



Discover Generics

Cost-Effective CT & MRI Contrast Agents



FRESENIUS
KABI

[VIEW CATALOG](#)

AJNR

CT and Angiography of Primary Extradural Juxtapellar Tumors

Tom Moore, S. Ramaiah Ganti, Michel E. Mawad and Sadek K. Hilal

AJNR Am J Neuroradiol 1985, 6 (4) 521-526

<http://www.ajnr.org/content/6/4/521>

This information is current as
of September 4, 2025.

CT and Angiography of Primary Extradural Juxtapellar Tumors

Tom Moore^{1,2}
S. Ramaiah Ganti^{1,3}
Michel E. Mawad^{1,4}
Sadek K. Hilal¹

The computed tomographic and angiographic features of 15 histologically proven primary extradural juxtapellar tumors were retrospectively reviewed. Five chordomas were characterized by prominent bone erosion and a significant posterior fossa component. Four trigeminal nerve neuromas each demonstrated bone erosion centered about Meckel's cave and moderate to marked contrast enhancement. Two cavernous sinus meningiomas revealed moderate contrast enhancement, expansion of the cavernous sinus, and moderate angiographic stain. Two cavernous hemangiomas of the cavernous sinus were intensely enhancing and demonstrated angiographic stain. Opacification of the sphenoid sinus with prominent bone destruction and lack of contrast enhancement was characteristic of a sphenoid sinus mucocoele. The dural reflection could be directly visualized or indirectly inferred in each case.

While much has been written concerning pituitary adenomas, there is a relative paucity of information in the literature concerning less common extradural juxtapellar tumors. We review our experience with some of the less common tumors of this area with special attention to radiologic differential diagnosis.

Materials and Methods

Fifteen histologically proven primary extradural juxtapellar tumors from the Neurological Institute were retrospectively reviewed. Pituitary adenomas were excluded from the study. Metastatic lesions and tumors that secondarily involved the juxtapellar region were also excluded. Six male and nine female patients comprised the study with ages ranging from 9 to 65 years.

High-resolution axial and direct coronal computed tomography (CT) was performed in each case. The coronal scans were obtained as 3-mm contiguous slices. Axial sections were 6-mm contiguous slices. Contrast material was administered in each case. Angiography was available in 13 cases.

Results

The characterization of a juxtapellar lesion as extradural in origin aids in the differential diagnosis and in surgical planning. Using high-resolution CT with contrast enhancement, we were able to demonstrate the dural reflection or infer its location in each of the 15 cases and, therefore, determine the extradural location of the lesion.

Chordoma

Each of the five chordomas demonstrated prominent erosion of the clivus. Three of the five lesions were confined to the midline. One lesion involved the petroclival junction, and a second lesion extended to the middle cranial fossa. Each of the five chordomas consisted of a significant posterior fossa component. Four of the five

This article appears in the July/August 1985 issue of *AJNR* and the September 1985 issue of *AJR*.

Received June 27, 1984; accepted after revision November 18, 1984.

¹ Department of Radiology, Neurological Institute of New York, Columbia-Presbyterian Medical Center, New York, NY 10032.

² Present address: Radiology Associates, 815 Pennsylvania Ave., Fort Worth, TX 76104. Address reprint requests to T. Moore.

³ Present address: Englewood Hospital, Englewood, NJ 07631.

⁴ Present address: Methodist Hospital, Houston, TX 77030.

AJNR 6:521-526, July/August 1985
0195-6108/85/0604-0521
© American Roentgen Ray Society

