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Gd-DTPA–Enhanced MR Imaging of Cochlear Schwannoma

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The majority of eighth cranial nerve tumors are acoustic schwannomas, with greater than 90% arising from the vestibular division within the internal auditory canal. Most originate near the porus acusticus at the glial-Schwann cell interface. The minority of vestibular schwannomas arise at other locations along the nerve, such as within the vestibule or at the fundus of the internal auditory canal. Schwannomas arising from the cochlear division in the absence of vestibular involvement or neurofibromatosis are rare. Previously, cochlear schwannomas have been seen primarily at autopsy, although demonstration by CT [1, 2] and polytomography [3] have been reported. CT evaluation of eighth cranial nerve tumors has largely been replaced by MR imaging. The recent availability of paramagnetic contrast agents has further enhanced the value of MR in the preoperative localization of intracanalicular or intralabyrinthine tumors [4]. The case reported here represents in vivo demonstration of an isolated cochlear schwannoma by means of paramagnetic-contrast–enhanced MR imaging. The ability to demonstrate the cochlear location of the abnormality had direct bearing on clinical management and surgical planning.

Case Report

A 36-year-old woman presented with a 3-year history of tinnitus, vertigo, and progressively severe neurosensory hearing loss in the right ear. Audiometric evaluation revealed a 65 dB loss with 20% discrimination. The caloric response was diminished, but the auditory brainstem response (ABR) revealed no delay in the interpeak latency. Acoustic schwannomas involving the vestibular division are most classically associated with an ABR interpeak delay. In the absence of this finding, a lesion of the cochlea or a very small vestibular lesion is suggested. The patient was referred directly to MR for evaluation of the temporal bones and cerebellopontine angles. No CT was obtained.

Multiple spin-echo images were acquired on a 1.5-T GE Signa unit with a 256 × 256 matrix. Sagittal and coronal T1-weighted images were obtained with 800/20/4 (TR/TE/excitations). Axial T2-weighted and proton-density images were obtained with 2500/30,80/1. After IV administration of Gd-DTPA, multiple axial T1-weighted images were obtained with 500/20/4.

On the noncontrast coronal short TR/TE (Fig. 1A) and axial long TR/TE (Fig. 1B) images, both cochleas appeared symmetric in size and signal intensity. On the noncontrast short TR/TE axial images (Fig. 1C), there was subtle asymmetry in the signal intensity of the cochlea, the right appearing slightly more intense than the left. Minor asymmetry of the cochlea related to patient positioning. However, after administration of Gd-DTPA, marked signal asymmetry was seen and the right cochlea appeared significantly brighter than the left (Fig. 1D).

The patient's clinical presentation indicated pathology involving the eighth cranial nerve. However, because intralabyrinthine lesions of varying origin and location have similar clinical presentations, the nature and precise location of the abnormality were unclear. On the basis of the marked hearing loss and the cochlear abnormality demonstrated on MR, the patient underwent cochlear exploration rather than the more conventional internal auditory canal exploration, via a transmastoid translabyrinthine approach. A soft-tissue mass was found in the apex of the cochlea, extending retrograde to the junction of the second and basal turns. The tumor was resected en bloc with the modiolus and basal membrane. Histopathologic evaluation confirmed the presence of a schwannoma. If the patient had undergone the more conventional exploration of the internal auditory canal, the tumor would have been missed.

Discussion

The frequency of acoustic schwannomas, based on autopsy series, is reported to be approximately 1% [5]. The vast majority of the schwannomas involve the vestibular division of the acoustic nerve. The frequency of intralabyrinthine schwannomas arising exclusively from the cochlear division is much smaller. Less than 15 have been reported in the literature, most recently by Mafee in 1988 [1, 2]. To date, in vivo demonstration of an intralabyrinthine schwannoma by contrast-enhanced MR has not been reported.

The MR findings in this case are nonspecific. Although localization of the abnormality to the cochlea was unequivocal, the origin of the signal abnormality was unclear. The normal signal intensity of the cochlea on the short TR/TE images excludes the presence of nonacute hemorrhage. However, the normal signal intensity on the long TR/TE images in conjunction with enhancement after Gd-DTPA administration suggests other causes, which include infectious (lues) or

