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Evaluation of hearing in patients with psoriasis considering the disease severity

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Abstract

Objective: Nowadays, psoriasis is accepted to be an autoinflammatory/autoimmune disease. As a result of chronic inflammation, psoriasis is widely investigated for associated diseases and comorbidities. However, there are limited data about the effects of psoriasis on hearing functions. The aim of the study was to investigate prospectively if patients with psoriasis have sensorineural hearing loss and the effect of the disease severity on hearing levels.

Methods: Overall, 50 patients (100 ears) with psoriasis and 45 healthy controls (90 ears) were included in the study. After otoscopic examination, pure tone air and bone conduction including high frequencies (500, 1000, 2000, 4000, 8000, and 16,000 Hz) and speech audiometry were performed to all participants.

Results: Median pure tone average of the patients was significantly different than controls. Moreover, the frequency levels of patients with psoriasis for both of the ears were all significantly different from the control group. As the limitation of the study, patients were not investigated for psoriatic arthritis and sera from patients were also not investigated for anti-bodies for inner ear antigens such as anti-connexin 26, anti-DEP/CD148 and anti 68K.

Conclusion: The possibility of inner ear involvement should be kept in mind in psoriasis as a result of chronic systemic inflammation. Patients with psoriasis may be evaluated with audiometry periodically even if they do not exhibit any hearing problems.

Keywords: Psoriasis, hearing loss, disease severity.

Özet: Psoriasis hastalarında işitmenin hastalığın şiddetine göre değerlendirilmesi

Amaç: Günümüzde psoriasis otoinflamatuar/otoimmün bir hastalık olarak kabul görmektedir. Kronik inflamasyonun sonucu olarak psoriasis eşlik eden hastalıklar ve komorbiditeler için yaygın araştırılmaktadır. Ancak psoriasisin işitme fonksiyonları üzerine etkisi hakkında sınırlı veri bulunmaktadır. Çalışmanın amacı psoriasisli hastalarda sensörinöral işitme kaybı ve hastalık şiddetinin işitme düzeylerine etkisini prospektif olarak araştırmaktı.

Yöntem: Çalışmaya toplamda 50 psoriasisli hasta (100 kulak) ve 45 sağlıklı kontrol (90 kulak) dahil edildi. Katılımcılara otoskopik muayene sonrası yüksek frekansları da içeren hava ve kemik iletimi (500, 1000, 2000, 4000, 8000, 16.000 Hz) ve konuşma odyometrisi uygulandı.

Bulgular: Hastaların ortanca saf ses ortalaması kontrollerden anlamlı düzeyde farklıydı. Ayrıca psoriasisli hastaların her iki kulak için tüm frekans düzeyleri kontrol grubundakilerden anlamlı derecede farklıydı. Çalışmanın kısıtlılığı olarak; hastalar psoriatik artrit açısından incelenmedi ve hastaların serumlarında anti-konneksin 26, anti-DEP/CD148 ve anti 68K gibi içkulak antijenleri için antikorlar da araştırılmadı.

Sonuç: Kronik sistemik inflamasyonun bir sonucu olarak psoriasiste içkulak tutulumu olasılığı akılda tutulmalıdır. Psoriasisli hastalar işitme problemleri olmasa bile periyodik olarak odyometriyle değerlendirilebilirler.

Anahtar sözcükler: Psoriasis, işitme kaybı, hastalık şiddeti.

Psoriasis is a chronic inflammatory immune-mediated skin disease accompanied by various disorders.[1] Although the exact cause remains unknown, it is clear that both genetic and environmental factors play a role in these possible associations. The more common comorbidities include psoriatic arthritis, inflammatory bowel disease, cardiovascular diseases, hypertension, obesity, diabetes, and dyslipidemia which are thought to be the results of chronic inflammation in patients

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with psoriasis.[2] A better understanding for the pathophysiology of psoriasis resulted in a shift from a hyperkeratotic disorder to a cytokine mediated malfunction of the immune system. Psoriasis has been classified as a T-cell mediated disease rather than a skin disease.[3] The role of T cells in pathogenesis is the determinant of the extent of systemic involvement. Especially, T-helper (Th)-1, Th-17, and Th-22 cell subpopulations proliferate and trigger the secretion of inflammatory cytokines.[4] There are also several studies investigating the association between psoriasis and autoimmune disorders. This systemic inflammation is involved in the pathogenesis of various autoimmune disorders like multiple sclerosis and systemic lupus erythematosus.[5]

