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Do Patients with Psoriasis Suffer from Hearing Loss?

Psöriyazis Hastalarında İşitme Kaybı Olur mu?

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ABSTRACT Objective: Sensorineural hearing loss has been associated with various diseases including vitiligo, rheumatoid arthritis, systemic lupus erythematosus, inflammatory bowel disease and Behcet's disease in the etiopathogenesis of which autoimmunity and chronic inflammation play a role. However, limited studies are available evaluating hearing levels in psoriasis which is another chronic inflammatory and autoimmune disease. The present study evaluates hearing levels in patients with psoriasis, a chronic inflammatory disease which are often accompanied by other comorbid conditions, and makes a comparison with healthy controls. **Material and Methods:** Fifty psoriasis patients and 50 healthy volunteers were included in the study. All participating patients underwent a complete otorhinolaryngologic examination prior to undergoing audiometry. The patients underwent pure-tone audiometry in an audiometry laboratory with voice isolation. **Results:** In the present study, statistically significant differences were noted between the groups in terms of hearing threshold in both left and right ear at 2000 Hz, and in the right ear at 4000 Hz and 8000 Hz. In all instances of significant difference, the patients in the psoriasis group had higher values. The mean air- and bone-conduction hearing thresholds in the left and right ear were significantly higher in the psoriasis group ($p<0.05$). The correlation analysis which was made to identify any possible relationship between Psoriasis Area Severity Index (PASI) and duration of disease revealed no significant relationship or correlation. **Conclusion:** It should be kept in mind that hearing loss can occur in psoriasis patients, and they should be followed up regularly with audiometry.

Keywords: Audiometry; hearing loss; psoriasis

ÖZET Amaç: Sensörinöral işitme kaybı vitiligo, romatoid artrit, sistemik lupus eritematozus, inflamatuvar barsak hastalığı ve Behçet hastalığı gibi etyopatogenezinde otoimmünitenin ve kronik inflamasyonun rol oynadığı birçok hastalık ile ilişkilidir. Fakat psoriasis gibi kronik inflamatuar ve otoimmün bir hastalıkta işitme düzeyini değerlendiren kısıtlı sayıda çalışma vardır. Bu çalışma, pek çok komorbiditeler ile birlikte olabilen, kronik inflamatuar bir hastalık olan psoriasiste işitme düzeyini sağlıklı kontrol grubu ile karşılaştırmalı olarak değerlendirmektedir. **Gereç ve Yöntemler:** Çalışmaya 50 psöriyazis hastası ile 50 sağlıklı gönüllü dahil edildi. Çalışmaya katılan tüm hastalara işitme testi yapılmadan önce tam bir kulak, burun, boğaz muayenesi yapıldı. Ardından hastalara ses izolasyonu sağlanmış odyometri laboratuvarında saf ses odyometri değerlendirmesi yapıldı. **Bulgular:** Bu çalışmada 2000 Hz'de hem sol kulak hem de sağ kulak işitme eşiği değerleri yönünden, 4000 ve 8000 Hz'de sağ kulak işitme eşiği değerleri yönünden gruplar arasında istatistiksel olarak anlamlı bir fark olduğu bulunmuştur. Fark bulunan tüm durumlarda psöriyazis grubunun değerlerinin daha yüksek olduğu görülmüştür. Hava yolu ve kemik yolunda hem sol kulak hem de sağ kulak ortalama işitme değerleri yönünden psöriyazis grubunun değerlerinin istatistiksel olarak anlamlı şekilde yüksek olduğu saptanmıştır ($p<0.05$). Psöriyazis Alan Şiddet İndeksi (PASI) skoru ve hastalık süresiyle işitme kaybı arasında korelasyon analizinde anlamlı bir ilişki ve korelasyon olmadığı görülmüştür. **Sonuç:** Psöriyazis hastalarında işitme kaybı olabileceği akılda tutulmalı ve odyometri ile düzenli olarak izlenmelidir.

