Asymptomatic aberrant carotid artery of the middle ear space
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Introduction

First reported in 1899 at a meeting of the Austrian Otolaryngology Society, an aberrant internal carotid artery (ICA) occurs in less than 1% of the population.1,2 Its prevalence is noted to occur less than 0.5 mm from the petrous temporal bone. The thin bony plate of carotid canal, separating the ICA from the middle ear cavity, is less than 0.5 mm thick.3 This is important to recognize, as patients with this condition have an increased risk of bleeding if encountered during surgery.4

In addition to an aberrant ICA, other vascular anomalies of the middle ear include a high riding jugular bulb, persistent stapedia, carotid canal, and dehiscent jugular bulb. One percent of the population has a dehiscent ICA canal, which can create the risk of an aberrant ICA, the rarest of the aforementioned. A high jugular bulb is present in anywhere from 6-22% of the population, but a dehiscent jugular bulb occurs in just 0.4%.3

We present an unusual case of an aberrant internal carotid artery and dehiscent jugular bulb, both identified incidentally on otologic examination. This rare combination elevates the risk of catastrophic bleeding if encountered during surgery.5

Case Report

A 15-year-old female was referred to our tertiary care pediatric otolaryngology clinic for evaluation of persistent middle ear fluid incidentally diagnosed by her pediatrician. She denied pain, tinnitus, and hearing loss but had no history of otitis media or otologic surgery.

Otoscopic showed no fluid in the middle ear, but did show a red pulsating retro-tympanic vascular mass located behind the inferior portion of the tympanic membrane (Figure 3). A pure tone audiogram demonstrated mild conductive hearing loss at 500 Hz rising to within normal limits at 3000 Hz and above.

High-resolution computed tomography (CT) of the temporal bones revealed a high riding jugular bulb with a dehiscent sigmoid plate resulting in protrusion of the jugular bulb into the malleus cotyle (Figure 4). An enhancing medial temporal fat with a high density mass consistent with the ICA canal was noted on imaging. The left foramen stylomastoideum could not be definitively diagnosed on our imaging studies (Figure 2).

The patient was diagnosed with an aberrant carotid artery with a dehiscent high jugular bulb. She was counseled on the risk of middle ear surgery and external canal manipulation. She has been followed closely with serial audiometric and otoscopic examination.

Discussion

The aberrant ICA is a rare anomaly, occurring in less than 1% of the population.3,6 The clinical presentation can include nonspecific symptoms including hearing loss and tinnitus, but may also present symptomatically.4 To prevent or reduce complications, it is important to identify the aberrant ICA on computed tomography (CT). Our patient was counseled on the risks and benefits of middle ear surgery, and the decision to proceed with middle ear surgery was made.

Despite the frequent co-occurrence of an aberrant ICA and PSA, an aberrant ICA is now most commonly thought to develop as a result of the ICA canal becoming a persistent foramen ovale. As shown in Figure 5, the right ICA is normal (green arrow). Further CTA re-projection demonstrates the angulated aberrant ICA (blue arrow) compared to the smooth anterior ICA (green arrow).

The patient should be forewarned that this technique can identify a rare variant of the ICA. It may not be sufficient to obtain imaging to obtain a diagnosis of an aberrant ICA. CT is generally sufficient, but must be obtained with intravenous contrast. In rare cases, the ICA may not be identifiable due to the density of the jugular bulb. 3D CT reconstructions and angiography should be performed to identify the aberrant ICA.

Conclusion

Asymptomatic aberrant carotid artery of the middle ear space is a rare condition. Only three cases have been reported with the combination of a high riding jugular bulb and an aberrant ICA. The patient in our case was likely present in our case due to the absent foramen ovale. This alone should allow the radiologist to make the diagnosis of left aberrant ICA. The patient was successfully treated with middle ear surgery and is doing well.

References