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Entirely Intracanalicular Meningioma: Contrast-Enhanced MR Findings in a Rare Entity

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Summary: We report an unusual case of an entirely intracanalicular meningioma in a 51-year-old woman. Contrast-enhanced MR images showed an enhancing lesion filling the lateral portion of the left internal auditory canal. Our findings suggest that meningiomas should be considered in the differential diagnosis of entirely intracanalicular masses.

Meningiomas constitute 10% to 15% of cerebellopontine angle tumors (1). One rare form of this type of tumor is entirely intracanalicular, without extension into the porus acousticus. Five well-documented cases have previously been reported, two with associated MR findings.

Case Report

A 51-year-old woman had a 2-year history of hearing loss and tinnitus on the left. A physical examination was otherwise unremarkable, and an audiogram revealed slight to moderate sensorineural hearing loss above 250 Hz.

MR imaging was performed on a 1.5-T system with an 18-cm field of view and a 3D quadrature head coil. Axial and coronal T1-weighted (450/20/3 [TR/TE//excitations]) spin-echo images and fast spin-echo T2 weighted ($3000/105_{eff}/4$) images were acquired. After intravenous administration of 0.1 mmol/kg of gadopentetate dimeglumine, coronal and axial T1-weighted (600/20/3) images were obtained. All axial and coronal images were 3-mm thick with a 0.5-mm intersection gap. Noncontrast and contrast-enhanced T1-weighted images were obtained with a matrix of 256 × 192. T2-weighted images were acquired with a matrix of 256 × 224 (Fig 1A–D).

The MR examination revealed an entirely intracanalicular lesion that was isointense with gray matter on T1-weighted sequences and slightly hypointense to isointense relative to gray matter on T2-weighted sequences, displacing CSF from the lateral aspect of the left internal auditory canal (IAC). The lesion enhanced uniformly and intensely. The radiologic diagnosis was probable acoustic nerve sheath tumor.

A repeat audiogram was performed 2 months after the first one to evaluate increased symptoms of hearing loss and new onset of occasional dizziness precipitated by head turning. The second audiogram showed a significant decrease in discriminatory tones on the left since the prior study.

Surgery was performed with a translabyrinthine approach to locate the suspected acoustic nerve sheath tumor. When the IAC was opened, an entirely intracanalicular, tan-colored mass was found, with no attachment to the walls or floor of the canal. It peeled away easily, consistent with the characteristics of an acoustic nerve sheath tumor. During exposure of the lateral portion of the tumor, the superior portion of the vestibular nerve was cauterized and divided, leaving the cochlear and inferior vestibular portions of the eighth nerve and the seventh nerve intact. The tumor was transected with microscissors to separate it from the more medial aspect of the seventh and eighth nerves, which were inferiorly displaced within the IAC. The transected portion of the specimen was submitted for a frozen section; however, no unusual features were noted at the time of submission, and the frozen-section diagnosis of meningioma was unexpected. The tumor was bound to the seventh nerve, but a good plane of dissection between the tumor and the seventh nerve was established, and after this dissection and the release of several arachnoidal bands, inspection around the nerves revealed no residual tumor or extension to the porus acousticus. The patient had an uneventful postoperative course.

Neuropathologic review of permanent sections of the 5 × 10-mm mass stained with hematoxylin-eosin showed a nonglial tumor with neoplastic cells arranged in sheets and whorls. The cells possessed a modest quantity of eosinophilic cytoplasm with indistinct borders between the cells. The nuclei were vesicular, some with vacuoles. Additionally, the tumor stained with epithelial membrane antigen and vimentin and weakly with S100. The above findings are consistent with a meningioma, which was the final pathologic diagnosis (Fig 1E).

At the 3-month follow-up, the patient reported gradual improvement of her dizziness. Gait and balance were intact. She had no hearing in the left ear; however, other neurologic findings were normal.

Discussion

Meningiomas account for 17% of all brain tumors. In one study of 9000 brain tumors, 1492 were found to be meningiomas; peak occurrence is between 45 and 55 years of age, and the female-to-male ratio is 9:5 (2). Five to ten percent of intracranial masses are found in the cerebellopontine angle, with meningiomas constituting 10% to 15% of these tumors (1).

A meningioma that is entirely intracanalicular is a rare entity; only five well-established intracanalicular meningiomas have been reported in the English-language literature. In three of these cases, the tumor occupied or extended medial to the porus acousticus;

