Melanocytoma of the Cavernous Sinus: CT and MR Findings

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Summary: We present the CT, MR angiographic, and histologic findings of a rare primary meningeal melanocytoma of the cavernous sinus. The primary differential diagnosis is between a melanin-containing tumor and an extraaxial cavernous angioma. Radiologic imaging cannot distinguish between the less aggressive primary meningeal melanocytoma and the more aggressive meningeal melanoma.

Index terms: Cavernous sinus; Brain neoplasms

Primary melanocytomas originate from the leptomeninges (1–4); neuroimaging findings have been described in a few reports (2–4). Computed tomographic (CT) findings in the present case showed a nonenhancing, homogeneous, hyperdense mass. T1-weighted magnetic resonance (MR) images showed slightly increased signal in relation to gray matter, and T2-weighted sequences showed homogeneous, very low signal. The lesion did not enhance with the addition of contrast material. Digital subtraction angiography showed no tumor vascularity. Melanocytomas are relatively benign and cannot be distinguished radiographically from the more aggressive meningeal melanoma.

Case Report

A 30-year-old woman who was 29 weeks pregnant presented with a severe frontal headache. No focal neurologic deficit was noted.

An unenhanced CT scan of the brain showed a homogeneous, hyperdense mass adjacent to the left cavernous sinus and lesser wing of the left sphenoid bone (Fig 1A). The mass was spherical with a diameter of 3 cm. No calcifications were present within the lesion. There was no hyperostosis of the adjacent bony structures. A contrast-enhanced CT scan did not show any change in the Hounsfield numbers within the lesion as compared with the unenhanced CT scan. T1-weighted MR images showed the mass to be homogeneous and of slightly increased signal in relation to adjacent white matter (Fig 1B and C). Within it were tiny areas of decreased signal (slightly speckled in appearance). Contrast-enhanced T1-weighted images did not show enhancement. T2-weighted images showed homogeneous low signal similar to adjacent cortical bone (Fig 1D). MR angiography showed a normal-appearing cavernous portion of the distal left internal carotid artery and no flow-related enhancement within the mass. Digital subtraction angiography showed no aneurysm or tumor vascularity. A follow-up MR study of the brain performed 1 month after surgical resection of the lesion did not show any residual mass.

At surgery, an extraaxial, black, well-defined, 3-cm encapsulated mass lay adjacent to the left cavernous sinus. Histologically, the tumor comprised nests of cells containing melanin (Fig 1E). The cells showed moderate nuclear pleomorphism without mitotic figures or necrosis (Fig 1F). The diagnosis was melanocytoma.

Discussion

Primary meningeal melanocytomas include a spectrum of meningeal tumors that originate from melanocytes, the benign end of which is represented by primary meningeal melanocytomas (1, 3). The malignant end is represented by primary or secondary meningeal melanoma (1–3).

Primary meningeal melanocytoma has a benign histologic appearance that includes lack of mitotic activity and necrosis. The melanocytic origin of this tumor is supported by the presence of dendritic cells, as well as typical melanosomes. These tumors do not metastasize, although local recurrence may occur as a result of incomplete surgical resection. The more aggressive meningeal melanoma has histologic findings similar to the meningeal melanocytoma with the addition of increased mitotic figures and necrosis. These tumors have a propensity to metastasize. There are two other closely

