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Middle cerebral artery aneurysm presenting as isolated hyperacusis

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Abstract
We present the first case of a middle cerebral artery aneurysm presenting as isolated hyperacusis. The patient had a Guglielmi detachable coil (GDC) embolization of his aneurysm with complete resolution of his symptoms. The pathophysiological mechanism is discussed. We suggest further radiological investigation in young patients presenting with this symptom.

Key words: Hyperacusis; Aneurysm; Middle Cerebral Artery

Inroduction

Hyperacusis or phonophobia is used to describe an unusual hypersensitivity or discomfort induced by exposure to sound.[1] Hyperacusis may be due to either peripheral or central causes. Hyperacusis is an intriguing symptom that rarely confronts the otologist in isolation. It often accompanies tinnitus in patients with cochlear pathology. It has also been described in patients with Bell's palsy, Williams' syndrome, herpes zoster oticus, Lyme disease, myasthenia gravis, migraine, depression and other diseases.[1–7] We believe that this is the first case in the literature of an intracranial aneurysm presenting with hyperacusis. The otological presentations of intracranial aneurysms and pathophysiological mechanisms by which hyperacusis is produced are discussed.

Case report

A 35-year-old man presented to the out-patient department with a six-week history of hyperacusis. He described sounds suddenly becoming 'accelerated, exaggerated and very loud' in both ears. These episodes tended to last five to 10 minutes and were associated with nausea. They occurred approximately three to four times a week. He had no other otolaryngological symptoms and no past medical history of note. Ear, nose and throat examination was completely normal. Pure tone audiometry and tympanometry were normal. A magnetic resonance imaging (MRI) scan of his internal acoustic meati and posterior fossa was requested because of his unusual presentation. This revealed a large aneurysm approximately 4×3 cm arising from the right middle cerebral artery with a laminated thrombus within the aneurysmal sac and demonstrable flow beyond the aneurysm (Figures 1 and 2). Digital subtraction angiography showed the aneurismal sac arising 1 cm distal to the origin of the middle cerebral artery (Figure 3).

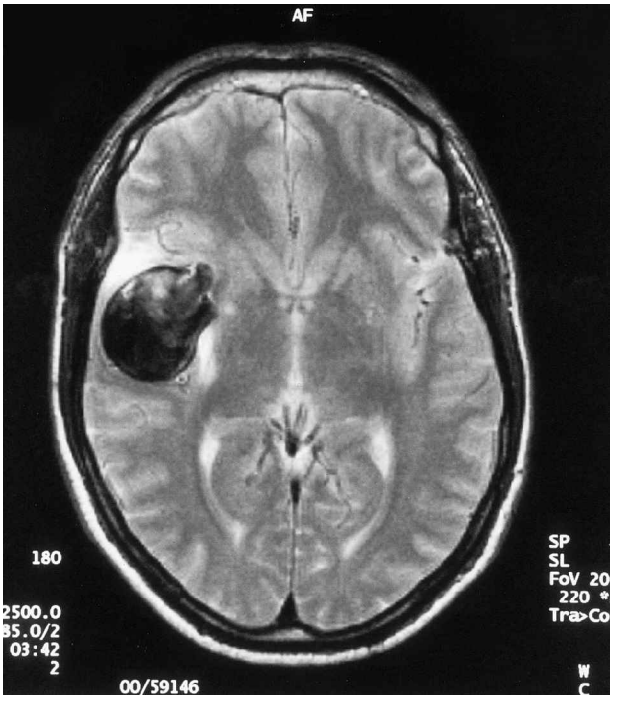

Fig. 1
Axial proton density T_2; showing a large aneurysm apparently arising from the right middle cerebral artery which measures 4×3 cm.

He was referred to the neurosurgical team and underwent GDC embolization of the aneurysm 12 days later. The procedure was uncomplicated and resulted in complete resolution of the hyperacusis. He remains asymptomatic 10 months after the operation.

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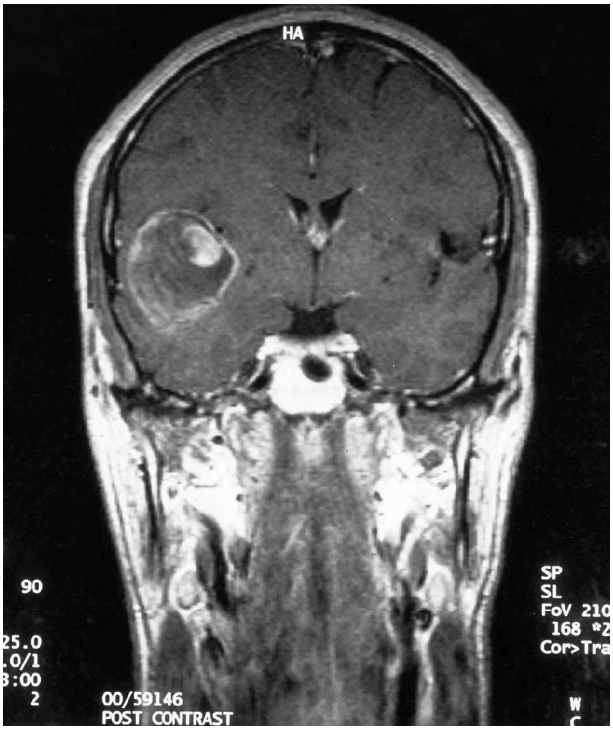

FIG. 2

Fine section coronal T_1 Post-gadolinium showing a large laminated thrombus within the aneurysmal sac which is of heterogenous signal intensity.

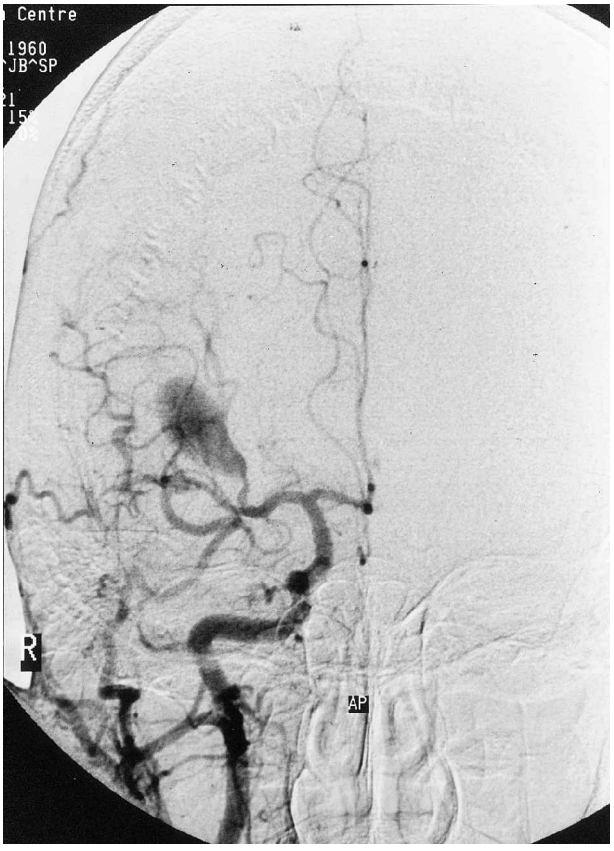

FIG. 3

Digital subtraction angiography showing the aneurysm arising from the right middle cerebral artery about 1 cm distal to its origin.

Discussion

The middle cerebral artery enters the sylvian fissure and divides into two to four branches that supply the lateral parts of the cerebral hemisphere including the auditory cortex (Area 41 of Broadmann).[8] Hence the afferent auditory pathways and auditory cortex are intimately associated with the middle cerebral arterial system.[9] We postulate that the turbulent flow and pressure effects of a middle cerebral artery aneurysm irritated the nearby auditory corex resulting in hyperacusis. This would be in keeping with the intermittent and brief nature of our patient's symptoms. The extensive crossover of auditory pathways at the brainstem explains the bilateral nature of his symptoms. The direct means by which hyperacusis is produced in the absence of cochlear pathology is unknown. Valente *et al.*[6] speculate on the relation of hyperacusis to hypersensitivity of hearing or distortion of the neural coding of the auditory input causing abnormal growth in loudness, whilst central hyperacusis as advocated by Marriage and Barnes[1] in 1995 is due to reduction of serotonin metabolism within the forebrain. A middle cerebral artery aneurysm as we postulate could certainly produce distortion in auditory input and transient fluctuations in serotonin metabolism. Central hyperexcitability[7] increased central gain[10] and failure of the central nervous system to habituate to the startle reponse[4] are other theories regarding the mechanism by which hyperacusis is produced. Most work on hyperacusis evolves from its association with tinnitus and it is less researched in its own right. Hyperacusis may be evaluated with measurements of loudness discomfort levels.[1,6] Other investigations often depend on accompanying otological symptoms. Intracranial aneurysms are estimated to occur in about 0.2–9.9 per cent of the population.[11–13] Unruptured intracranial aneurysms usually present with symptoms suggestive of raised intracranial pressure such as headaches, nausea, vomiting and blurring of vision or with cranial nerve deficits, embolic ischaemia and mass effects.[12] Herald leaks of a subarachnoid haemorrhage are a late feature. Otological presentations are extremely uncommon. Pulsatile tinnitus is the most frequent otological manifestation with an anterior inferior cerebellar artery (AICA) aneurysm followed by a sigmoid sinus aneurysm as common culprits.[14–16] Other reported otological presentations include vertigo, progressive and sudden sensorineural hearing loss. The management of unruptured aneurysms has been extensively debated in recent literature with most authors in favour of surgical intervention once they fulfil size criteria.[11–13,17–19] The form of surgical intervention may be clipping of the aneurysm or, as in our case, embolization by a neuroradiologist.[17–19]

This unique case suggests that in any young patient presenting with unexplained auditory symptoms further radiological investigation should be considered.

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