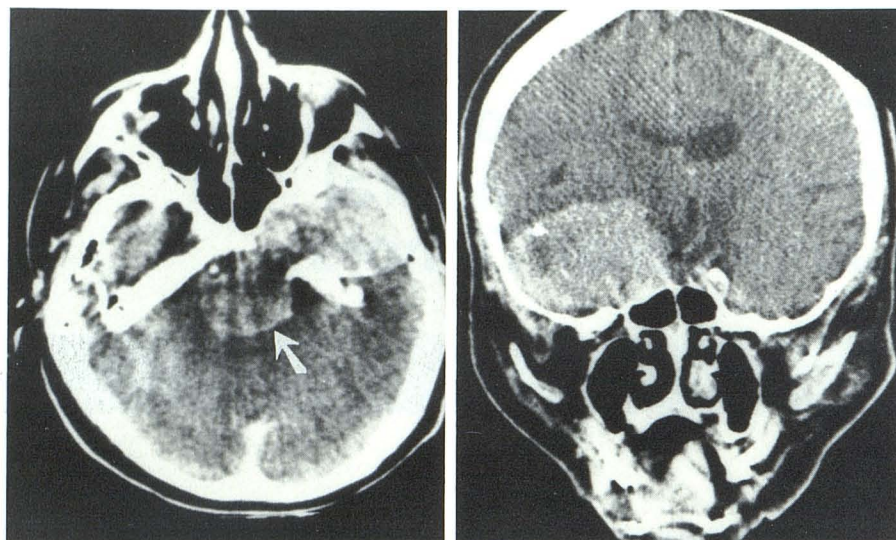
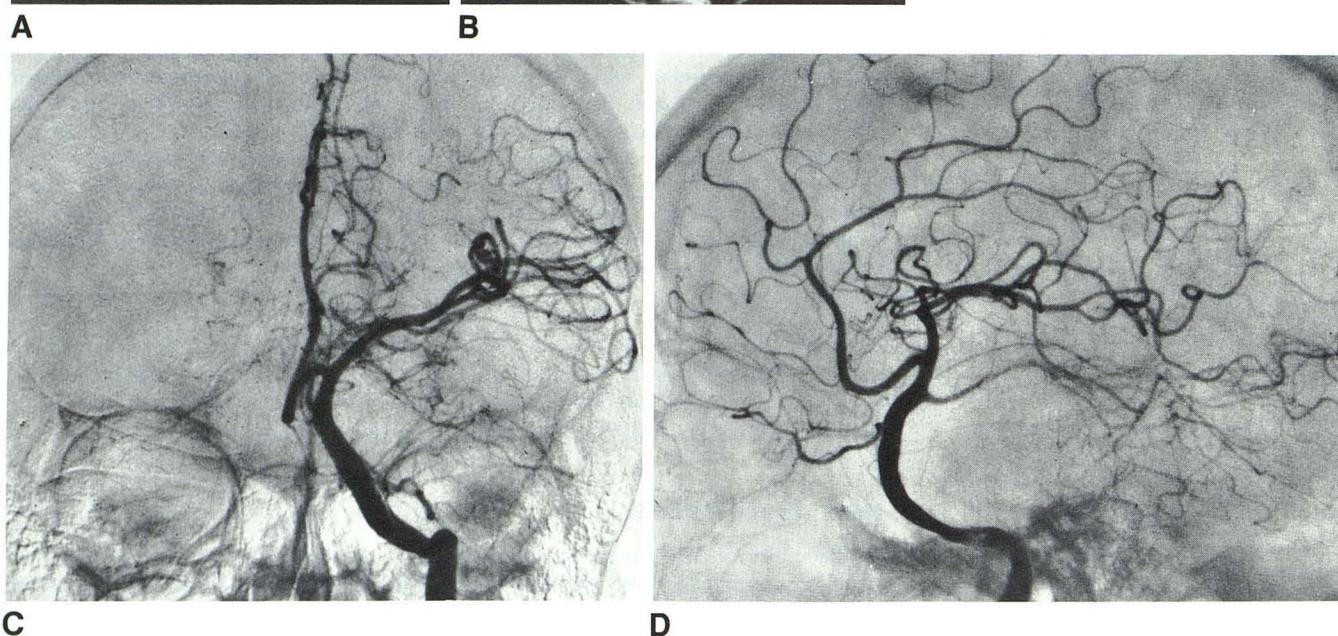