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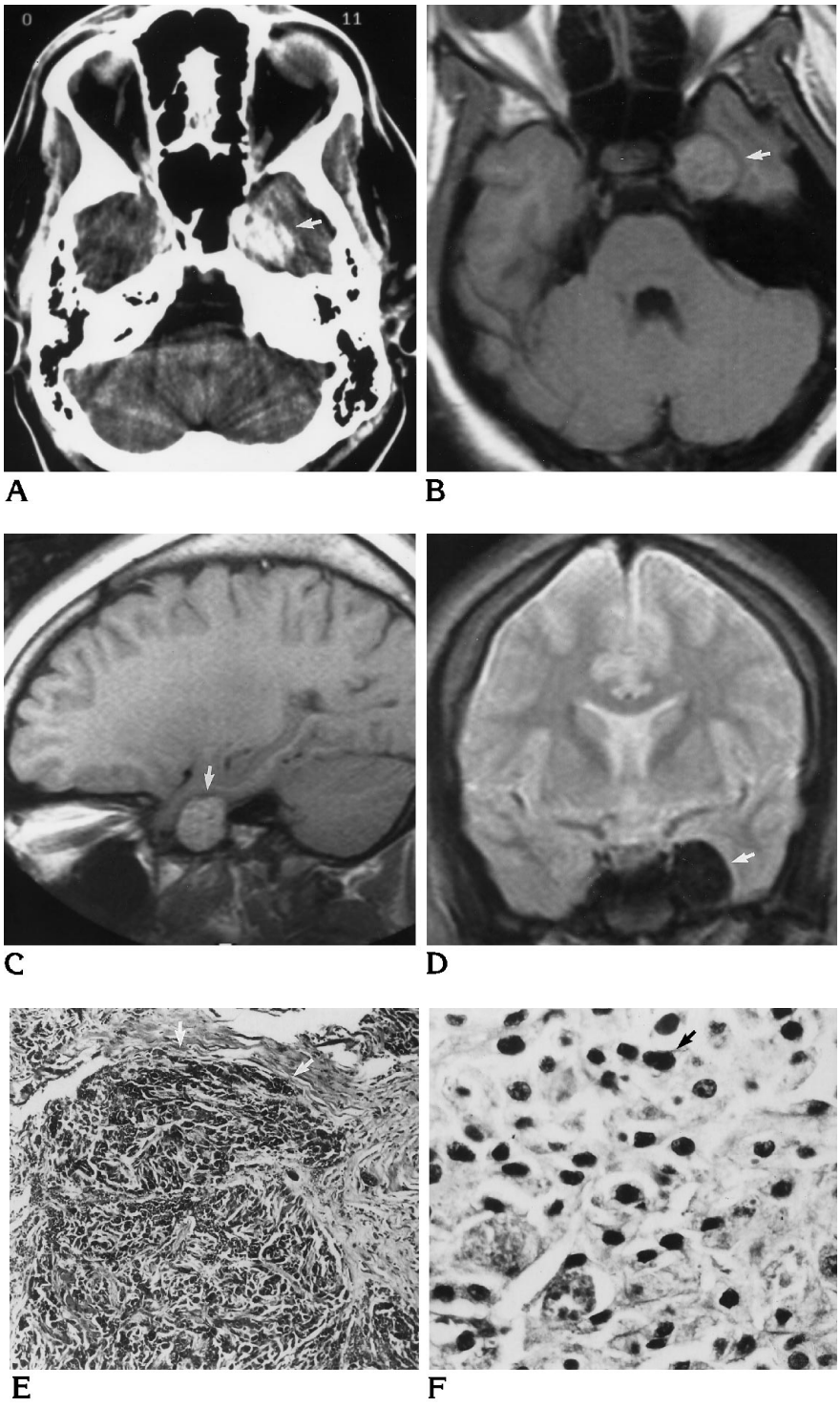

Fig 1. Thirty-year-old pregnant woman with severe frontal headache.

A, Unenhanced axial CT scan shows a hyperdense mass (*arrow*) in the medial portion of the left middle cranial fossa adjacent to the cavernous sinus.

B, Axial T1-weighted (750/20/4 [repetition time/echo time/excitations]) MR image shows an extracranial mass (*arrow*) that has slight increased signal with punctate areas of low signal.

C, Sagittal T1-weighted (483/20/2) MR image shows a speckled pattern and a well-defined margin (*arrow*).

D, Coronal T2-weighted (2050/100/2) MR image shows markedly decreased signal (*arrow*) within the lesion, consistent with a paramagnetic effect.

E, Low-power photomicrograph shows large nests (*arrow*) of cells containing melanin (hematoxylin-eosin stain).

F, After bleaching with H_2O_2, the neoplastic cells show moderate nuclear pleomorphism (*arrow*) with no mitotic figures or necrosis on high-power photomicrograph.

related tumors that can be histologically distinguished from meningeal melanocytomas; they are melanotic meningioma and melanotic schwannoma. There is some opinion that many previously reported melanotic meningiomas that had a good postoperative course may have indeed been melanocytomas (1).

