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Sudden Sensorineural Hearing Loss from a Jugular Bulb Diverticulum

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A 19-year-old woman presented with an 11-month history of sudden-onset left sided hearing loss accompanied by vertigo and headache. Audiometric testing revealed profound left-sided hearing loss. A contrast-enhanced MRI of the internal auditory canal performed 5 months after symptom onset was interpreted as showing a vascular loop, probably the anterior inferior cerebellar artery, abutting and indenting on the left vestibulocochlear nerve; and a prominent and high-riding left jugular bulb. In this study, the internal auditory canals were assessed to be of normal width, with walls that were smooth and sharply defined. A cerebral CT angiogram

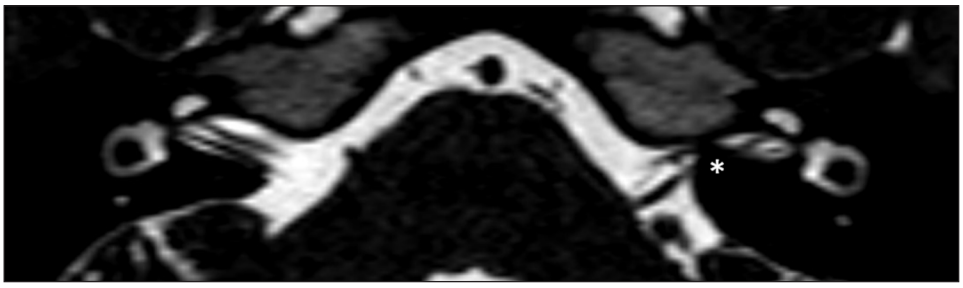

Figure 1. Axial hi-resolution T2-weighted sequence (T2-DRIVE) at the level of the internal auditory canal. Note protrusion (white asterisk) originating from posteromedial wall of the left IAC, appearing to abut and compress cranial nerves within the IAC

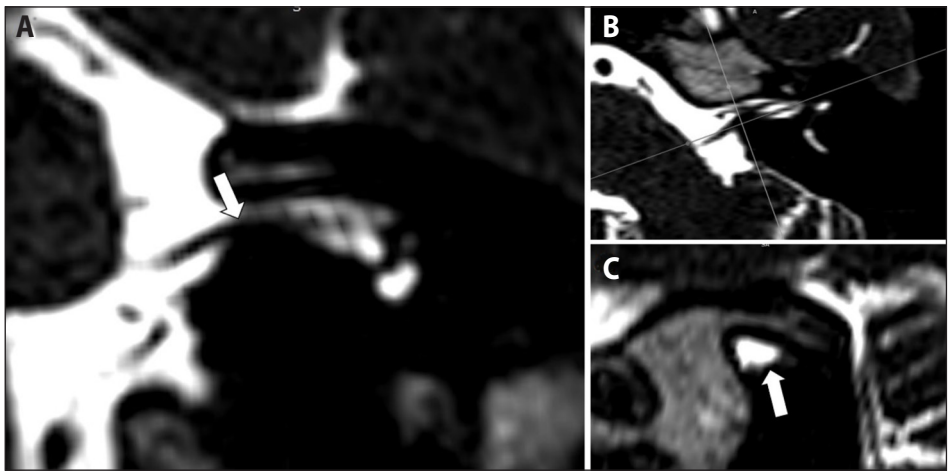

Figure 2. Hi-resolution T2-weighted sequence (T2-DRIVE) images reconstructed in non-orthogonal planes aligned with the orientation and direction of the 8th cranial nerve **(2B);** showing the protrusion causing upward compression and distortion of the cranial nerve (**2A,** white arrow). The nerve could not be clearly delineated from the protrusion in the cross-sectional view of the internal auditory canal (**2C**, white arrow)

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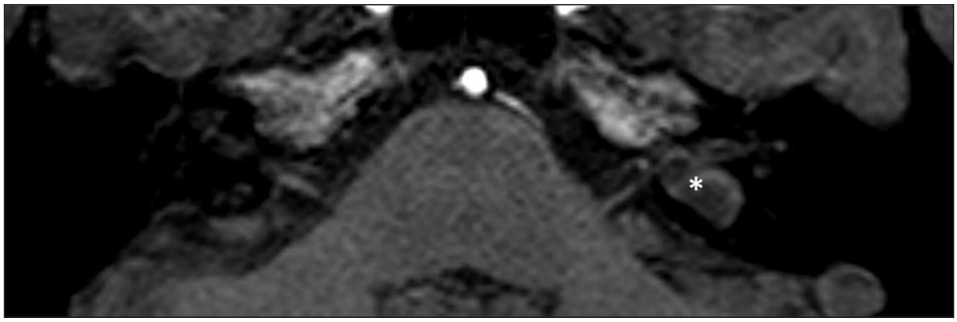

Figure 3. Axial hi-resolution T1-weighted sequence (T1W-3D FFE) at the level of the internal auditory canal. Note isodense soft tissue structure (white asterisk) within protrusion, appearing to be an upward extension of the jugular bulb

