

Tinnitus caused by traumatic posterior auricular artery–internal jugular vein fistula

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Abstract

A patient with an arteriovenous fistula that developed after a traffic accident was recently treated. The patient noticed pulsatile tinnitus in the right orbital region two months after the accident. On the first visit, the preliminary clinical impression of this case was a carotid-cavernous fistula, but angiography showed a fistula between the posterior auricular artery and the internal jugular vein. Although rare, this arteriovenous fistula should be included in the differential diagnosis of pulsatile tinnitus in the orbit region. The fistula was controlled by embolization with a platinum coil. This is the first report of an arteriovenous fistula between the posterior auricular artery and internal jugular vein.

Key words: Tinnitus; Arteriovenous Fistula

Introduction

Traumatic arteriovenous fistula is usually secondary to penetrating injuries. It is known to occur most commonly in the head and neck area, and may be accompanied by symptoms and signs such as machine-like bruit, pulsatile mass, palpable thrill, nerve compression, and pulsatile tinnitus.¹ The diagnosis is made by thorough history and careful physical examination, ultrasonography, computerized tomography (CT), angiography, and magnetic resonance imaging (MRI). Arterial causes such as arteriovenous malformation, and non-arterial causes such as glomus tumour and brain tumour should be considered in the differential diagnosis.

The authors successfully treated a 31-year-old male, who was found to have posterior auricular artery-internal jugular vein fistula six months after a traffic accident, by embolization using a platinum coil.

Case report

A 31-year-old male with a right-sided pulsatile tinnitus for four months' duration was admitted to the department of Otolaryngology–Head and Neck Surgery of Korea University Guro Hospital. The patient had had open reduction and internal fixation of the right femur due to a femur fracture in a traffic accident six months prior to the diagnosis.

Although he had lost consciousness at the time of the accident, no apparent injuries to the head and neck region were sustained. Brain CT, brain MRI, and neurological examinations were all within normal limits. The patient noticed right ear fullness and pulsatile tinnitus that was synchronous with his heartbeat, propagated to the entire head, and aggravated by exercise.

Pulsatile bruit could be auscultated on the right orbital regions, and through a Toynbee tube inserted in the right external auditory canal. The amplitude of the tinnitus was decreased when the right side of the neck was compressed,

or when the neck was rotated to the left. Both tympanic membranes were normal, impedance audiometry showed A-type audiograms on both ears, and the hearing threshold was 40 dB and 30 dB on the right side, and the left side, respectively, on pure tone audiometry. The magnitude of the tinnitus was 35 dB at 3000 kHz on the tinnitogram.

A vascular origin tinnitus was suspected, and an angiography showed a fistula between the right posterior auricular artery and the right internal jugular vein (Figure 1(a)). The contrast media that entered through the fistula filled the lumen of the internal jugular vein. A large flow of blood was seen through the arteriovenous fistula. Pulsatile bruit, much like that heard in carotid-cavernous fistula, was audible in the orbital region.

Selective vascular occlusion was chosen to correct the distressing tinnitus. Embolization of the posterior auricular artery was performed by inserting three platinum coils (Target Therapeutics, Inc., CA, USA, 4 × 4 mm, 3 × 3 mm, 2 × 2 mm) in the distal portion of the artery (Figure 1(b)). An angiogram performed immediately after the embolization confirmed complete obliteration of the fistula, and the patient was neurologically intact after the procedure. The patient's tinnitus was completely resolved following the procedure, and he was determined to be symptom-free one year later in follow-up procedures.

Comment

Pulsatile tinnitus can occur with a wide range of frequency, intensity, and duration, and is characteristically synchronous with the patient's heartbeat.² Further the tinnitus may be subjective or objective. Arteriovenous fistula can be congenital, inflammatory, or more commonly, traumatic in origin.³ Diagnosis of an arteriovenous fistula may be delayed in the acute phase because it takes some time for distal dilatation of the vein.⁴ Rich *et al.*⁴ reported that the diagnosis of traumatic arteriovenous fistula may be delayed between two to six months in 50 per cent of all

