermoviscous, wear

Pub No: PP-034

Polyhydroxybutyrate as a Potential Biopolymer Alternative to Dental Resin Materials: A Preliminary Study

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Aim: Polyhydroxybutyrate (PHB) is a biopolymer obtained from natural and sustainable sources. It is known as lipid acid polymers produced intracellularly by bacteria. This immunologically compatible polymer has a high potential for use in the medical field. The aim of this study is to compare the biocompability of PHB with different resin containing dental materials.

Materials and Methods: Resin composites (Point 4-Kerr, G-aenial anterior-GC), flowable resin composites (Filtek Ultimate Flowable-3M ESPE, Nova Compo HF-Imicryl), compomer (Nova Compomer-Imicryl), fissure sealant (Fissured Nova Plus-Imicryl) and experimental medical grade PHB (Innovaplast Biotechnology Inc.) were tested in this in vitro study. The standardized disk-shaped specimens (6x2 mm) were prepared and then incubated with mouse fibroblast cells (L929) for 24 and 48 hours. Then MTS assay (based on reduction of the MTS tetrazolium compound by viable cells to generate a colored formazan dye in cell culture media) was used to assess cell cell viability and cytotoxicty. The cells treated without any specimen were served as control group in the experimental model. GraphPad Prism software-La Jolla was used for statistical analysis. Differences were considered statistically significant at $p<0.05$.

Results: The highest cell viability was determined in PHB, Nova Compomer and Fissured Nova Plus groups at 24 hours. The cell viability increased 122% in PHB group at 24 hours. The decrease in cell viability was observed in all groups at 48 hours ($p<0.05$). The highest cell viability rate was detected in PHB and Nova Compomer groups. The

cell viability rate was observed as lower than 25% in other tested resin containing dental materials ($p<0.05$).

Conclusion: Considering the cell viability data, it was determined that PHB has the potential to be used as an alternative biocompatible biopolymer to resin-containing dental materials in the field of dentistry. Further studies are necessary to support the findings and design innovative biomaterials.

Keywords: polyhydroxybutyrate, biopolymer, biocompability, resin containing dental material, cell culture

Pub No: PP-035

The Biological and Physical Properties of Calcium Hydroxide-Containing Pulp-Capping Materials and Their Modifications

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Aim: The aim of this study is to evaluate biological and physical properties of calcium hydroxide-containing pulp-capping materials and their modifications with different solutions and antioxidant addition.

Materials and Methods: Calcium hydroxide-containing pulp-capping materials as powder-liquid (Emsure calcium hydroxide, Merck-Germany) and paste form (Dycal, Dentsply-USA) were used. Saline solution and synthetic tissue fluid were used instead of distilled water in the mixing of calcium hydroxide. Resveratrol (RES) added to all materials as antioxidant. The study groups were as follows, calcium hydroxide+distilled water (C); calcium hydroxide+saline (S); calcium hydroxide+synthetic tissue fluid (STF); Dycal (D); calcium hydroxide+distilled water+RES (C+RES); calcium hydroxide+saline+RES (S+RES); calcium hydroxide+synthetic tissue fluid+RES (STF+RES); Dycal+RES (D+RES). The cytotoxicity was determined on L929-cells by WST-1 method. The antibacterial activity was evaluated against Streptococcus mutans (DSM20523), Lactobacillus acidophilus (DSM 20079) and Enterococcus faecalis (ATCC 29212) by agar-diffusion test. The water absorption and water solubility were examined according to ISO 6876 and ISO 3107 standarts. The color change (ΔE) was evalauted by spectrophotometer.

Results: The highest cell viability was determined in C+RES group and the lowest cell viability was detected in D and D+RES groups after 24 hours ($p<0.0001$). RES addition provided increase in cell viability and the highest rate was detected in C+RES, S+RES and STF+RES groups after 48 hours ($p<0.0001$). A limited inhibition zone against Streptococus mutans was detected only in D and D+RES groups and any antibacterial activity was not observed in other groups. The lowest water absorption and water solubility were obtained in D and D+RES groups ($p<0.0001$). Poor colour match ($\Delta E \geq 3.7$) was observed in D and D+RES groups. No color change was detected in other groups.

Conclusion: Modification of mixing solutions did not improve the properties of calcium hydroxide. RES addition may be used to increase the biocompatibility of calcium hydroxide without any adverse effect on the mentioned physical properties.

Keywords: pulp capping, calcium hydroxide, antioxidant, resveratrol, synthetic tissue fluid

Pub No: PP-036

Clinical Evaluation of the Efficacy of Professional Biofilm Removal Methods

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Aim: To investigate the objective and subjective efficacy of clinical novices using either hand instruments, polishing paste and cups or an air-polishing device for professional mechanical biofilm removal in a prospective, randomized controlled crossover design.

Materials and Methods: 31 fourth-year students at the Dental School of Heidelberg University with no clinical experience were included. After calibration on simulation models, all subjects performed mutual professional dental tooth cleanings in a randomized split-mouth design. To verify the objective efficacy, the plaque control record (PCR) was collected before and after cleaning. One half of the mouth was cleaned using an air-polishing device with erythritol powder (AP, AIRFLOW® Prophylaxis Master), the other half was conventionally cleaned with hand instruments, polishing paste and cups (HI). The subjective efficacy of both methods was assessed by self-administered questionnaires. The difference of the PCR before and after cleaning (ΔPCR) was calculated and for group comparison (AP versus HI), the Wilcoxon two-sample signed-rank test was performed.

Results: The mean ΔPCR for AP was 32.45 ± 14.40 % and for HI 24.00 ± 15.30 %. Regarding the group comparison, ΔPCR was significantly higher on sites that were cleaned using AP ($p<0.001$). The subjective perceived efficacy of the air-polishing device was rated significantly higher by both students applying the two devices (HI: 71.45 ± 17.18 %; AP: 88.42 ± 6.40 %; $p<0.001$), and students treated as patients (HI: 74.68 ± 17.60 %; AP: 85.77 ± 11.43 %; $p=0.008$).

Conclusion: In the perception of both the treating, and treated dental students participating in this study, the mechanical biofilm removal using an air-polishing device is more efficacious than the conventional method. Further clinical studies on the efficacy with the two devices are needed with operators at different clinical experience levels.

Keywords: professional mechanical biofilm removal, air-polishing device, subjective and objective efficacy

Pub No: PP-037

Prevalence of Dental Caries in Chronic Hemodialysis Patients in Ouagadougou, Burkina Faso

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Aim: This study aimed to determine the prevalence of dental caries in chronic hemodialysis patients in order to know the content and make proposals to improve the oral health status of chronic hemodialysis patients.

Materials and Methods: This was a descriptive cross-sectional study with prospective collect which took place from September 11 to October 26, 2019 in the nephrology and hemodialysis department of YOUHC. It took into account all chronic hemodialysis patients who agreed to participate in the survey and who had been on dialysis for at least three months in the department.

Results: The study involved 248 hemodialysis patients. Male patients numbered 141 (56.9%) and the sex ratio was 1.3. The average age of hemodialysis patients was 43.3 ± 14.89 years with extremes of 13 years and 81 years. The average CAO index of the patients was 2.65 ± 3.51 with an individual CAO index which oscillates between 0 and 26. The CAO prevalence was 68.1%. The average number of decayed teeth was 1.52 ± 2.33 with extremes ranging from 0 to 12 teeth. The prevalence of caries was 49.6%. The most decayed teeth were 37, 47 and 38.

Conclusion: This study showed a high prevalence of dental caries in hemodialysis patients. In a vision of global patient care, collaboration between nephrologist and dentist is essential.

Keywords: dental caries, chronic hemodialysis patients, prevalence

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Investigation of Riboflavin as Biomimetic Mineralization on Demineralized Dentin by Optical Coherence Tomography

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Aim: Optical coherence tomography (OCT) has considerable potential as a non-invasive imaging technique for carious lesions as it eliminates the need for the removal of the superficial layer and eliminates radiation. The aim of this study was to assess the biomimetic remineralization capacity of Riboflavin for demineralized dentin samples using spectral-domain optical coherence tomography (SD-OCT).

Materials and Methods: Twenty four dentin blocks were were randomly divided into 6 groups as: 2% Riboflavin; Universal bonding agent (Optibond Universal, Kerr); Functional tricalcium phosphate (fTCP) (Clinpro ™ 5000, 3M); Universal bonding agent+2% Riboflavin; fTCP + 2% Riboflavin; Remineralizing solution (Positive Control). The dentin samples were immersed in a demineralization solution maintained for 72 hours and remineralization agents were applied for 10 days. The optical depth of backscattered light of enamel was measured using Zeiss Cirrus HD SD-OCT 5000 (Carl Zeiss Meditec). SD-OCT analyzes were performed after demineralization and after remineralization procedures. The appropriate values that correspond to the visual boundary of dentin lesions were measured. Paired two-sample t-test was used to compare the application within the groups ($p<0.05$).

