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Case Report

Venous Engorgement as a Cause of Facial Canal Enlargement

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There are various causes of facial canal enlargement. From congenital anomalies to neoplasms, many pathologic conditions should be considered. However, normal variants of vascular anatomy can also result in facial canal enlargement on temporal bone imaging. In order to avoid unnecessary procedures and complications, such as bleeding and facial nerve injury, this possibility should also be taken into account. A case of a 50-year-old male who was diagnosed with facial canal enlargement because of venous engorgement in the facial canal is herein described.

KEY WORDS: Facial canal enlargement, venous engorgement, temporal MRI, blood supply of facial nerve

INTRODUCTION

Facial canal enlargement on temporal bone imaging is usually a critical sign that alarms otologists, suggesting congenital cholesteatoma [1], meningocele [2], or facial nerve neoplasms, such as schwannomas, neurofibromas, meningioma, paragangliomas, perineural spread of parotid malignancies, and other metastatic lesions [3-5]. However, normal variants of vascular anatomy can also cause facial canal enlargement, as was shown in a recent case report of fallopian canal enlargement due to a prominent vein in the temporal bone [6]. We herein present a case of facial canal enlargement due to the presence of a venous engorgement in the facial canal with imaging and surgical findings.

CASE PRESENTATION

A 50-year-old male, who had a history of previous simple mastoidectomy with ossiculoplasty in the left ear, was referred to our clinic due to recurring otorrhea. Otoscopic exam showed granulation tissue and a central perforation of the tympanic membrane. The patient initially showed no symptoms of facial palsy or dizziness. His pure tone audiogram demonstrated partial hearing loss on the left side with an air-bone gap of 34 dB and normal hearing on the right side.

Temporal bone computed tomography (CT), performed in the axial plane with coronal reconstruction, showed a soft tissue lesion filling the left tympanic and mastoid cavity, suggesting recurrent otomastoiditis. In addition, it also showed diffuse smooth enlargement of the bony facial canal from the geniculate ganglion to the stylomastoid foramen (Figure 1a, b). The contralateral facial canal was normal in size.

For further evaluation of the facial nerve lesion, such as a schwannoma and other malignancies, temporal magnetic resonance imaging (MR) was performed. On the gadolinium-enhanced T1-weighted images, diffuse and strong enhancement was observed in the left facial canal, along with a thin tubular filling defect of the normal peripheral facial nerve, which suggested a venous structure rather than a tumor. Soft tissue lesions filling the left tympanic and mastoid cavity were hyperintense on both T1- and T2-weighted images without diffusion restriction and showed mild peripheral enhancement on the enhanced images, which suggested chronic otomastoiditis (Figures 1c, d).

Under the diagnosis of chronic mastoiditis with the possibility of anatomical variation of the facial canal, canal wall down mastoidectomy was performed by retroauricular approach. Granulation tissue in the middle ear and mastoid cavity was removed. The facial nerve canal wall was thinned from the second genu to the geniculate ganglion. The facial canal had a dark blue appearance and tended to bleed easily, suggesting a venous structure (Figure 2). Cholesteatoma or any kind of neoplasm was not observed. After the surgery, there was no sign of facial paralysis over 3 years of follow-up.