Sensorineural hearing loss can occur during autoimmune diseases and was first described as autoimmune sensorineural ear disease (ASED).[6] Since then it has been reported in many inflammatory disorders such as rheumatoid arthritis,[7] ankylosing spondylitis,[8] Behçet's disease.[9] Since the underlying mechanism in psoriasis is a systemic inflammation effecting multiple organ systems, we decided to investigate if patients with psoriasis have sensorineural hearing loss, and then to compare audiometric results according to age, sex, disease severity, disease duration, localization of the disease, and treatment modalities.

Materials and Methods

Study design

Overall, 50 patients with psoriasis who were diagnosed at the dermatology department of a tertiary care center and 45 healthy controls were included in the study. The diagnosis of psoriasis in all patients was done by the help of the clinical findings. The disease severity was calculated by Psoriasis Area Severity Index (PASI). Informed consent was taken from all of the participants. A detailed history including disease duration, medical history, and distribution of the lesions as well as possible etiological factors leading to hearing loss (including chronic otitis media, trauma, and drug use) were taken. In addition to dermatological examination, otoscopic examination of all the patients was performed by a single clinician at Hacettepe University Hospital Department of Otorhinolaryngology. Patients with tympanic membrane perforation were excluded. As a control group, 45 healthy people without any systemic disorders or any cochleovestibular disease associated with hearing loss were selected.

Audiological evaluation

All patients underwent pure tone audiogram at frequencies of 500–16,000 Hz, and pure tone averages (PTA) were noted (average of 500, 1000, 2000, 4000 Hz). Also speech audiometry was performed to all participants in a sound-proof chamber (MAICO 41, MAICO Diagnostics, Berlin, Germany). The hearing level ≤20 dB was accepted as normal.

Statistical analysis

The statistical analyses were performed using SPSS 16.0 program (SPSS Inc., Chicago, IL, USA). A p value <0.05 was considered as significant. Chi-square test was used to compare the gender of the patients and controls and Mann-Whitney U test was used to compare the age of the patients. Spearman's rho was calculated for the correlations between pure tone audiometric results and PASI scores, duration of the disease. For overall comparisons of audiological data of two groups, Mann-Whitney U test was used.

Results

Demographic data (Table 1)

In the study group, there were 50 patients with psoriasis (31 female, 19 male) with a median age of 34 (range: 18–74) years. The control group was composed of 45 healthy subjects (22 female, 23 male) with a median age of 29 (range: 20–56) years. There was no significant difference between patients and control group according to age and sex.

Table 1. Demographic data of the patients and controls.

No. of the patients / controls	50 (31 F, 19 M) / 45(22 F, 23 M)
Median age of the patients / controls	34 (min 18, max 74) years / 29 (min 20, max 56) years
Median duration of the disease	114 (min 6, max 7200) months
Previous treatment modalities	Topical treatments 98% (n=48) Oral cyclosporin 24% (n=12) Oral/subcutaneous methotrexate 24% (n=12) Phototherapy 12% (n=6) Acitretin 12% (n=6) Biologics 2% (n=1)
Median value of PASI score	17 (min 1, max 47)
Localizations of the lesions	Scalp 78% (n=38) Earlobe 70% (n=34) Face 36% (n=17) Upper extremities 72% (n=35) Palmoplantar 16% (n=8) Lower extremities 88% (n=43) Trunk 74% (n=36) Back 66% (n=32) Gluteus 73% (n=36) Nail 29% (n=14)

F: female; M: male

The median duration of the disease in patients with psoriasis was 114 (range: 6–720) months. According to medical history of patients with psoriasis, 98% (n=48) of the patients were treated with topical treatment modalities, 24% (n=12) with oral cyclosporin, 24% (n=12) with oral and/or subcutaneous methotrexate, 12% (n=6) with phototherapy, 12% with (n=6) acitretin, and with 2% (n=1) biological treatment modalities, respectively. Scalp involvement was observed in 78% (n=38) of the patients, earlobe involvement in 70% (n=34), face involvement in 36% (n=17), upper extremities in 72% (n=35), palmoplantar in 16% (n=8), lower extremities in 88% (n=43), trunk in 74% (n=36), back in 66% (n=32), gluteus in 73% (n=36), and nail in 29% (n=14) of the patients. Median value of the PASI score of the patients was 17 (range: 1–47).

