| 日本語ラベル | イングリッシュラベル |
|------------|------------------|
| タイトル | Title |
| 総数 | Traumatic perilymphatic fistula caused by a camellia branch: A case report |
| 著者 | Author(s) |
| Uehara, Natsumi / Fujita, Takeshi / Nibu, Ken-ichi / Kakigi, Akinobu |
| 掲載誌・巻号・ページ | Citation |
| Acta Oto-Laryngologica Case Reports, 5(1):101-105 |
| 刊行日 | Issue date |
| 2020 |
| 資源タイプ | Resource Type |
| Journal Article / 学術雑誌論文 |
| 版区分 | Resource Version |
| publisher |
| 権利 | Rights |
| © 2020 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. |
| DOI | DOI |
| 10.1080/23772484.2020.1840274 |
| JaLCDOI | |
| URL | |
| http://www.lib.kobe-u.ac.jp/handle_kernel/90007737 |

PDF issue: 2021-04-28
Traumatic perilymphatic fistula caused by a camellia branch: A case report

Natsumi Uehara, Takeshi Fujita, Ken-ichi Nibu & Akinobu Kakigi

To cite this article: Natsumi Uehara, Takeshi Fujita, Ken-ichi Nibu & Akinobu Kakigi (2020) Traumatic perilymphatic fistula caused by a camellia branch: A case report, Acta Oto-Laryngologica Case Reports, 5:1, 101-105, DOI: 10.1080/23772484.2020.1840274

To link to this article: https://doi.org/10.1080/23772484.2020.1840274
Abstract

Traumatic perilymphatic fistula with pneumolabyrinth and stapediovestibular dislocation is rare, and these treatments are still controversial. A 38-year-old man presented to our hospital with vertigo and right-ear hearing loss. The symptoms occurred immediately after a traumatic ear injury after falling on a branch of a camellia tree. Computed tomography showed the presence of air in the vestibule and stapediovestibular dislocation. He underwent surgery treatment. The stapes was found to be depressed into the vestibule, which was cracked, with a piece of the tree branch lodged in the crack. Hence, we did not reposition the stapes. We sealed the oval window using perichondrium, a cartilagenous columella was placed. In this case, immediate surgical intervention was necessary to prevent infection. There was no additional inner ear damage and the patient’s hearing was partially restored, removing the stapes seems to have been an acceptable solution.

Introduction

Perilymphatic fistula is due to leakage of perilymph from the inner ear into the middle ear. Such leakage may induce sudden sensorineural hearing loss, tinnitus, aural fullness, vertigo, disequilibrium, or combinations of these symptoms. The common causes of traumatic perilymphatic fistulas are penetrating ear injury (e.g. by an earpick), barotrauma, middle ear surgery, and temporal bone fracture [1,2]. Although penetrating ear injuries are not uncommon in otolaryngologic practice, inner ear damage caused by a fractured stapes is less frequent because the stapes is protected from direct trauma by the overhanging scutum and its deep location in the middle ear cavity. Moreover, stapes luxation into the vestibule is rare because the footplate of the stapes is firmly attached to the oval window by the annular ligament. With such injuries, it is important to determine how deeply deplaced the stapes is and whether it is fractured because the condition of the stapes determines the treatment options, surgical approach, and outcome [3,4]. We report a case of traumatic perilymphatic fistula with stapediovestibular dislocation caused by falling on a tree branch.

Case presentation

A 38-year-old man presented to the Kobe University Hospital with the chief complaints of vertigo and right-ear hearing loss. These symptoms occurred immediately after suffering a traumatic ear injury caused by falling on a branch of a camellia tree. Otoscopic examination revealed a small perforation of the tympanic membrane and disarticulation of the incudostapedial joint (Figure 1). The spontaneous and gaze nystagmus test showed horizontal-rotatory nystagmus beating from right to left. Pure-tone audiography showed mild, mixed hearing loss in his right ear with a slightly increased bone conduction threshold. The left ear showed mild conductive hearing at low-frequencies (Figure 2). High-resolution computed tomography (HR-CT) of the right temporal bone revealed areas of low density in the vestibule. In addition, the stapes was deeply depressed into the vestibule (Figure 3). These findings suggested that air was present inside the vestibule. HRCT of the left side revealed a normal ossicular chain. The patient was diagnosed with a traumatic perilymphatic fistula and pneumolabyrinth.

To seal the perilymphatic fistula and prevent middle and inner ear infection, we performed combined...
endoscopic and microscopic surgery less than 1 day after the injury. The stapedius tendon had been torn by the branch, allowing the stapes to fall deep into the vestibule. Although air bubbles were seen in the vestibule, we did not attempt removal by suction for fear of causing additional damage to the inner ear. We therefore dropped Ringer’s solution into the tympanic cavity, forcing the air out.

