

## Iatrogenic pulsatile tinnitus

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### Abstract

We present an unusual case of iatrogenic arteriovenous malformation following a myringoplasty and its treatment by embolization. Thorough examination and investigation of patients with pulsatile tinnitus is stressed. Angiography is essential to diagnose life-threatening and treatable lesions in the presence of normal otoscopy, audiological assessment and enhanced computed tomography.

**Key words:** Iatrogenic disease; Tinnitus; Myringoplasty; Arteriovenous malformation; Embolization, therapeutic.

### Introduction

Objective tinnitus which is rhythmic and synchronous with the patient's heart beat is a rare symptom. Possible causes of pulsatile tinnitus are glomus tumour, dehiscent internal carotid artery and arteriovenous malformations (Velasco *et al.*, 1989). Tinnitus is a recognized complication of any middle ear surgery, but should not be dismissed as a consequence of insult to the cochlea. Pulsatile objective tinnitus can result from iatrogenic damage to the local vasculature, as illustrated by this case.

### Case report

GR, a 36-year-old man, presented with a complaint of pulsatile tinnitus in the left ear. He also complained of slight deafness in the left ear, but no otorrhoea nor dizziness. Four years previously he had had a myringoplasty in the same ear by a post-auricular approach performed by the senior author (LMF). Review of the notes suggested that the patient had recovered uneventfully from the operation and on follow-up the graft of temporalis fascia had taken. The patient had first commented on this pulsatile tinnitus a few months post-operatively.

Otoscopy had then suggested a middle ear effusion and there was a small pearl of squamous epithelium in the posterosuperior region. An audiogram showed mild conductive deafness. At myringotomy, fluid was aspirated and a grommet was inserted. The pearl of squamous epithelium was excised. Following this the patient's hearing improved, but he continued to complain of pulsatile tinnitus. This was thought to be a side-effect of the original operation and largely ignored. A few months later, the tinnitus had worsened significantly and was very distressing. As a small pearl had previously been removed an exploratory tympanotomy was carried out to exclude residual cholesteatoma causing tinnitus, but the middle ear was found to be normal, the tympanic membrane healthy and the grommet functioning.

The patient attended a number of review appointments with the complaint of tinnitus, but presumably disillusioned, finally defaulted.

Four years after the first operation the patient was now referred by his general practitioner, again with a very disturbing pulsatile tinnitus in the left ear, and examined by one of the authors (RA). On palpation he was noticed to have very prominent pulsations of the left superficial temporal artery. There was an obvious bruit on auscultation. Enhanced CT scanning was

normal. Selective external carotid angiography (NB) showed an arteriovenous fistula between a grossly dilated left superficial temporal artery and an enlarged superficial scalp vein (Fig. 1). The fistula was occluded by placement of a 1.2 ml detachable silicone balloon in the superficial temporal artery, immediately proximal to the fistula. Post-embolization angiography showed normal appearances (Fig. 2).

The patient is now symptom free and his hearing has returned to normal.

### Discussion

Tinnitus is a common presenting symptom. Objective tinnitus that is rhythmic and synchronous with the patient's heartbeat is rare. Holgate *et al.* (1977) described the symptom in connection with vascular tumours in the cerebellopontine angle. Neumann and Grossgerge (1977) reported a highly positioned jugular bulb or an internal carotid artery lacking bony separation from the middle ear as possible causes. More frequently, however, the symptom is due to an arteriovenous malformation (Vallis and Martin, 1984), to a tumour of the jugular glomus or to atherosclerosis.

Arteriovenous fistulae may be of traumatic, inflammatory or congenital origin. Congenital lesions surprisingly tend to become symptomatic between the fifth and seventh decades of life. Trauma is the most common cause of acquired arteriovenous fistulae, although some latent congenital arteriovenous fistulae are aggravated after cranio-encephalic traumas. In our case the aetiology was iatrogenic trauma. During the myringoplasty, it is highly likely that the superficial temporal artery was damaged either by direct incision, harvesting the graft or adjacent diathermy. This probably triggered off the formation of an arteriovenous fistula between the superficial temporal artery and an adjacent superficial cerebral vein.

During most ear operations by either post-aural or end-aural approach the superficial temporal artery is at risk and is not infrequently damaged, though this is rarely significant. As illustrated in this case, damage to the vessel can cause major complications and is to be avoided.

Pulsatile tinnitus demands a thorough examination and investigation. Clinical examination should include palpation of the skull and auscultation. The possibility of vascular tumour or malformation can only be confirmed by angiography. The development of digital subtraction imaging has made angiography more effective and safe. Reluctance to proceed with



FIG. 1

Selective external carotid angiography showing a-v fistula between superficial temporal artery and superficial cerebral vein—lateral view.