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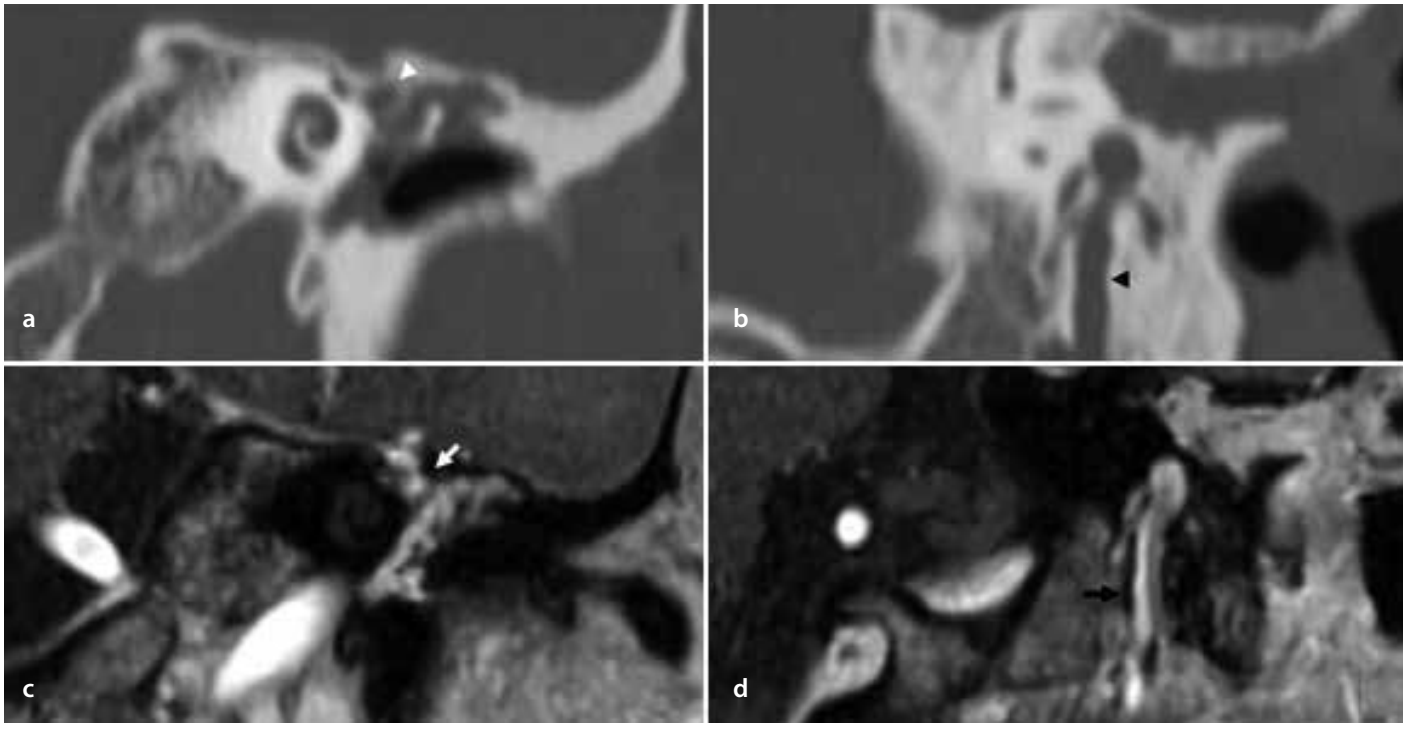

Figure 1. a-d. Imaging of the facial nerve. Enlargement of the tympanic segment of the facial nerve (white arrowhead) (a) and the mastoid segment (black arrowhead) seen on temporal bone computed tomography (b). Intense enhancement with nerve contour in the facial nerve canal is observed in the tympanic segment (white arrow) (c) and in the mastoid segment (black arrow) on gadolinium-enhanced T1-weighted magnetic resonance images (d)

Figure 2. Intraoperative findings. The facial canal (arrow) looked dark blue from the second genu to the geniculate ganglion and tended to bleed easily

This case was approved from the institutional review board (IRB) committee of Inha University Hospital, and informed consent was obtained before chart review (IRB number: 13-0945).

DISCUSSION

Facial canal enlargement on temporal bone imaging can be seen in various conditions. The normal diameter of the fallopian canal in the temporal bone has been reported to be 0.9 to 2 mm [7, 8]. From a congenital anomaly to neoplasms, many causes should be considered for the correct diagnosis. Similarly, there are many causes of facial canal enhancement on gadolinium-enhanced MR images. Enhancement of the facial nerve represents breakdown of the blood-peripheral nerve barrier or other pathological conditions, including Bell's palsy, infection, radiation, cholesteatoma, trauma, and neoplasms [9]. In addition, it is possible for the normal facial nerve to show mild enhancement of the labyrinthine segment, geniculate ganglion, and proximal tympanic segments, presumably due to the presence of a circumneural venous plexus in these segments [9, 10]. Venous congestion was also reported as a cause of facial nerve enhancement, due to its relatively well-developed anastomosis, in a human temporal bone study [11].