Our case of melanocytoma originated from the cavernous sinus. In a previously reported melanocytoma (2) of Meckel's cave in a 43-year-old woman, a postcontrast CT scan showed a high-density mass in the anteromedial portion of the middle cranial fossa. Angiography confirmed the presence of a mass. The

authors did not comment on the presence or absence of tumor vascularity. Two years after surgery and radiation treatment (55 Gy), the tumor recurred. After repeat surgery and an additional 20 Gy of radiation therapy, the patient was stable at the 2-year follow-up. Of note is that this patient had an associated ipsilateral nevus of Ota. This entity has been previously reported in some cases of melanocytoma and represents an oculodermal melanocytosis involving the distribution of the V1 and V2 divisions of the trigeminal nerve (1, 2). Another report (4) described a melanoma of the lateral wall of the cavernous sinus in a 61-year-old woman. This tumor was hyperdense without enhancement on CT scans and was hyperintense on T1-weighted MR images and hyperintense with multifocal areas of low signal intensity on T2-weighted MR images. The lesion did not enhance with administration of contrast material. This tumor recurred after surgery (interval not given). Radiation therapy was administered (dose not given) after repeat surgery.

Primary tumors of the cavernous sinus have been divided into intracavernous and interdural types, depending on their site of origin in relation to the lateral wall of the cavernous sinus (4). The lateral wall is composed of an inner membranous layer and an outer dura propria. The interdural space is a potential space between these two layers. Lesions originating from this space include neurinomas of the cranial nerves (VI and, less likely, III and IV), epidermoid tumors, and melanomas. Cavernous angiomas also may arise from this space(s). Interdural lesions displace the cavernous carotid artery medially and do not typically encase this vessel. Lesions arising within the cavernous sinus (intracavernous) include meningiomas and hemangiopericytomas. These lesions encase the carotid artery and displace the cranial nerves laterally.

In our case, an unenhanced CT scan showed a hyperdense lesion in the region of the cavernous sinus. The initial differential diagnosis was cavernous carotid aneurysm, meningioma, or hypercellular neoplasm. Findings at MR imaging, MR angiography, and cerebral arteriography excluded an aneurysm. The lesion was hyperintense with fine punctate areas of decreased signal on T1-weighted MR images and was low in signal on T2-weighted MR images. There was no enhancement with administration of contrast material. These findings excluded a meningioma. Furthermore, there was medial displacement of the cavernous carotid artery, suggesting an interdural lesion. The MR findings narrowed the differential diagnosis to melanomatous neoplasm, cavernous angioma, or epidermoid tumor. The MR characteristics of melanomatous lesions have been described (2, 6). The increased signal on T1-weighted images and the decreased signal on T2-weighted images are caused by the paramagnetic effects of stable free radicals in melanin, which result in shortening of both T1 and T2 relaxation times. The CT finding of a hyperdense mass is also consistent with a melanomatous tumor (4).

Cavernous angiomas are uncommon lesions that most frequently occur intraaxially. An extraaxial location for these lesions is rare; a small number of cases have been reported (7–15). The majority of extraaxial cavernous angiomas are located in the middle cranial fossa. Other extraaxial locations include the optic chiasm, the perimesencephalic cistern, the internal auditory canal, the cerebellar pontine angle, and the sella and parasella area. Most of these lesions were hyperdense on unenhanced CT scans. All lesions showed contrast enhancement. MR findings have been described in four cases (11, 12). Three cavernous angiomas had signal that was isointense with gray matter on T1-weighted images, homogeneous enhancement after administration of contrast material, and markedly increased signal with lack of a peripheral hypointense ring on T2-weighted images. The fourth lesion had signal characteristics that were typical of intraaxial cavernous angiomas (10, 16, 17); namely mixed increased and decreased signal with a hypointense rim on both T1-weighted and T2-weighted images. The peripheral hypointensity was more prominent on the T2-weighted images because of the paramagnetic effects of hemosiderin. One should not draw definitive conclusions from a small series; however, the lesion we described did not enhance, and the MR findings differed from three of the four cases of extraaxial angiomas in which the MR findings were described. Therefore, it was less likely that our case represented an extraaxial angioma.