The disrupted stapes was elevated carefully but was not repositioned because a piece of the tree branch was observed in a crack in the stapes (Figure 4). An additional movie file shows this in more detail (see Supplemental data 1). We then dropped dexamethasone (3.3 mg/ml) into the tympanic cavity and filled it to protect the inner ear function. The oval window was sealed with perichondrium, and a columella made of tragus cartilage was placed. Finally, the tympanic membrane was closed by perichondrium. The patient was treated symptomatically with antibiotic prophylaxis and a steroid.

Postoperatively, the patient’s vertigo decreased rapidly and significantly. Five months after the surgery,
he was free from vertigo, and his right-ear hearing was partially restored (Figure 5).

**Discussion and conclusions**

Although clinical diagnosis of the perilymphatic fistula may be challenging, it is usually not difficult after penetrating trauma to the middle ear. Most patients with perilymphatic fistula present with sensorineural hearing loss, tinnitus, aural fullness, vertigo, and/or disequilibrium immediately after the injury. It is important to evaluate the tympanic membrane, preferably under a microscope. As reported previously, a foreign object rupturing the posterosuperior quadrant may cause obscure damage to the ossicular chain or perilymphatic leak. It may even leave an unsuspected foreign body in the middle ear [5]. Identification of pneumolabyrinth—the presence of air in the labyrinth—on high-resolution computed tomography after ear trauma indicates the presence of perilymphatic fistula.

No standard treatment of perilymphatic fistula with pneumolabyrinth has been established. For patients with mild symptoms, some authors described conservative treatment with close monitoring of the patient’s hearing, hopefully leading to the resolution of vestibular symptoms [6–9]. Such resolution likely is due to central compensation rather than restoration of peripheral vestibular function, with the leaks possibly having sealed spontaneously [10]. In patients with cerebrospinal fluid otorrhea, progressive hearing loss, or unresolving vestibular problems, explorative tympanotomy should be performed to prevent progression of the sensorineural hearing loss and possible loss of vestibular function [11–13]. Treatment of dizziness is usually successful, whereas that of hearing loss is difficult and often unsuccessful. Most reports have shown unsatisfactory hearing outcomes regardless of the treatment strategy chosen [4,11].

The location of air in the labyrinth is an important prognostic factor. Regarding cases in which pneumolabyrinth was limited to the vestibular organs, air and bone conduction hearing improved, whereas no cases in which pneumolabyrinth extended to both the cochlea and vestibular organs showed improvement in their air and bone conduction thresholds. For patients with air in the cochlea via only the round window, a good hearing outcome can be expected [6].

Animal experiments showed irreversible dysfunction of the inner ear when there was air in the scala vestibule rather than in the scala tympani. In the histological analysis, structures such as the organ of Corti, Reissner’s membrane, spiral ganglion, and stria...
vascularis retained normal morphology in animals, with air in the scala tympani, whereas collapse of the Reissner’s membrane was observed in those with air in the scala vestibuli [14]. Based on these results, it was suggested that the location of air is helpful when deciding if surgical intervention is appropriate. In addition, stapes luxation to the vestibule requires immediate surgical intervention because air in the cochlea as well as the vestibule can cause irreversible damage to the inner ear. In the present case, in which the air was limited to the vestibule, we expected restoration of the hearing.

For perilymphatic fistula with stapes luxation after penetrating trauma to the middle ear, not only the timing of the surgical intervention but the surgical procedure itself should be carefully considered. Even when stapes that are depressed deeply into the vestibule are removed, the prognosis for recovery of hearing is not necessarily satisfactory [3,10,15]. Because of the risk of sensorineural hearing loss, removing the footplate during surgical repair should be avoided whenever possible [16]. Immediate surgical intervention—including removing or elevating the stapes—is the treatment of choice in cases where the stapes is fractured and depressed into the vestibule because otherwise the changes in the inner ear become irreversible [17]. When the stapes remains in the vestibule, scarring can occur around it and cause late inner ear damage [4,17]. In the current case, the stapes was fully depressed into the vestibule, although the superstructure of the stapes was visible at the oval window. Hence, we removed the stapes carefully and injected dexamethasone into the tympanic cavity to prevent inner ear damage. Intratympanic dexamethasone injection has expected to protect the inner ear damage due to its antioxidant and anti-inflammatory properties including for treatment of sudden sensorineural hearing loss [18].

