Audiological Findings in Autoimmune Hepatitis: Hearing Loss at High Frequencies

Otoimmün Hepatitte Odyolojik Bulgular: Yüksek Frekanslarda İşitme Kaybı

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ABSTRACT

Objectives: In this study we aimed to examine the audiological findings in autoimmune hepatitis (AIH).
Patients and Methods: Nine patients with the diagnosis of AIH were included in the study. Eighteen healthy age and sex matching volunteers constituted the control group. All the subjects underwent audiologic evaluation with pure tone and speech audiometry.
Results: Pure tone air conduction threshold averages for right ears in study and control group were 10.14 ± 4.70 and 6.73 ± 1.43 dB, respectively (p=0.022). Pure tone air conduction threshold averages for left ears in study and control group were 10.42 ± 4.84 and 6.66 ± 1.35 dB, respectively (p=0.018). There was significant decline at high frequencies (4000, 6000 and 8000 Hz) in AIH group compared to healthy controls (p<0.05). Speech reception thresholds and speech discrimination percentages were also significantly decreased in AIH (p<0.05).
Conclusion: In conclusion, this is the first study in the literature showing the presence of hearing loss in AIH. However further studies with larger groups and including other assessment tools such as OAE are needed.

Key Words: Autoimmune, autoimmune hepatitis, hearing loss, sensorineural hearing loss, audiometry

Received: 06.24.2017 **Accepted:** 08.20.2017

ÖZET

Amaç: Bu çalışmada otoimmün hepatitte (OİH) odyolojik bulguların incelenmesi amaçlandı.
Gereç ve Yöntemler: OİH tanısı ile takip edilen dokuz hasta çalışmaya dahil edildi. Yaş ve cinsiyet bakımından çalışma grubuyla eşleşen 18 sağlıklı gönüllü birey kontrol grubunu oluşturdu. Tüm katılımcılara, saf ses ve konuşma odyometrisi ile odyolojik değerlendirme yapıldı.
Bulgular: Çalışma ve kontrol grubunda sağ kulakların saf ses hava iletim eşiği ortalamaları sırasıyla 10.14 ± 4.70 ve 6.73 ± 1.43 dB' idi (p = 0.022). Çalışma ve kontrol grubunda sol kulakların saf ses hava iletim eşiği ortalaması sırasıyla 10.42 ± 4.84 ve 6.66 ± 1.35 dB bulundu (p = 0.018). OİH grubunda sağlıklı kontrollerle karşılaştırıldığında yüksek frekanslarda (4000, 6000 ve 8000 Hz) anlamlı bir düşüş vardı (p<0.05). OİH'de konuşma alımı eşikleri ve konuşma ayırımı yüzdeleri de anlamlı şekilde azalmış bulundu (p<0.05).
Sonuç: Sonuç olarak, bu çalışma ile OİH'de işitme kaybının varlığı literatürde ilk defa gösterilmiş oldu. Bununla birlikte, otoakustik emisyon (OAE) gibi diğer testleri de içeren ve daha büyük örneklem büyüklüğüne sahip başka çalışmalara da ihtiyaç vardır.

Anahtar Sözcükler: otoimmün, otoimmün hepatit, işitme kaybı, sensorinöral işitme kaybı, odyometri

Geliş Tarihi: 24.06.2017 **Kabul Tarihi:** 20.08.2017

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doi:http://dx.doi.org/10.12996/gmj.2017.73

INTRODUCTION

Autoimmune disorders (AD) may cause various audiological and vestibular impairments (1-2). Autoimmune inner ear disease (AIED) may present as an isolated primary inner ear disease or an otologic manifestation of a rheumatologic disorder so called secondary autoimmune inner ear disease (3-4). Rheumatoid Arthritis (RA), Systemic Lupus Erythematosus (SLE), Wegener's Granulomatosis (WG), Ulcerative Colitis, Ankylosing Spondylitis, Sjögren Syndrome, Behçet's Disease and Cogan's Syndrome are known to cause some degree of sensorineural and/or conductive type hearing loss (5-14). The inner ear pathologies caused by these disorders are commonly mild and slowly progressive whereas primary AIED is characterized by sudden onset, commonly bilateral, fluctuant and progressive sensorineural hearing loss (SNHL) with accompanying vertigo in some occasions. (3-4).

Autoimmune hepatitis (AIH) is a rare, chronic disease of the liver characterized by inflammation and necrosis, which may eventually progress to cirrhosis (15). It is affecting 14-35.9/100,000 of the population with an incidence of 1.9-3/100,000 per year (16). The vast majority of the patients (%80) are female (17). The most common initial symptoms are fatigue, myalgia, right upper quadrant pain and jaundice (15-16). Elevated liver function tests (AST, ALT), sero-positivity including antinuclear antibody (ANA), and several findings in liver biopsy are diagnostic after exclusion of other hepatocellular etiology (17).