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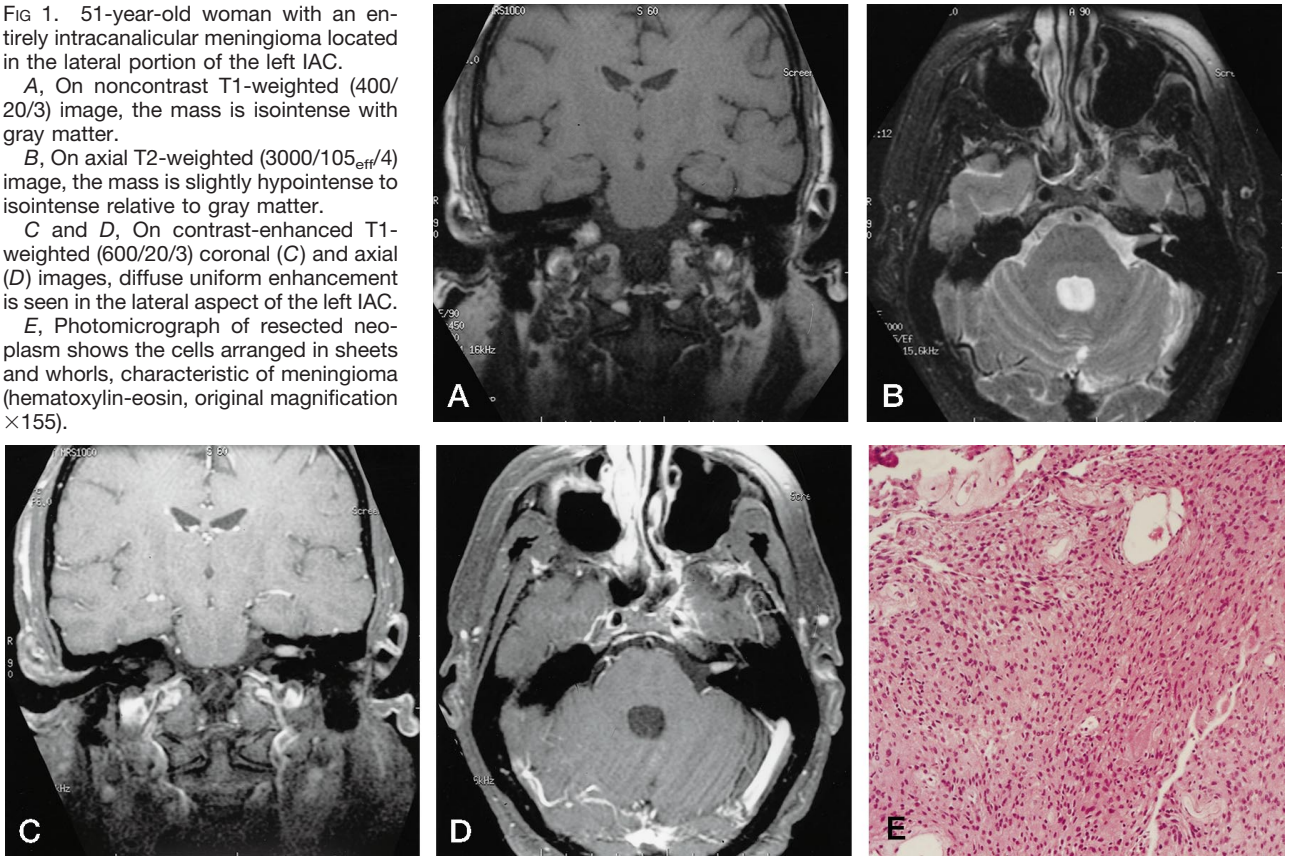

FIG 1. 51-year-old woman with an entirely intracanalicular meningioma located in the lateral portion of the left IAC.

A, On noncontrast T1-weighted (400/20/3) image, the mass is isointense with gray matter.

B, On axial T2-weighted (3000/105$_{eff}$/4) image, the mass is slightly hypointense to isointense relative to gray matter.

C and *D*, On contrast-enhanced T1-weighted (600/20/3) coronal (*C*) and axial (*D*) images, diffuse uniform enhancement is seen in the lateral aspect of the left IAC.

E, Photomicrograph of resected neoplasm shows the cells arranged in sheets and whorls, characteristic of meningioma (hematoxylin-eosin, original magnification ×155).

therefore, they cannot be considered entirely intracanalicular (3, 4).

Virchow first described this rare tumor in 1863 (5). A second case, reported in 1975, described a 14-year-old boy in whom radiographs of the petrous bone failed to reveal any abnormalities of the IAC (6). A bizarre case was reported of a trilobed meningioma that involved the ampulla of the posterior semicircular canal and that, more than 7 months later, recurred in the IAC and cerebellopontine angle (7). In this case, contrast-enhanced CT scans failed to show the tumor, but it was detected on a myelogram of the posterior fossa. Two published reports have described noncontrast MR findings of this entity (4, 8).

No studies have explored the imaging differences between acoustic nerve sheath tumors and meningiomas in the IAC. What is known about the imaging findings of these two tumors is based on research of tumors that extend outside the IAC. Studies have shown that on T2-weighted images acoustic nerve sheath tumors are generally isointense with the pons, whereas meningiomas are generally hyperintense relative to the pons (9, 10). Both enhance intensely, but the tumors may be differentiated by time-intensity curves and relaxation-rate increments (11–13). How well the existing data apply to the subset of tumors that are entirely within the IAC is unknown.

Another point of interest is the origin of meningiomas of the IAC. Meningiomas arise from cells lining the arachnoid villi, with the majority residing around veins and dural sinuses. In addition, they are present near neural foramina and have been histologically proved in the IAC (3). In view of this fact, one might expect meningiomas to arise more frequently in the IAC than has been reported.

A potential advantage of the correct preoperative diagnosis is that it would prompt a wider excision of the dura surrounding the tumor. Data from a review of a population of patients with cranial and spinal meningiomas in a variety of locations indicate that meningiomas tend to recur even after a grossly complete excision. Recurrence rates are 6%, 15%, and 20% after 5, 10, and 15 years, respectively (14). Again, it is unknown whether the subset of entirely intracanalicular meningiomas behaves in this manner. Fortunately, in our patient, a frozen section revealed the meningioma before the completion of surgery. In two previous cases of intracanalicular meningioma, a second operation was performed, one because of tumor recurrence and the other because of an unexpected postoperative diagnosis of meningioma and a desire for total resection (7, 6).

Conclusion

Even in retrospect, we do not believe there were any unique imaging features that would have allowed us to preoperatively identify this tumor as a meningioma rather than an acoustic neuroma. The case is reported to emphasize our opinion that the differential diagnosis of entirely intracanalicular IAC tumors with the imaging features described here must be

expanded to include meningiomas, even though they are quite rare.

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