Most previous cases of penetrating ear trauma due to foreign bodies [6] have been due to earpicks. The present case is rare because it involved damage incurred by a tree branch. The surgical findings suggested that wood from the tree was trapped in a crack in the stapes, and that if it were not removed, the risk of infection was high. In such cases, explorative tympanotomy is important for checking the condition of the tympanic cavity and to ensure an absence of foreign bodies.

In this case, the cause of fistula was obvious, infection was possible, and it was necessary to perform ossicular chain reconstruction. Immediate surgical intervention was necessary to prevent infection. As there was no additional inner ear damage, and the patient’s hearing loss was partially restored, we believe that removal of the stapes was an acceptable solution.

Acknowledgments
We thank Edanz Group (https://en-author-services.edanzgroup.com/) for editing a draft of this manuscript.

Informed consent statement
The patient presented in this case report was provided informed consent for publication.

Disclosure statement
No potential conflict of interest was reported by the author(s).

ORCID
Natsumi Uehara http://orcid.org/0000-0002-6620-4546
Takeshi Fujita http://orcid.org/0000-0002-6457-6231
Ken-ichi Nibu http://orcid.org/0000-0002-5461-4871
Akinobu Kakigi http://orcid.org/0000-0003-4353-8989

References
[1] Alzahrani M, Fadous R, Dufour JJ, et al. Perilymphatic fistulas: can we predict the diagnosis? Eur Arch Otorhinolaryngol. 2015;272(8):1885–1891.
[2] Kobayashi T, Gyo K. Earpick injury of the stapes. Am J Otolaryngol. 2000;21(3):340–343.
[3] Hatano A, Rikitake M, Komori M, et al. Traumatic perilymphatic fistula with the luxation of the stapes into the vestibule. Auris Nasus Larynx. 2009;36(4):474–478.
[4] Yamasoba T, Amagai N, Karino S. Traumatic luxation of the stapes into the vestibule. Otolaryngol Head Neck Surg. 2003;129(3):287–290.
[5] Armstrong BW. Traumatic perforations of the tympanic membrane: observe or repair? Laryngoscope. 1972;82(10):1822–1830.
[6] Hidaka H, Miyazaki M, Kawase T, et al. Traumatic pneumolabyrinth: air location and hearing outcome. Otol Neurotol. 2012;33(2):123–131.
[7] Lao WW, Niparko JK. Assessment of changes in cochlear function with pneumolabyrinth after middle ear trauma. Otol Neurotol. 2007;28(8):1013–1017.
[8] Gunesh RP, Huber AM. Traumatic perilymphatic fistula. Ann Otol Rhinol Laryngol. 2003;112(3):221–222.
[9] Prisman E, Ramsden JD, Blaser S, et al. Traumatic perilymphatic fistula with pneumolabyrinth: diagnosis and management. Laryngoscope. 2011;121(4):856–859.
[10] Bogaerts M, Waterval J, van Dinther J, et al. Treatment of traumatic stapediovestibular luxation:
case report with the introduction of a new technique and review of literature. Otol Neurotol. 2014;35(4):582–588.

[11] Tsubota M, Shojaku H, Watanabe Y. Prognosis of inner ear function in pneumolabyrinth: case report and literature review. Am J Otolaryngol. 2009;30(6):423–426.

[12] Kim SH, Kazahaya K, Handler SD. Traumatic perilymphatic fistulas in children: etiology, diagnosis and management. Int J Pediatr Otorhinolaryngol. 2001;60(2):147–153.

[13] Kita AE, Kim I, Ishiyama G, et al. Perilymphatic fistula after penetrating ear trauma. Clin Pract Cases Emerg Med. 2019;3(2):115–118.

[14] Kobayashi T, Sakurada T, Ohyama K, et al. Inner ear injury caused by air intrusion to the scala vestibuli of the cochlea. Acta Otolaryngol. 1993;113(6):725–730.

[15] Sarac S, Cengel S, Sennaroglu L. Pneumolabyrinth following traumatic luxation of the stapes into the vestibule. Int J Pediatr Otorhinolaryngol. 2006;70(1):159–161.

[16] Vanderstock L, Vermeersch H, De Vel E. Traumatic luxation of the stapes. J Laryngol Otol. 1983;97(6):533–537.

[17] Arragg FG, Paparella MM. Traumatic fracture of the stapes. Laryngoscope. 1964;74:1329–1332.

[18] El Sabbagh NG, Sewitch MJ, Bezdjian A, et al. Intratympanic dexamethasone in sudden sensorineural hearing loss: a systematic review and meta-analysis. Laryngoscope. 2017;127(8):1897–1908.