Fig. 1.—Chordoma. **A**, Postcontrast axial CT scan. Extensive tumor within posterior fossa and middle cranial fossa. Arrow denotes enhancing thin rim of dura. **B**, Postcontrast coronal view. Extraaxial tumor bulk within middle cranial fossa. **C**, Anteroposterior (AP) angiogram, midarterial phase. Elevation of horizontal part of middle cerebral artery. **D**, Corresponding lateral angiogram. Elevation of sylvian triangle. Stretching of internal carotid and posterior communicating arteries.



lesions were isodense with brain before contrast administration, and one lesion was hyperdense. Each lesion demonstrated mild contrast enhancement. The dural reflection was evident in each case. Tumor calcification was present in each case, and calcification within the dura mater was evident in four of five cases. An avascular mass effect was present in the four available angiographic studies. One case showed elevation of the horizontal part of the middle cerebral artery indicating middle cranial fossa extension (fig. 1).

Neuromas of the Trigeminal Nerve

Each of the four trigeminal neuromas was isodense with normal brain before contrast administration and demonstrated moderate to marked enhancement. In addition, the enhancement in three of the four tumors was inhomogeneous. No

lesions were calcified, but mild bone erosion was evident in each case characteristically involving Meckel's cave at the petrous apex. One of the tumors had a small posterior fossa component. The dural reflection was demonstrated in each case (figs. 2 and 3).

Cavernous Hemangiomas

Each of the two cavernous hemangiomas arose within the cavernous sinus. Each was isodense with normal brain before contrast administration and demonstrated intense contrast enhancement. Prominent bone erosion in the parasellar region was present in each case. Neither lesion was calcified. The dural reflection was demonstrated in both patients. Angiographic findings consisted of a mild stain in one case and a

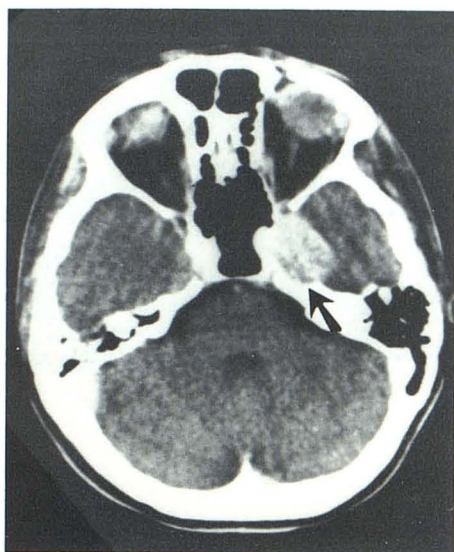
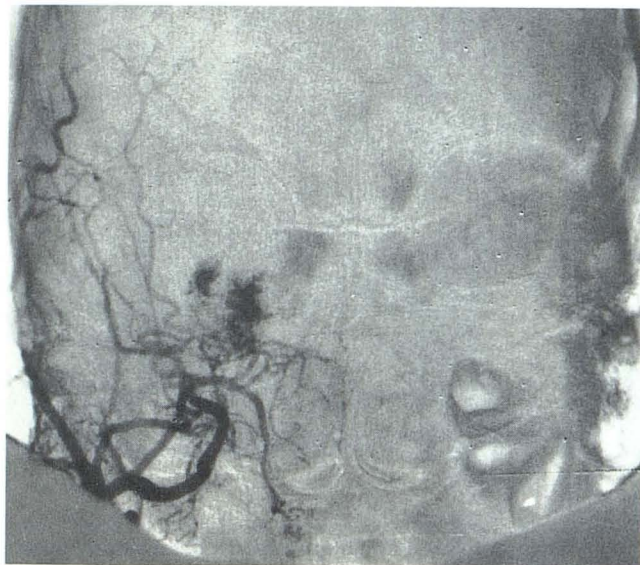
**A**

Fig. 2.—Trigeminal neuroma. **A**, Postcontrast axial CT scan. Enhancing tumor mass with involvement of Meckel's cave (arrow). **B**, AP angiogram, external carotid artery injection. Parasellar vascular stain arises from dural branches of middle meningeal artery. **C**, Lateral angiogram, internal carotid artery injection. Vascular stain arises from cavernous branches of internal carotid artery.

