

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Temporomandibular joint herniation into the middle ear: A rare cause of mastication-induced tinnitus

Jin Woo Choi, MD, PhD^a, HyunJoo Nahm, MD^b, Jung Eun Shin, MD, PhD^b,
Chang-Hee Kim, MD, PhD^{b,*}

^a Department of Radiology, Konkuk University Medical Center, Research Institute of Medical Science, Konkuk University School of Medicine, Seoul, Republic of Korea

^b Department of Otorhinolaryngology-Head and Neck Surgery, Konkuk University Medical Center, Research Institute of Medical Science, Konkuk University School of Medicine, 120-1 Neungdong-ro (Hwayang-dong), Gwangjin-gu, Seoul, Republic of Korea, 05030, Seoul, Republic of Korea

ARTICLE INFO

Article history:

Received 29 September 2019

Revised 25 October 2019

Accepted 26 October 2019

Available online 22 November 2019

Keywords:

Tinnitus

Mastication

Temporomandibular joint

Middle ear

Foramen of Huschke

ABSTRACT

A 75-year-old patient complained of mastication-induced clicking tinnitus on the left side, and otoendoscopic examination revealed that the left tympanic membraneTM was outwardly bulged by clenching her teeth. Temporal bone computed tomography demonstrated that the posteromedial bony wall of the glenoid was partially dehiscent, allowing herniation of soft tissue contents of temporomandibular joint into the middle ear. Increased middle ear pressure due to soft tissue herniation can induce left tympanic membrane bulging and accompanying clicking tinnitus. Herniation of temporomandibular joint soft tissue into the middle ear should be considered as a differential diagnosis when clicking tinnitus is evoked by mastication.

© 2019 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license.

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Foramen tympanicum (FT), or foramen of Huschke results from a defect in normal ossification of the tympanic portion of the temporal bone, and serves as a communication route between the external auditory canal (EAC) and infratemporal

fossa. Although closure of FT normally occurs during the first 5 years after birth, rarely persistent FT may lead to herniation of the temporomandibular joint (TMJ) tissue into the EAC, causing symptoms including tinnitus, conductive hearing loss and otalgia [1–13].

The posterior wall of the glenoid fossa, where the TMJ is located, forms the anterior wall of the bony EAC, and the an-

Acknowledgment: This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea Government (MSIP) (2019R1H1A1080123).

Conflict of interest: None.

* Corresponding author.

E-mail address: ryomachang@gmail.com (C.-H. Kim).

<https://doi.org/10.1016/j.radcr.2019.10.032>

1930-0433/© 2019 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license. (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

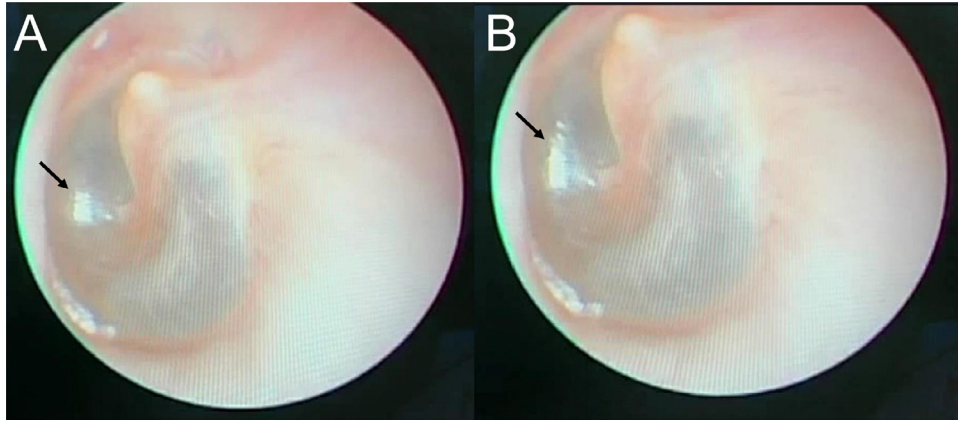


Fig. 1 – Otoendoscopic findings of the left tympanic membrane (TM) at rest (A) and during jaw-clenching (B). Note that the appearance of cone of light (black arrow) is different between them due to bulging of the TM during jaw-clenching

terior wall of the middle ear more medially. Thus, herniation of TMJ soft tissue into the middle ear may occur if persistent FT is located more medially. In this article, we present a case with mastication-induced clicking tinnitus whose tympanic membrane (TM) bulges out by clenching her teeth.

