Asymmetric Temporal Bone Pneumatization: An MR Imaging Pitfall

A healthy 44-year-old woman was evaluated neurologically because she had had dizziness without vertigo and right facial pain for several months. The pain was not typical for trigeminal neuralgia, and she had had no loss of hearing. Physical examination showed no abnormalities. Cranial MR imaging was ordered for evaluation of the cerebellopontine angle.

Axial MR images showed apparently normal eighth cranial nerves bilaterally (Fig. 1). However, an asymmetric area of increased signal was noted anterior to the origin of the right eighth cranial nerve. Coronal and parasagittal sections showed high signal intensity in the right cerebellopontine angle, but without any mass effect. The MR signal from this area was that of fat, and a possible lipoma or other fatty tumor was considered.

Axial CT scanning showed asymmetric pneumatization of the temporal bones, particularly the petrous apex. The left was pneumatized completely, and the right contained marrow. This marrow clearly was the explanation for the high MR signal intensity in the right cerebellopontine angle.

Discussion

Pneumatization of the temporal bone begins in the late prenatal period and proceeds in stages to the fully developed adult pattern. It has been divided into five regions: (1) middle ear, (2) mastoid, (3) perilabyrinthine, (4) petrous apex, and (5) accessory. The embryology of this process and the detailed anatomy have been reviewed by Virapongse et al. [1].

Pertinent to this case is the petrous apex, which is pneumatized in approximately 35% (reported range, 11–62%) of all temporal bones. The petrous air cells originate from specific locations within the antrum, middle ear, and auditory tube. From these areas, the air cells extend into the substance of the petrous bone to various degrees [2]. Symmetry of pneumatization in the temporal bones occurs in 72–99% of the general population. In a thorough study by Myerson et al. [3], the prevalence of asymmetric pneumatization of the petrous tips was only 4%. Therefore, in most cases, an imaging pitfall will not be encountered because of the relatively high degree of symmetric pneumatization.

Because cortical bone is not imaged on MR, it is difficult to discern bony pneumatization in the base of the skull. In this case, the side of apparent MR abnormality corresponded to the side of the patient’s symptoms and therefore was cause for some concern. The excellent bone detail of the axial CT scan unequivocally established the MR “lesion” as a normal anatomic variant (marrow in nonpneumatized petrous bone).

The opinions expressed herein are those of the authors and are not to be construed as those of the Department of Defense or the U.S. Army Medical Department.

REFERENCES


Fig. 1.—Asymmetric pneumatization of temporal bone.

A, Axial long TR, relatively long TE (3000/45) MR image at level of internal auditory canals shows normal eighth cranial nerves (arrows) and an area of increased signal intensity anterior to right auditory nerve.

B and C, Coronal (B) and right parasagittal (C) T1-weighted MR images (400/17) show a focus of very high signal, consistent with fat, in right cerebellopontine angle.

D, Axial CT image of temporal bone clearly shows asymmetric pneumatization of bony petrous apex. Marrow in right petrous apex is source of high MR signal in this region. (Incidentally noted is a small amount of fluid in right sphenoid sinus.)