**B****C**

prominent stain with pooling of contrast material in the second case (fig. 4).

Meningiomas

The three meningiomas were located within the cavernous sinus. Each was isodense with normal brain before contrast administration and exhibited moderate contrast enhancement. One tumor demonstrated mild bone erosion of the lateral aspect of the sella turcica. The wall of the cavernous sinus was displaced laterally in each case. Hyperostosis of the adjacent sphenoid bone and clinoid process was evident in two of the meningiomas. Angiography demonstrated a mild to moderate stain in each case. The intracavernous carotid

artery was encased by one tumor, pushed laterally by a second, and deviated medially by a third tumor (fig. 5).

Mucocele

Our single case of sphenoid sinus mucocoele was hypodense relative to normal brain and demonstrated no significant enhancement. Prominent opacification of the sphenoid sinus was present. The bony margin of the posterior and lateral aspect of the sphenoid sinus was eroded and expanded. The overlying dura was displaced posteriorly and laterally. Angiography revealed an avascular mass effect, with both posterior and lateral displacement of the cavernous carotid arteries (fig. 6).



Fig. 3.—Trigeminal neuroma. **A**, Postcontrast axial CT scan. Inhomogeneously enhancing mass with parasellar and petroclival junction bone erosion. Arrow denotes enhancing dura. **B**, Postcontrast coronal view. Bone erosion of lateral aspect of sella turcica. Inferior bone erosion in region of Meckel's cave and foramen ovale.

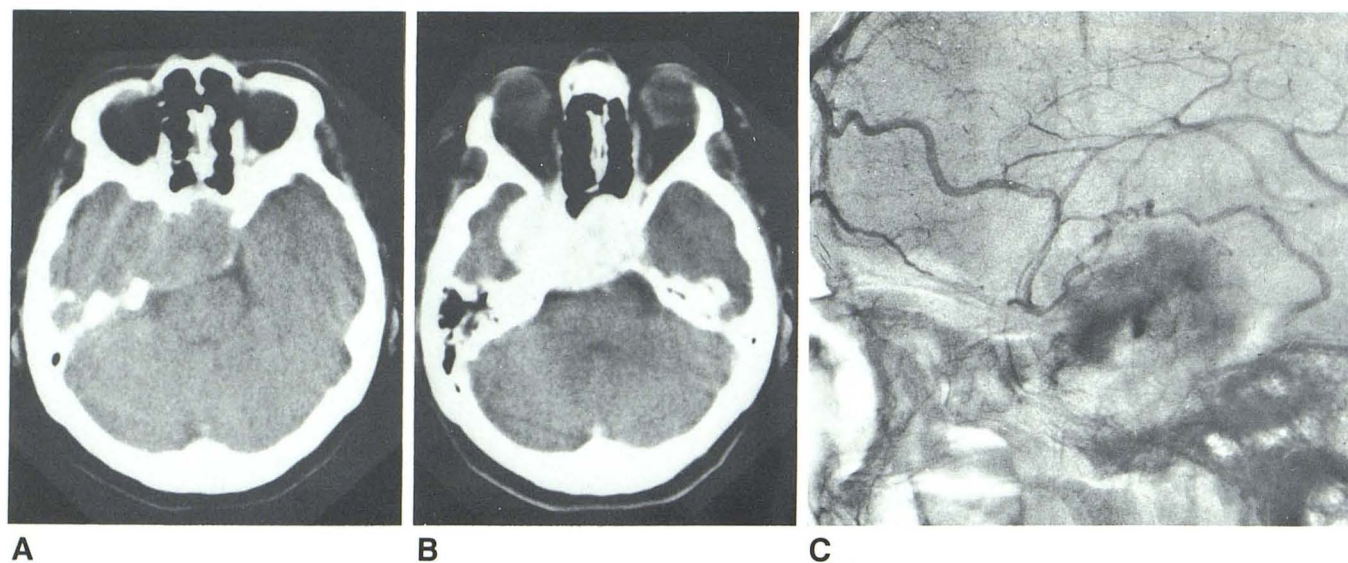


Fig. 4.—Cavernous hemangioma. **A**, Precontrast axial CT scan. Isodense sellar and parasellar mass with smooth margins. **B**, Postcontrast axial CT scan. Densely enhancing, smoothly margined sellar and parasellar mass. **C**, Lateral angiogram, venous phase, internal carotid artery injection. Dense stain with pooling of contrast material.