Results: At the baseline (after demineralization), there was no statistically significant difference in the optical lesion depths of the dentin blocks in the six groups ($p=0.487$). The reflectivity and the optical lesion depth decreased after remineralization in all groups. A significant decrease in the depth of optical lesion on the dentin surfaces in all groups was observed following the remineralization ($p<0.05$) except adhesive application ($p>0.05$).

Conclusion: Within the limitations of this study, the surface treatment with Riboflavin provided biomimetic dentin remineralization. Further investigations are needed on Riboflavin as a potential innovative bioactive material of dentine remineralization as minimal intervention which is an important concept in clinical restorative dentistry.

Keywords: biomimetic mineralization, riboflavin, tri-calcium phosphate, optical coherence tomography (oct)

Pub No: PP-039

Analysis of Dentin Remineralization and Obstruction of Dentinal Tubules

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Aim: In the current approach of dental caries treatments, it is important to preserve the affected dentin. Even if the restoration is done, a success based on remineralization of the affected dentin is mentioned. In this study, it was aimed to investigate the reincorporating minerals into demineralized dentin to achieve remineralization.

Materials and Methods: Mid-coronal dentin was exposed to a demineralization solution for 96 h to replicate affected dentin. The specimens were randomly divided into the following groups (n=10): 5% NaF (Proshield Fluoride Varnish), CPP–ACFP (MI Paste Plus, GC Corp.), CaGP (R.O.C.S. Medical Mineral Gel), negative control (Deionized Water) and subjected to 8 days pH cycling. The dentin surface was evaluated by Attenuated Total Reflection-Fourier Transform Infrared Spectroscopy (ATR-FTIR), Surface Microhardness (SMH) while tubular obstruction was evaluated using Scanning Electron Microscopy (SEM).

Results: After pH cycling, SMHR% of 5% NaF group (17.73+/-9.93) was significantly higher in comparison to the other groups ($p<0.001$). There was no difference of SMHR% between CaGP group (5.07+/-3.86) and CCP-ACFP group (7.22+/-5.4) ($p>0.05$). In the IR spectrum of the -OH bond peak, the band shift to lower frequencies may be due to relaxation of the collagen fibril structure from water absorption. The mineral/collagen area ratio that is significantly smaller for affected dentin as compared to remineralized dentin. The phosphate bands in all remineralization group of increased significantly after 8 days pH cycling. SEM analysis revealed that all agents were particles deposited

on dentin surface, which formed a new surface layer which completely occluded dentinal tubules; demonstrating that the dentinal tubules were exposed in the control group.

Conclusion: In conclusion, all the agents have a good remineralization effect on demineralized dentin specimens and occlude the dentinal tubules in hydroxyapatite-like crystal structure which can induce the biomimetic remineralization of the dentine.

Keywords: affected dentin caries, ATR-FTIR, remineralization, SMHR%

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Preparation of Website Containing Information About Dental Trauma and Evaluation of Its Quality and Readability

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Aim: The aim of this study is to prepare a website with sufficient information on emergency treatment for dental trauma patients and to reveal its' effectiveness by evaluating the knowledge level of users.

Materials and Methods: A Turkish website about emergency interventions for dental trauma was prepared and published at "disacil.ege.edu.tr" address. Information on emergency treatment of dental trauma in both dentitions and 'ToothSOS' mobile application was explained and addresses of institutions that are open for 7/24 hours in Izmir were given under sub-titles. The keywords "tooth injury, emergency tooth injury, tooth dislocation, Izmir, dental trauma, tooth fracture, dental emergency, emergency tooth" were added to the system to display the website. The website was evaluated with DISCERN, JAMA and Ensuring Quality Information for Patients (EQIP) criteria. The texts were evaluated with Cetinkaya-Uzun Readability Index. Pre-test and post-test were created to evaluate the readability and understandability of the website. 200 parents of patients who applied to University's Pediatric Dentistry clinic composed the study population.

Results: The website obtained 64 points in DISCERN tool, 75 in EQIP and fulfilled JAMA criteria. The texts were at "Educational" and "Independent Readability Level". The percentage of correct answers to all questions increased in the post-test. The highest increase between the pre-test and post-test was seen in the answers about the storage media for avulsed tooth. "Milk" as the correct answer was 17,5% in the pre-test and 57% in the post-test with statistically significant difference ($p< 0,05$). The correct answer percentage about 'ToothSOS' was 37% in pre-test and 57% in post-test. The average intelligibility score was 4,5 when evaluated with 5-Point Likert Scale.

Conclusion: Findings showed that the resource in the form of a website can benefit trauma patients. There is a need to increase easily accessible internet resources with understandable, accurate and reliable information about dental trauma.

Keywords: dental trauma; website; survey; DISCERN; JAMA

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Dispersion of Aerosols in a Dental Education Setting – A Pilot Study

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Aim: Aim: Especially during the COVID-19 pandemic, aerosols such as those generated during dental treatments are considered a potential source of infection. The aim of this study was to assess the aerosol exposure of patients, students, and dental personnel in a dental clinic setting with incompletely separated dental chairs using a newly developed model.

Materials and Methods: Materials and Methods: An emitter manikin (EM), simulating a patient and five aerosol-inhaling manikins (AIM), simulating other patients, students and staff were located in different positions in the 105 m^2 dental education room, including seven dental treatment chairs and a supervisor's desk. A ventilation system with 6 inlets and 8 outlets in the opposite wall maintained a 6-fold complete air exchange per hour. The EM, sitting in a treatment chair, exhaled an NaCl-containing aerosol which dispersed in the room. The air was inhaled by the AIMs and dissolved small volumes of in distilled water. The resulting increased water conductivity was measured over 20 min. and set in relation to values of a reference situation (conference room, mean distance 1.5m from EM) without ventilation. Due to the cumulative character of measurements and the pilot character of the study, no measurement repetitions or statistics were performed.

Results: Results: Compared to the reference situation, simulated patients in neighboring chairs and persons in emitter´s proximity were not exposed to increased aerosol levels, neither when the ventilation was on (10-24%) nor off (41-55%). Simulated students, treating the emitter were exposed to the highest aerosol levels. However, with ventilation switched on, numbers were still lower than in the reference situation (31%-90%). Without ventilation, aerosol exposure was increased (150%).

Conclusion: Conclusion: The described model allows estimation of aerosol exposure under various environmental conditions. The local setting with ventilation resulted in a lower aerosol exposure for tested positions compared to the reference situation.

Keywords: aerosol, COVID-19, ventilation

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3D Analysis of the Adhesive Interface in Deep Margin Eelevation: A Micro – CT Study

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Aim: The aim of the present study was to evaluate interfacial three-dimensional adaptation of different flowable materials before and after

cyclic fatigue in a simulated deep-margin elevation scenario. The null hypothesis tested was that marginal sealing of enamel and dentin cervical margins is not influenced by flowable composites with different viscosities.

Materials and Methods: Extracted premolars were selected and a class II MOD cavity was prepared with the mesial box with cervical margin 1mm above CEJ and distal box with cervical margin 1mm below CEJ. After performing adhesive procedures (selective enamel etching and two-step self-etch adhesive system), specimens were divided in 5 groups according to the employed materials for horizontal deep-margin relocation: nanohybrid composite (Clearfil ES2, Kuraray); medium viscosity flowable composite (Majesty ES2 Low-Flow, Kuraray); low viscosity flowable composite (Majesty ES2 Superlow-Flow, Kuraray); conventional viscosity flowable composite (Tetric Flow, Ivoclar); CAD/CAM inlay (Katana Avencia, Kuraray). All restoration except for group 5 were finalized by oblique layering with nanohybrid composite. To reveal interfacial gap progression specimens were scanned with a micro-CT (SkyScan 1172), before and after 500000 cycles of thermomechanical chewing simulation (50N, 1Hz). Data were imported into Mimics software after smoothing and region growing: only external gap was considered in the analysis. Obtained STL optimal quality masks were imported into Geomagic software for noise removal and volume calculation. Interfacial gap progression, expressed in mm3, was collected and statistically analyzed with ANOVA test ($\alpha<0.05$).

Results: The mean external gap augmentation was tridimensionally measured as volume. Flowable composites showed significantly less gaps than nanohybrid composites ($p=0.0023$). No differences were found between different tested flowables.

Conclusion: The initial null hypothesis is accepted since flowable resin composites with different viscosities were equally able to seal enamel and dentin cervical margins in deep-margin elevation technique.

Keywords: interfacial adaptation, deep margin elevation, flowable composites, cyclic fatigue, nanohybrid composites

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Marginal Adaptation of Highly-Loaded Flowable Composites on Class V Cavities: an OCT Study

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Aim: The aim of the present study was to quantify marginal gaps at enamel and dentin finishing lines in class 5 restorations restored with different flowable materials before and after thermal fatigue. The null hypothesis tested was that flowable composites are not able to provide enamel and dentin marginal sealing in class 5 cavities.

