A Venous Cause for Facial Canal Enlargement: Multidetector Row CT Findings and Histopathologic Correlation

SUMMARY: An enlarged facial nerve canal can be seen in both pathologic and nonpathologic processes. The purposes of this report are the following: 1) to present a rare cause of bony facial nerve canal enlargement, due to an enlarged vein, with high-resolution MDCT and histopathologic correlation; and 2) to discuss the vascular anatomy that gives rise to this variant.

ABBREVIATIONS: A = artery; AICA = anterior inferior cerebellar artery; GSPN = greater superficial petrosal nerve; MDCT = multidetector row CT

Discussion

Arterial supply to the facial nerve is segmental. The intracanalicular facial nerve is supplied by the AICA. The internal auditory artery, a branch of AICA, supplies the labyrinthine segment of the facial nerve.

The petrosal artery (also referred to as the superficial petrosal artery) branches off from the middle meningeal artery immediately after it enters the skull through the foramen spinosum. It enters the hiatus of the GSPN accompanying that nerve and provides arterial arborization to the geniculate ganglion and the tympanic segment (Fig 3). There is occasionally a second branch of the middle meningeal artery; the superior tympanic artery, which either anastomoses with the petrosal artery or itself extends into the facial canal (sometimes accompanying the lesser petrosal nerve) (Fig 3).

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Venous drainage of the facial nerve generally accompanies the named arteries within the nerve sheath. Ultimately the venous drainage from the geniculate ganglion and tympanic segment is into the middle meningeal vein. In our case, the V-shaped configuration of the venous channels suggests that these represent prominent petrosal and superior tympanic veins.

 Causes of facial canal enlargement are numerous. Congenital/developmental variants include a persistent stapedial artery (associated with absent foramen spinosum), congenital cholesteatoma, and meningocele with or without a CSF fistula involving the facial canal. Primary facial nerve neoplasms include schwannomas, neurofibromas, hemangiomas, meningiomas, epidermoids, and paragangliomas. Also, perineural spread of parotid (and other) malignancies via this route, leukemia infiltration, and metastatic disease affecting the facial nerve have been described.

Although the presence of veins and arteries in the facial canal is well known, venous causes of facial canal enlargement have not been previously described. Being aware of a venous etiology of facial canal enlargement can help prevent unnecessary work-up and intervention in asymptomatic patients. The otologist can be alerted to the presence of this vascular variant if middle cranial fossa surgical procedures en-
tailing elevation of the dura are planned to decrease intra-operative bleeding risk.

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Fig 1. A, Axial MDCT scan through the right temporal bone at the level of the cochlea demonstrates smooth enlargement of the tympanic segment of the facial canal (white arrows) with a V-shaped continuation anteriorly at the level of the first genu (black arrow and white arrowhead). B, Axial image at a more inferior level demonstrates an enlarged mastoid segment of the facial nerve (black arrow).

Fig 2. Photomicrographs of axial histopathologic specimens through the right temporal bone. A, Prominent veins (white arrow, black arrowhead) enter the facial canal anteriorly. The asterisk indicates the genu of the facial nerve. B, An enlarged vein (small black arrow) accompanies the mastoid segment of the facial nerve (long black arrow). The asterisk indicates the cochlea; the small black arrowheads, the tympanic membrane (hematoxylin-eosin stain, 1.5× magnification).

Fig 3. Schematic illustrates the tortuous course of the intratemporal facial canal, from proximal to distal ends: 1) labyrinthine segment 2) geniculate ganglion 3) tympanic segment, and 4) mastoid segment. The petrosal artery arises from the middle meningeal artery and enters the fallopian canal via the hiatus for the GSPN (5). The superior tympanic artery arises from the middle meningeal artery and supplies the facial nerve through a separate bony canal.