Discussion

Our series of extradural tumors had several features in common. First, with high-resolution axial and coronal CT aided by contrast enhancement, the dura could be demonstrated in almost all cases. Occasionally, calcification of the dura, as seen in four of the five chordomas, permitted its identification.

Second, with markedly enhancing tumors, such as cavernous hemangiomas and some trigeminal neuromas, the dura could not be directly visualized due to a lack of differential enhancement between the tumor and the dura. However, the position of the dura could be strongly inferred by the presence of a smoothly margined tumor mass. In addition, tumor was confined to the extradural space in each case, and no radiographic or surgical evidence of dural breakthrough or violation was encountered. No brain edema was present.

The tumors in our series could be differentiated by the presence or absence of tumor calcification, degree and character of contrast enhancement, degree and location of bone erosion, and to some extent, by angiographic criteria.

The most common tumor in our series was the chordoma (five of 15). Chordomas are rare, forming only 0.1%–0.2% of intracranial tumors [1]. These tumors arise from primitive notochordal remnants, and about 30% are intracranial [2]. While each chordoma in our series demonstrated prominent erosion of the clivus, lateral extension occurred with two lesions. These tumors are primarily midline, but previous authors have reported many cases that were predominantly or entirely unilateral [3, 4]. The chordomas could be distinguished from other tumors of our series primarily by the following characteristics: (1) prominent irregular bone destruction of the clivus, (2) significant posterior fossa tumor com-