Materials and Methods: Intact single-rooted teeth were selected. On the buccal surface a standardized class 5 cavity was created, with the following design: 5mm apical-coronal extension, 3mm mesial-distal extension, 2mm depth, cervical margin: 90°, coronal margin: 45° bevel 1.5mm long. A self-etch adhesive (Clearfil SE Bond 2, Kuraray) was applied after 30s selective enamel etching. Specimens were then divided in three groups, according to the materials used for class 5 restoration:-G1: Majesty ES Flow SuperLow (Kuraray)-G2: Majesty ES Flow Low (Kuraray)-G3: Clearfil Majesty ES-2 (Kuraray) All materials were applied following a horizontal layering technique, then finished and polished after curing. The presence of marginal gaps at enamel and dentin finish lines was evaluated before and after TC (10000 cycles between 5°C and 55°C) using OCT images. Five images of each restored tooth were obtained. Images were analyzed using ImageJ software that measured the entire length of the gaps at the enamel/dentin-restoration interface. The length of gaps (μm) was analyzed using two-way ANOVA and the Tukey tests.

Results: There was a significant interaction between materials and TC ($p=0.001$), and a significant difference among all material types ($p<0.0001$), before and after TC ($p<0.0001$). Increased marginal gaps at enamel and dentin finish lines were noticed after TC for all groups. Flowable composites seems to better seal margins than nanohybrid composites.

Conclusion: The initial null hypothesis is rejected since tested flowable resin composites, independently of their viscosity, showed less gap formation at enamel and dentin margin in a class 5 restoration than nanohybrid composites.

Keywords: flowable composites, nanohybrid composites, fifth-class restoration, thermal fatigue, enamel and dentine marginal sealing

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Influence of Blood Contamination on Surface Topography of Two Retrograde Tricalcium Silicate-based Cements

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Aim: The present study aimed to compaire the surface characteristics of two calcium silicate-based cements after retro-filling and placing in different environmental conditions with a non-contact 3D optical profilometer.

Materials and Methods: Thirty-two cylindrical cavities were prepared on resected root apices of freshly extracted human single-rooted teeth. The cavities were filled using ProRoot MTA or premixed MTA Neo-Putty and assigned to two subgroups (n=8) according to the setting conditions: wet and blood. All specimens were storage in an incubator at 37°C and 95% humidity for 28 days. Surface topographies were evaluated using an optical 3D profilometer (Zeta-20, Zeta Instruments, KLA, USA) at three different regions of interest of each specimen at three time points (1, 3 and 28 days), and the roughness of the material surfaces was quantified. Statistical analyses including Paired Samples Test, Wilcoxon Signed Ranks Test and Mann-Whitney Test were performed by IBM SPSS Statistics (25.0) at $p<0.05$.

Results: In wet condition, the roughness of ProRoot MTA increased after 3 days, but decreased after 28 days ($p<0.05$), whereas MTA Neo-Putty increased rapidly at every time point ($p<0.05$) showing the highest roughness after 28 days. In blood contamination, ProRoot MTA showed similar superficial roughness in day 1 and day 3, but significant increased change was detected in day 28 ($p<0.05$). While in the contrary, the MTA Neo-Putty presented constant surface level through time ($p>0.05$). The roughness of ProRoot MTA was higher in wet conditions up to 3 days compared with MTA Neo-Putty ($p<0.05$). Although, in

blood condition, MTA Neo-Putty showed higher roughness on the 28th day than ProRoot MTA ($p<0.05$).

Conclusion: Dry, wet, and blood conditions had a time-dependent effect on the surface topography of the materials affecting the accumulation of hydroxyapatite identified as increased roughness. The blood contamination decreased the surface roughness and concerned the setting reactions and mechanisms behind materials' bioactivity and biocompatibility.

Keywords: surface topography, blood contamination, 3d optical profilometry, tricalcium silicate-based cements, retrograde filling

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Radiographic Evaluation of Root Canal Filling by Students

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Aim: The aim of this study was to evaluate root canal fillings performed by students at the Institute of Odontostomatology of the Cheikh Anta Diop University in Dakar (UCAD).

Materials and Methods: This was a retrospective study. Retro alveolar check radiographs of root canal fillings performed by 4th and 5th year dental students of UCAD Institute of Dentistry and Stomatology during the academic years 2018- 2019 and 2019-2020 were searched in the patients' records. The informations were analyzed using SPSS (Statistical Package for Social sciences version 20.0). Descriptive analyses were used to express the frequencies of radiographic criteria of root canal filling quality. Pearson's Chi square text was used to investigate the relationship between the initial variables and root canal filling quality. The level of significance was set at $p\leq0.05$.

Results: Of the 167 teeth treated, 82% were made by students in their 5th year. The distribution of the treated teeth according to their location showed a predominance of maxillary teeth (56.3%). According to tooth type, molars were the most treated (47.3%). Two root canal filling techniques were identified, the 'fitted single cone' which is used in 70.1% of cases and 'cold lateral condensation' in 29.9% of the cases. The specific results showed an overall success rate of 16.76%. The success rates the limit of root canal filling was 37.1% and the density was 20.4%. All root canals were filled in 92.8% of the treatments performed. Regarding path errors, 94% of the teeth were free of errors, 4.8% had a perforation and 1.2% had an instrument fracture. Analytical results showed that tooth type and location had an influence on the quality of the root canal filling ($p\leq0.05$).

Conclusion: It appears from this study that the success rate of root canal fillings performed by students is low and that improvements need to be made in the endodontic curriculum.

Keywords: root canal treatment, root canal filing, students, dakar.

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3D CBCT Evaluation of Residual Root Canal Filling Material Volume

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Aim: To evaluate the volume of residual root canal filling material, after preparation of root canals, previously filled with hydraulic condensation and bioceramic sealer BioRoot RCS (Septodont, France).

Materials and Methods: Samples with length of 12 mm³ from the apex have been obtained by cutting off the coronal aspect of single rooted human extracted teeth (n=50). The root canals have been prepared and obturated with hydraulic condensation technique and bioceramic sealer with matching gutta-percha points (Pro Taper Gold System). After definitive setting of the endodontic sealer the samples are divided in 5 groups. In group 1 only Pro Taper Retreatment (PTR) files are used. In group 2 ultrasonic tips (Pro Ultra 6, 7, 8) are used in conjunction with PTR files. In group 3 the Self Adjusting File (SAF) is used in conjunction with PTR files. In group 4 after PTR files, chloroform is added during the preparation with SAF for one minute, and in group 5 - 40% citric acid (Cercamed) is used instead of chloroform. All the samples are scanned in 3D CBCT (Hyperion 9, MyRay) and Horos® software is used to measure the volume of the residual root filing material. Data is statistically analyzed with ANOVA and Pairwise Comparison Analysis.

Results: The volume of residual root filing material for group 1 is 4.87144 mm³, for group 2- 0.11139 mm³, for group 3- 2.18957 mm³, for group 4 – 0.92138 mm³, and for group 5 – 0.6755 mm³. Statistical differences are found between group 1 and group 2, as well as between group 2 and group 3 ($p<0.05$).

Conclusion: CBCT can be used to measure the volume and objectify the exact location of residual root filling material in previously obturated root canals.

Keywords: 3D CBCT evaluation, bioceramic sealer, hydraulic condensation, residual root canal filling material volume

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Layered Composite Lamina Veneers After Bleaching and Gingival Realignment with Diode Laser

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Aim: A 26-year-old female patient applied to our clinic. She received orthodontic treatment at the age of 18. Abfraction areas were noticed in teeth 11-21 due to incorrect contact. The patient complained of her tooth color and different gingival levels. The patient wanted an immediate solution. For this purpose, we planned tooth-bleaching, gingival reshaping, and composite veneers for the patient.

Case Description: Worn and broken areas of the dentition were covered with composite before bleaching. Office bleaching was performed with Phillips Zoom! whitening gel (Phillips Zoom, USA) containing 25% hydrogen peroxide for both jaws. Diode laser was used for gingivectomy procedures, and the Zenith points were reformed. After gingivectomy, three appointments of ozone therapy were applied to support the recovery. After mucosal healing, composite lamina veneers were applied by a layering method. To provide an aesthetics result, enamel, dentin and body shades of G-aenial anterior (GC, Japan) composite were used. The color used were BW, BOW, JE and A1.

Results: The discomfort caused by the irregularity of the gingival level disappeared with the arrangement of the Zenith points. Worn areas of the dentition and the diastema between the lower teeth were covered with composite lamina veneers. The color and shape differences between the upper canines was resolved. After the treatment the patient was recalled every 6 months.

Discussion: The patient had an oversized mandible with roots of her lower teeth close to the buccal side. The ideal treatment option should be orthognathic surgery, orthodontic therapy followed by porcelain lamina veneers. However, as the patient wanted an immediate treatment option, composite lamina veneers was applied.

