MRI of unusual lesions in the internal auditory canal

Abstract  We report the MRI findings of six unusual lesions of the internal auditory canal: three haemangiomas, one lipoma, one metastasis and one traumatic neuroma. We compare the findings to those of 20 intracanalicular schwannomas. We noted the site and size of the tumour, its signal intensity, borders and the homogeneity of enhancement were studied on T1-weighted images before and after intravenous contrast medium and T2-weighted images. Most schwannomas were homogeneous lesions, isointense on T1- and T2-weighted images, and strongly enhancing. Spontaneous high signal on T1-weighted images, heterogeneous contrast enhancement and extranodular enhancement were helpful for recognising lesions other than schwannomas; site, size and signal on T2-weighted images were not. All the haemangiomas had a specific pattern of contrast enhancement, with an anterior core intensely enhancing portion and a posterior portion which enhanced moderately or not at all.

Key words  Schwannoma · Haemangioma · Lipoma · Metastasis · Internal auditory canal · Magnetic resonance imaging

Introduction
Lesions of the internal auditory canal (IAC) and cerebellopontine angle (CPA) may present with tinnitus, or other disorders of hearing or balance. Samii et al. [1] reported only 2.7% of these lesions to be confined to the IAC. Vestibular schwannomas represent about 90% of the masses identified [2]. Because of the small size of pure intracanalicular lesions, detailed analysis is limited. Moreover, tumours other than schwannomas are rare and frequently of different types [3], and their imaging data remain poorly described. However, the MRI features of such lesions may be different from those of schwannomas. The distinction between vestibular schwannoma and other lesions could influence treatment, especially when conservative management is considered. Imaging of patients with vestibular schwannomas is important for defining the best therapeutic ap-
proach [4]. We therefore, we compared six cases of intracanalicular masses other than schwannomas with 20 schwannomas on conventional MRI to try to identify simple signs which may aid in their differentiation.

Methods

Between 1986 and 1997, we operated on 325 masses in the CPA, 46 of which were strictly confined to the IAC. Preoperative MRI were available for review in 26 of these 46 patients. Histological study defined two groups: the schwannomas (20; the reference group) and six other masses: one lipoma, three cavernous haemangiomas, one traumatic neuroma of the inferior vestibular nerve, and one metastasis of an undifferentiated carcinoma of unknown origin. There were 11 men and nine women with schwannomas and three men and three women with other masses, aged 22–61 years (mean 47.2 years), and 29–65 years (mean 42.2 years), respectively. The patients were referred because of progressive unilateral hearing loss (15 with schwannomas, four with other masses), sudden unilateral hearing loss (three and one), vertigo and/or balance disorders (12 and four), tinnitus (16 and two) and peripheral facial palsy (one in each group).

MRI was performed on various 1–2 T units. Films available for analysis consisted of axial spin-echo (SE) T2-weighted images (in 21 cases), axial reconstruction of 3D Fourier transform of constructive interference in steady state (FT-CISS) images limited to the IAC (in two), axial spin-echo T1-weighted images before (24), and after (26) intravenous contrast medium. Slice thickness of spin-echo images was 3–4 mm. Coronal contrast-enhanced images were available in some cases.

Two observers blinded to the histological data reviewed the MRI studies by consensus. The note the following: largest diameter (mm), side, position in the inner or outer half of the IAC, signal intensity compared to the pons, and homogeneity on T2- and T1-weighted and contrast-enhanced images. Any other abnormalities on the MRI were also recorded. The radiological findings were compared with the pathological diagnosis.

Results

All 20 intracanalicular schwannomas were unilateral. They were on the left in nine cases and the right in 11. They measured 6–12 mm (mean 9.15 mm). They occupied the whole IAC in nine cases, the inner half in eight, and the outer half in three. On all available T2-weighted images (17 cases) the schwannomas were isointense with the pons; 15 (88%) appeared homogeneous, and two (12%) heterogeneous. T1-weighted images (in 18 cases) showed tumours as isointense with the pons (Fig. 1), and all but one (94.4%) were homogeneous. All 20 schwannomas showed intense contrast enhancement (Fig. 1), and all but one (95%) were homogeneous. One was heterogeneous on T2-weighted images and on T1-weighted images before and after contrast medium.

All the other masses were unilateral lay within the left IAC. They measured from 8–12 mm (mean 9.67 mm). Three occupied the whole IAC, two the inner and one the outer half.

Of the three haemangiomas (Fig. 2), two gave moderately high signal on T2-weighted SE images. On the 3DFT-CISS images, the third gave very low signal, isointense with the pons. One haemangioma was heterogeneous on T2-weighted SE images. On T1-weighted images, all three were isointense and homogeneous. Contrast enhancement was heterogeneous in all three with a consistent pattern of two components, an anterior intensely enhancing core and a posterior part which enhanced only moderately (in two cases) or not at all.

The lipoma gave high signal on T1- and was isointense on T2-weighted images; no contrast enhancement was visible (Fig. 3). No fat suppression images were available. The mass was homogeneous on the different sequences.

The metastasis was a homogeneously isointense on both T1- and T2-weighted images, enhancing intensely. Thick linear meningeal enhancement was continuous with it medially. Another nodule was seen in the left cerebellar hemisphere, highly suggestive of another metastasis (Fig. 4).

The traumatic neuroma was homogeneous with the different sequences. It was visible on the reconstruction of the 3DFT-CISS, giving signal as low as that of the other soft other tissues. It was isointense on T1-weighted images, and enhanced strongly. There was a thin line of meningeal enhancement adjacent to the superior surface of the temporal bone (Fig. 5). This patient had fibrous dysplasia of the left temporal bone and the left part of the sphenoid bone, causing stenosis of the external auditory canal and the eustachian tube, left middle-ear cholesteatomatous otitis and mastoiditis, extending into the labyrinth. The tegmen tympani was not destroyed.

No difference in size or in position within the IAC was noted between the groups. The schwannomas were equally distributed on both sides, whereas the other lesions were all on the left. On both T1- and T2-weighted images, most of the intracanalicular schwannomas were homogeneous and isointense, and showed homogeneously intense contrast enhancement. Thus, high signal on T1- or T2-weighted images, and heterogeneous of signal before or after contrast medium were useful for identifying other lesions, as was contrast enhancement outside the tumour nodule. High signal on T2-weighted SE images was specific for haemangioma, although inconstant, and on T1-weighted images was specific for lipoma. Heterogeneity was very suggestive of an unusual lesion, but again was inconsistent. Contrast enhancement was homogeneous and confined to the mass in all but one of the schwannomas, and heterogeneous or associated with extranodal extension in all other masses.