Case report

A 75-year-old woman was referred to our clinic with the complaint of mastication-induced tinnitus on the left side. The patient reported that she experienced a clicking sound when clenching her teeth, especially during mastication over the past 3 months. She did not complain of other ear symptoms such as hearing loss, otalgia, aural fullness, and otorrhea. She denied previous history of other auditory disorder, brain or ear trauma, or otologic surgery. Otoendoscopic examination showed a normal TM and EAC, but revealed that the left TM was outwardly bulged when she clenched her teeth (Fig. 1; Supplemental video 1) although the right TM showed no change (Supplemental video 2). Temporal bone computed tomography revealed that the posteromedial wall of the left

glenoid was dehiscent with a 3-mm sized bony defect in the region of the anterior mesotympanum at the entrance to the Eustachian tube (Fig. 2), through which, we suspect, retrodisical TMJ soft tissue protruded during tightening her jaw, causing outward bulging of the TM. The patient did not opt for surgery because she felt that the discomfort was minimal and tolerable. Instead, we decided on conservative management, including muscle relaxants and avoidance of chewing on the left side. After conservative management, she revisited our clinic and reported that her symptoms were much relieved even though outward bulging of the left TM was still observed when tightening her jaw (Supplemental vide 3).

Discussion

The FT is formed during a membranous ossification process of the temporal bone, and is normally open at birth. The FT becomes smaller from birth as the tympanic plate grows with time, and finally closes by the age of 5 years in general. Persistent FT occasionally occurs due to failure of ossification process which may be influenced by the mechanical interaction

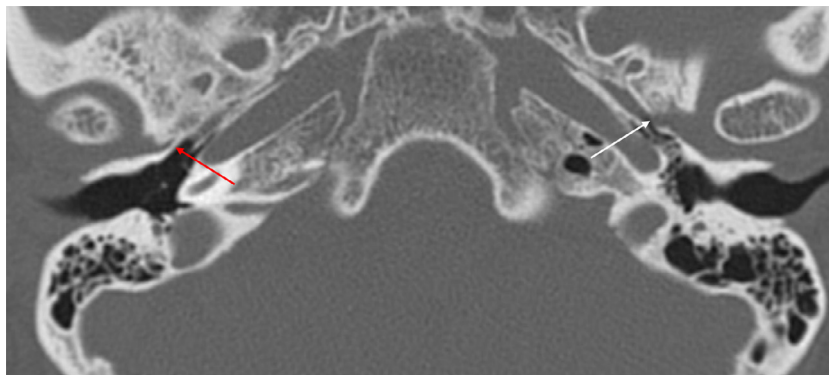


Fig. 2 – Temporal bone computed tomography reveals well-defined small bony defect in the region of the left anterior mesotympanum at the entrance to the Eustachian tube (white arrow). No bony defect is noted in the right side (red arrow). (Color version of figure is available online.)

between the mandible and the tympanic bone [1]. A radiological study demonstrated that the incidence of persistent FT was estimated between 4.5% and 17.9% [4,14], and the average size of the foramen was 2.7 mm and 3.0 mm in the coronal and sagittal planes, respectively [5]. Although persistent FT is usually asymptomatic, necessitating no further treatment, surgical closure of bony defect may be required in symptomatic cases [3,7,8,15]. Spontaneous TMJ herniation as a complication of persistent FT has been reported only about 30 cases in the English literature [2–5,7–15], and the “herniation” occurred into the EAC in all of the cases.

