Imaging Case of the Month
Unusual Association of Bilateral Persistent Stapedial Arteries and Microtia With Bilateral Ossicular Anomalies Resulting in Conductive Hearing Loss

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Although rare, the presence of a persistent stapedial artery is the most common vascular anomaly of the middle ear, with a reported incidence of 0.48%, as found in a study of 1,048 temporal bone dissections (1). When discovered radiographically, it is often associated with absent foramina spinosum, aberrant internal carotid arteries, mild middle ear malformations, and anomalies of the facial nerve that relate to maldevelopment of the second branchial arch. With second branchial arch malformations, microtia may also be found, and even in minor cases, a significant number have been discovered to harbor ossicular malformations contributing to conductive hearing loss (2). Most reports of persistent stapedial arteries describe unilateral cases, which are more frequently identified incidentally during surgery or from postmortem studies of temporal bones (3). We present a very rare and interesting case of a child with bilateral persistent stapedial arteries.

CASE PRESENTATION

A 6-year-old female subject was referred for hearing loss and speech delay. Physical examination was significant for bilateral Grade I microtia with cup ear deformities but normal-appearing external auditory canals and tympanic membranes. An audiogram demonstrated moderate, bilateral conductive hearing loss. High-resolution thin section axial and coronal computed tomography (CT) of the temporal bones revealed bilateral persistent stapedial arteries and absent foramina spinosum.

On the right, the long process of the incus was elongated and abnormally oriented, projecting posteriorly instead of medially toward the oval fossa. The tip of the long process was slightly thickened, lacking its normal lenticular configuration. No definite stapes was identified, and specifically, no suprastructure seen (Fig. 1, A and B). On the left, the incus seemed to be normal, but only 1 crus of the stapes was identified (Fig. 1, C and D). On each side, a tubular structure was seen coursing along the cochlear promontory and oval fossa, the anterior portion of the tympanic segment of the facial nerve canal was enlarged, and the foramen spinosum was absent. Aberrant internal carotid arteries were not identified. The inner ear structures were normal. The patient was subsequently referred to our audiology services for a trial of amplification and an evaluation for a potential bone-anchored hearing implant.

DISCUSSION

Anatomic and histopathologic studies have shown that the stapedial artery arises from a branch of the hyoid artery (a second branchial arch derivative), which is a branch of the internal carotid artery. The hyoid and stapedial arteries most often atrophy during the third month of fetal development (4). The stapedial artery has been described as following a predictable course, arising from the petrous internal carotid artery, which then enters the anteromedial hypotympanum in an osseous canal and then also travels through a short segment of Jacobsen’s canal. It then exits this canal to travel onto the promontory, coursing dorsally and cephaled through the obturator foramen of the stapes. It then enters the facial canal through a dehiscence just behind the cochleariform process to exit the canal near the geniculate ganglion, where it enters the extradural space of the middle cranial fossa. The course of this artery explains the CT findings in our case, whereby the persistent artery was present where the
stapes should have been and the facial nerve canal was widened to accommodate the persistent vessel.

CONCLUSION

Bilateral persistent stapedial arteries are rare. Identification of this anomaly is clinically significant in patients who have ossicular anomalies associated with conductive hearing loss because amplification may be advised over middle ear exploration.

REFERENCES


**FIG. 1.** High-resolution CT imaging, temporal bone. **A,** Axial view of the right temporal bone demonstrating elongated long process of the incus (*large arrow*), which is deviated posteriorly to a round soft tissue structure, which represents a portion of the persistent stapedial artery (*small arrow*). **B,** Coronal view of the right temporal bone demonstrating a persistent stapedial artery coursing along the cochlear promontory and into the oval fossa where it is medial to the tip of the long process of the incus (*large arrow*). The oval window is thickened at this level, and the facial canal is dehiscent (*small arrow*). **C,** Axial view of the left temporal bone (at the same location of the right axial cut seen in **A**), demonstrating normal configuration and position of the incus (*large arrow*). A small soft tissue structure in the region of the oval fossa represents the persistent stapedial artery (*arrowhead*). A thin curvilinear structure along its anterior aspect probably represents a single crus of the stapes superstructure (*small arrow*). **D,** Coronal view of left temporal bone (0.7 mm; anterior to the position shown in **B**, coronal of right ear), demonstrating persistent stapedial artery entering the facial canal under the lateral semicircular canal (*large arrow*). A small structure lateral to it represents the tip of the normal incus (*small arrow*).