Keywords: composite lamina veneers, gingivectomy, ozon therapy, smile design

Pub No: PP-048

Treatment of Poor Aesthetic Upper Central Incisor by Augmented Implant Suported Pfm & Zirconium

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Aim: To replace a periodontally affected and aesthetically poor upper central incisor and a broken upper central incisor in a male and a female patient by augmented blx roxolid sla active Struman implant supported porcelain fused to metal (pfm) and zirconium crowns.

Case Description: A 45-year-old male and a female patient of the same age suffered from poor aesthetic on upper central incisors due to localized periodontal disease and crown fracture respectively. After taking chief complains, making oral examinations and taking x-rays; a diagnosis and treatment plan was presented to the patients and get approved. A flap was raised, the teeth were extracted, and granulation tissues were removed. Blx Struman implants of proper diameter and lengths were implanted and a mixture of allogenic and xenogenic bone particles were put on and around the implants and were covered with jason botiss and medpark membranes respectively. Temporary abutments were fixed, and composite temporary crowns were placed for aesthetic purposes and the flaps were sutured. After a healing period of 3 months; porcelain fused to metal and zirconium crowns were placed over the implants after removing the temporary crowns.

Results: Excellent osseointegration of both implants was achieved and good gingival tissue healing was obtained around the implants. Strong stable crowns were achieved improving the aesthetic outcome of the treatment.

Discussion: Blx sla aktive and sla surfaced implants with accurate placement in the 3rd position together with maxgraft allogenic and cerabone xenogenic bone particles have successfully osseointegrated with the surrounding natural bone and supported the external soft tissue of gingiva and oral mucosa around the implants. Proper porcelain fused to metal and zirconium crowns contributed to improving the aesthetic and function of teeth and gingiva of these patients.

Keywords: augmentation, blx implants, crowns, p.f.m zirconium

Pub No: PP-049

Multiple Diastemas Closure with One-Shade Composite: A Case Report

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Aim: Maxillary anterior (MA) diastema is a common aesthetic complaint of many patients. The aim of this case report was the treatment of multiple diastema closure of anterior teeth with one-shade composite resin restorations (CRR).

Case Description: 35-year-old male patient applied to our clinic complaining about the unaesthetic appearance of his upper teeth. After clinical and radiological examination, direct CRR were planned for 6 MA teeth. A diagnostic wax-up model and a palatal silicone index (Elite HD+, Zhermack, Germany) was created. Under rubber-dam isolation, 37.5% Orthophosphoric-acid (Acid gel, Kerr) was applied to the surfaces of the unprepared enamel for 30 second, rinsed and dried. Then, a universal adhesive agent (BondForce-II, Tokuyama, Japan) was applied to surfaces and polymerized (VALO, Ultradent, USA) for 20 second. The teeth were restored with one-shade resin composite (Omnichroma, Tokuyama) according to manufacturer's instructions. Finishing and polishing were performed with discs (OptiDisc, Kerr, Germany) and polishing rubbers (Opti1Step, Kerr). The CRR were completed in a single visit. The patient was recalled after 1-, 3-, and 5-months. Restorations were evaluated according to the modified United States Public Health Services (mod-USPHS) criteria.

Results: According to the mod-USPHS criteria; color match, surface texture, anatomical form, marginal integrity, discoloration, secondary caries, gingival inflammation, and color stability were evaluated. The restorations with Omnichroma were scored as "alpha" for all the follow-up periods and for every criterion. In this case, patient satisfaction was achieved both aesthetically and functionally.

Discussion: Direct CRR may be performed in a single visit. The wax-up model provides an advantage for creating a midline and multiple diastemas. Composite resins applied in one-shade offers advantages to the clinician in terms of omitting the color selection step and eliminating the possible improper color match. One-shade composite resin maybe preferred as a restorative material in anterior aesthetic restorations.

Keywords: multiple diestama, direct resin restoration, one-shade composite resin

Pub No: PP-050

Aesthetic Rehabilitation of Anterior Teeth: A Case Report

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Aim: The aim of this case report is to report an aesthetic rehabilitation of anterior teeth with composite lamina and resin infiltration method.

Case Description: A 22-year-old female patient was admitted to our clinic due to the misposition of her lateral incisor and white spot lesions on her teeth. In the intraoral examination, it was seen that the teeth were healthy, after treatment options were explained to the patient, composite restoration was planned for tooth number-12 and treatment with the resin infiltration method, which is a tissue-friendly treatment technique, without restorative treatment for white spot lesions. A gingivectomy was planned for #12 in order to provide a better aesthetic in the patient. 2 weeks after the gingivectomy operation, the patient was called again and isolation was achieved with a rubber dam. After etching (Ruby Etch, Turkey) and bonding (Clearfil SE Bond, Kuraray, Japan) procedures were undertaken, and composite resin (Neo Spectra ST, Germany) was applied to #12. It was applied as a lamina and polishing was completed with polishing discs (Zenit flex, Germany). Then, Icon resin infiltration (DMG, Germany), a minimally invasive treatment option, was applied to number-13-21-22-23. A 15% HCl acid gel (Icon-Etch) was applied on the lesion. To the dry lesion area, ethanol (Icon-Dry) was applied for 30 seconds, then the tooth surface was dried and Icon resin was applied. Control sessions of the patient were planned.

Results: The tooth could be in a suitable position with the composite resin restoration, without any material loss. The opaque appearance of the lesions treated with the resin infiltration, and aesthetic appearance of the patient was satisfactory.

Discussion: In such cases, the patient should be treated with the most conservative methods possible in order to resolve the aesthetic and functional problems and regain psychosocial confidence.

Keywords: composite resin, resin infiltration, white spot lesion

Pub No: PP-051

Indirect Conservative Treatment of Teeth with Excessive Tissue Loss

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Aim: This case presents the treatment of tooth 16 which has excessive tissue loss and an indirect restoration produced with nanohybrid resin composite CAD/CAM block (Lava™□ Ultimate, 3M™□ ESPE, Germany) in a single appointment.

Case Description: An 18 year old male patient was admitted to our clinic with complaints of food impaction, related pain. Tooth 16 had a large composite filling, discoloration, an irregular wall. The old filling and unsupported tooth tissue were removed. Immediate dentin sealing (IDS) and cervical margin relocation (CMR) were performed with a cross-sectional matrix and flowable composite (Filtek Supreme, 3M™ ESPE, Germany). After preparation digital measurement was taken by Cerec Primescan (Dentsply Sirona, USA). The design and manufacturing stage was made with the same device. The restoration was checked for location and suitability. Since the patient had nausea reflex, rubber dam was not applied. A retraction cord was applied to the tooth. Teflon tape was applied to the adjacent teeth. A 6th generation self-etch bonding system (Clearfil SE, Kuraray, Japan) was applied as manufacturer's instructions and light cured 20 seconds with LED curing light (3M™ Elipar™, Germany). Inner surface of restoration, which was sandblasted with 30 μm silica-coated Al_2O_3 particles in dental laboratory, was cleaned with alcohol and dried. Then silane (Ultradent, USA) was applied for 60 seconds. The luting cement (RelyX Ultimate, 3M ESPE) was applied to both surfaces. The overlay was adapted to the tooth. It was pressed from the occlusal surface. The excess cement residues were cleaned with sharp explorer and dental floss. Each surfaces were light-cured for 20 seconds. Occlusion control, polishing was completed.

Results: As a result of the indirect restoration produced by CAD/CAM, the patient had a compatible restoration in a short time.

Discussion: CAD/CAM may be a good alternative for both the dentists and laboratories. Restorations can be delivered to the patient in one visit.

Keywords: digital measurement, CAD/CAM, indirect composite

Pub No: PP-052

Oral Rehabilitation of a Teenager with Minimum Intervention Concept: A Case Report

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Aim: The aim of this case report was to describe a complete oral rehabilitation by minimum intervention concept of a teenager having high risk caries, with a complaint for enamel-dentin fracture at upper right first anterior tooth.

Case Description: Fourteen years old female patient who suffered an enamel-dentin fracture of the right maxillary central incisor applied to our clinic with the fractured segment stored in milk. Clinical examination of the patient who has open bite was carried out as described below: •DMFT •Lesion severity •Caries activity •Salivary flow rate and buffer capacity •Plaque and gingival index •Individual caries risk assessment using CAMBRA Whereas the radiographic evaluation was carried out with bitewing and periapical X ray. Oral rehabilitation of the patient was managed with minimum intervention concept.Accordingly, •Fractured segment was reattached via flowable composite following to selective etching plus universal adhesive procedure as an aesthetic approach, •Oral hygiene training, plus Tooth Mousse application daily as non-invasive technique, • Resin infiltration technique for mesial and distal surfaces of the tooth #34, 35 and mesial surface of 36 as micro-invasive technique,•Application of fissure sealant via fissurotomy to #17, 27, 37, 47, •Resin composite for dentin caries of #15-12-11, 25, 26, 36, 16, 32, 31, 41, 42 as minimally invasive technique.