Audiometric data

All of the patients with psoriasis and the control group had normal hearing levels (<20 dB) according to PTA. The median PTA of the right ear was 10.6 (range: 0–78) dB while the left ear was 10 (range: 1.25–106) dB in patients with psoriasis. The median PTA of the right ear was 5 (range: 0–28) dB while the left ear was 5 (range: 0–125) dB in the control group. Overall, median PTA of the patients with psoriasis was 10 (range: 1–92) dB and 6 (range: 0–26) dB in the control group. There was significant difference between patients with psoriasis and controls according to median PTA variables (p=0.00).

When the effect of disease severity on PTA variables was taken into consideration, we observed no correlation between PTA of the patients and PASI scores (Spearman's rho=0.629). The patients were also divided into 2 subgroups according to PASI scores. Group 1: patients who had PASI scores ≥10 (n=39, 78%), Group 2: patients who had PASI scores <10 (n=11, 22%). There were no significant differences according to PTA scores between above two groups (p=0.122). Median PTA variables of the patients with psoriasis and controls are shown in Table 2.

The differences between PTA variables of the patients with psoriasis were also investigated according to distribution of the lesions. There were no significant differences between median PTA variables according to distribution of the lesions such as face, ear, scalp, trunk, back, upper extremities, lower extremities, gluteus, nail and palmoplantar region. Median PTA scores of the patients with psoriasis were also investigated according to the previous systemic medications such as oral cyclosporine, systemic methotrexate, oral acitretine, and phototherapy. No significant differences were observed according to previous medications of the patients with psoriasis between PTA variables. There was also no correlation between disease duration and median PTA variables of the patients with psoriasis (Spearsman's rho=0.852).

Table 2. Median PTA variables of the patients with psoriasis and controls.

	Median PTA (dB)	p value
Patients Controls	10 (min 0, max 93) 6 (min 0, max 26)	0.00
Group 1 Group 2	9.3 (min 4, max 16) 11.2 (min 0, max 95)	1.22

PTA: pure tone average, **Group 1:** patients who had PASI scores ≥10, **Group 2:** patients who had PASI scores <10

When the hearing levels of the patients with psoriasis according to specific hearing frequencies (500, 1000, 2000, 4000, 8000, and 16,000 Hz) were taken into consideration, there was a significant difference between patients with psoriasis and control group, as shown in Table 3. However, the statistical analysis revealed significance in all frequencies, the median of hearing level at frequences 500–4000 Hz, were not lower than 20 decibels. But at the hearing level of high frequencies such as 8000 and 16,000 Hz, patients with psoriasis had hearing levels lower than 20 decibels, which can be accepted as hearing loss at high frequencies.

Discussion

In a review of the English and Turkish literatures, we found only two original articles, investigating the effects of psoriasis on ear functions. In a study by Karabulut et al.,[10] 42 patients (mean age 36.1 years; range: 13–71 years) with psoriasis and 60 controls were investigated for hearing and cochlear function. Hearing examination included complete

Table 3. Median frequency values of the patients and controls.

Median frequencies (Hz)	Patients		Controls		p value
	Right ear (dB)	Left ear (dB)	Right ear (dB)	Left ear (dB)	
500	10	10	5	5	0.00
1000	10	10	5	5	0.00
2000	10	10	5	5	0.03
4000	10	10	5	5	0.02
8000	20	5	17	10	0.00
16,000	37	40	10	10	0.00

