



Aberrant sylvian vein: A newly described cause of pulsatile tinnitus

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Abstract

We herein report a newly described cause of venous pulsatile tinnitus: protrusion of an aberrant sylvian vein into the tympanum. A 60-year-old woman presented with a 4-month history of objective persistent pulsatile tinnitus in the right ear with no other complaints. The pulsatile tinnitus diminished with rotation of the head to the right side or by compression of the right cervical vascular structures. The frequency and intensity of the tinnitus were 125 Hz and 20 dB HL, respectively. Audiometry and otoscopic examination findings were normal. Radiologic examination showed that the right sylvian vein protruded into the tympanum through the dehiscent anterior cortical plate of the tympanum.

Keywords

Pulsatile tinnitus, sylvian vein, tympanum, computed tomography

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Introduction

Tinnitus is a common otologic symptom affecting 30% of the population worldwide.¹ Approximately 4% of affected patients have pulsatile tinnitus (PT), defined as the perception of somatosounds that are synchronized with the pulse in the absence of an external acoustic stimulus.² PT has numerous causes, which can be classified as arterial, venous, and avascular.^{3–8} The most common arterial cause of PT is a dural arteriovenous fistula; other arterial pathologies include intracranial arterial aberrancy or redundancy, aneurysms, dissection, and fibromuscular dysplasia. Venous causes of

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PT include jugular bulb abnormalities, venous cerebral thrombosis, dural sinus stenosis, sigmoid sinus diverticula, sigmoid plate dehiscence, and a persistent petrosquamosal sinus. Avascular causes include glomus tumors, pneumocephalus, otosclerosis, Paget's disease, histiocytosis X, myoclonus, and dehiscent semicircular canals.^{3-5,9-12} PT usually seriously affects the patient's quality of life. Some patients even commit suicide because the noise is unbearable.¹³ It is very important to reach an accurate etiological diagnosis because the treatment should be directed toward the cause of the PT. We herein report the first case of PT resulting from protrusion of an aberrant sylvian vein into the tympanum.

Case report

A 60-year-old woman presented with a 4-month history of persistent right-sided tinnitus. The tinnitus could be heard by both the patient and clinicians; it was a rhythmical noise that was synchronous with the heartbeat. The patient had been in otherwise good health without similar previous episodes, a history of trauma, or temporomandibular joint disorders.

Physical examination revealed that the PT transiently diminished with rotation of the head to the right side or by compression of the right cervical vascular structures, suggesting that the PT was induced by a venous abnormality. Pure tone audiometry, tympanometry, and acoustic reflex threshold measurement were performed; all results were normal. A tinnitus matching test showed that the frequency and intensity of the tinnitus were 125 Hz and 20 dB HL, respectively. Otosopic examination revealed a normal tympanic membrane.

High-resolution CT (HRCT) of the temporal bone, CT angiography (CTA) and CT venography (CTV) of the head and neck, and MR imaging of the inner ear were performed. HRCT showed a defect in the



Figure 1. Axial high-resolution CT showed protrusion of a soft tissue shadow in the right middle cranial fossa into the tympanum through the dehiscent anterior cortical plate of the tympanum.

anterior cortical plate of the right tympanum and a soft tissue-density shadow protruding from the right middle cranial fossa into the right tympanum through the defect in the cortical plate (Figure 1). The soft tissue-density shadow on HRCT exhibited a flow void on MR imaging (Figure 2). CTV of the head and neck indicated that the soft tissue-density shadow on HRCT was a right aberrant sylvian vein traveling through the bottom of the temporal lobe and protruding into the tympanum through the defective anterior cortical plate of the right tympanum (Figure 3). No other causes of PT were found.

Discussion

Physical examination of our patient suggested that her PT had a venous cause, and radiological examination revealed protrusion of an aberrant sylvian vein into the tympanum, which was located close to the inner ear. Furthermore, we found no other possible causes of her PT. Therefore, we considered that protrusion of the aberrant sylvian vein into the tympanum was the most likely cause.

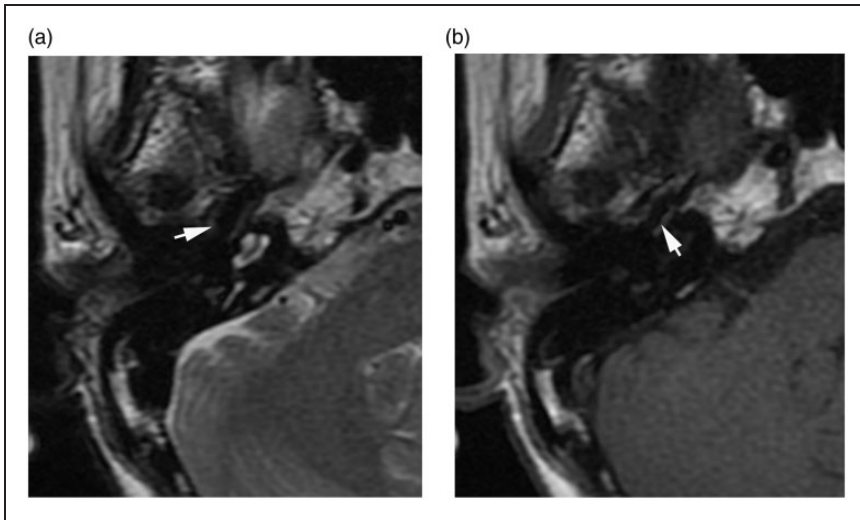


Figure 2. Axial (a) T2- and (b) T1-weighted MR images showed flow void protruding from the right middle cranial fossa into the tympanum.