Results: At baseline examination, the patient was of high caries risk level. DMFT score was 19. All lesions were active with different

lesion severity. Bleeding on probing was the sign of gingivitis. Average plaque score was 2 with moderate accumulation in sulcus. After a month, oral status of the patient progressively improved. Reattached segment successfully survived.

Discussion: It was concluded that oral rehabilitation with minimum intervention treatment concept of the teenager having high caries risk status was considered as comprehensive and promising method.

Keywords: oral rehabilitation, minimum intervention concept, enamel-dentin fracture, caries risk assessment, minimal invasive treathment

Pub No: PP-053

Minimally Invasive Treatment and Esthetic Rehabilitation of a Severely Carious Dentition of a Teenager

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Aim: This case reports depicts a minimally invasive treatment of a severely carious dentition of a 17-year-old patient with focus on both non-invasive and restorative aspects.

Case Description: After diagnostics at initial presentation, the patient was transferred to a hygiene phase and underwent a total of three professional dental cleanings with oral hygiene instructions. In a restorative phase, all posterior teeth with the diagnosis Caries progressiva profunda et media were treated minimally invasively with composite restorations while all teeth with the diagnosis Caries progressiva superficialis were treated with non-invasive measures such as a fluoride varnish and biofilm control. The maxillary front teeth were restored with composite cores after measures to maintain the vitality of teeth 21 and 22 (direct pulp capping). The restorative treatment of the maxillary front teeth was designed in a backward planning strategy. Hence, a mock-up was prepared after model analysis. The mock-up was used for planning and patient communication as well as the fabrication of provisional crowns. Subsequently, teeth 13-23 were prepared for crowns consisting of zirconium oxide frameworks with glass ceramic veneering. The raw firing was tried in before final completion of the crowns and subsequently delivered.

Results: All non-cavitated carious lesions could be successfully arrested with non-invasive measures. Cavitated caries lesions were treated minimally invasively with composite restorations. Due to the extensive tissue loss and the desired esthetic improvement the maxillary front was restored with crowns. Regular follow-ups for 2 years showed no caries progression or restoration failures.

Discussion: The presented case depicts the importance of patient compliance to ensure successful management of carious lesions on the basis of minimal intervention treatment strategies aiming to (1) avoid initiation of the restorative cycle and (2) to ensure the longevity of minimally invasively placed restorations.

Keywords: minimally invasive treatment, esthetic rehabilitation, minimal intervention, restorative dentistry

Pub No: PP-054

Direct Composite Resin Rehabilitation of Anterior Teeth with Diastema and Caries: Case Report

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Aim: To present a patient with polydiastema and caries in gingival margin areas; to convey the procedure steps and shortly follow-up the direct composite resin veneer restorations performed with a minimally invasive technique.

Case Description: A systemically healthy 29-year-old male patient applied to our clinic complaining about the appearance of his anterior teeth. As a result of clinical examinations, it was determined that the patient had extensive caries in the diastema between the teeth number 11, 12, 21 and caries in the gingival margin areas of the teeth number 13 and 23. Due to the patient's rapid aesthetic expectation, it was decided to perform diastemas directly with a hands-on technique in a single session. After the color selection was made, isolation was achieved. 37% phosphoric acid gel (Ruby Etch, Istanbul, Turkey) was applied to the enamel surfaces for 30 seconds. After acid washing and surface drying, a self-etch adhesive system (Clearfil SE Bond, Kuraray, Japan) was applied to the tooth surfaces and cured with light (VALO Cordless LED, Ultradent, USA) for 10 seconds. A transparent matrix system was used to create the palatal and proximal profiles of the restorations, respectively. For enamel and dentin replacements, 'A2' color of Estelite Sigma Quick (Tokuyama Dental, Japan) and 'A2' color of Filtek Z550 (3M, USA) composite resins were used with a layering technique. Polishing discs (RubyPlaton, Istanbul, Turkey) and polishing rubbers were used for finishing and polishing.

Results: As a result of the initial and 6-month clinical follow-up, it was observed that aesthetic restorations were obtained in terms of color and anatomical form, compatible with the surrounding natural tooth structure.

Discussion: Recently, diastema closure with direct composite resins is a clinically proven treatment procedure. Preparation-free restoration of teeth with direct composite veneers may be preferred to prosthetic treatment, especially in young patients.

Keywords: aesthetics, polydiastema, direct adhesive technique

Pub No: PP-055

Treatment of Molar-Incisor Hypomineralization with Porcelain and Composite Veneers: A Case Report with Two Years Follow-Up

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Aim: Molar incisor hypomineralization (MIH) is defined as a demarcated and qualitative enamel defect of systemic origin that affects one or more permanent molars and permanent anterior teeth in severe cases. This case report aimed to present the esthetic and functional rehabilitation of maxillary and mandibular anterior teeth affected by severe MIH in an adolescent patient using porcelain and direct composite veneers for the restoration.

Case Description: A 17-year-old female patient with enamel defects on maxillary and mandibular anterior teeth, complaining about sensitivity and esthetics, was referred to the Restorative Department. After dental, medical, intraoral, and radiographic evaluations, it was revealed that the patient had severe MIH. After discussing the level of defects, patient's age, socioeconomic status, and patient expectations, porcelain veneers for maxillary and direct composite veneers for mandibular anterior teeth were planned. After initial periodontal treatment and surgical crown lengthening, porcelain laminate veneers (Panavia V5; Kuraray, IPS E-max; Ivoclar) on maxillary anterior teeth and direct composite veneers (Clearfil SE Bond 2; Kuraray; Filtek Ultimate, 3M ESPE) on mandibular anterior teeth were placed. In addition, oral hygiene education was given to the patient, and follow-up examinations were planned for 6, 12, and 24 months.

Results: All the porcelain and direct composite veneer restorations were evaluated as clinically acceptable during the 6, 12 and 24 months follow-up examinations. No debonding, chipping, or fractures were evident; however oral hygiene and patient motivation was decreased on the 24-month evaluation. Gingival inflammation and discoloration of direct composite veneers were evident.

Discussion: Along with the improvement in adhesive dentistry and restorative materials, minimally invasive treatment options such as porcelain or direct composite veneers in severely MIH-affected anterior teeth became a valid treatment option. However, as the individuals with MIH have been shown to have more treatment episodes and increased behavior management problems, short follow-up appointments should be planned.

Keywords: molar incisor hypomineralization, porcelain veneers, direct composite veneers, MIH

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Aesthetic Management After Anterior Dental Trauma: A Case Report

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Aim: This clinical case presents a treatment of trauma-induced avulsion, enamel-dentin fractures and anterior diastemas with composite resins in a patient.

Case Description: A 19-year-old female patient presented to our clinic due to her trauma-induced fractured maxillary teeth and central tooth loss. On the clinical examination, the fractured teeth were found healthy. Treatment options were discussed with the patient. Implant treatment of #21 was decided, and until the alveolar socket healing, it was planned to restore that space with a composite resin as a pontic. Firstly, the piece of cracked tooth number-22 was removed. Then it was restored with resin-modified glass-ionomer cement (Riva Light-Cure HV, SDI, Australia). Etching (RubyEtch, Ruby Dent, Turkey) and bonding (Clearfil SE Bond, Kuraray, Japan) procedures were undertaken, #11 and #22 were restored with nanofilled composite resin (Filtek Ultimate, 3M ESPE, USA). An impression, a cast and diagnostic waxing were developed, a silicon index and for the missing tooth, a pontic were fabricated (Filtek Ultimate). At the follow-up session, palatal walls were formed using the silicon index, and diastemas were closed (Filtek Ultimate) under a rubber dam (OptraDam Plus, Ivoclar Vivadent, Liechtenstein). After the rubber dam removal, the ribbon (U.P. Fiber Splint, INOD, Korea) was prepared for bonding by first wetting it with a bonding agent (Clearfil SE Bond) and was bonded with additional composite resin to the palatal surfaces of #11, #22 and the pontic. Occlusion was checked, then finishing and polishing were done by using polishing discs (Ruby-Platon, Ruby Dent, Turkey). Control appointments are scheduled.

Results: The aesthetic response was noticeable to the patient's satisfaction. A follow-up examination is not done yet.

Discussion: The fixed anterior fiber-reinforced composite resin bridge suggests an alternative treatment option for the temporary replacement of a missing anterior tooth. And direct composites are suitable options for restoring diastemas and fractured teeth.

Keywords: avulsion, diastema, fractured teeth, resin bridge, ribbond

Pub No: PP-057

Aesthetic Rehabilitation of Anterior Crown Fracture with Transparent Strip Crown

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Aim: This case report represents the treatment of traumatically fractured right maxillary central tooth by direct resin restoration which is performed with a transparent fabricated strip crown.