audiological evaluation as well as distortion product otoacoustic emission. The mean PASI score of the patients was 5.7±3.2. Unlike our study, there was no statistically significant difference between patients and controls in audiometric values as well as distortion product otoacoustic emission values.[8] As the PASI score of the patients in the study above is smaller than our study, we think that they have less systemic inflammation, and less immune impairment causing no effects on hearing functions. Moreover, the audiometric data of the patients were not investigated according to demographic findings, disease severity, treatment modalities apart from our study. In the Turkish literature, there is one more study investigating the hearing functions in psoriasis. In this study by Guvenc et al.,[11] 51 patients with psoriasis and 51 controls were examined for hearing loss with pure tone audiometry. Mean PASI score of the patients were 9.6±6.4 which is also less than our PASI scores. Similar to the study by Karabulut et al.,[10] there was no significant difference between patients and controls according to median PTA values. However, the bone and hearing thresholds were statistically different at all frequencies except 1000 Hz for right ear and 500 and 1000 Hz for left ear in patients than controls. The seek for a correlation between PASI scores and hearing frequencies yielded a significant link between PASI scores and hearing loss at medium and high frequencies. In contrast to the study stated above, we could not find any correlation between mean frequency (4000, 8000, 16,000 Hz) variables of the patients and PASI scores, disease duration, previous systemic treatment modalities, and distribution of the lesions. However, similar to the study by Guvenc et al.[11] the hearing levels of the patients with psoriasis according to specific hearing frequencies (500, 1000, 2000, 4000, 8000, and 16,000 Hz) were significantly different than controls.

Moreover, there are two case reports about sensorineural hearing loss associated with psoriatic arthritis in the English literature. Giani et al.[12] described a 12-year-old girl who had sensorineurol hearing loss during etanercept therapy. She was successfully treated with oral prednisolon without any recurrence in spite of etanercept administrations. Srikumar et al.[13] also described a 62-year-old man with psoriatic arthritis presented with sudden-onset hearing loss on medication with methotrexate. The patient recovered on oral corticosteroids. The authors above stated that patient with psoriatic arthritis may be prone to sensorineural hearing loss. Although a clear relationship is still uncertain, immune impairment in arthritis may increase susceptibility to an associated autoimmune disease.[10,11]

Since the original description of ASED by McCabe et al.,[6] there had been several studies trying to explain the exact mechanism of the hearing loss. The disease was defined as a progressive hearing loss that deteriorates in the course of weeks and months and it may improve with immunosuppressive therapy. The incidence of ASED is not well-established as it has no definitive diagnostic test. Similar with other autoimmune disorders, it occurs more frequently in women. The diagnosis of ASED is based primarily on clinical evaluation and audiological test. Serological tests which can detect specific antibodies were described and heat shock protein 70 (HSP-70) is particularly noteworthy. Unfortunately, HSP-70 is expressed in many inner ear diseases as an indicator of early cell damage, and it is not specific for ASED.[14]

The pathogenesis of immune-mediated hearing loss in autoimmune diseases other than psoriasis is still vague. The autoimmune theory is the most popular idea and the term autoimmune inner disease encompasses the cases of cochleovestibular dysfunction related to various systemic immune-mediated diseases. In this entity, the inner ear may not be a target of an immune attack but is vulnerable to indirect injury by deposition of immune complexes or other mechanisms.[15] In recent years, psoriasis was classified not as only a skin disease but also as a T-cell mediated systemic disorder. T cells lines such as T-helper (Th)-1, Th-17, Th-22 populations may be expanded and trigger the release of inflammatory cyctokines including tumor necrosis factor-α, and interleukins.[4,16] In this perspective, the systemic inflammation associated with psoriasis may have a role in the development of immune-mediated hearing loss.

One of the limitations of our study is that the patients were not investigated by a rheumatologist for arthritis. However, they had been asked if they had any symptoms of active arthritis during dermatology visits. Sera from patients were also not investigated for antibodies for inner ear antigens such as anti-connexin26, anti-DEP/CD148 and anti 68 kD. Patients who had lesions in external ear meatus were not noted. However, audiological tests were evaluated after local treatments for patients who had severe psoriatic lesions in external meatus.

In conclusion, psoriasis is defined as a chronic, immune-modulated inflammatory disease that affects many systems. The range and nature of the conditions that are associated with psoriasis suggest a possible link between the underlying systemic inflammatory pathways that drive psoriasis and ASED. Consequently, the possibility of inner ear involvement should be kept in mind and psoriasis patients

with high PASI scores should be monitored with audiometry regularly even if they do not admit with hearing problems directly.

Conflict of Interest: No conflicts declared.

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