Anahtar Kelimeler: Odyometri; işitme kaybı; psöriyazis

Psoriasis is a chronic inflammatory skin disease with a prevalence rate of 2-3 percent in the population.[1] Psoriasis has a complex and multifactorial etiology and pathogenesis of disease is still unclear.[2] Previously, psoriasis was described as a disease associated with epidermal hyperproliferation, shortening of epidermal turnover time, and impaired

barrier function of the epidermis. Today, psoriasis is defined as an immune-mediated, chronic inflammatory disease with organ-specific (skin or joint and skin) comorbidities.[3] In this regard, recent studies indicate that the term psoriatic disease would be more appropriate than psoriasis.[4] Psoriasis is characterized by joint involvement in addition to skin, although the presence of accompanying comorbidities such as metabolic syndrome, cardiovascular disease, psychological/psychiatric disorders, inflammatory bowel disease and insulin resistance suggests that the chronic inflammation also affects other organs.[5,6]

Sensorineural hearing loss (SNHL) occurs as a complication of autoimmune disorders, and was first described by McCabe.[7] In literature, hearing loss has been associated with various diseases, including rheumatoid arthritis, vitiligo, inflammatory bowel disease, systemic lupus erythematosus and Behcet's disease in the etiopathogenesis, of which autoimmunity and chronic inflammation play a role.[8-12] However only limited number of studies are available evaluating hearing levels in psoriasis, which is another chronic inflammatory and autoimmune disease.[13] The present study evaluates hearing levels in patients with psoriasis, a chronic inflammatory disease, which is often accompanied by other comorbid conditions, and makes a comparison with healthy controls.

MATERIAL AND METHODS

The study included 50 patients who attended our dermatology outpatient clinic and diagnosed with psoriasis vulgaris based on clinical and/or histopathological findings, but who received no systemic therapy, and 50 healthy controls matched for age and gender. This study was approved by the local ethics committee (Decision number: 2018-KAEK-189_2018.01.25_08). Written informed consent was obtained from all patients before enrollment. The study was carried out according to the principles expressed in the Declaration of Helsinki.

Patients receiving systemic therapeutic agents for psoriasis, pregnant and breast-feeding women, patients on ototoxic drugs, patients with a history of head-neck trauma, tympanic membrane perforation, acustic trauma exposure, cardiovascular disease, recurrent otitis media, vertigo, Meniere's disease, and those with a pathological findings on an otoscopic examination were excluded from the study. A dermatological examination of all the patients was made by the same dermatologist, and the Psoriasis Area Severity Index (PASI) of the patients was calculated. Sociodemographic characteristics of the patients, such as age and gender, age at disease onset, disease duration, previously received therapies (local therapies, acitretin, cyclosporine, methotrexate and biological agents) and the body surface area (BSA) were recorded.

All participating patients underwent a complete otorhinolaryngologic examination prior to undergoing audiometry. The patients underwent pure-tone audiometry in an audiometry laboratory with voice isolation. The audiometric measurements were performed using a Maico ma53 audiometry device (MAICO Diagmostic GmbH, Berlin, Germany) and Telephonic HB-7 headphones. For the pure-tone audiometry, measurements started at 1000 Hz frequency from the intact ear. The measurements were then performed at 2000 Hz, 4000 Hz, 8000 Hz, 500 Hz and 250 Hz frequencies in respective order. If the patient heard the first tone at 1000 Hz and at 30 dB, then the threshold was reduced to 20 dB and lower. If the patient did not hear the first tone at 30 dB, the threshold was incremented to 40 dB and higher until a response was achieved. The lowest sound intensity heard by the patient was determined and the relevant frequency was noted as the threshold value. Bone-conduction was evaluated at between 500 Hz and 4000 Hz. A vibrator was placed on the mastoid protrusion of the temporal bone for the measurement of bone-conduction, for which measurements were started at 1000 Hz and 30 dB. The evaluation proceeded as in the air-conduction. Pure-tone averages were calculated as the arithmetic mean of the air and bone-conduction hearing thresholds at 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz.

STATISTICAL ANALYSIS

The IBM SPSS 24.0 (IBM Corp. Armonk, NY, USA) software package was used for the statistical analysis of the data. Kolmogorov-Smirnov and Shapiro-Wilk tests were carried out to check for the normal distribution of data, and Independent Samples t-test was used to compare the data with normal distribution. Chi-square test was used to compare quantitative data. The relationship between variables was analyzed using Pearson's correlation coefficient. A p value of <0.05 indicated a significant difference between the groups.

