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Case Report / *Olgu Sunumu*

Self-inflicted negative pressure of the external ear canal: a rare cause of tympanic membrane perforation

Dış kulak yoluna kendi kendine negatif basınç: Nadir bir kulak zarı delinmesi nedeni

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ABSTRACT

Tympanic membrane (TM) perceives and amplifies sound, and transmits the information to the brain. Tympanic membrane perforation means loss of TM's integrity due to various reasons including penetrating or blunt traumas, sudden changes in pressure, excessive acoustic energy changes or otitis media and it may result from application of negative pressure to TM through external ear canal with fingers. Herein, we present two patients with self-inflicted traumatic TM perforations and discuss management of this rare entity in the light of literature.

Keywords: Digital trauma; perforation; self-inflicted; tympanic membrane.

ÖZ

Kulak zarı (KZ) sesi algılayıp yükselterek beyne bilgi aktarır. Kulak zarı delinmesi kesici veya künt travmalar dahil olmak üzere ani basınç değişiklikleri, aşırı akustik enerji değişimleri veya orta kulak iltihabı gibi çeşitli nedenlerden dolayı KZ'nin bütünlüğünün kaybı anlamına gelir ve parmak ile dış kulak yolundan KZ'ye uygulanan negatif basıncın bir sonucu olabilir. Bu yazıda kendi kendine travmatik KZ delinmesi olan iki hasta sunuldu ve literatür ışığında bu nadir tablonun tedavisi tartışıldı.

Anahtar sözcükler: Dijital travma; perforasyon; kendi kendine; kulak zarı.

The tympanic membrane (TM) is located between the external and the middle ear. It receives and amplifies sound waves, and transmits vibrations to the ossicular chain. Since it is a thin sheet, the TM is relatively sensitive to air pressure changes in the external auditory canal (EAC). Tympanic membrane perforation (TMP) is a loss of TM integrity due to various reasons including penetrating or blunt traumas, sudden changes in pressure, excessive acoustic energy changes or otitis media.[1] The incidence of TMP in the general population is unknown. Tympanic membrane perforation may result from finger-manipulation pressure transmitted to the TM through the external ear canal. Patients with traumatic TMP usually present with hearing loss, bleeding, cerebrospinal fluid (CSF) leak, vertigo, tinnitus, infection, and otalgia. With written informed consent, we present two patients with self-inflicted traumatic TMP and discuss our management of this rare entity in the light of the literature.

CASE REPORT

Case 1- A 48-year-old male with a history of frequent ear itching presented to our clinic with complaints of left earache, tinnitus, hearing loss, and vertigo after scratching the left ear with his index finger. Otoscopic examination showed that both external ear canals had eczematous otitis and a 4x4 mm, regular bordered, anteroinferiorly located central perforation of the left TM with hyperemia and subepithelial hemorrhage at the

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periphery of the perforation (Figure 1). The left middle ear mucosa also had hyperemia. Other otolaryngologic examinations were normal. Audiometric findings in the left and right ears were 18/12 dB and 12/12 dB respectively. Closure of the TMP was not achieved with adhesive strip patching at the end of a three-month follow-up period. A tragal cartilage butterfly graft tympanoplasty was performed and the TM was intact six months postoperatively.

Case 2- An 18-year-old female with a history of eczematous otitis externa presented to our clinic with complaints of excessive otalgia, vertigo, hearing loss, and tinnitus in right ear after scratching the right ear with her index finger. Otoscopic examination revealed a 3x2 mm, anteroinferiorly located central perforation of the right TM with hyperemia around the manubrium mallei (Figure 2). The left TM was retracted and matte colored. Anterior rhinoscopy displayed hypertrophied and pale bilateral inferior turbinates and serous secretion that was suggestive of allergic rhinitis. She had used antihistaminic drugs for seasonal allergic rhinitis (AR) but given up the drugs for three months. Audiometric findings in the left and right ears were 32/20 dB and 38/20 dB respectively. Medical therapy for AR and secretory otitis media were given and the perforation was patched with an adhesive strip. The perforation healed spontaneously and audiometric findings returned to normal values dramatically at the end of third week of follow-up.

DISCUSSION

The longest diameter of the tympanic membrane measures between 9.0 mm and 10.2 mm whereas the shortest diameter varies between 8.5 mm and 9.0 mm. There are two general regions of the tympanic membrane: the pars tensa and the pars flaccida. The larger pars tensa region consists of three layers: skin, fibrous tissue, and mucosa and is comparatively robust, and is the region most commonly associated with perforations. The pars flaccida consists of two layers, lacks a fibrous layer, and is relatively fragile.[2] The integrity of the TM and associated structures is important for proper sound conduction. It receives and amplifies sound and plays role in the transmission of sound to the brain. Since it is a thin sheet, the TM is relatively sensitive to air pressure changes in the EAC.

The incidence of TMP in the general population is not known. It was found that 4% of a population of Native American children had TMP[3] and 8.6% of patients consulting a physician for ear disease in Nigeria were found to have a traumatic tympanic membrane perforation.[4] The worldwide incidence of traumatic TMP is unknown.