In our literature review, there were several papers reporting audio-vestibular impairments associated with various autoimmune disorders as mentioned above. However, to our knowledge this is the first study reporting the audio-vestibular findings associated with AIH in the literature up to date. Therefore, in this study we aimed to examine the audiological findings in AIH.

MATERIAL and METHODS

Study Design

This study was conducted in Gazi University Hospital in Ankara, Turkey. The approval was taken from the local ethics committee. The patients who have been followed at Gastroenterology Department with the diagnosis of AIH were included in the study. All the subjects in the study group were female, thus healthy age matching female volunteers constituted the control group. All the subjects underwent a through otorhinolaryngologic examination. The exclusion criteria were the presence of tympanic membrane perforation or other findings of chronic otitis media. The written informed consent was taken from the patients and controls.

Audiological Examination

Pure tone audiometry (PTA) and speech audiometry were performed on all subjects in our Audiology Department. Hearing level was designated in dB value. Air conduction thresholds were tested at 250, 500, 1000, 2000, 4000, 6000 and 8000 Hz frequencies. Bone conduction thresholds were tested at 500, 1000, 2000, 4000 Hz frequencies. Pure tone average was calculated with the hearing thresholds at 500, 1000, 2000 and 4000 Hz frequencies. Speech discrimination percentage was calculated 40 dB above speech reception threshold (SRT) recorded.

Statistical Analysis

SPSS version 20.0 statistical software package (Chicago, Illinois) was used for statistical analysis. The descriptive statistics were presented as mean ± standard deviation (SD). Continuous variables were tested by Kolmogorov-Smirnov Test, histograms and P-P test for normality. Audiological data were compared with Mann Whitney U test. Mean age comparison was performed with Pearson Chi Square test. In all the tests $p < 0.05$ was considered to be significant statistically.

RESULTS

There were 9 cases with AIH in the study group. 18 healthy induvial comprised the control group. All the subjects in the study and control group were female. The mean age in the study and control groups were 34.0± 14.3 and 31.6±10.6, respectively. There was no significant difference regarding the mean age between groups (p=0.411). Six patients were liver biopsy proven AIH cases. The other subjects were diagnosed based on clinical examination, serologic studies and elevated liver enzymes. The mean disease duration for AIH was 2.33±1.73 years. Two patients were suffering occasional dizziness and one patient was suffering tinnitus in the study group. There were four cases in AIH group with other accompanying AD and/or systemic diseases as shown in Table 1. Pure tone air conduction averages for right ears in study and control groups were 10.14 ± 4.70 and 6.73 ± 1.43 dB, respectively (p=0.022). Pure tone air conduction averages for left ears in study and control groups were 10.42 ± 4.84 and 6.66 ± 1.35 dB, respectively (p=0.018). There was significant hearing loss in the study group compared to control group. Comparison of the mean air conduction levels with PTA for each frequency tested is shown in Table 2 and Figure 1. There was significant decline at high frequencies (4000, 6000 and 8000 Hz) in AIH group compared to healthy controls (Table 2). Bone conduction levels are shown in Table 3. There was only significant difference between groups at 2000 Hz of left ears. There was not any significant difference in air-bone conduction gaps between the study and control groups (Table 4). The mean speech discrimination was 100 % in the control group. Whereas it was 96.4±5.1 (p=0.003) and 97.8±4.5 (p=0.042) in right and left ears of patient group, respectively. Likewise, SRT levels were significantly decreased in the patient group (Table 5).

Table 1. Accompanying diseases in AIH patients

P	Associated Diseases
1	Primary biliary cirrhosis, Sjögren's disease
2	Vitiligo, asthma
3	Celiac disease
4	Sjögren's disease, Hashimato's thyroiditis, Diabetes Mellitus Type I

P: patient

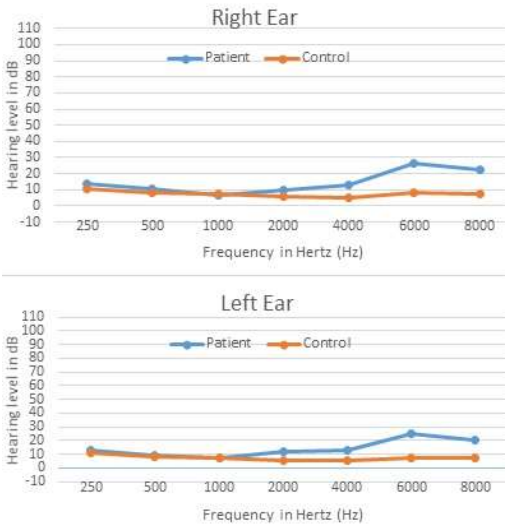


Figure 1. Comparison of air conduction thresholds with PTA for right and left ears between patient and control groups