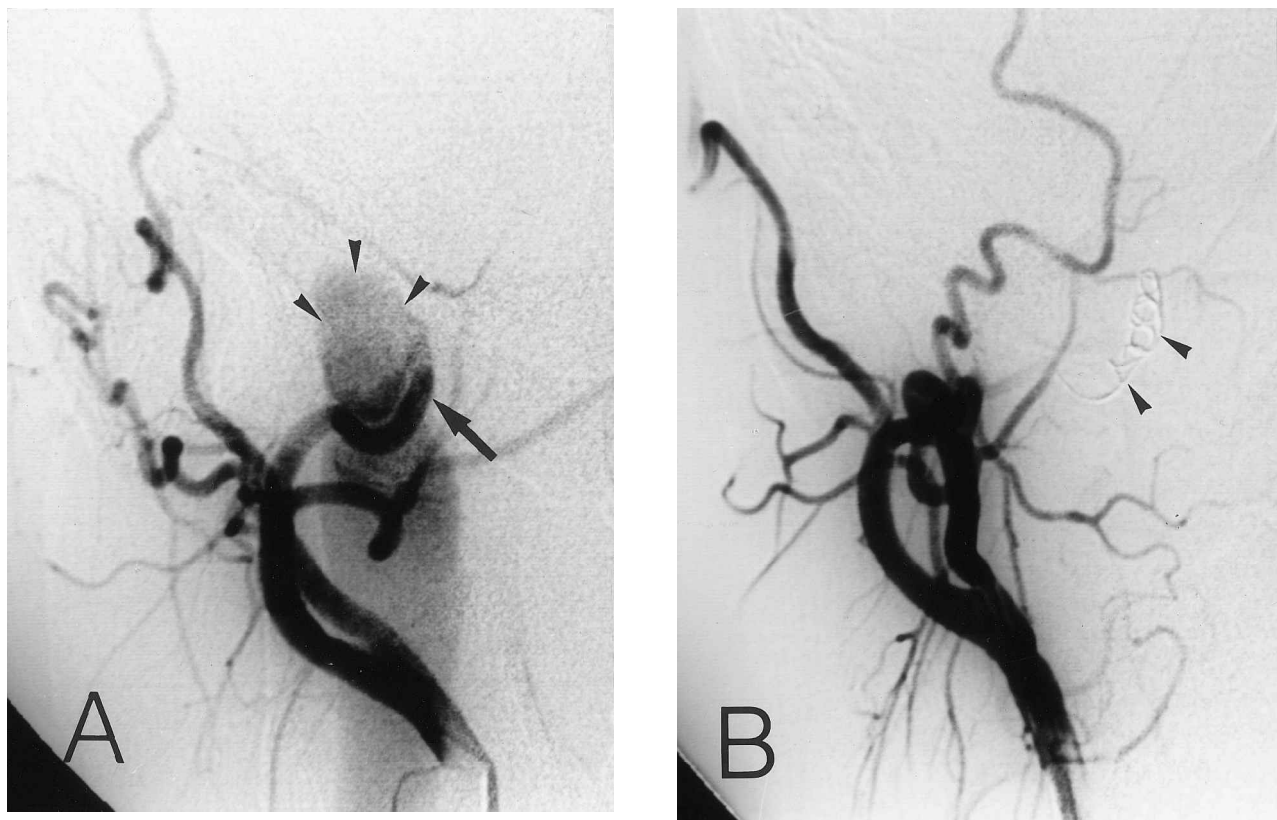


FIG. 1

(a) Right carotid angiography demonstrates the posterior auricular artery (arrow) and its venous drainage to the internal jugular vein through the fistula, which is filled with contrast media (arrowheads). (b) Post-embolization right carotid angiography shows the fistula occluded by platinum coils (arrowheads)

cases. For our patient, the pulsatile tinnitus became apparent two months post-trauma.