The last lesion to consider in the differential diagnosis is an epidermoid tumor. These lesions have variable signals on MR images but may have the appearance of a hyperintense mass on T1-weighted sequences (4, 18). The typical CT appearance of an epidermoid tumor is a nonen-

hancing mass that is relatively isodense or slightly hyperdense relative to cerebrospinal fluid (19). In our case, the lesion was markedly hyperdense on CT scans, which makes the diagnosis of an epidermoid tumor much less likely.

References

1. Russel DS, Rubinstein LJ. Melanocytomas. In: Russel DS, Rubinstein LJ, eds. *Pathology of Tumours of the Nervous System*. Baltimore, Md: Williams & Wilkins; 1989: 794–797
2. Botticelli AR, Villani M, Angiari P, Peserico L. Meningeal melanocytoma of Meckel's cave associated with ipsilateral Ota's nevus: case report. *Cancer* 1983;51:2304–2310
3. Abbott M. Killeffer FA, Crandall PH. Melanotic meningioma: case report. *J Neurosurg* 1968;29:283–286
4. El-Kalliny M, Van Loveren H, Keller JT, Tew JM. Tumors of the lateral wall of the cavernous sinus. *J Neurosurg* 1992;77:508–514
5. Matias-Guiu X, Alejo M, Sole T, et al. Cavernous angiomas of the cranial nerves: report of two cases. *J Neurosurg* 1990;73:620–622
6. Chappell PM, Kelly WM, Ericus M. Primary sellar melanoma simulating hemorrhagic pituitary adenoma: MR and pathologic findings. *AJNR Am J Neuroradiol* 1990;11:1054–1056
7. Simard JM, Garcia-Bengocea F, Ballinger WR Jr, et al. Cavernous angiomas: a review of 126 collected and 12 new clinical cases. *Neurosurgery* 1986;18:162–172
8. Sundaresan N, Eller T, Ciric I. Hemangiomas in the internal auditory canal. *Surg Neurol* 1976;6:1259–1261
9. Kaard HP, Khangure MS, Waring P. Extraaxial parasellar cavernous hemangioma. *AJNR Am J Neuroradiol* 1990;11:1259–1261
10. Momoshima S, Shiga H, Yuasa Y, et al. MR findings in extracerebral cavernous angiomas of the middle cranial fossa: report of two cases and review of the literature. *AJNR Am J Neuroradiol* 1991; 12:756–760
11. Nambia S. Extracerebral cavernous hemangioma of the middle cranial fossa. *Surg Neurol* 1983;19:379–388
12. Fehlings MG, Tucker WS. Cavernous hemangioma of Meckel's cave. *J Neurosurg* 1988;68:645–647
13. Pozzati E, Giuliani G, Ferracini R, Gaist G. Facial nerve palsy secondary to a dural cavernous angioma of the middle cranial fossa eroding the tegmen tympani. *Neurosurgery* 1988;23:245–247
14. Tien R, Dillon WP. MR imaging of cavernous hemangioma of the optic chiasm. *J Comput Assist Tomogr* 1989;13:1087–1100
15. Buonaguid R, Canapicci R, Mimassi N, Ferdeghini M. Intrasellar cavernous hemangioma. *Neurosurgery* 1984;14:732–734
16. Gomori JM, Grossman RI, Goldberg HI, et al. Occult cerebral vascular malformations: High-field MR imaging. *Radiology* 1986; 158:707–713
17. Rapacki TFX, Brantely MJ, Furlow TW, et al. Heterogeneity of cerebral cavernous hemangiomas diagnosed by MR imaging. *J Comput Assist Tomogr* 1990;14:18–25
18. Horowitz BL, Chari MH, James R, Bryan RN. MR of intracranial epidermoid tumor: correlation of in vivo imaging with in vitro spectroscopy. *AJNR Am J Neuroradiol* 1990;11:299–302
19. Latack JT, Kartush JM, Kemink JL, et al. Epidermoidomas of the cerebellopontine angle and temporal bone: CT and MRI aspects. *Radiology* 1985;157:361–366