Table 2. Air conduction hearing threshold levels in dB

Frequency	Right ear			Left ear		
Hz	**Patient**	**Control**	**P value**	**Patient**	**Control**	**P value**
250	13.89±7.81	10.28±3.19	0.204	12.78±8.33	10.83±3.53	0.476
500	10.56±4.64	8.33±2.42	0.205	9.44±3.00	8.06±2.50	0.248
1000	6.67±2.50	7.78±2.55	0.285	7.78±2.63	7.22±2.55	0.593
2000	10.00±7.90	5.56±1.61	0.055	11.67±7.90	5.83±1.91	**0.020**
4000	13.33±16.58	5.28±1.17	**0.027**	12.78±10.92	5.56±1.61	**0.041**
6000	26.11±25.34	8.33±3.42	**0.007**	25.00±14.36	7.22±2.55	**<0.001**
8000	22.78±26.47	7.50±3.93	**0.026**	20.56±15.29	7.50±3.09	**0.003**

Table 3. Bone conduction hearing threshold levels in dB

Frequency	Right ear			Left ear		
Hz	Patient	Control	P value	Patient	Control	P value
500	3.33±5.59	4.56±2.68	0.802	3.89±4.16	4.44±2.70	0.955
1000	3.89±4.16	4.39±2.54	0.953	4.44±3.90	4.11±2.74	0.422
2000	6.67±7.50	3.94±2.57	0.277	8.89±7.40	3.78±2.39	**0.018**
4000	11.11±17.63	3.61±2.54	0.345	9.44±12.36	3.56±2.70	0.270

Table 4. Air-bone gap comparison between groups

Frequency	Right ear			Left ear		
Hz	Patient	Control	P value	Patient	Control	P value
500	7.22±8.33	3.50±2.66	0.384	5.56±5.27	3.89±3.14	0.539
1000	4.44±8.07	3.28±2.53	0.496	3.89±4.85	3.39±2.76	0.867
2000	3.89±3.33	1.61±1.81	0.086	2.22±3.63	2.06±2.07	0.542
4000	2.22±3.63	1.67±2.02	0.819	3.33±3.53	2.00±2.30	0.399

Table 5. Speech audiometry comparison between groups

	Right ear			Left ear		
	Patient	Control	P value	Patient	Control	P value
SRT	14.44±6.82	5.56±1.61	**< 0.001**	15.00±8.29	5.56±1.61	**< 0.001**
SD	96.4±5.1	100	**0.003**	97.8±4.5	100	**0.042**

SRT: Speech reception threshold **SD:** speech discrimination percentage

DISCUSSION

In this study, significant hearing loss was shown in AIH for the first time. Hearing loss was mainly observed at high frequencies (4000, 6000 and 8000 Hz) compared to healthy control group. Thus, speech discrimination and SRT were also decreased in the study group. No significant air-bone gap revealed between the study or control group (p>0.05). These findings are indicating the presence of some degree of SNHL in AIH. Also, three cases (30%) were suffering dizziness or tinnitus, which may point to audio-vestibular involvement in AIH.

There are various autoimmune diseases known to cause some degree of hearing loss as mentioned before. These disorders are classified as secondary AIED (3-4). Hearing impairment may be due to several different etiologies for each of these disorders. It may be due to vasculitis, ossicular involvement, neuritis or ototoxicity of the drugs used for the treatment of rheumatologic diseases (18). Thus, hearing loss may be seen in conductive, sensorineural or in mixed pattern in secondary AIED (5-14, 19-20). Özcan et al. suggested middle ear involvement for the reason of hearing loss in RA (18). Whereas, Kastanioudakis and colleagues have shown SNHL in RA. Therefore, they have suggested cochlear involvement to be responsible from hearing loss in RA (19). In the study of Andonopoulus et al. a statistically significant decrease at high frequencies revealed in SLE patients aged 16-29 compared with the controls suggesting 'premature aging' of the inner ear in SLE cases (7). Freeman et al. proposed mildly increased prevelance of SNHL secondary to Sjögren's disease (12).

In our study, as like many other rheumatologic diseases we also found SNHL at high frequencies in AIH patients. This finding may point to cochlear or retro-cochlear involvement in AIH. AIH may also be regarded as a secondary disease causing AIED.

However, there are some limitations of this study. In our opinion the major limitation is the presence of other AD such as Celiac Disease and Sjögrens Syndrome in four cases in the study group, which may also be responsible from hearing loss. On the other hand, the sample size of the study group is too small to make a precise interpretation about hearing status in AIH. Besides, otoacoustic emission testing (OAE) would be valuable to objectively show outer hair cell function in the inner ear.

CONCLUSION

In conclusion to the best of our knowledge this is the first study in the literature showing the presence of SNHL in AIH. However further studies with larger sample size including other assessment tools such as OAE is needed to determine the effects of AIH on hearing precisely.

Conflict of interest:
No conflict of interest was declared by the authors.

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