RESULTS

The study included 100 respondents: 50 patients with psoriasis (26 males, 24 females) and 50 control subjects (26 males, 24 females). The mean age was 40.9±12.4 years in patients with psoriasis and 41.0±12.3 years in control group. There was no statistically significant difference between the patients with psoriasis and control group in either age or gender (p>0.05). The mean duration of disease was 11.6±11.0 years, the mean PASI was 7.8±7.7 and the mean BSA was 8.4±10.2 in patients with psoriasis. The demographic findings are summarized in Table 1.

A total of 200 ears, 100 in psoriasis group and 100 in control group, were evaluated and the data was compared. A statistically significant difference was noted between the groups in terms of hearing threshold in both the left and right ear at 2000 Hz, and in the right ear at 4000 Hz and 8000 Hz (p<0.05). In all instances in which a significant difference was noted, it was the patients in the psoriasis group that recorded higher values. In intragroup analyzes, a significant difference was noted between the hearing thresholds of the left and the right ears at 1000 Hz and 2000 Hz in control group (p<0.05). In two instances of significant difference, the values in the left ear were higher. In all intragroup analyses, no statistically significant difference was observed in psoriasis group (p>0.05) (Table 2, Figure 1).

TABLE 1: Demographic characteristics.

	Control (n=50)	Patient (n=50)	p
Gender			
Female	24 (48%)	24 (48%)	1.000*
Male	26 (52%)	26 (52%)	
Age (Year)	41.0±12,3	40.9±12,4	0.987**

* Chi-Square Test ** Independent Samples T-Test (Mean±SD).

In intergroup comparisons, a significant difference was noted between the groups in terms of mean hearing thresholds in both left and right ears in air and bone-conduction (p<0.05). In four instances in which a significant difference was noted, the patients in psoriasis group recorded higher values (Table 3, Figure 2). In intragroup analyses, a significant difference was noted between the mean hearing thresholds of the left and the right ears in air-conduction (p<0.05), with the values in the left ear being higher. There was no significant difference in intragroup comparisons in psoriasis group (p>0.05).

The correlation analysis which was carried out to reveal a possible relationship between PASI and sensorineural hearing loss revealed no significant relationship or correlation (p>0.05). Likewise, no significant relationship or correlation was noted between disease duration and hearing loss (p >0.05).

DISCUSSION

In this study, statistically significant differences were noted between the groups in terms of hearing threshold in both left and right ear at 2000 Hz, and in the right ear at 4000 Hz and 8000 Hz. In all instances of significant difference, the patients in psoriasis group had higher values. The mean air- and bone-conduction hearing thresholds in the left and the right ear were significantly higher in psoriasis group (p<0.05). The correlation analysis which was made to identify any possible relationship between PASI and duration of disease revealed no significant relationship or correlation.

Although the exact etiopathogenesis of psoriasis is still unknown, studies tend to focus on the possible pathogenic role of genetic, immunological and environmental factors, and recent data suggests that T-cells and proinflamma tory cytokines play a role in its pathogenesis.[3] The internal ear is vulnerable to autoimmune

TABLE 2: Intergroup and intragroup comparisons of hearing thresholds.

		Control (n=50)	Patient (n=50)	p*
250 Hz	Left ear	10.2±6.5	10.1±6.3	0.938
	Right ear	8.5±5.9	9.0±4.5	0.636
	p*	0.176	0.321	
500 Hz	Left ear	12.3±6.2	13.5±6.9	0.366
	Right ear	10.7±5.5	11.6±5.9	**0.434**
	p*	0.178	0.144	
1000 Hz	Left ear	13.8±4.1	15.5±7.0	0.143
	Right ear	11.5±5.5	13.5±7.6	0.133
	p*	0.019	0.174	
2000 Hz	Left ear	12.9±4.9	17.0±9.2	**0.007**
	Right ear	10.2±5.1	15.0±8.3	**0.001**
	p*	**0.008**	0.257	
4000 Hz	Left ear	18.4±9.1	20.7±12.3	0.290
	Right ear	15.2±9.2	20.7±15.2	**0.032**
	p*	0.084	1.000	
8000 Hz	Left ear	21.8±11.1	23.7±13.8	**0.452**
	Right ear	19.7±10.4	25.5±16.1	**0.035**
	p*	0.332	0.550	

*: Independent Samples T-Test (Mean±SD).