Case Description: A 15-year-old patient with fractured upper right cental tooth applied to our clinic (Istanbul University Department of Restorative Dentistry). After decision of direct composite rehabilitation for treatment, the matching strip crown (TDV Dental, Brasil) was selected. The incisal edge of the tooth no 11 (FDI) was prepared and beveled. Then 37% phosphoric acid (Scotchbond Acid, 3M ESPE) was applied for 30 seconds. The 8th generation universal bond adhesive system (Scotchbond Universal Bond, 3M ESPE) was applied following the manufacturer's instructions. A small hole was made in the incisal edge of the preselected strip crown. The restoration was performed by applying A2 shade both injectable and nano-hybrid composite resin (Filtek Ultimate, 3M Espe), and light cured (3M Elipar, Germany). After removing the strip crown, final shaping and polishing procedures were carried out with fine-grained diamond burs and aluminium-coated discs. (Sof-Lex, 3M ESPE).

Results: Restorative treatment was applied in one session with direct resin composite. Using prefabricated strip crowns rather than free-hand resin restorations provides the dentist with an ideal tooth shape immediately and shortens chair-time during treatment.

Discussion: Type of fracture is an important factor to determine the treatment plan in dental trauma patients. In appropriate cases, direct composite resin application is more economic, effective, conservative and quick treatment option than prosthetic restorations for crown fracture. The fracture line can be hidden well with the help of bevel

preparation and right choice of composite material. The practitioner shuold follow-up the case for longevity of restorations.

Keywords: fracture, direct composite, resin restoration, strip crown

Pub No: PP-058

Class IV Composite Restorations of Central Incisors: One-Shade vs Multishade, Case Series

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Aim: Fractures or deformities are common in central incisors. The aim of this case series was to compare and evaluate incisal/class IV restorations using 3 different composites: OptiShade (Kerr), Amaris (Voco), and Ceram-X Duo (Dentpsly-Sirona).

Case Description: 3 patients with the complaint of fractures on their anterior teeth were applied to the clinics of Restorative Dentistry Department (Case1 18-year-old female, Case 2 20-year-old female, and Case 3 17-year-old male). Following radiographic and clinical examinations, enamel fracture was detected in the incisal 1/3 of the central incisors and it was decided to perform direct composite resin restorations (CRR) as the treatment plan. 37% orthophosphoric acid (Kerr) was used in selective-etch mode. 3 different universal adhesive agents (OptiBond Universal, Kerr; Futurabond U, Voco; and Prime&Bond Universal, Dentsply-Sirona) were applied to the cavities according to manufacturer's instructions. CRRs were completed with nano-hybrid (Amaris TL and D2, Voco), one-shade (OptiShade Light and Medium, Kerr), and ceramic reinforced (Ceram-X Duo D2 and E1, Denstply-Sirona) composites using incremental technique. Valo-Cordless (Ultradent) was used for polimerisation with 1000 mW/cm². Finishing and polishing procedures were performed with polishing discs (Bisco) and Twist Dia (Kuraray) polishing wheels. Patients were recalled at 1 and 3-month for clinical evaluation and scores according to FDI criteria.

Results: The esthetic, functional and biological evaluation of the restorations according to the FDI criteria in 1 and 3-months follow-up were scored as 1.

Discussion: One shade universal composites provide advantage in color selection for the clinician, however composites with different contents and brands vary in opacity, color, and brightness. Considering the esthetic expectation of the patients and the longevity of class IV CRR, the material should be selected considering the shape, color and fracture line of the tooth structure and the optic properties of the material.

Keywords: one-shade composit resins, incremental technique, class IV restoration

Pub No: PP-059

Conservative Treatment of Endodontically Treated Teeth with Indirect Composite Resin Restorations: Case Series

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Aim: Onlays and overlays have been proposed for restoring root filled teeth. The fabrication of indirect ceramic or resin composite overlays (CO) may permit greater control over occlusal and proximal contacts and reduce the negative effect of polymerization shrinkage when compared to direct restorations. In this case series we aimed to evaluate the clinical effectiveness of CO in posterior teeth with excessive tooth structure loss after endodontic treatment.

Case Description: Five molar and one premolar teeth of six patients who admitted to our clinic after completion of endodontic treatment, CO were planned for the restoration of them. After cavity preparations, CO were fabricated using laboratory composite (SR Nexco, Ivoclar Vivadent). Post-cure polymerization was completed by using light, under the pressure and heat, CO surface was roughened with 9.5% hydrofluoric-acid (Porcelain Etchant, Bisco). Enamel and dentin surfaces were conditioned with 37% orthophosphoric acid (Vococid, Voco). Adhesive (G2-Bond Universal, GC) was applied and light-cured on the tooth then silane (Silane Primer, Kerr) and G2-Bond were applied on the internal aspect of CO. Restorations were cemented with self-adhesive resin (G-CEM LinkAce, GC), cured by LED (Valo, Ultradent) for 40sec for each side and completed after polishing with Enhance PoGo (Dentsply). Composite overlays were recalled after 1 week 1, 3 months and scored according to FDI with using five-step grades.

Results: No aesthetic or functional complaints were detected in the patients who were called for 1 week, 1 month and 3 month controls. In the clinical and radiographic evaluation, it was observed that CO restorations were scored as 1 according to FDI criterias in terms of functional, biological and aesthetic properties.

Discussion: Ceramic and composite inlay/onlay and overlays are often a conservative solution for excessive tooth structure loss. Compared to ceramic materials, indirect resin composites exhibit better stress distribution, repairability, lower cost and ease of handling.

Keywords: ındirect composites, overlay, conservative dentistry

Pub No: PP-060

Direct Composite Resin Restoration of Peg Shaped Maxillary Lateral Incisors

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Aim: Peg lateral is a type of microdontia that describes the lateral incisors as being smaller than normal and conical in shape. It is frequently seen in maxillary lateral teeth. In this case, it was aimed to treat the deformity of the upper two peg lateral incisors with minimally invasive direct resin restoration, in one session, with freehand technique.

Case Description: A 34-year-old female patient without systemic disease applied to our clinic with a complaint about the aesthetic appearance of her upper incisors. After clinical and radiographic examination, it was determined that the teeth were periodontally healthy, there was sufficient distance in the lateral and occlusal contacts, and it was decided to improve the aesthetic appearance of the upper lateral teeth with direct adhesive resin restoration. Color selection was made with the button method. After being isolated with a rubber dam, lateral teeth were etched with 37% phosphoric acid gel (Imicryl Panora 200, Turkiye) for 15 seconds, washed 10

seconds with water, air-dried. Then the adhesive resin (Heraeus Kulzer Gluma Bond, Germany) was applied according to the manufacturer's instructions and polymerized with a LED light device. Composite resin (Heraeus Kulzer Charisma Smart, Germany) in the color of A2, in the gingival and middle third of the lateral teeth and in the color of A1, in the incisal third was applied in 2mm layers, and each layer was polymerized with LED light device. The restoration was polished by using 3M ESPE Sof-Lex extra thin polishing discs, 3M ESPE Sof-Lex Spiral Disc, Shofu Super Snap Buff MiniDiscs.

Results: After 3 months of follow-up, the restorations were evaluated according to the modified USPHS criteria and scored as alpha and were found clinically acceptable

Discussion: Advances in adhesive materials have made it possible to make aesthetic and functional restorations in a single session while preserving the natural tooth tissue.

Keywords: adhesive resin, peg lateral, direct restoration

Pub No: PP-061

Esthetic Rehabilitation of Anterior Teeth with Amelogenesis Imperfecta: A Case Report

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Aim: Amelogenesis Imperfecta is a genetic disorder that causes defective enamel development in both the primary and the permanent dentitions. The aim of this case report was to conservatively treat an amelogenesis imperfecta patient who applied to our clinic with esthetic complaints.

Case Description: A 20-year-old male patient was referred to our clinic complaining about the esthetic problems of his anterior teeth. After clinical and radiological examinations, he was diagnosed having amelogenesis imperfecta and caries on his teeth. After discussion, it was decided to restore his dentition in a minimally invasive way with a direct technique and resin composites. As a first step, the resin composite shade was determined with a button try-in technique. All the caries lesions were removed under rubber dam isolation and restored with a resin composite. The teeth were then prepared for resin composite veneers in a minimally invasive way and a 35% orthophosphoric acid (3M Scotchbond Etchant; 3M ESPE, USA) was applied on the teeth for 30 seconds, rinsed, dried and a universal adhesive agent (Clearfil Universal Bond Quick, Kuraray, Japan) was applied according to manufacturer's instructions. The teeth were restored using Clearfil Majesty ES-2 (A2 shade, Kuraray, Japan) with the help of OptraSculpt Pad (Ivoclar, Liechtenstein), a sable seek brush and a Modeling Liquid (GC, Japan). The finishing procedures were completed using Sof-Lex discs (3M ESPE) and polishing with Twist Dia wheels (Noritake, Japan).

