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Meningioma of the internal auditory canal with extension into the vestibule

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Abstract
Meningiomas account for approximately 18 to 19 per cent of all brain tumours. Although they can arise in numerous locations, meningiomas of the internal auditory canal (IAC) are rare. Most tumours that originate in the IAC are schwannomas of the VIIIth cranial nerve (acoustic neuromas). We report a case of a meningioma which appears to originate from the IAC and extends into the vestibule. The clinical findings and the radiographical features of meningiomas of the IAC are similar to those of acoustic neuromas. Pre-operative differentiation between acoustic neuromas and meningiomas of the IAC may be difficult.

Key words: Meningioma; Vestibule; Auditory canal, internal

Introduction

Meningiomas account for approximately 18 to 19 per cent of all brain tumours and are the second most common tumour to involve the cerebellopontine angle (CPA) (Nager and Masica, 1970). The great majority of tumours that originate in the internal auditory canal (IAC) are VIIIth nerve schwannomas (acoustic neuromas). Controversy exists as to whether meningiomas can arise within the IAC or whether involvement of the IAC occurs secondarily by extension from the CPA. Meningiomas of the CPA typically originate from the posterior face of the petrous bone and most meningiomas do not involve the IAC. There have been only 11 previous reports of intracanalicular meningiomas (IAC meningiomas) (Singh *et al.*, 1975; Brookler *et al.*, 1980; Hooper *et al.*, 1990; Langman *et al.*, 1990; Atlas *et al.*, 1992; Ogata *et al.*, 1993; Hodgson and Kingsley, 1995; Bohrer and Chole, 1996; Zeitouni *et al.*, 1997). We report a case of a patient with meningioma of the IAC which appears to originate from the IAC and extends into the vestibule and the CPA.

Case report

A 55-year-old male presented with a one-month history of dizziness and right-sided facial weakness. He had a five-year history of tinnitus in the right ear and progressive right hearing loss. Physical examination revealed a mild facial nerve palsy. There was no response to pure-tone audiometry in the right ear. A caloric test revealed no vestibular response on the right side. The remainder of the neurological examination showed no abnormal findings. Plain X-rays showed no definite enlargement of the right IAC. A magnetic resonance image (MRI) revealed an enhanced lesion in the IAC, which filled the IAC and extended into the CPA. A pre-operative diagnosis of acoustic neuroma was made.

We decided to remove the tumour via the translabyrinthine approach. During the surgery, the semicircular canals were found to be normal. Within the vestibule, a small tissue mass was found and removed. This mass was determined to be isolated within the vestibule. The IAC was explored and a tumour was found in the IAC, which extended 7 mm into the CPA, without intracranial attachment. The tumour was removed with preservation of the facial nerve. The post-operative course was uneventful aside from a transient worsening of facial nerve function which recovered in several weeks. Histopathologically, the mass in the vestibule and the tumour of the IAC were identical and both were found to be meningothelial meningiomas with psammoma bodies.

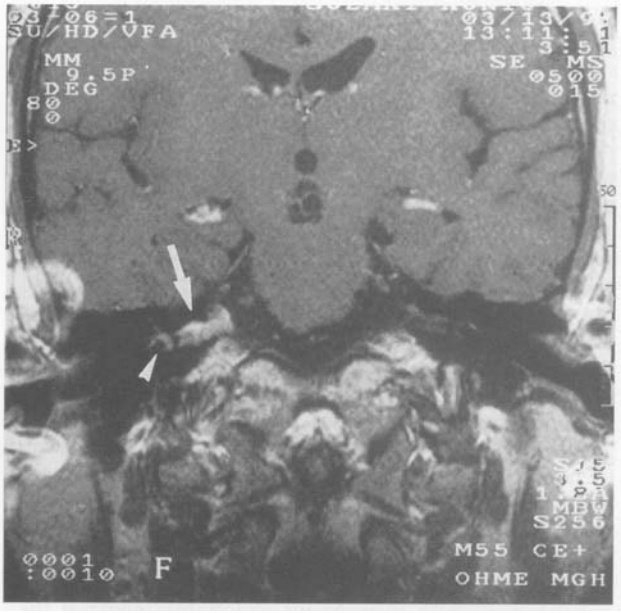

Fig. 1
Coronal enhanced T1-weighted MRI showing an intracanalicular mass with extension to the CPA (arrow). A high signal area was recognized in the inner ear (arrowhead).