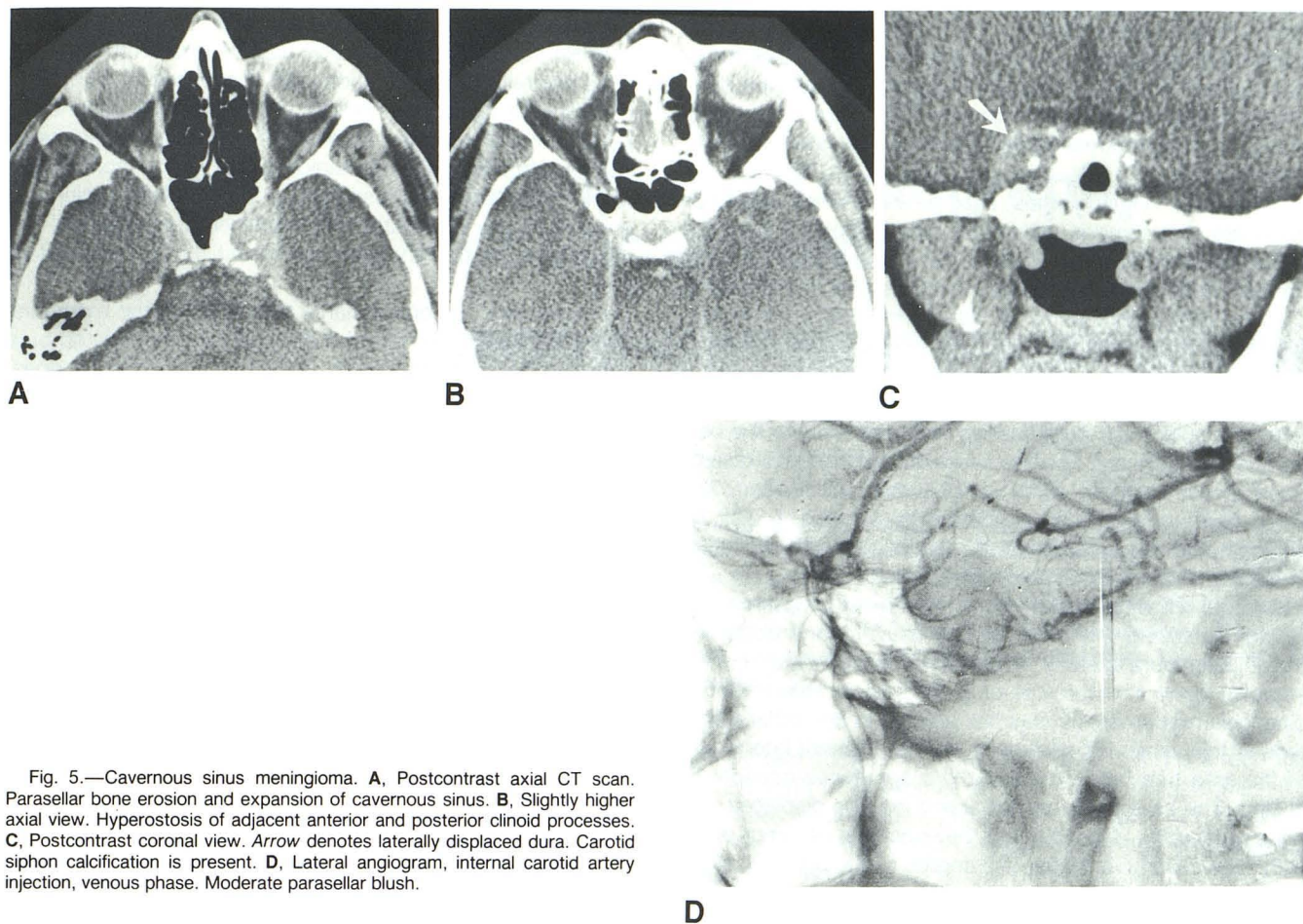


Fig. 5.—Cavernous sinus meningioma. **A**, Postcontrast axial CT scan. Parasellar bone erosion and expansion of cavernous sinus. **B**, Slightly higher axial view. Hyperostosis of adjacent anterior and posterior clinoid processes. **C**, Postcontrast coronal view. Arrow denotes laterally displaced dura. Carotid siphon calcification is present. **D**, Lateral angiogram, internal carotid artery injection, venous phase. Moderate parasellar blush.

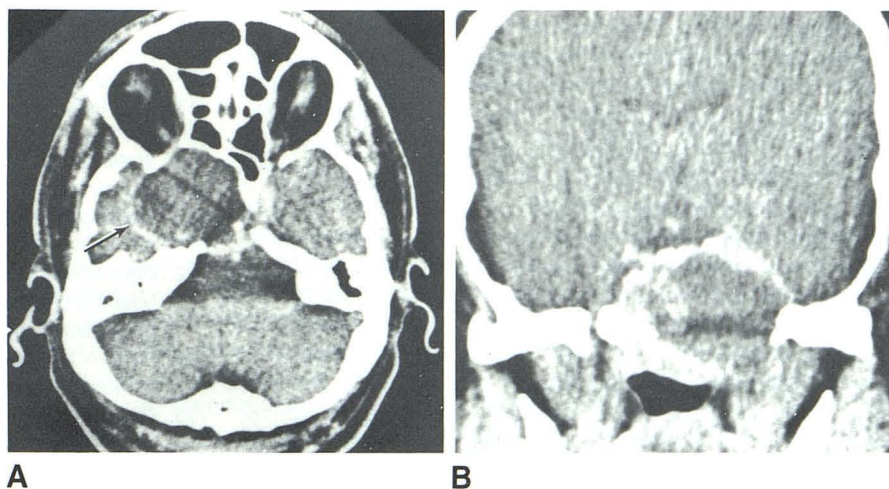


Fig. 6.—Sphenoid mucocoele. **A**, Postcontrast axial CT scan. Hypodense mass with lateral and posterior displacement of enhancing dura and, probably, adjacent sinus mucosa (arrow). **B**, Postcontrast coronal view. Hypodense mass with elevation of enhancing dura and, probably, adjacent sinus mucosa. Erosion of skull base.

ponent, and (3) tumor calcification. Although chordomas are generally avascular, there are reports of angiographic tumor stain [5–7].