Results: At the end of the treatment, with the help of direct resin composite restorations, it was possible to achieve a satisfactory esthetic outcome.

Discussion: Direct resin composite restorations were found to be a conservative and esthetic treatment option for patients who suffer from amelogenesis imperfecta.

Keywords: amelogenesis imperfecta, resin composite, esthetic rehabilitation, minimally invasive

Pub No: PP-062

Esthetic Rehabilitation of Maxillary Anterior Teeth Following Orthodontic Treatment - Two Case Reports

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Aim: These case reports describe the management of twin patients with multiple diastemas, peg-shaped lateral incisors and gingival asymmetries in the maxillary anterior area.

Case Description: 21-year-old twin female patients (D.C.&T.C) attended to our clinic because of the diastemas of maxillary anterior teeth after orthodontic treatment. Clinical and radiological evaluations revealed that the teeth were vital and the surrounding tissues were healthy. Firstly, gingivectomy was decided in both cases and patients were treated by a 940 nm diode laser (Diode Epic, BioLase, California, USA) in pulsed mode with a E3 fiber tip at 1,8 W power. After a 2-week recovery period, the cases of diastema closure (D.C) and peg-shaped lateral incisors shaping (T.C) procedures were performed. After the shade selection was made with the button technique, the teeth were isolated with a rubber dam and no preparations were performed. G2-Bond Universal (GC, Tokyo, Japan) was preferred as the adhesive agent with prior phosphoric acid application. Universal composite resin (G-aenial ACHORD, A1, GC Corp.) was used for diastema closure and peg-shaped lateral incisor shaping, and polymerized with a LED device (Radii Plus, SDI) for 20 s. The restorations were then evaluated for occlusal interferences and lateral movements. After obtaining the macro and micro surface morphologies on the buccal surfaces, the restorations were polished with polishing disks (OptiDisc, Kerr, ABD), silicone rubber polishers (HiLuster; Kerr Corp, Orange, CA) and polishing strips (GC Epitex strips). The patients were motivated for oral hygiene and informed for recalls.

Results: After the restorative procedures, the patients were satisfied with the appearances. At the 1-month recall, no discolorations or chipping were detected on the restorations.

Discussion: The use of conservative direct resin bonding, such as proximal build-ups and recontouring of tooth shape provided the symmetrical and harmonious arrangement of the teeth, while at the same time, it is a conservative approach for younger patients who have completed orthodontic treatment.

Keywords: diestema closure, peg-shaped lateral incisor, esthetic rehabilitation, gingivectomy, diode laser

Pub No: PP-063

Esthetic Rehabilitation of Sunflower Seed Abrasions and Diastemas Using Bleaching and Resin Composites

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Aim: A 50-year-old male patient applied to Ege University School of Dentistry in January 2022 with aesthetic complaints from his anterior

teeth. He wanted to obtain more whiter and esthetically aligned teeth with minimum tooth tissue loss.

Case Description: In the intraoral examination, dry sunflower seed abrasion on teeth 11 and 31, diastemas between central incisors and polydiastemas between the lower incisors were observed. Abfraction lesions on teeth 13–14-34-44-45 were also detected. In addition, external discoloration on all the jaws was noticed due to patients' poor oral hygiene. On radiographic examination, a slight loss of alveolar bone was perceived, and no other significant pathological formations were observed. It was planned to treat the patient's esthetic concerns with a minimally invasive approach by performing a vital bleaching treatment followed by resin composite restorations. In line with the treatment plan, the patient received two office bleaching sessions (Bio-Whiten Office Bleaching, Turkey). Two weeks later, resin composite color selection was performed with a button try-in technique with a nanohybrid CeramX SphereTEC One (Dentsply Sirona, USA) material. To find the right color, dentine color was chosen in the cervical third and enamel color in the middle third. Cervical and dentine color was A3 and enamel color was A2. Restorations were completed using an Etch&Rinse approach with an adhesive system (Prime&Bond, Dentsply Sirona, USA) with the help of sectional contoured matrix bands under rubber-dam isolation. Extra fine diamond burs, finishing discs and polishing paste was used for the finishing and polishing procedures.

Results: In this case report, it was seen that resin composites protect the dental tissues at the very highest level and allow the esthetic restorations of the teeth in a single appointment.

Discussion: After 3 months, the patient was still very satisfied with the outcome of the treatment and quit his bad habit of eating sunflower seeds.

Keywords: abrasion, resin composite, esthetic rehabilitation, polydiastema

Pub No: PP-064

Esthetic Smile Rehabilitation with Minimally Invasive Methods: A Case Report

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Aim: The harmony between white and properly aligned teeth and healthy periodontal tissues plays an important role in smile esthetics. The purpose of this case report was to present an esthetic smile rehabilitation of a male patient who was not satisfied with the diestemas in his anterior teeth and the shape of the gingiva with minimally invasive methods.

Case Description: A 25-year-old male patient referred to Hacettepe University, Faculty of Dentistry with the complaint of diestemas in his maxillary anterior teeth. After clinical and radiographic examination, the patient received dental prophylaxis and oral hygiene instructions one week before treatment. Gingivectomy, crown lengthening and gingivoplasty were performed using a Diode laser (Biolase X, Corona, USA). The healing of the soft tissues was evaluated after 2 weeks. Following full recovery of the soft tissues, the teeth were isolated with a rubber-dam and reshaped with a single color universal composite resin in A1 shade (G-aenial A'CHORD, GC, Tokyo, Japan) using a modeling liquid moistened sable brush after application of a universal adhesive (G2-Bond Universal, GC) in etch & rinse mode. Restorations were finished and polished using a series of discs (Sof-lex 3M, Minnesota, USA), and rubber cones (Enhance PoGo (Dentsply, York, USA), tapered diamond bur (FG 314,858) and Clearfil Twist Dia (Kuraray, Tokyo, Japan). Finishing and polishing strips (Epitex, GC) were used for interproximal surfaces. Restorations and periodontal tissues were evaluated 1 week, 1 and 6 months after placement.

Results: The esthetic expectation of the patient for the the maxillary anterior teeth was successfully achieved. At the end of 6 months, fracture or discolorations were not observed in the restorations and periodontal tissues seemed to be healty.

Discussion: Diastemas and gingival smile can be successfully rehabilitated with the right methods and materials through the minimally invasive approach.

Keywords: smile design, gingivoplasty, laser, direct composite resin, aesthetic rehabilitation

Pub No: PP-065

Functional Rehabilitation of an Upper First Molar with IPS E-Max Overlay: A Case Report

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Aim: Esthetic restoration is a prime concern for everyone in today's world. Dentists are in search of a new range of conservative, durable, and tooth-colored restorative options. Various types of ceramic material are currently available, among which IPS e-max has recently gained much attention due to its high strength and excellent aesthetics. Herewith, we would like to report the results of a case treated with IPS e-max Press indirect overlay restoration.

Case Description: A 30-year-old male patient came to the Department of Restorative Dentistry, the University of Gazi to seek treatment for incompatible composite restoration in 26, with no pain and sensitivity in the tooth. The patient was interested in esthetical durable restoration and after receiving patient consent it was decided that indirect ceramic overlay would be used as restoration. Cavity preparation was performed according to principles. After cavity preparation, impressions were made and sent to the laboratory, where IPS e-max overlay was prepared. In the laboratory, dye cut was prepared and ceramic Overlay was prepared with Ivoclar Programat EP 3010 firing and pressing furnace. After preparation, the restoration was etched, silanized, andcemented with GC FujiCEM Evolve Resin-reinforced Glass Ionomer Cement (GC, JAPAN).

Results: The patient is comfortable with restoration. All ceramic overlays demonstrated promising results of esthetic, marginal adaptation for medium to large size carious lesions. They indicate adequate marginal adaptation and function of restoration. The limited data illustrate that they yield a generally comparable survival outcome. While the longevity of ceramic overlays appears to be similar to their composite alternatives and has the advantage of being more color stable.

Discussion: All ceramic overlays provide long-term occlusal stability, which resin composite may not provide in a cuspal-coverage restoration. The stronger bond of resin cement to porcelain is particularly important when cusps are covered. For these reasons, when even one

cusp of a posterior tooth is being covered with esthetic bonded Overlay, the ceramic overlay is preferred.