Arteries and their venous counterparts are different according to the segment of the facial nerve. The labyrinthine segments are supplied by the internal auditory artery, which arises from the anterior inferior cerebellar artery. The middle meningeal artery via the petrosal artery supplies the perigeniculate area, and the stylomastoid artery supplies the tympanic and mastoid segments. The superior tympanic artery occasionally extends into the facial canal, and the stylomastoid artery also anastomoses with the petrosal artery at the tympanic segment of the facial nerve. Similarly, accompanying veins drain each segment of the facial nerve. The venous blood from the geniculate ganglion and tympanic segment drains into the middle meningeal vein [1, 12, 13].

In this case, venous engorgement was a cause of facial canal enlargement. Although venous causes of facial canal enlargement have not been previously described in live patients, this possibility should be considered so that otologists will not mistakenly perform excessive procedures, such as facial canal exploration and even catastrophic biopsy. In addition, information regarding the presence of venous congestion can be helpful in avoiding intraoperative bleeding and facial nerve injury during otologic surgery.

Informed Consent: Written informed consent was obtained from the patient who participated in this case.

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REFERENCES

1. Robert Y, Carcasset S, Rocourt N, Hennequin C, Dubrulle F, Lemaitre L. Congenital cholesteatoma of the temporal bone: MR findings and comparison with CT. Am J Neuroradiol 1995; 16: 755-61.
2. Gray BG, Willinsky RA, Rutka JA, Tator CH, et al. Spontaneous meningocele, a rare middle ear mass. Am J Neuroradiol 1995; 16: 203-07.
3. Falcioni M, Russo A, Taibah A, Sanna M. Facial nerve tumors. Otol Neurotol 2003; 24: 942-7. [CrossRef]
4. Lo WW, Shelton C, Waluch V, Solti-Bohman LG, Carberry JN, Brackmann DE, Wade CT. Intratemporal vascular tumors: detection with CT and MR imaging. Radiology 1989; 171: 445-8. [CrossRef]
5. Petrus LV, Lo WM. Primary paraganglioma of the facial nerve canal. Am J Neuroradiol 1996; 17: 171-4.
6. Moonis G, Mani K, O'Malley J, Merchant S, Curtin HD. A venous cause for facial canal enlargement: Multidetector row CT findings and histopathologic correlation. Am J Neuroradiol 2011; 32: 83-4. [CrossRef]
7. Eicher SA, Coker NJ, Alford BR, Igarashi M, Smith RJ. A comparative study of the fallopian canal at the meatal foramen and labyrinthine segment in young children and adults. Arch Otolaryngol Head Neck Surg 1990; 116: 1030-5. [CrossRef]
8. Nakashima S, Sando I, Takahashi H, Fujita S, et al. Computer-aided 3-D reconstruction and measurement of the facial canal and facial nerve. I. Cross-sectional area and diameter: preliminary report. Laryngoscope 1993; 103: 1150-6. [CrossRef]
9. Hong HS, Yi BH, Cha JG, Park SJ, Kim DH, Lee HK, et alk. Enhancement pattern of the normal facial nerve at 3.0 T temporal MRI. Brit J Radiol 2010; 83: 118-21. [CrossRef]
10. Jäger L, Reiser M. CT and MR imaging of the normal and pathologic conditions of the facial nerve. Eur J Radiol 2001; 40: 133-46. [CrossRef]
11. Balkany T, Fradis M, Jafek BW, Rucker NC. Intrinsic vasculature of the labyrinthine segment of the facial nerve-Implications for site of lesion in Bell's palsy. Otolaryngol Head Neck Surg 1991; 104: 20-3.
12. Nager GT, Proctor B. The facial canal: normal anatomy, variations and anomalies. II. Anatomical variations and anomalies involving the facial canal. Ann Otol Rhinol Laryngol Suppl 1982; 97: 45-61.
13. Ogawa A, Sando I. Spatial occupancy of vessels and facial nerve in the facial canal. Ann Otol Rhinol Laryngol 1982; 91: 14-9.