Aberrant internal carotid artery
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Patient: 7 years, male

Clinical History:

We present the findings of computed tomography and magnetic resonance angiography performed on a seven-year-old male patient with pulsatile tinnitus.

Imaging Findings:

It was for the first time, one year ago, that the patient's mother noticed a sound in his left ear. There was no previous history of ear infections. At that time, the presence of a mass was determined in the middle ear cavity, behind the tympanic membrane. The mass was identified as a glomus tumor, and an operation for its removal was suggested. One year after the initial presentation, the case was presented for operation. On otoscopic examination, his left external auditory canal was found to be normal, the tympanic membrane was intact and a red mass was observed behind the tympanic membrane. There was an easily audible pulsatile sound at the left side. The right ear was normal. An audiometric examination revealed 55 dB conductive hearing loss on the left side and a normal audiogram on the right side. A thin-section bone algorithm axial computed tomography (CT) scan of the temporal bones revealed that there was an abnormally lateral course of the petrous portion of the left internal carotid artery (ICA) that protruded into the tympanic cavity, representing an aberrant ICA (Fig. 1). In addition, there was a bony plaque found covering the region of the oval and round windows, and the carotid canal on the left side was narrower than that on the right side. MRA revealed that the left internal carotid artery was coursing laterally. The left ICA was hypoplastic and the A1 segment of the ipsilateral anterior cerebral artery was not seen. The right internal carotid artery was found to be normal (Fig. 2).

Discussion:

An aberrant lateral course of the ICA lying within the middle ear is a rare congenital anomaly. The incidence of an aberrant ICA is approximately 1%. Most of the cases occur in females, and on the right side. This entity rarely occurs bilaterally. An aberrant carotid artery usually causes pulsatile tinnitus and variable hearing loss (mostly conductive). The tinnitus may be the result of either the direct mechanical transmission of the vessel's pulsation to the tympanic membrane and the ossicles, or the audible sound produced by arterial blood flow emanating from the abnormal vessel within the middle ear. The hearing loss may be caused by the mass effect of the vessel. Other symptoms are vertigo, otalgia and the sensation of fullness in the ear. Most patients are asymptomatic. The clinical findings include the presence of a red or blue mass behind the tympanic membrane that may or may not be pulsatile, and a sound may be heard within the middle. The etiology of an aberrant ICA is not exactly known. Some authors suggest that the reason could be the absence of the hypotympanic bony plate because of a congenital failure of ossification. With age, as the artery elongates and becomes tortuous, it protrudes through the defect into the tympanic cavity. Others suggest that the cervical ICA never develops and an aberrant carotid artery forms when the inferior tympanic artery (a branch of the ascending pharyngeal artery) enlarges to supply the territory of a cervical carotid artery. The inferior tympanic artery runs through the middle ear and then joins the horizontal petrous
carotid artery. The so-called aberrant carotid artery is, in fact, the markedly hypertrophied inferior tympanic artery. The inferior tympanic canaliculus, which enlarges to accommodate the artery, resembles the carotid canal in both size and location. The recognition of an aberrant intratympanic carotid artery is particularly significant because it is a potentially hazardous anomaly. It must be differentiated from other middle ear mass lesions such as glomus tumor, cholesteatoma and a protruding jugular bulb, which may appear similar on a clinical examination. A high-resolution temporal bone CT shows the aberrant lateral course of the carotid artery through the middle ear. An enhancing soft tissue mass is seen in the hypotympanum, extending toward the oval window area, indenting the promontory and displacing the tympanic membrane laterally. Conventional angiography and MRA show the aberrant vessel that is deviated laterally and past the “vestibular line”. The vestibular line is a vertical line drawn tangentially to the lateral margin of the vestibule on an anteroposterior view. Asymptomatic aberrant arteries require no treatment; however, regular follow-up examinations must be performed. Therapy is usually reserved for patients with pulsatile tinnitus, hemorrhage, or cranial nerve palsies. Some authors recommend separation of the ICA from the middle-ear space by covering the vessel with fascia or interposition of synthetic material between the artery and ossicle. In case of hemorrhage, ligation of the ICA may be necessary. If misdiagnosed, it may result in rupture and massive bleeding or other catastrophic results during surgical intervention. Therefore, a radiological examination is important in the differential diagnoses of pulsatile retrotympnic masses before surgical intervention.

**Differential Diagnosis List:** Aberrant internal carotid artery.

**Final Diagnosis:** Aberrant internal carotid artery.

**References:**

Description: A thin section, bone algorithm CT showing the aberrant course of the left internal carotid artery through the middle ear. The left carotid canal is narrower than the right one. Origin:
Figure 2

Description: An image acquired with MRA showing the lateral aberrant course of the left internal carotid artery. The left internal carotid artery is hypoplastic and the A1 segment of the anterior cerebral artery is absent. Origin: