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Clinical Records

Intrapetrous carotid artery aneurysm presenting as epistaxis and otalgia

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Abstract
Aneurysm of the intrapetrous carotid artery is an extremely rare and potentially serious occurrence that presents diagnostic and therapeutic difficulties. Such aneurysms may follow trauma, atherosclerosis, mastoid surgery or most commonly can represent a developmental abnormality. We present the case of an 18-year-old female with a short history of recurrent left-sided otalgia and epistaxis who underwent successful endovascular balloon entrapment of a left intrapetrous carotid aneurysm.

Key words: Aneurysm; Carotid artery, internal; Petrous bone

Introduction

Patients with intrapetrous carotid artery aneurysm may present with a wide variety of symptoms; unilateral deafness secondary to haemotympanum, impairment of related cranial nerves due to direct pressure effects or occasionally with epistaxis following leakage. When epistaxis is the main presenting symptom, as in our case, the diagnosis may be delayed by the common nature of this complaint. Awareness of this condition is important in order to direct the clinician to perform angiography which is the definitive investigation. Once the diagnosis has been established, treatment consists of endovascular balloon occlusion under radiographic control or aneurysm resection with, or without, subsequent reconstruction.

Case report

An 18-year-old female presented to The Cambridge Military Hospital as an emergency in January 1994 with a left-sided epistaxis together with left-sided otalgia. On questioning she gave a history of short, recurrent episodes of epistaxis associated with throbbing tinnitus and deafness of the left ear over the preceding two weeks. There was no history of vertigo or otorrhea and previously she had been well with no past medical history of ear disease. On examination the left tympanic membrane was dull and indrawn suggestive of a middle ear effusion. The Rinne test was negative on the left and the Weber test lateralized to the left ear. Pure tone audiometry showed a 30 dB conductive hearing loss on the left side. Inspection of the anterior nares failed to identify a site of epistaxis although blood clot was noted to both sides of the nose. Fibreoptic nasendoscopy revealed further blood clot within an otherwise normal nasopharynx.

A left myringotomy was performed under local anaesthetic to confirm the presence of an effusion and allow ventilation. An incision was made in the antero–inferior quadrant of the tympanic membrane and scanty, blood-stained mucous was aspirated. There was no immediate improvement in the patient's hearing and during her admission she continued to have epistaxis from both anterior nares, which resolved without active management.

An MRI scan of the temporal bones, performed to exclude the possibility of a glomus tumour, demonstrated high signal within the left middle ear and associated mastoid air cells on both the T_1 and T_2-weighted images (Figure 1). There was no enhancement with gadolinium and the brain stem and posterior fossa were noted to be normal as was the cerebellopontine angle. A CT scan was performed to delineate the petrous temporal bone which confirmed the absence of bony erosion.

It was considered that the high signal demonstrated on MRI scan within the left temporal bone might represent bleeding secondary to a glomus tumour and it was decided to proceed to exploratory left tympanotomy. At operation a permeatal incision was made and the tympanic membrane reflected forwards to reveal blood and granulation tissue within the middle ear. There was no evidence of a glomus tumour. The patient made a satisfactory post-operative recovery but continued to suffer minor epistaxis following discharge and was readmitted shortly afterwards with a major epistaxis. On arrival she was found to have a haemoglobin of 8.5 g/dl and required resuscitation and four units of packed red cells. Once more the epistaxis

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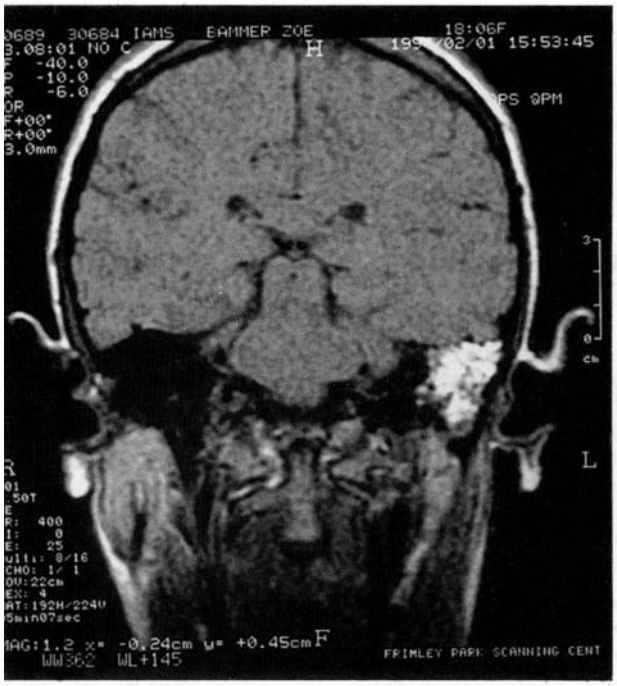

FIG. 1.

T_1-weighted spin-echo image in the coronal plane demonstrating high signal within the left middle ear and associated mastoid air cell system.

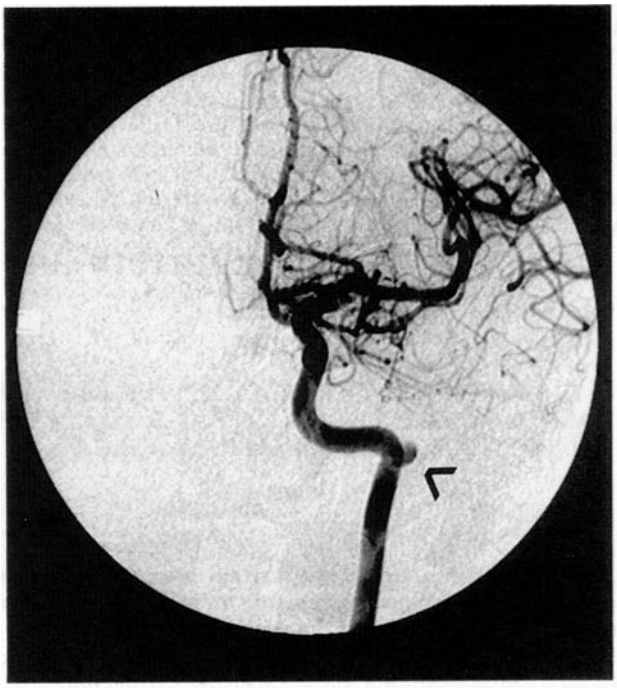

FIG. 2

Selective injection of the left internal carotid artery in antero-posterior (AP) view demonstrating an aneurysm of the intrapetrous segment (arrowed).

resolved spontaneously. A provisional diagnosis of an internal carotid artery aneurysm was made on the basis of the previous clinical findings and imaging techniques and she was subsequently transfered to The National Hospital for Neurology and Neurosurgery, for vascular studies. Angiography was performed in May 1994 via a right femoral approach and demonstrated a left intrapetrous carotid artery aneurysm (Figure 2). Test occlusion of the left internal carotid artery produced no neurological deficit in the conscious patient and she proceeded to successful left internal carotid endovascular balloon occlusion. Immediately following this procedure she was noted to have a left-sided Horner's syndrome with unilateral pupillary constriction and slight ptosis .

Twelve months after treatment she had remained well and there had been no recurrence of her previous symptoms. There was no resolution of the left-sided Horner's syndrome.

Discussion

Aneurysms of the internal carotid artery are rare but may occur anywhere along its course from the bifurcation of the common carotid artery in the neck to its termination below the anterior perforated substance of the brain where it divides into anterior and middle cerebral arteries. The internal carotid artery has, for descriptive purposes, been divided into cervical, petrous, cavernous and cerebral parts and most aneurysms develop within the cervical segment below the skull base (Williams and Warwick, 1986).

Aneurysm of the intrapetrous carotid artery is an extremely uncommon and potentially serious occurrence that is difficult to detect and treat. Such aneurysms are generally congenital in nature but may also follow basal skull fracture, chronic middle ear infection, mastoid surgery or with advancing years, atherosclerosis.

Berry aneurysms of the cerebral arteries are noted to occur at points of arterial branching where the internal (Lindop, 1988). It follows that developmental intrapetrous carotid artery aneurysms may arise at the junction of the internal carotid artery with its intrapetrous branches in particular the pterygoid and caroticotympanic arteries.

During its course through the petrous temporal bone the carotid artery lies in close proximity to auditory structures, at first anterior to the cochlea and tympanic cavity and then medial to the eustachian tube. A thin, bony lamella, cribriform in the young patient and often partly absorbed in old age separates the carotid artery from the tympanum and eustachian tube (Williams and Warwick, 1986). This may be eroded by the presence of an aneurysm.

Following sudden leakage patients may present acutely with haemorrhage into the eustachian tube or middle ear cavity resulting in epistaxis or otorrhagia. Bleeding may be severe and occasionally life-threatening (Moore *et al.*, 1979). However, most cases are preceded by a history of recurent minor epistaxis sometimes over months or years.

Intrapetrous carotid aneurysms are slowly progressive and may present with symptoms relating to compression effects upon related structures, in particular adjacent cranial nerves. In such circmstances patients may present with a variety of symptoms including gradual deafness, pulsatile tinnitus, vertigo, dysphagia, hoarseness, paraesthesia or facial paresis. Transient limb weakness has been reported secondary to embolization of a thrombus from an aneurysmal sac to the distal cerebral circulation (Costantino *et al.*, 1991).

Investigation with CT scan may demonstrate erosion of the petrous temporal bone and blood may be seen within the middle ear and mastoid air cell system following leakage. In the absence of haemorrhage, such studies are often unremarkable and clinical judgement must be relied upon to proceed to further investigation. Magnetic resonance angiography (MRA) may demonstrate an intrapetrous aneurysm but is not widely available and the definitive imaging technique is angiography with demonstration of the aneurysmal sac.

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carotid artery aneurysm is possible via an infratemporal fossa approach although the procedure is difficult and carries operative risks including facial nerve palsy (Glasscock *et al.*, 1983). Surgical ligation of the common carotid artery has been used in the past for the control of severe, intractable epistaxis but collateral vessels may lead to further bleeding at a later stage and therefore the procedure is no longer considered to offer definitive management (Costantino *et al.*, 1991).

Of increasing importance is the use of endovascular balloon techniques which are technically easier, as well as quicker and less demanding of resources. Temporary balloon occlusion of the internal carotid artery in the conscious patient during angiography can be used to determine the adequacy of cerebral cross-flow circulation. In the absence of neurological deficit after test occlusion, permanent occlusion may be performed by the introduction of a balloon proximal to the aneurysmal segment. Alternatively, as in our case, balloon occlusion may be performed with the introduction of an endovascular balloon into the intrapetrous carotid artery distal to the aneurysm and a second balloon into the proximal internal carotid artery. Others have placed a balloon within the aneurysmal sac itself with preservation of the parent vessel (Willinsky *et al.*, 1987). Endovascular balloon techniques immediately decrease the possibility of haemorrhage but carry the risk of balloon migration and Horner's syndrome due to damage of sympathetic nerves accompanying the internal carotid artery.

Conclusions

Intrapetrous carotid artery aneurysm is a rare occurrence and should it present as epistaxis, delay in diagnosis may result from the common nature of this complaint. Epistaxis in the presence of a haemotympanum should alert the clinician to the possibility of this condition. Whilst magnetic resonance angiography (MRA) may demonstrate the lesion, formal angiography is still necessary for definitive diagnosis and delineation.

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