Weissman et al reported 2 patients with dehiscence of the TMJ where TMJ soft tissues are herniated posteromedially, obstructing the middle ear entrance of the Eustachian tube [6]. The “herniation” interfered the middle ear drainage through the Eustachian tube, and caused an acute middle ear and mastoid effusion in both patients. In our patient, no evidence for middle ear effusion was noted, and no evidence for prior trauma in the TMJ or congenital deformity of the mandibular condyle was demonstrated on temporal bone computed tomography. This is, to the authors’ knowledge, the first description of mastication-induced tinnitus which was caused by spontaneous herniation of the TMJ tissue into the middle ear. The finding, that the TM was bulged outwardly by tightening the patient’s jaw, can be explained by the increased middle ear pressure due to soft tissue herniation into the middle ear. Moriyama et al suggested that mastication-associated repeated trauma on the bony defect causes softening of the intervening tissues and enlarging the defect size, making TMJ soft tissue herniated more easily [2]. This may explain why patients with persistent FT, as our patient, usually experience symptoms late in the adulthood.

In conclusion, spontaneous herniation of TMJ tissue into the middle ear through a persistent FT is an extremely rare condition, with mastication-induced tinnitus being one of the possible symptoms. In this condition, outward bulging of the TM accompanied by clicking tinnitus can be observed by clenching the patient’s teeth. When symptoms are minimal and patients do not want surgical treatment, conservative management such as avoidance of chewing foods on the affected side can be a good alternative.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.radcr.2019.10.032](https://doi.org/10.1016/j.radcr.2019.10.032).

REFERENCES

- [1] Mao JJ, Nah HD. Growth and development: hereditary and mechanical modulations. *Am J Orthod Dentofacial Orthop* 2004;125(6):676–89.
- [2] Moriyama M, Kodama S, Suzuki M. Spontaneous temporomandibular joint herniation into the external auditory canal: a case report and review of the literature. *Laryngoscope* 2005;115(12):2174–7.
- [3] Singh I, Jain A, Prasad P, Rajpurohit P. Spontaneous temporomandibular joint herniation: a rare case. *Oral Maxillofac Surg* 2017;21(1):87–90.
- [4] Tozoglu U, Caglayan F, Harorli A. Foramen tympanicum or foramen of Huschke: anatomical cone beam CT study. *Dentomaxillofac Radiol* 2012;41(4):294–7.
- [5] Wang RG, Bingham B, Hawke M, Kwok P, Li JR. Persistence of the foramen of Huschke in the adult: an osteological study. *J Otolaryngol* 1991;20(4):251–3.
- [6] Weissman JL, Hirsch BE, Chan K, Tabor EK, Curtin HD. Dehiscent temporomandibular joint. *Radiology* 1991;180(1):211–13.
- [7] Xie B, Zhang S, Liu Y. Endoscopic-assisted repair of spontaneous temporomandibular joint herniation through a transcanal approach. *Otol Neurotol* 2019;40(6):772–6.
- [8] Yoo MH, Park JW, Lee HS, Yang CJ, Park HJ. Repair of the foramen of Huschke using an extended endaural approach. *Laryngoscope* 2016;126(9):2137–9.
- [9] Lee CK, Park KH. Spontaneous temporomandibular joint herniation. *Otolaryngol Head Neck Surg* 2011;144(2):292–3.
- [10] Lee YW, Park YH. Bilateral spontaneous symptomatic temporomandibular joint herniation into the external auditory canal: a case report and literature review. *Auris Nasus Larynx*. 2018;45(2):346–50.
- [11] Lim KH, Jung JY, Rhee J, Choi J. Temporomandibular joint herniation through the foramen of Huschke with clicking tinnitus. *Eur Ann Otorhinolaryngol Head Neck Dis* 2019;S1879-7296(19):30070–5.
- [12] Park YH, Kim HJ, Park MH. Temporomandibular joint herniation into the external auditory canal. *Laryngoscope* 2010;120(11):2284–8.
- [13] Shin JE, Jeong KH, Ahn SH, Kim CH. Temporomandibular joint herniation into the external auditory canal: two cases involving a persistent foramen tympanicum. *J Craniofac Surg* 2015;26(4):e331–3.
- [14] Lacout A, Marsot-Dupuch K, Smoker WR, Lasjaunias P. Foramen tympanicum, or foramen of Huschke: pathologic cases and anatomic CT study. *AJNR Am J Neuroradiol* 2005;26(6):1317–23.
- [15] Shapiro MC, Osborn T. Temporoparietal fascia flap and total temporomandibular joint replacement for the management of patent foramen of Huschke. *Int J Oral Maxillofac Surg* 2016;45(8):1023–6.