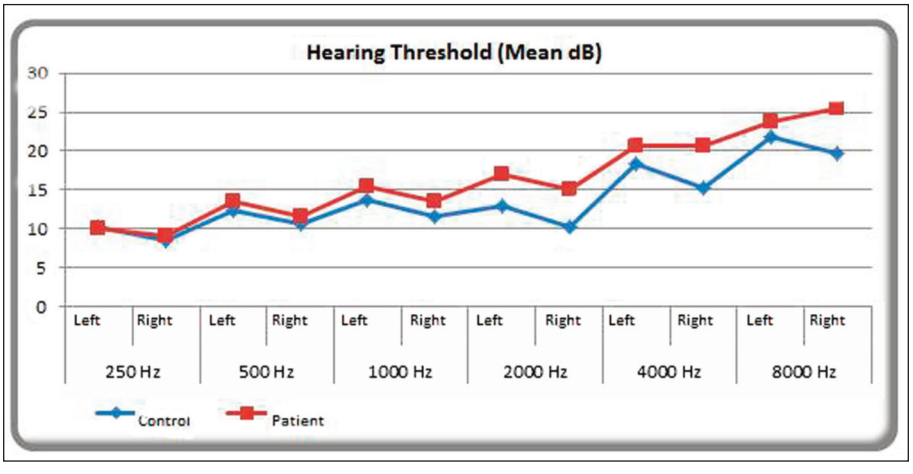

FIGURE 1: Intergroup and intragroup comparisons of hearing thresholds.

TABLE 3: Intergroup and intragroup comparisons of the mean hearing thresholds.

		Control (n=50)	Patient (n=50)	p*
Air Conduction	Left ear	14.3±4.4	16.7±7.0	**0.046**
	Right ear	11.8±4.7	15.3±7.5	**0.007**
	p*	**0.007**	0.337	
Bone Conduction	Left ear	6.0±1.4	7.4±4.0	**0.017**
	Right ear	5.8±1.3	7.1±3.8	**0.022**
	p*	0.471	0.702	

*: Independent Samples T-Test (Mean±SD).

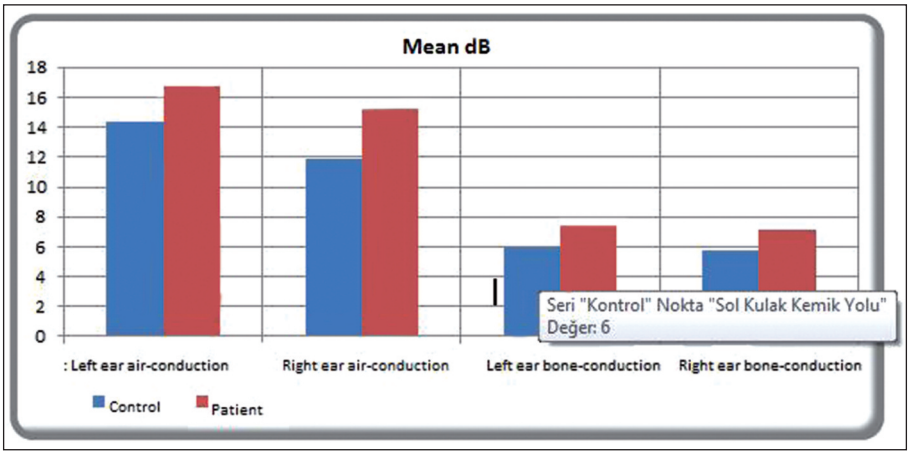

FIGURE 2: Intergroup and intragroup comparisons of the mean hearing thresholds.

pathologies, and SNHL may be shown up before the occurrence of systemic symptoms in autoimmune diseases.[14] Hearing loss has been reported in various autoimmune and autoinflammatory diseases, such as psoriatic arthritis, rheumatoid arthritis, ankylosing spondylitis and inflammatory bowel disease.[12-15] Leukocytes enter from peripheral circulation into the cochlea in presence of inflammation in the body, and the accumulation of leukocytes and the local production of immunoglobulins causes an inflammatory reaction that results in the degeneration of the organ of corti, stria vascularis and spiral ganglion, leading finally to SNHL.[16] In general, T lymphocyte-mediated cytotoxicity, vasculitis and immune complex deposition associated with the circulating proinflammatory cytokines are the widely accepted mechanisms of SNHL that accompany immune-mediated disorders.[17] One study involving 20 patients with active ulcerative colitis identified statistically significant hearing loss at all frequencies in a pure-tone audiometry, and the patients were also found to have elevated serum proinflammatory cytokine levels, such as tumor necrosis factor-alpha (TNF-α), IL-1 and IL-6. According to the authors, an increase in the levels of these cytokines results in cochlear degeneration, which applies to other chronic inflammatory and autoimmune disorders.[18] T lymphocytes play an active role in the etiopathogenesis of psoriasis, and patients have elevated circulating proinflammatory levels, including TNF-α, IL-1 and IL-6. It is therefore not surprising to observe SNHL in psoriasis patients. Although there are few studies and case reports in literature reporting hearing loss in patients with psoriasis, there are reports of SNHL accompanying psoriatic arthritis.