Keywords: overlay, all ceramic, ips e-max press

Pub No: PP-066

Midline Diastema Closure and Aesthetic Rehabilitation of Incisors: A Case Report

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Aim: Recently, diastema closure with direct composite resin restoration has become one of the most popular treatment options to satisfy patient's esthetic expectations. In this case report, we applied direct composite resin using free-hand technique to maxillary central and lateral incisors to close diastema and correct the tooth size discrepancy

Case Description: A 42-year old female patient was admitted to our clinic with an esthetic complaint about upper anterior teeth. After intraoral and radiographic examination, the midline diastema was detected on the mesial surface of the teeth 11 and 21, also disproportion between 12,11,21,22. After treatment options were offered to the patient, we decided to apply direct resin restoration in a single visit. First, color selection was performed and a rubber dam was applied. Teeth were etched with 37% orthophosphoric acid gel (Actino gel, Prevest DenPro) for 30 seconds. The acid was washed well and gently air-dried. Then, the seventh generation bonding system (Bond Force II, Tokuyama Corp) was applied and light cured for 20 seconds. A thin layer of flowable composite was used to form palatal shell and then supra-nano spherical filled A1 and A2 composite (Palfique Estelite Paste, Tokuyama Corp) resins were placed incrementally. Finishing and polishing procedures were achieved by using yellow and red banded knife-edge tip diamond bur and polishing discs (Sof-Lex, 3M ESPE).

Results: In diastema closure and build-up cases, direct resin restorations using free-hand technique can be applied in single visit as an economical and minimal invasive treatment option with satisfying results.

Discussion: Prior mission of dental practitioner should be solving problem of patient with minimal invasive treatment approach. Direct composite resin restorations are the most conservative treatment option for healthy tissue with excellent esthetic and functional results. It is important to follow up composite restorations regularly to bring under control the problems early such as microleakage and discoloration.

Keywords: diastema closure, direct resin restoration, composite restoration

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Minimally Invasive Aesthetic and OVD Rehabilitation in a Patient with Multiple Dental Anomalies

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Aim: Aesthetic rehabilitation of diastemas and malformed teeth using direct adhesive methods has become a frequently preferred minimally invasive treatment method. The composite resins can also be used for altering the occlusal vertical dimension (OVD). This case report describes the post-orthodontic rehabilitation of OVD and anterior aesthetics with direct composite resin restorations in a patient with multiple dental anomalies.

Case Description: A 25-year-old female patient was referred to our department for aesthetic rehabilitation after 2.5 years of orthodontic treatment. The patient presented with bilateral deficiency of lateral incisors, microdontia and polydiastemas. She was also suffering from deep-bite and TME pain. After careful examination, a stepwise treatment plan was established for the rehabilitation of OVD and anterior aesthetic. The OVD was planned to be increased by 3 mm. For this purpose, temporary restorations were placed and the patient was followed-up weekly upto 1 month for monitoring the adaptation to the new OVD and the course of TME pain. As satisfactory progress was achived; the permanent prepless occlusal veneer restorations were directly applied to the upper posterior teeth with a micro-hybrid posterior composite (Gradia Direct Posterior & Solare Universal Bond/GC). One week after, the patient was re-evaluated and anterior aesthetic smile design was performed digitally. On the following session, anterior aesthetic rehabilitation was accomplished for reshaping the malformed teeth and diastema closure with direct composite veneers (G-anial A1-JE & Solare UniversalBond/GC) The patient was evaluated at 1 week, 1-3 months and follow-ups were planned.

Results: After 3 months evaluation period, all the restorations were clinically very good according to FDI criteria and the patient was fully satisfied.

Discussion: Direct adhesive composite resin restorations offer satisfactory results for both patients and dentists, in the rehabilitation of OVD and numerious aesthetic problems, by keeping the advantage of being more tissue friendly, maintainable, cost-effective and less time consuming than the other alternatives.

Keywords: occlusal vertical dimension, direct composite resin, dental anomalies, anterior aesthetic rehabilitation, smile design

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Re-Attachment of a Fractured Maxillary Incisor Tooth

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Aim: When a fractured teeth fragment is recovered by a patient and brought to the dental office within a reasonable time, the fragments can be conservatively reattached to the remaining tooth structure. The re-attachment of a tooth fragment is a simple, long-lasting, esthetic and minimally invasive way of esthetic rehabilitation for traumatized teeth. This case report describes the re-attachment of a tooth fragment on the upper right central incisor with a flowable resin composite.

Case Description: A 53-year-old female patient with an uncomplicated crown fracture on her right maxillary central incisor was referred to our department. She told us that she kept the tooth fragment in cold milk for 14 hours before coming to us. At the intraoral examination, it was noticed that the coronal fracture was supragingival, involving only enamel and dentin. No abnormal mobility of the injured tooth was observed, and the periodontal tissues were healthy. The fractured fragment had an excellent adaptation to the tooth. After cleaning of the fragment with 2% chlorhexidine digluconate, the tooth remnant and the fragment were etched with 35% orthophosphoric acid (3M Scotchbond Etchant; 3M ESPE, USA) for 30 seconds, rinsed and air-dried. Then, a

universal adhesive system (G-Premio BOND, GC, Japan) was applied over the fragment and the tooth and light cured. A flowable composite resin (A2, Premise, Kerr, Germany) was applied over the fragment and the tooth, the fragment was positioned accurately and then photopolymerized for 20 seconds from the labial and the palatal sides. The bonded parts were finished with Sof-Lex discs (3M ESPE) and polished with wheels (Twist Dia, Noritake, Japan).

Results: At the 2-month recall, the patient was still very happy with the outcome of the treatment.

Discussion: The adaptation of a tooth fragment to its original position through dental bonding is considered an excellent approach in the treatment of coronal fractures.

Keywords: dental trauma, crown fracture, fragment re-attachment, bonding

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Resin Infiltration Technique for Traumatic Hypomineralization: A Case Report

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Aim: Minimal invasive dentistry is defined as maximum preservation of healthy dental structures with the respect of original tissues. The aim of the case report was to overcome the aesthetic concern of traumatic hypomineralization by using a minimal invasive treatment with the resin infiltration technique.

Case Description: A 20-year old patient applied the clinic for the complain of white opacities on her maxillary anterior teeth. Following the clinical and radiological examination, hypomineralization lesions identified on the buccal surface of her maxillary central incisors and canines. After rubber dam isolation, teeth surfaces were cleaned with pumice and the resin infiltration technique (Icon, DMG) was applied as follows: (1) 15% HCl gel applied for 2min and washed with water spray for 30s and air dried. (2) Ethanol applied for 30s to remove water for visibility of microporosity. First two-step were applied for 3 times on each tooth. (3) Low-viscosity resin infiltrate applied for 3min, excess materials removed and light cured (D-Light Pro, GC) for 40s. Then, the resin infiltrate applied as a second layer for 1 minute and light-cured for 40s. The resin infiltration technique repeated again after 10 days later. To restore the morphology of the buccal surfaces of the central incisors, a thin layer of light cure composite resin restorative material (G-aenial, GC) applied and polished (Sof-Lex System, 3M-ESPE). No additional treatment performed for the canines. The color change before and after each application was evaluated by using spectrophotometer (EasyShade-V, VITA).

Results: The patient was esthetically and functionally satisfied with the treatment after 3-month follow-up. Spectrophotometer results showed shade chances before and after: for central incisors and canines from C4 to A3 and B3 to A3,5, respectively.

Discussion: The use of the minimally invasive "resin infiltration technique" to treat traumatic hypominerazilation is a highly conservative method that ensure a healthy and harmonious smile.

Keywords: hypomineralization, minimal invasive dentistry, resin infiltration technique

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Semidirect Restoration of Severely Damaged Teeth with Biomimetic Approach

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Aim: The aim was to restore severely damaged posterior teeth by applying the principles of biomimetic dentistry.

Case Description: We have a presentation of a case series of 4 patients, who needed large restorations in posterior teeth. Upon clinical and radiologic assessment, all patients were systemically healthy; teeth were asymptomatic with no periapical pathology. We decided to restore the teeth by semi-direct technique based on the concept of biomimetic restorative dentistry. This treatment approach aims to preserve intact tooth and restore the damaged teeth by aesthetically and biomechanically mimicking the natural tooth structure. The steps followed in the treatment are as follows: rubber-dam isolation, removal of carious tissue and old restoration, cavity preparation, immediate dentin sealing and resin coating, deep margin elevation (Clearfil SE Bond, Kuraray Japan, G-ænial Universal Injectable, GC Corporation. Japan), impression (Aljinat Cavex Netherlands) and flexible model fabrication with polyether (3M ESPE Impregum Penta Soft St. Paul, MN, ABD). Composite (G-ænialPosterior, GC Corporation, Japan) build ups on the flexible die model and cementation with injectable composite.

Results: As a result of the clinical and radiographic examination, it was observed that the marginal adaptation, contact and contour of the restorations were acceptable at 3-month control.

Discussion: There were some integrity problems in marginal adaptation of the restoration at try-in phase since adjustments were done. It might have resulted from the surface detail of polyether cast which was not clear at cavity margin. Additional silicon may be a better choice for this purpose. Round bur was used for cavity preparation without magnification and it may cause irregular cavity surface and boundaries. Special overlay burs may be used for this purpose. Besides, flexible die model easily obtained with polyether and aproximal contact of restorations are obtained optimally. The laboratory phase has been eliminated and therefore cost-effective long-term treatment has been achieved.

Keywords: semi-direct restoration, flexible die

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