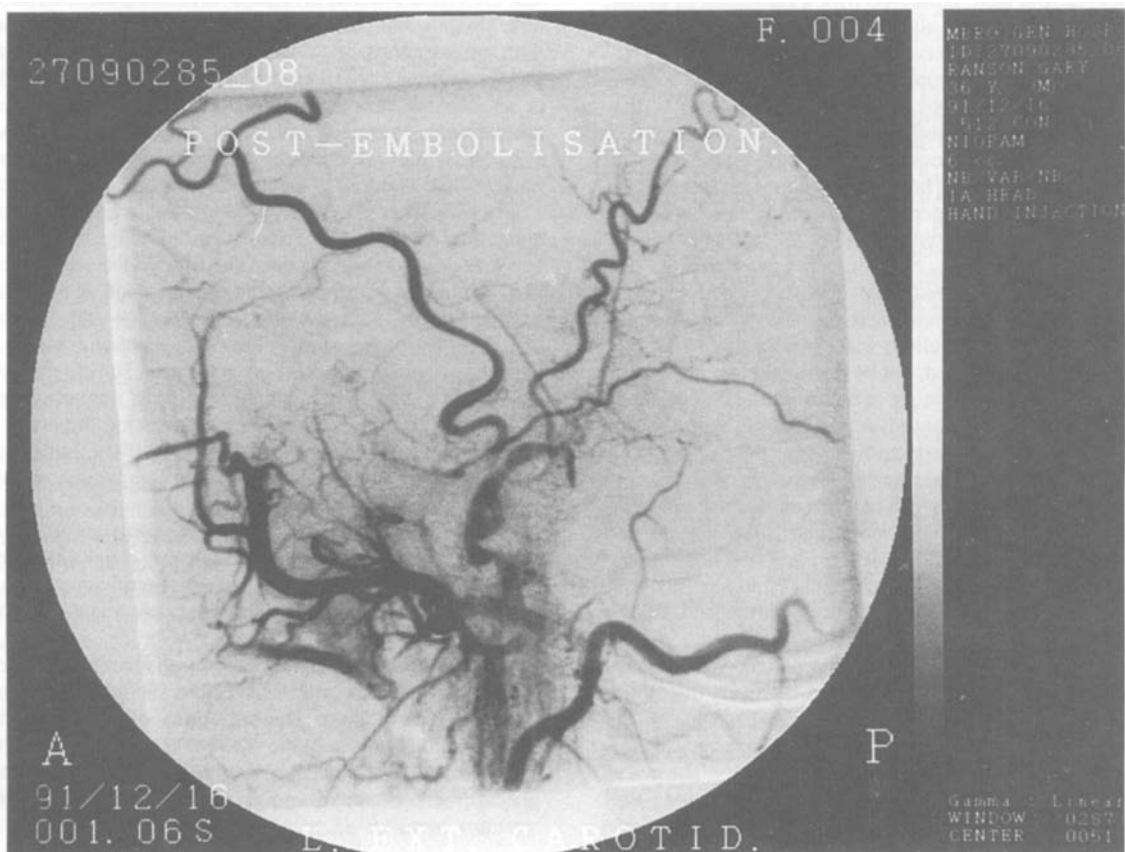


FIG. 2

Selective external carotid angiography after embolization of the fistula with silicone balloon—lateral view.

arteriography in the evaluation of patients with pulsatile tinnitus appears to be due to an outdated impression of the associated morbidity. Unless arteriography is utilized, life threatening and treatable lesions such as arteriovenous shunts, aneurysms, arteriosclerosis, fibromuscular dysplasia and glomus jugulare tumours may not be diagnosed (Levine *et al.*, 1987).

Treatment of the arteriovenous malformations can be by embolization or surgery or a combination of embolization and surgery (Morrison, 1989). Recent developments in the technique of embolization have made it the treatment of choice. Harris *et al.* (1979) in Sweden described 11 cases of pulsatile tinnitus (eight arteriovenous malformations and three glomus tumours) which were treated by selective embolization using strips of gelatin sponge. Most cases obtained relief of tinnitus, although a number of patients required more than one treatment. Complications included pain in the distribution of the embolized vessels, transitory facial weakness and transitory aphasia. The cure rate is over 95 per cent, with little risk and in particular less morbidity and hospitalization than with any other means of treatment (Reizine *et al.*, 1985; Berenstein and Lasjaumias, 1987). The arteriovenous fistula is usually at the site of an abrupt change in calibre between the artery and the vein. The fistula itself needs to be occluded and this is best achieved by balloons rather than by particulate agents (such as polyvinyl alcohol particles) or glue (such as isobutyl cyanoacrylate). In our case we used silicone balloons for embolization. The patient did not have any complications and is symptom free after one year.

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