

## CASE REPORT

# Intrapetrous Anastomosis between the Internal Jugular Vein and the Superior Petrosal Sinus: Cone Beam Computed Tomography Incidental Finding

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## ABSTRACT

This is a case report of a 62-year-old male who presented to the Ear, Nose, and Throat clinic for a follow-up exam for hearing loss stemming from a fall from a horse in his infancy. A Cone Beam Computed Tomography (CBCT) examination revealed an intrapetrous communication between the internal jugular vein bulb and the superior petrosal sinus. Three-dimensional bone and soft tissues volume renderings were generated to demonstrate this incidental anatomical variant.

**Key words:** Anastomosis, cone beam computed tomography, jugular, petrosal, sinus, vein

## INTRODUCTION

The internal jugular vein (IJV) is a major vessel that collects blood from the head and neck areas and is connected with ipsilateral cavernous sinuses through the inferior petrosal sinus (IPS). The superior petrosal sinus (SPS) is a dural sinus

that communicates with the cavernous sinus anteriorly and with the transverse sinus posteriorly. The SPS receives blood from the anterior cerebellar and complex superior petrosal vein. Communication between the IJV and SPS is not normally present.

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## CASE REPORT

A 62-year-old male bus driver with a history of hearing loss in the right ear presented to the Ear, Nose, and Throat (ENT) clinic for a follow-up exam. The hearing loss resulted from a fracture of the temporal bone following a fall from a horse in his infancy. The otolaryngological exam was normal, but a Cone Beam Computed Tomography (CBCT) showed an intrapetrous communication between the IJV and the SPS, revealing an ascendant tortuous path passing through the middle of the ipsilateral superior semicircular canal. Three-dimensional bone and soft tissues volume renderings were generated to demonstrate this anatomical variant [Figures 1 and 2]. Magnetic resonance imaging (MRI) was not performed because the sensorineural hearing loss is not an acute complication of his fracture. Presently, the patient does not have any other complication and continues with his normal life and will be monitored with follow-up examinations.

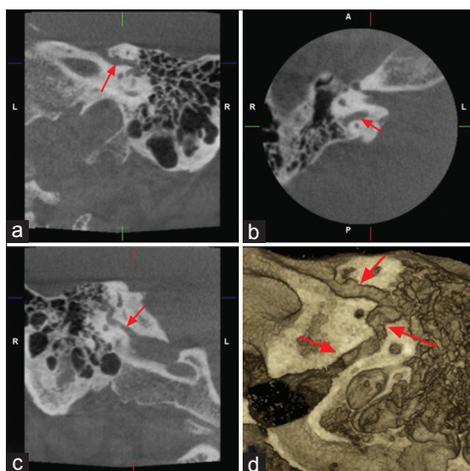
## DISCUSSION

Development of the intracerebral veins and their extracranial drainage is a complex process in humans. The superficial vessels drain into the external jugular vein and the middle and deep vessels into the IJV.<sup>[1]</sup> The IJV is a major vein that collects blood from the head and neck region and is also a clinically important vein.<sup>[2]</sup> The IJV is formed by the union of the lateral sinus and the inferior petrous vein.<sup>[1]</sup> The size of the IJV is directly affected by the drainage pattern of the dural sinuses, particularly the superior sagittal sinus (SSS) and rectal sinus (RS).<sup>[2]</sup> The IJV is connected to ipsilateral cavernous sinuses through the IPS, a dural venous sinus running along the intracranial surface

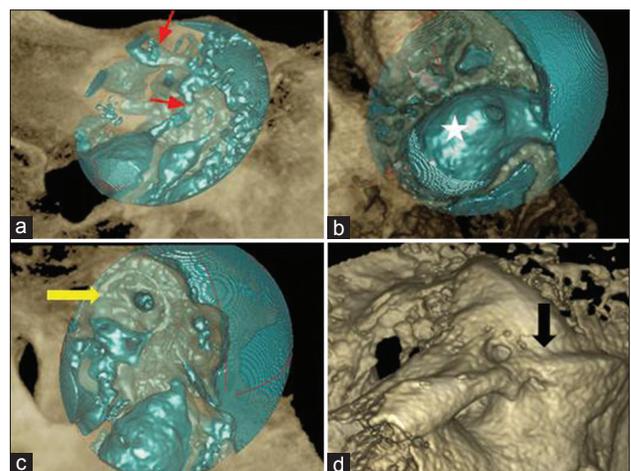
of the petroclivial fissure.<sup>[3]</sup> Actually, in the literature, there are no reports about anastomosis between IJV and SPS in humans and animals.

The SPS is also known as a dural sinus which communicates with the cavernous sinus anteriorly and with the transverse sinus posteriorly. It runs over the trigeminal nerve in the lateral margin of the tentorium and in the superior petrosal sulcus of the temporal bone. The SPS normally works as a drainage route receiving blood from the anterior cerebellar and brain stem, venous systems, and does not work as a normal drainage route from the cavernous sinus.<sup>[4]</sup> In addition, the SPS receives different drainages from the complex superior petrosal vein: Type I above and lateral to the facial nerve, Type II between the lateral limit of the trigeminal nerve and the medial limit of the facial nerve, and Type III empties above and medial to the trigeminal nerve.<sup>[5]</sup>

Evaluation of the temporal bone region requires higher-resolution imaging as demonstrated in this particular case. High-resolution imaging should be used in the periodic assessment of patients with history of temporal bone fractures. This is due to the risk of meningitis resulting from a middle ear infection disseminating through membranous consolidation of the fracture.<sup>[6,7]</sup> Several studies have been published on the use of CBCT technology for imaging of the temporal bone, specifically the middle and inner ear structures.<sup>[8]</sup> CBCT offers lower radiation dose, thinner slices, and provides reliable morphologic assessment of the temporal bone resulting from an increase in spatial resolution, when compared to Multidetector Computed Tomography (MDCT).<sup>[9,10]</sup> The Computed



**Figure 1:** 62-year-old male patient with clinical history of unilateral sensorineural hearing loss and fracture of the right temporal bone in his infancy. CBCT of temporal bone: (a) Sagittal, (b) axial, (c) coronal, and (d) three-dimensional images with osseous volume rendering show the intrapetrous communication between the IJV and the SPS (red arrows) with an ascendant tortuous path, passing through the middle of the superior semicircular canal.



**Figure 2:** 62-year-old male patient with clinical history of unilateral sensorineural hearing loss and fracture of the right temporal bone in his infancy. 3D soft tissues volume rendering: (a) shows intrapetrous communication path (red arrows); (b) inferior view shows IJV bulb, (white star); (c) superior semicircular canal (yellow arrow); (d) 3D osseous volume rendering shows SPS canal (black arrow).

Tomographic Dose Index (CTDI) of an MDCT scan of the middle ear is around 170 mGy, compared to 15–30 mGy from CBCT imaging. This makes CBCT the ideal technique of choice for ENT applications.<sup>[11]</sup>

## CONCLUSION

An intrapetrous anastomosis between the IJV and the SPS is an abnormal finding. This is a clear anatomical variant discovered as an incidental finding in a routine follow-up CBCT examination. CBCT imaging plays a highly important role for the surgeon when planning surgical intervention in the temporal bone which may be required either because of complications due to underlying disease or for other reasons.

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## Conflicts of interest

There are no conflicts of interest.

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