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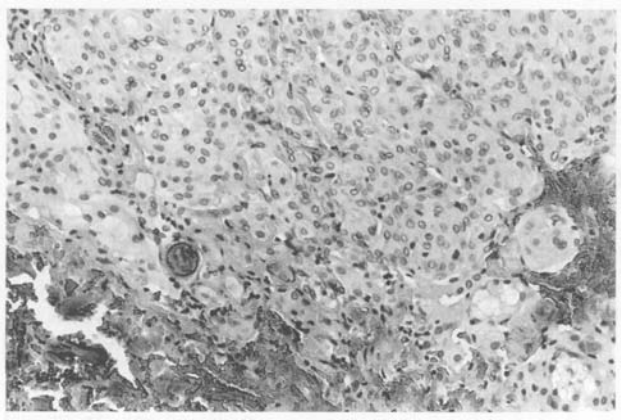

FIG. 2
Histopathological analysis of the mass demonstrating meningioma. (H&E; ×120).

Discussion

Although acoustic neuromas account for the great majority of intracanalicular lesions, alternative pathological entities such as meningiomas, facial nerve neuromas, haemangiomas, hamartomas, lipomas and arachnoid cysts should also be considered (Bohrer and Chole, 1996; Ajal *et al.*, 1998).

Meningiomas are thought to arise from the arachnoid lining cells of arachnoid villi. They arise most frequently along the dural venous sinuses where arachnoid granulations are found. Meningiomas that arise from the posterior face of the petrous bone most commonly arise from arachnoid granulations associated with the sigmoid sinus, jugular foramen, torcula, or the superior and inferiorpetrosal sinuses (Maniglia, 1978). Arachnoid granulations also occur less commonly along the dural lining of the foramina of the cranial nerves, including the IAC (Aoyagi and Kyuno, 1912). Thus, meningiomas may originate within the IAC.

It is important to differentiate intracanalicular meningiomas (IAC meningiomas) from acoustic neuromas. The symptoms, physical findings, and audiovestibular test results in patients with meningiomas of the IAC are similar to those in patients with acoustic neuromas. Although hearing loss has been noted to be less frequent with CPA meningiomas than with similar-size acoustic neuromas, an ipsilateral sensorineural hearing loss was present in our case in addition to the 11 previously reported cases of IAC meningiomas. Facial nerve palsy was present in three of the 12 cases (our case and the 11 previously reported cases). This suggests that involvement of the facial nerve is more common in IAC meningiomas than in acoustic neuromas, where facial nerve dysfunction is relatively rare. Pre-operative differentiation is usually made by comparing various radiographical features. On T1-weighted MRI images, both acoustic neuromas and meningiomas are mostly isointense, but occasionally hypointensive relative to the brain parenchyma. On T2-weighted MRI images, acoustic neuromas tend to be higher in intensity than meningiomas (Wilms *et al.*, 1992). In addition, acoustic neuromas tend to show more enhancement with intravenous gadolinium contrast than meningiomas (Bohrer and Chole, 1996). However, this difference is too small to be of differential value. When an IAC meningioma grows outside the IAC into the CPA, other radiological signs, such as a dural tail or calcification on computed tomography (CT) scan, may facilitate the diagnosis (Lalwani and Jackler, 1993). Bone invasion is an unusual finding with intracanalicular tumours, but may suggest the diagnosis of a meningioma if encountered. In clinical practice, pre-operative differentiation between acoustic neuromas and meningiomas may be difficult. In fact, most of the previous studies on IAC meningiomas reported that the pre-operative diagnosis of a IAC mass was acoustic neuroma.

IAC meningiomas behave differently from acoustic neuromas. Meningiomas within the temporal bone often invade widely. Once the meningiomas reaches the fundus of the IAC, the tumour can invade the labyrinth and cochlea of the inner ear. It can follow individual nerve fibres to their end organs, and spread widely throughout the perilabyrinthine marrow and air cells (Nager and Masica, 1970). Singh *et al.* (1975) reported a case in which an IAC meningioma extended from the IAC along the facial nerve canal, to involve the horizontal and vertical portions of the facial nerve. A case presented by Brookler *et al.* (1980) involved the ampullated end of the posterior semicircular canal. In a case of two IAC meningiomas reported by Hooper *et al.* (1990) the tumour extended laterally from the IAC into the vestibule of the inner ear. The case presented in this article also had a tumour that extended into the vestibule. However, in contrast to the case presented by Hooper *et al.*, the tumour that we found in the vestibule did not appear to be connected with the intracanalicular tumour. The propensity for invasion of the inner ear associated with meningiomas warrants careful identification of the lateral extent of the tumour, both radiologically and at the time of surgery. A translabyrinthine approach is particularly advantageous in this respect. In our case, we discovered a high signal area in the inner ear on enhanced T1-weighted MRI studies, retrospectively. Therefore, we may have been able to detect a lesion in the inner ear pre-operatively.

Meningiomas have a much higher tendency toward recurrence than acoustic neuromas. The most important factor in determining the recurrence rate is the presence of residual disease at the tumour resection (Mirimanoff *et al.*, 1985). Meningiomas should be exised completely. To minimize the chance of recurrence, wide dural excision should be performed. In addition, in meningiomas that involve the fundus of the IAC, consideration should be given to exenteration of the inner ear to reduce the probability of recurrence.

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