Differential diagnoses to be considered in objective pulsatile tinnitus synchronous with heartbeat and following trauma should include dural arteriovenous fistula, internal carotid artery – cavernous sinus fistula and other arteriovenous fistulae. The most common cause is believed to be due to a dural arteriovenous fistula, that is formed when the occipital artery or the middle meningeal artery communicates with the transverse sinus or the cavernous sinus.⁵ The bruit, due to dural arteriovenous malformation localizes to the region of the mastoid, and vanishes when the occipital artery is compressed.^{2,6} Increased blood flow through the dural arteriovenous fistula may lead to severe headache, neuropathy of cranial nerves V, VII, XII, and visual disturbance.⁵ The next disease entity to consider is the carotid cavernous sinus fistula. The pulsatile tinnitus may be auscultated in the orbital region, and other symptoms such as pulsatile proptosis, conjunctival injection, limitation of ocular motion, headache, and visual disturbance may also be present.⁷ Although uncommon, tinnitus due to arteriovenous fistula of the periauricular vasculature, communications between the internal carotid artery and the vertebral artery, or between the internal maxillary artery and vein have been reported,⁷ but to the best of our knowledge, a fistula between the post-auricular artery and the internal jugular vein has never been reported.

For patients with pulsatile tinnitus without a history of trauma, Sismani⁸ stated that when the tympanic membrane is intact on otoscopy, increased intracranial pressure should be suspected, and hydrocephalus, cavernous sinus thrombosis, and benign intracranial hypertension should

be first ruled out through neurological and ophthalmic examinations. When abnormalities of the carotid artery or heart are suspected, cardiac problems should be ruled out by ultrasonography, and when tinnitus due to stenosis of the carotid artery is suspected, MRI, magnetic resonance angiogram, or cervical artery angiogram should be performed.

The patient in this case had a history of head trauma and the occurrence of pulsatile tinnitus in the orbital area lead to a preliminary impression of a carotid cavernous sinus fistula. Therefore, angiography was chosen as the primary diagnostic modality. The angiography demonstrated the tinnitus originated from the fistula between the right posterior auricular artery and the right internal jugular vein.

Although some arteriovenous fistulae have been reported to heal spontaneously,⁹ surgical ligation or embolization with a detachable balloon is necessary in most cases. Embolization with a detachable balloon via the arterial approach has been utilized as an alternative treatment modality, and recently, embolization using coils has been attempted. Small diameter coils are especially useful when it is impossible to pass a balloon through the narrow orifice of the fistula, or when the venous portion of the fistula is not large enough to inflate the balloon. The cure rate of arteriovenous fistula using this technique is reported to be higher than 95 per cent.

In conclusion, the evaluation of a patient complaining of pulsatile tinnitus demands a thorough history and physical examination. If pulsatile tinnitus were detected in the orbital region of trauma patient, a carotid cavernous sinus fistula will be chosen as a preliminary clinical impression. But various arteriovenous fistulae in the head and neck

area can be the cause of pulsatile tinnitus in the orbit region. Although a fistula between the posterior auricular artery and internal jugular vein is rare, this arteriovenous fistula should be included in the differential diagnosis of pulsatile tinnitus in the orbit region.

References

- 1 Robbs JV, Carrim AA, Kadwa AM, Mars M. Traumatic arteriovenous fistula: experience with 202 patients. *Br J Surg* 1994;**81**:1296–9
- 2 Waldvogel D, Mattle HP, Sturzenegger M, Schroth G. Pulsatile tinnitus: a review of 84 patients. *J Neurol* 1998;**245**:137–42
- 3 Agrawal R, Flood LM, Bradey N. Iatrogenic pulsatile tinnitus. *J Laryngol Otol* 1993;**107**:445–7
- 4 Rich NM. Traumatic arteriovenous fistula and false aneurysm. *Surgery* 1975;**78**:817–25
- 5 Shah SB, Lalwani AK, Dowd CF. Transverse/sigmoid sinus dural arteriovenous fistulas presenting as pulsatile tinnitus. *Laryngoscope* 1999;**109**:54–8
- 6 Sila CA, Furlan AJ, Little JR. Pulsatile tinnitus. *Stroke* 1987;**18**:252–6
- 7 Levine SB, Snow JB. Pulsatile tinnitus. *Laryngoscope* 1987;**97**:401–6
- 8 Sismanis A. Pulsatile tinnitus: a 15-year experience. *Am J Otol* 1998;**19**:472–7
- 9 Kim YH, Gildenberg PL, Duchesneau PM. Angiographic evidence of spontaneous closure of nontraumatic arteriovenous fistula of the vertebral artery. *J Neurosurg* 1973;**38**:658–61

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