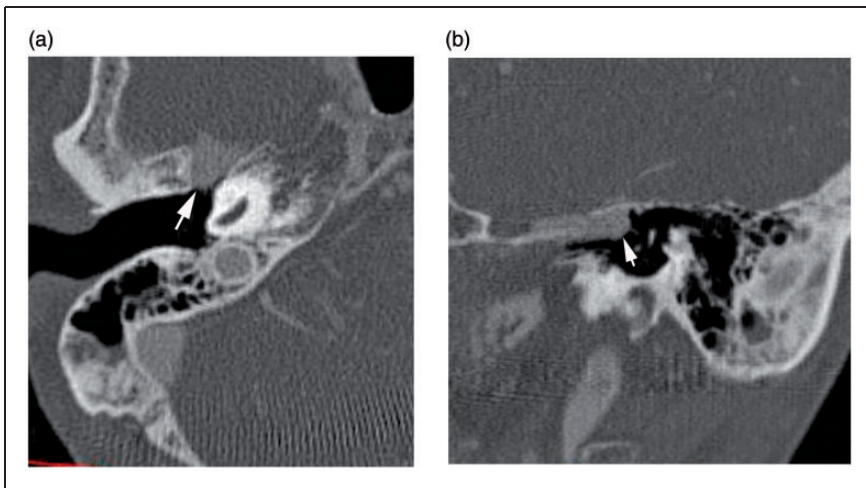


Figure 3. (a) Axial and (b) oblique venous-phase CT images showed that the right sylvian vein traveled through the bottom of the temporal lobe and protruded into the tympanum through a defect in the anterior cortical plate of the tympanum.

The sylvian vein, also known as the middle cerebral vein or superficial middle cerebral vein, originates from the middle part of the lateral surface of the cerebral hemisphere and collects blood from parts of the frontal, temporal, and parietal lobes

near the lateral fissure. It courses along the lateral fissure, turns anteriorly and inferiorly, and then drains directly posteriorly at the level of the skull base to the sphenoparietal sinus, cavernous sinus, or superior petrosal sinus. Two adjacent structures, the

posterior portion of the sylvian vein and the tympanum, are typically separated by a slice of the complete cortical plate, which constitutes the anterior wall of the tympanum.¹⁴ The size of the sylvian vein varies tremendously. Kazumata et al.¹⁵ classified this vein into three types: type I, in which the sylvian vein is absent or very hypoplastic (10% of patients in their study); type II, in which the sylvian vein consists of a single main stem (46%); and type III, in which the sylvian vein consists of two main stems (44%). According to this classification, the patient in the present report had a type II sylvian vein.

The sylvian vein is present in 90% of healthy people,¹⁵ and it has not been previously reported as a cause of PT. Compared with healthy people, the cortical plate between the sylvian vein and tympanum in our patient was defective; this may have been an important factor in the development of PT elicited by the sylvian vein. Like the sigmoid plate and cortical plate around the internal carotid artery,^{9,10,16,17} the complete cortical bone between the sylvian vein and tympanum can serve as insulation, which can impede the noise from the sylvian vein to the tympanum or inner ear. Insulation properties may be destroyed when the cortical plate is defective. The noise from the sylvian vein could be easily transmitted to the tympanum and sensed as PT by the inner ear.

PT occurred in our patient at 60 years of age, suggesting that protrusion of an aberrant sylvian vein into the tympanum is not congenital in origin. We suspect that the anterior cortical plate of the tympanum may be complete before the presence of PT. The defect in the cortical plate may have been caused by the long-term effect of blood flow in the sylvian vein. Once the cortical plate has developed a defect, the sylvian vein may gradually protrude into the tympanum over time, resulting in PT.

PT is a multifactorial disease, and various imaging strategies have been used to improve the reliability of determining its

etiology. The first-choice techniques for the initial radiological survey in patients with PT at our institution are CTA and CTV of the head and neck. The scan protocols have been described in our previous studies.^{9,10} These imaging techniques not only demonstrate arterial and venous structures (as well as temporal bone in one study), but they also serve as effective screening tools for dural arteriovenous fistulas.^{18,19} The protrusion of an aberrant sylvian vein into the tympanum in this patient was correctly diagnosed with these scanning methods.

Therapeutic options in such patients are limited. The sylvian vein is one of the most susceptible vessels to injury or occlusion during surgery. Injury or ligation of the sylvian vein may be an important contributor to brain edema, venous infarction, or hemorrhage.^{14,15} Our patient was still able to tolerate the noise; therefore, no definitive therapy was offered.

Conclusion

Protrusion of an aberrant sylvian vein into the tympanum is a rare and newly described cause of PT. We recommend the use of CTV of the head and neck with a bone window as the primary diagnostic method for patients suspected to have this condition because this imaging technique simultaneously reveals abnormalities of the vein and bony cortical plate of the tympanum.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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