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Multiple Intrapetrous Aneurysms of the Internal Carotid Artery

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Aneurysms of the petrous portion of the internal carotid artery are quite rare, there having been only 20 such examples previously reported [1-7]. Although some aneurysms have been bilateral, there has been no report of more than one aneurysm ipsilaterally. Historically many of the reported cases were originally diagnosed as glomus jugulare tumors until angiography and/or operation led to the correct diagnosis. Sometimes surgeons performing middle ear exploration (even for suspected vascular tumors) without preoperative angiography had disastrous results [1, 3, 4]. We report an example of multiple ipsilateral aneurysms of the intrapetrous internal carotid artery diagnosed preoperatively by angiography and offer a postulate for their origin.

Case Report

A 25-year-old diabetic woman had diminished hearing in the right ear for 2 years. Because of increasing hearing loss now associated with a "throbbing" sensation and right-sided headache, she underwent otolaryngologic evaluation. Physical examination revealed a "bluish cyst" behind the right tympanic membrane and a mild mixed hearing loss but was otherwise normal. There was no history of any craniocerebral trauma or significant infection.

Thin-section polytome laminograms of the temporal bones (fig. 1) revealed marked enlargement of the right jugular fossa with destruction of the bony ridge separating the jugular fossa from the carotid canal. Right carotid arteriography (fig. 2) showed the abnormality to be caused by multiple intrapetrous internal carotid aneurysms. Examination of the left carotid artery (not shown) was normal.

Two days later, the patient underwent ligation of the right internal carotid artery under local anesthesia. She had an uncomplicated postoperative course with complete remission of her symptoms at follow-up 12 months later.

Discussion

The clinical evaluation of patients with "pulsatile" or "throbbing" tinnitus is not always simple. Differential possibilities include (but are not limited to) abnormal position of the jugular bulb or carotid artery, persistent embryonic arteries, aneurysm, and the broad spectrum of glomus jug-

ulare tumors. In addition, one may encounter arteriovenous malformations of the dura as well as fistulous communications between branches of the occipital artery and dural sinuses [8-12].

Even though this patient's clinical findings initially suggested a glomus tumor, it was not possible to pinpoint the extent of the suspected abnormality until extensive radiographic evaluations had been completed. The temporal bone tomograms demonstrated abnormalities of the jugular fossa and destruction of the carotid ridge, but the vascular study was fundamental to the (unexpected) diagnosis.

In this patient angiography revealed three saccular aneurysms of the petrous internal carotid artery. The more proximal and larger aneurysms are situated in the same abnormal cavity in the temporal bone and are difficult to separate. These could possibly be two parts of a single lobulated aneurysm involving the proximal carotid canal and jugular fossa with erosion of the bony carotid ridge. The third aneurysm is definitely independent of the other two and occupies a more distal part of the carotid canal.

In embryonic development there are basically two branches of the internal carotid artery in the carotid canal: the caroticotympanic and the pterygoid arteries. The caroticotympanic artery is derived from the hyoid artery and enters the tympanic cavity through a minor carotid canal foramen to ultimately anastomose with the tympanic branch of the maxillary artery. The artery of the pterygoid canal (when present) exits into the pterygoid canal to anastomose with a branch of the external maxillary artery.

We believe that our case of ipsilateral multiple aneurysms of the petrous carotid artery lends credence to the postulate that these aneurysms arise at potentially weak areas in the arterial wall that were originally sites of origin of embryologic arteries. These embryologic arteries ultimately atrophy as the fetus matures [3, 6, 9, 13]. The absence of any history of significant trauma, infection, or signs of atherosclerosis would further tend to support the theory of congenital origin.

Ten years ago plain tomography and angiography were the only major radiographic forms of investigation possible. As newer and better CT scanners become more widely available, evaluation of the base of the skull by this modality

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A



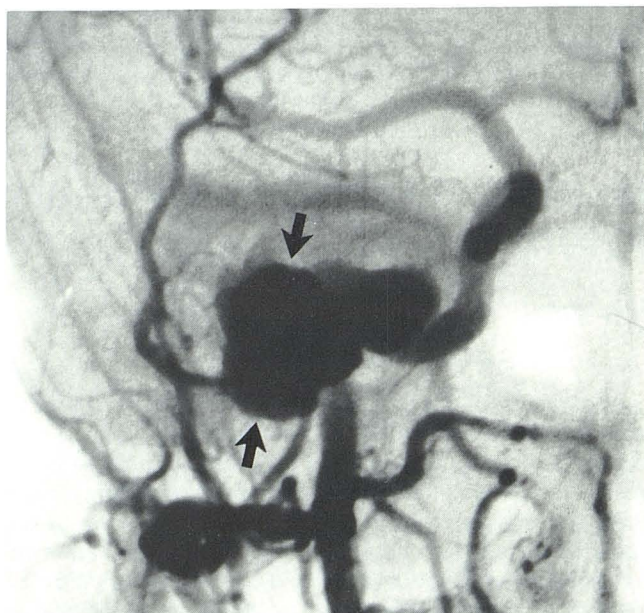
B



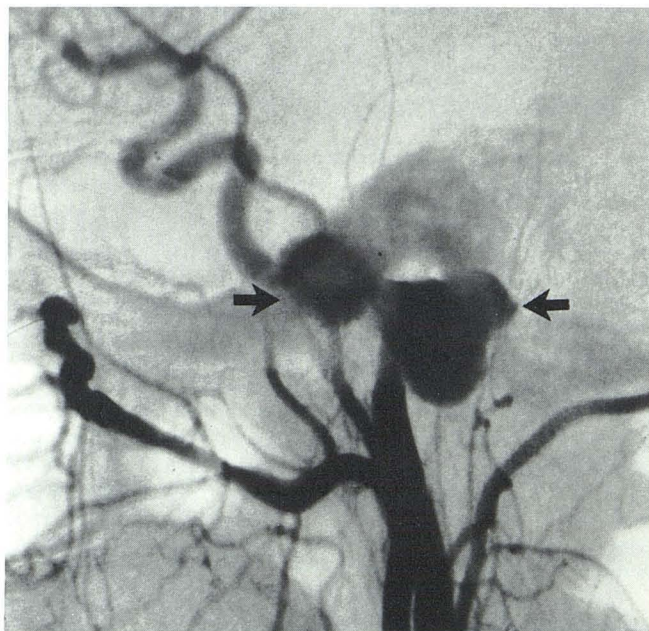
C

Fig. 1.—Anteroposterior (A), basal (B), and lateral (C) petrous bone tomograms. Marked enlargement of right jugular foramen (closed arrows) and erosion of carotid ridge (open arrow).

will improve and will likely lessen the necessity for plain tomography. Whether this will have an effect on the need for arteriography is not clear. Aneurysms are frequently multiple and angiographic investigations are still the accepted "gold standard" for determining the exact surgical anatomy. Perhaps intravenous digital angiography will lend itself to the evaluation of these types of abnormalities, thus diminishing the number of direct arterial studies.



A



B

Fig. 2.—Anteroposterior (A) and lateral (B) subtraction films from right carotid arteriogram. Multiple aneurysms (arrows) of intrapetrous segment of internal carotid artery.

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