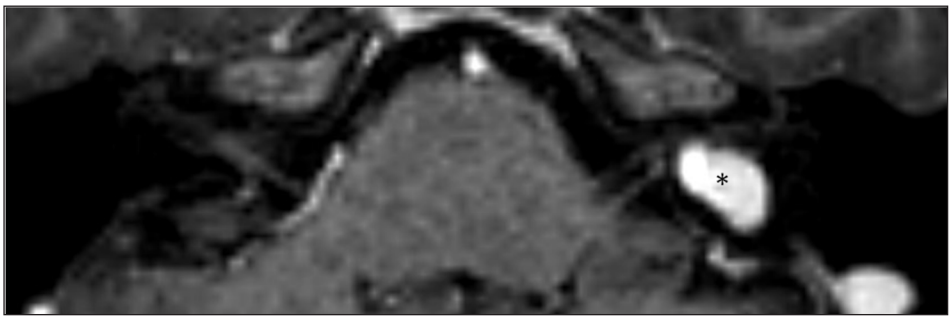

Figure 4. Axial hi-resolution Gd-enhanced T1-weighted sequence (T1W-3D TFE Gd) at the level of the internal auditory canal showing smooth, vivid enhancement of a high-riding jugular bulb (black asterisk), connected with the sigmoid sinus in lower cuts

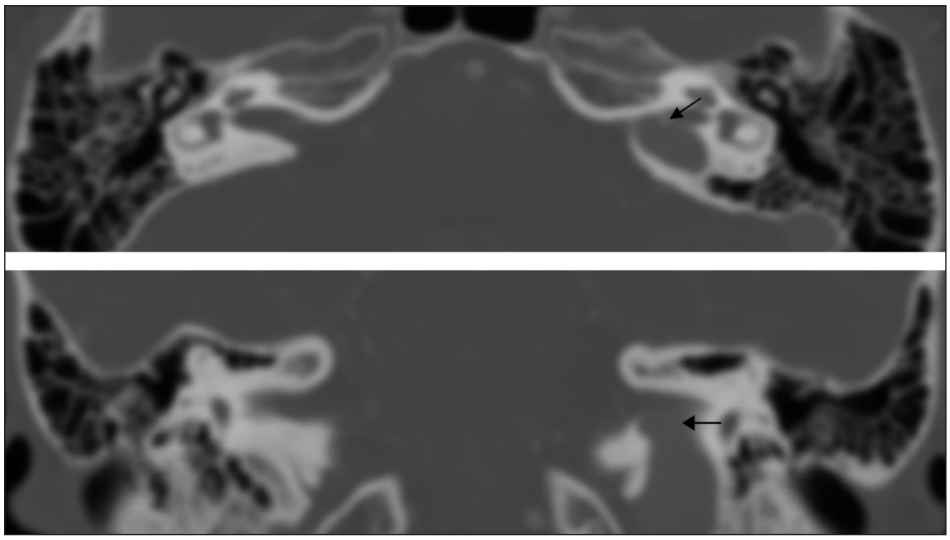

Figure 5. A. Axial temporal bone CT section at level of the internal auditory canal; and **B.** Coronal temporal bone CT section at level of the internal auditory canal. Note protrusion of the high-riding jugular bulb with a waist-like margin (black arrows)

subsequently performed did not show any abnormal findings related to the previously identified vascular loop. On the basis of these radiologic findings, the patient was advised surgery by physicians at a tertiary-care institution, presumably to address the identified vascular loop. A second opinion was sought by the patient.

Review of the MRI initially focused on the axial high-resolution T2-weighted sequence (T2-DRIVE), as the fast spin-echo T2-weighted sequence has been recommended as a reliable and cost-effective MR screening protocol for the detection of masses in the IAC.[1] In contrast to the official radiology report, stenosis of the left internal auditory

canal by a protrusion (*Figure 1*, white asterisk) originating from the posteromedial wall of the internal auditory canal was noted. This protrusion, which had no MR signal intensity, appeared to abut and compress the cranial nerves within the IAC. Reconstruction of the images in non-orthogonal planes aligned with the orientation and direction of the left 8th cranial nerve showed the protrusion causing upward compression on and distortion of the nerve. (*Figure 2*, white arrows)

Attention was directed to the axial high-resolution T1-weighted sequence (T1W-3D FFE), which revealed that the protrusion contained an isointense soft tissue structure (*Figure 3*, white asterisk) located within the petrous bone medial to the posterior semicircular canal. This structure appeared to be an upward extension of the jugular bulb.

The axial high-resolution contrast-enhanced T1-weighted sequence (T1W-3D TFE Gd) showed smooth, vivid enhancement of the identified structure (*Figure 4,* black asterisk), which connected with the sigmoid sinus in lower cuts. This confirmed the presence of a high-riding jugular bulb that encroached on the internal auditory canal.

Any doubt as to its true nature was dispelled by a review of the temporal bone structures on high-resolution CT which was fortunately available in the cerebral CT angiogram. This revealed a protrusion of the high-riding jugular bulb with a waist-like margin (*Figure 5A* and *B,* black arrows), allowing further characterization of the lesion as a jugular bulb diverticulum.[2]

A high-riding jugular bulb that projects into the middle ear is not an uncommon anatomic variation. On the other hand, a jugular bulb diverticulum, which is an outpouching of the jugular bulb that can extend superiorly, medially, and posteriorly in the petrous bone, is a true venous anomaly that has been described rarely in the medical literature.[3,4] When symptomatic, patients with this anomaly can present with sensorineural hearing loss, tinnitus, vertigo and auricular pain.[3-5] Proper identification of a jugular bulb diverticulum in the evaluation of a patient with neurotologic symptoms is necessary to avoid inappropriate medical and surgical intervention.

As demonstrated in this patient, a jugular bulb diverticulum may not be identified by a screening MRI that utilizes only a T2-weighted sequence. T1-weighted MRI sequences with and without contrast are necessary to demonstrate its soft tissue imaging characteristics. Although not the initial imaging study of choice for sudden sensorineural hearing loss, high-resolution bone-window CT may be necessary to delineate the bony anatomy of the jugular foramen and confirm the presence of this anomaly.

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