In a retrospective review of 64 patients with traumatic TMP, the etiology comprised of slaps (35.9%), instrumentations (10.9%), self ear cleaning (10.9%), road traffic injury (23.5%), foreign body (12.5%), explosions (4.7%), falls (1.6%).[5] In another retrospective analysis of 198 patients with traumatic TMP, the causes and frequencies of the traumatic TMPs were as follows blow (n=90), collision (n=40), insertion of cotton bud (n=36), insertion of sharp object (n=9), firecracker explosion (n=5), barotrauma (n=4), kick by a child (n=2), weld bead (n=2), and unknown (n=10) and 45.5%, 20.2%, 18.1%, 4.5%, 2.5%, 2%, 1%, 1%, and 5% respectively.[6]

Overpressure is the most common mechanism of trauma to the TM.[4-8] It was shown that rupture of normal TMs in cadavers was performed at an

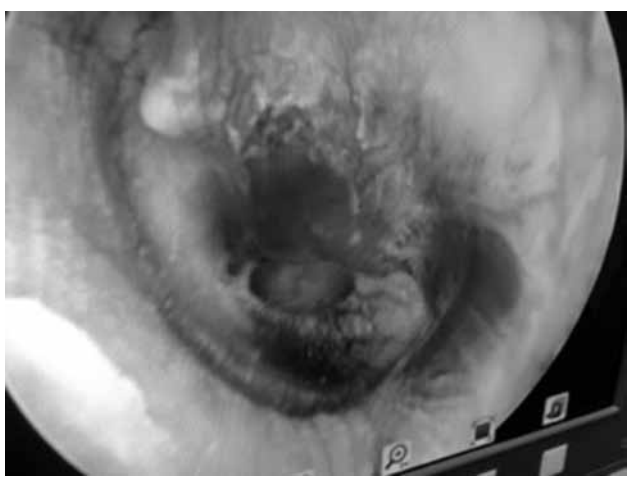

Figure 1. Central perforation of left tympanic membrane with hyperemia and subepithelial hemorrhage at its periphery.

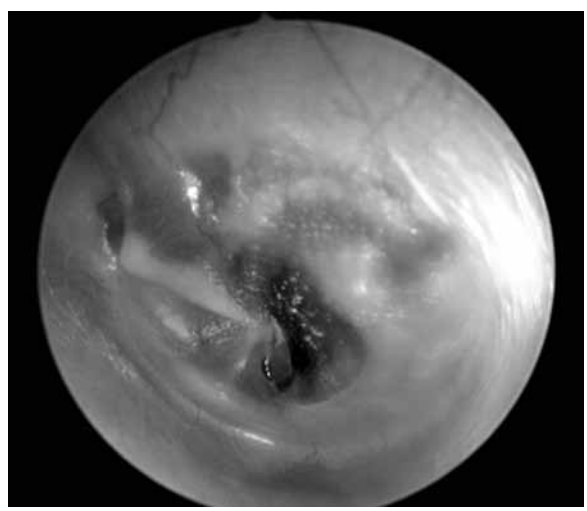

Figure 2. Central perforation of right tympanic membrane with hyperemia.

over-pressure of between 0.5 and 2.0 atmospheres. The difference explains the large variation in membrane strength between individuals. For example, atrophic tympanic membranes can rupture at between 0.3 and 0.8 atmospheres. In addition to this, the membrane's tensile strength declines with advancing age.[9] Several factors have proven to positively or negatively affect an individual's susceptibility to TMP. A study has revealed that disease or previous injury, increased age, inadequate pneumatization, and TM position perpendicular to the incident wave all increase the likelihood of perforation and up to 80% of all TMPs heal spontaneously, with relatively few requiring operative intervention.[10] In the case of self-inflicted negative pressure in the EAC which is a rare cause of TMP, the patients insert a finger into the EAC (nearly always after a bath) and then pulled it out. This perforation is possibly due to concurrent eustachian obstruction/dysfunction and exertion of negative overpressure to EAC. Immediately afterwards they experience pain, vertigo, and hearing loss. Several studies revealed that self-inflicted negative pressure of the EAC with fingers may even cause malleus fracture.[11-13]

The presenting symptoms of traumatic TMP and their frequency were hearing loss (95.3%), bleeding (68.8%), CSF leak (15.6%), dizziness (9.4%), tinnitus (52%), infection (37.5%), and pain (59.4%).[5]

Both our patients had ear pruritus. One patient had eczematous external otitis and the other suffered from AR. They applied negative pressure to their ears by inserting a finger into the EACs and then experienced earache, vertigo, hearing loss, and tinnitus which are frequently-encountered signs of TMP. Both patients has experienced the presenting symptoms just after removal of their fingers from EAC, not at the time of insertion to there. Eczematous otitis externa includes various dermatologic conditions involving the skin of the EAC and may range from atopic dermatitis, contact dermatitis, seborrheic dermatitis, neuro dermatitis, infantile eczema etc. This condition is characterized by intense itching, in fact this may be the only complaint of patients.[14] Patients with seasonal AR tend to present to the physician mainly with symptoms of watery rhinorrhea, repetitive sneezing, and also with nasal congestion, pruritis of the nose, ears, eyes, and palate, and watering eyes.[15]

Patients with traumatic TMP should be informed about keeping the ear dry by preventing water from entering the ear canal.[16,17] In several studies, it has been found that most traumatic TMPs have a tendency to heal spontaneously with similar rates.[18-23] Traumatic TMP frequently occurs in healthy members of the community, generally has excellent prognosis, and if the perforation does not close spontaneously by 3-6 months (in the absence of secondary infection), surgical closure should be considered.[16,17]

In our cases, both patients had pruritus in their ears and the traumatic TMPs resulted from self-inflicted negative pressure on the EAC. In conclusion, physicians should manage patients with pruritic ears meticulously to prevent eventual traumatic TMPs.

Declaration of conflicting interests

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