The first study to evaluate hearing loss in patients with psoriasis was conducted by Karabulut et al.[14] The authors reported no significant difference between the groups in terms of their pure-tone audiometry results. In a study reporting 51 patients with psoriasis and 51 healthy controls, Güvenç et al. observed higher air- and bone-conduction hearing thresholds at all frequencies in patients than in the control subjects.[19] Their study reported no correlation between PASI, disease duration and hearing loss. Similar to the study by Güvenç et al., the present study found hearing loss in patients with psoriasis, and no correlation was found between PASI, disease duration and hearing loss.[19] Yen et al. conducted a retrospective cohort study by matching patients diagnosed with psoriasis with control subjects in terms of gender, age and comorbidities between January 1, 2001 and December 31, 2006.[20] They followed all patients until the end of 2011, evaluating incidences of sudden SNHL at least six years after the first diagnosis of psoriasis. Incidences of sudden SNHL were found to be 1.51-fold higher in patients with psoriasis than in the control group. The authors concluded that psoriasis is associated significantly

with the risk of SNHL development. More recently, Borgia et al. conducted a pilot study on hearing function in 77 patients with psoriasis, and found that SNHL was significantly more common in patients with psoriasis; conductive and mixed-type hearing loss was more common in patients with psoriasis with joint involvement than in patients without joint involvement; the prevalence of hearing loss was higher in patients with a disease duration of more than 10 years and among smokers; and the severity of psoriasis was higher in patients with hearing loss than in patients without hearing loss.[21] In the present study, statistically significant differences were noted between the groups in terms of the hearing threshold in both the left and the right ears at 2000 Hz, and in the right ear at 4000 Hz and 8000 Hz. In all instance of significant difference, the values in the psoriasis group were higher. The present study made no evaluation of the patients for arthritis. Furthermore, no significant relationship was found between disease severity and duration and hearing loss. One of the most commonly used measurement scales for defining the severity of psoriasis is PASI, which grades symptoms of the disease such as erythema, dandruff and infiltration, according to their anatomical localizations. It has been shown to be a reliable and reproducible scoring method for plaque psoriasis in adult patients.[22] The mean PASI score of the patients with psoriasis in the present study was 7.8, although the values were quite close to each other. This may be the reason why no correlation was found between severity and hearing loss in our study. The authors suggest that studies involving patients with more severe disease and a higher number of patients may come up with significant results.

CONCLUSION

In conclusion, psoriasis is a chronic systemic inflammatory disease that has a life-long course, and that is often accompanied by multiple comorbidities. Taking a holistic approach to the patient is important. The role played by dermatologists should involve not only the diagnosis and treatment of the skin symptoms associated with the disease, but should also include an investigation of non-dermatologic manifestations. It should be kept in mind that hearing loss can occur in psoriasis patients, meaning that they should be followed up regularly with audiometry. Knowledge of this association, as well as the early diagnosis and treatment of hearing loss, may improve the patients' quality of life, as problems related to hearing can cause significant discomfort and difficulty in daily life.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Gülhan Gürel, Yunus Kantekin;* ***Design:*** *Gülhan Gürel;* ***Control/Supervision:*** *İlknur Haberal Can;* ***Data Collection and/or Processing:*** *Gülhan Gürel, Yunus Kantekin;* ***Analysis and/or Interpretation:*** *İlknur Haberal Can;* ***Literature Review:*** *Gülhan Gürel;* ***Writing the Article:*** *Gülhan Gürel, Yunus Kantekin;* ***Critical Review:*** *İlknur Haberal Can;* ***References and Fundings:*** *Gülhan Gürel, Yunus Kantekin;* ***Materials:*** *Gülhan Gürel, Yunus Kantekin.*

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