Radiology Quiz Case 1: Diagnosis

Diagnosis: Meningioma of the internal auditory canal

Meningiomas arise from arachnoid lining cells, usually around the tips of the arachnoid villi,[1] which are found in the walls of intracranial venous sinuses.[2] The tip of the arachnoid villi projects into the sinus lumen, while their cavity is continuous with the subarachnoid space and is partly filled with loose arachnoid tissue.[1] The villi are probably involved in absorption of cerebrospinal fluid.[3] In the posterior cranial fossa, arachnoid villi are present in all the venous sinuses, on the superior surface of the vermis of the cerebellum, and in the CPA.[3] They can also be found in the petrous pyramid (internal acoustic meatus, jugular foramen, close to the geniculate ganglion, and along the lesser superficial petrosal nerves).[4] Meningiomas may therefore arise in any of the previously mentioned locations.

Tumors of the CPA represent 10% of all intracranial lesions, and the vast majority are acoustic neuromas.[5] Meningiomas make up 10% to 15% of all CPA tumors.[6] The CPA is the most frequent location for meningiomas of the posterior fossa, and the posterior face of the petrous bone is the site of attachment for most of them.[1] In a recent series of 21 meningiomas of the CPA, the tumors were classified according to site of attachment to the posterior face of the petrous bone: 10 were attached posterior to the meatus and 11 were attached anterior to the meatus.[7] Ten tumors were totally extracanalicular (48%), 2 were totally intracanalicular (9%), and 9 were both intracanalicular and extracanalicular (43%). Therefore, 2 tumors (9%) were considered to have an intracanalicular origin.[7] Another series from 1996 included 30 patients with meningiomas of the CPA.[8] The tumors were classified according to location as follows: (1) not in the internal auditory canal (IAC), (2) protruding into the porus acusticus, or (3) occupying a significant amount of the IAC. The authors found that the incidence of dead ear was much higher before surgery when the tumor was in the IAC. There was no mention of any tumor that was entirely intracanalicular.[8]

The differentiation of CPA meningiomas from acoustic neuromas is desirable before surgery because hearing is much more likely to be preserved during surgery for large meningiomas than during removal of large acoustic neuromas.[7,8] Facial nerve preservation is also more likely in cases involving meningioma than in those involving acoustic neuroma.[7] The signs and symptoms of meningiomas of the CPA and those of acoustic neuromas, however, are very similar, as are the results of audiometric and vestibular tests.[7] Preoperative diagnosis of meningiomas of the CPA must therefore rely on imaging techniques. Gadolinium-enhanced MRI is the technique of choice to distinguish meningiomas from other CPA tumors. Meningiomas of the CPA are characterized by a broad dural base in the posterior face of the petrous bone, with an enhancing dural tail, a position not centered in the IAC, and signs of calcification and local hyperostosis. They rarely penetrate or cause erosion of the IAC.[7,9] Acoustics neuromas are round, often cystic masses that are found centered in the IAC and eroding the porus acusticus.[9]

Our patient had an entirely intracanalicular tumor that was isodense with brain tissue on T1-weighted MRI scans before contrast injection (Figure 3). After contrast injection (Figure 4), there was homogeneous enhancement of the tumor and an enhancing dural tail was seen posteriorly. Even though the correct diagnosis was not made before surgery, in retrospect the isodensity with brain tissue before contrast injection, the homogeneous enhancement of the lesion, and the enhancing dural tail in the postcontrast image should have pointed to the possibility of a meningioma of the CPA. The dead ear on the left (Figure 1) is compatible with the findings in previous series[8]: intracanalicular extension of a meningioma of the CPA is associated with preoperative profound hearing loss. The patient was operated on using the translabyrinthine route; the tumor that extended to the fundus of the IAC was entirely removed; and the facial nerve was easily dissected away from the tumor and preserved. The patient's facial function after surgery was House-Brackman grade II. The histopathologic features of the tumor were entirely compatible with meningothelial meningioma.

Of all the series we were able to review from the literature, only one[7] mentions the presence of 2 totally intracanalicular meningiomas of the CPA, for an incidence of 9% in the series. Other series[8,9] report cases of meningiomas of the CPA penetrating the IAC but none entirely inside the canal. Although the true incidence of intracanalicular meningiomas of the CPA cannot be determined at this time, it is certainly safe to say that they must be rare. Careful attention to the characteristics on gadolinium-enhanced MRI scans of the CPA/IAC described herein will lead to the preoperative diagnosis of these rare lesions as well as to the appropiate surgical approach.

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