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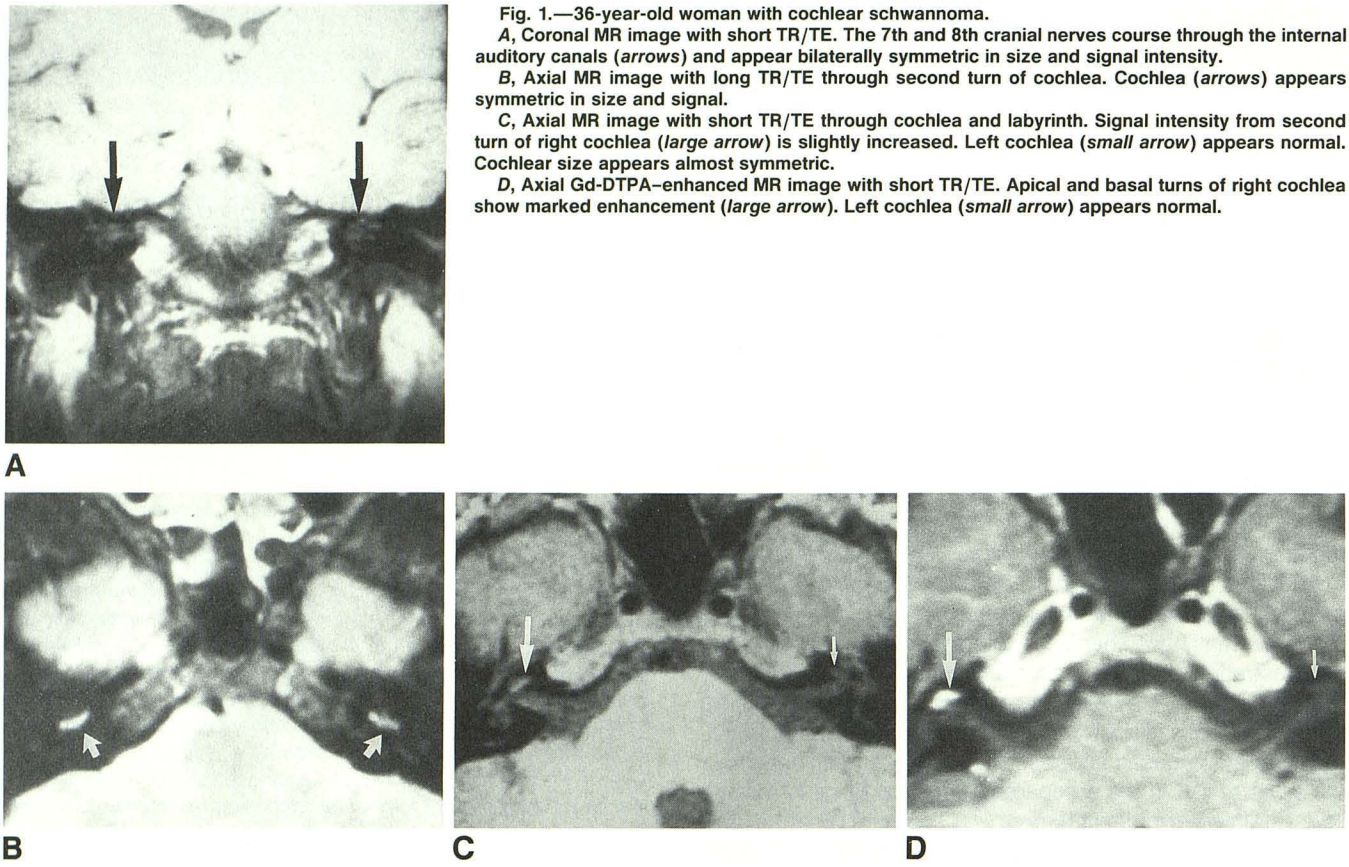

Fig. 1.—36-year-old woman with cochlear schwannoma.

***A*, Coronal MR image with short TR/TE. The 7th and 8th cranial nerves course through the internal auditory canals (*arrows*) and appear bilaterally symmetric in size and signal intensity.**

***B*, Axial MR image with long TR/TE through second turn of cochlea. Cochlea (*arrows*) appears symmetric in size and signal.**

***C*, Axial MR image with short TR/TE through cochlea and labyrinth. Signal intensity from second turn of right cochlea (*large arrow*) is slightly increased. Left cochlea (*small arrow*) appears normal. Cochlear size appears almost symmetric.**

***D*, Axial Gd-DTPA–enhanced MR image with short TR/TE. Apical and basal turns of right cochlea show marked enhancement (*large arrow*). Left cochlea (*small arrow*) appears normal.**

inflammatory (sarcoid) processes, other neoplasms (lymphoma), or vascular insult.

Prior to the advent of MR, air- or water-soluble contrast cisternography with CT has been the method of choice for demonstrating an intracanalicular or small cerebellopontine angle schwannoma [6]. Because of its high soft-tissue contrast and multiplanar imaging capabilities, MR has replaced CT, when available, for the evaluation of these masses [7–9]. Although enhancement with Gd-DTPA is a nonspecific finding, the sensitivity of MR increases with its use.

Cochlear schwannomas are a rare cause of eighth cranial nerve pathology, yet their clinical presentation may mimic the more common vestibular nerve schwannomas. Because the origins and locations of the eighth nerve lesions vary, clinical evaluation and surgical planning can be problematic. The increased sensitivity provided by contrast-enhanced MR makes it the method of choice in the evaluation of patients presenting with clinical signs and symptoms of eighth cranial nerve pathology. In this case, MR provided accurate preoperative localization of the abnormality, which was essential for the diagnosis and appropriate surgical planning.

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