Our series included four neuromas of the trigeminal nerve. These tumors were seen to arise within Meckel's cave at the anterior aspect of the petrous bone just lateral to the petroclival junction. Lateral displacement of the dura was seen in

each case and was best demonstrated on coronal CT views after injection of contrast material. These tumors generally enhanced more than the remaining lesions of the series, with the exception of cavernous hemangiomas. While bone erosion centering on Meckel's cave was present in each case, this erosion was not as irregular or as destructive in appearance as that demonstrated by the chordomas. In addition, the

tumor bulk in three of the four trigeminal neuromas was confined to the anterior part of the petrous apex. One tumor had a small posterior fossa component. Angiography demonstrated mild to moderate vascular supply from meningeal branches of the internal carotid artery and/or external carotid system [8, 9].

Cavernous hemangiomas arising within the cavernous sinus are rare tumors, with most reports coming from the Japanese literature [10]. These tumors are a difficult surgical problem because of their location and degree of vascularity. Our two cases were isodense with normal brain before contrast administration and were characterized by their extreme and homogeneous enhancement. No other tumors in our series displaced this degree of enhancement. These tumors tend to displace the dura laterally and may encase the cavernous carotid artery. Our two cases demonstrated parasellar bone erosion without evidence of tumor calcification, and these findings have been supported by others [11, 12]. An angiographic stain was exhibited in each case, with one tumor exhibiting pooling of contrast material.

Coronal CT was instrumental in demonstrating three meningiomas arising within the cavernous sinus and displacing the adjacent dura laterally. When present, hyperostosis of the adjacent bony structures is of great help in establishing a diagnosis. Hyperostosis was not present in any other tumor type in this series. Bone erosion of the adjacent lateral wall of the sella turcica is helpful but is a somewhat nonspecific finding. The cavernous carotid artery may be displaced medially or laterally, depending on the exact site of tumor origin within the cavernous sinus. The degree of angiographic blush was similar to that present in the three cases of trigeminal neuroma but generally less than that found in the two cases of cavernous hemangioma. The tumor supply may arise either from cavernous branches of the internal carotid artery or from meningeal branches of the external carotid circulation.

Prominent opacification of the sphenoid sinus with significant expansion and bone erosion of the sinus wall is typical of a sphenoid sinus mucocoele. These tumors may extend anteriorly to involve the ethmoid sinuses or nasopharynx. Less commonly, these tumors extend superiorly or posteriorly to involve the sellar and suprasellar region or the clival and prepontine region. While our single case of mucocoele was hypodense relative to normal brain, previous authors have described both iso- and hyperdense sphenoid sinus mucocoeles [13, 14]. The tumor margin was well demonstrated in our case due to a lack of tumor enhancement coupled with prominent enhancement of probably both the dura and the adjacent sinus mucosa. If substantial intracranial extension of the mucocoele is present, an avascular mass effect on the cavernous carotid arteries, basilar artery, or A1 segment of

the anterior cerebral artery may be seen.

While the previous discussion has focused on tumors that arise primarily within the juxtaseellar space, one must keep in mind that a significant number of tumors may secondarily occupy this area. Direct extension of nasopharyngeal carcinomas into the juxtaseellar region is not uncommon. Blood-borne metastases may also occupy the parasellar region and are also usually associated with prominent bone erosion. The most common primary sites are breast, lung, and prostate [15].

In summary, tumors primarily arising within the extradural juxtaseellar region are unusual but can be differentiated by a combination of enhancement characteristics, bone changes, and angiographic findings. In addition, the dura can be directly visualized or its position inferred in the vast majority of cases.

REFERENCES

1. Movren R, Poinso Y, Sebahoun G, et al. Les chordomes de la base du crane. *Sem Hop Paris* 1970;46:501-510
2. Utne JR, Pugh DP. The roentgenologic aspect of chordoma. *AJR* 1955;101:34-36
3. Schechter MM, Liebeskind AL, Azar-Kia B. Intracranial chordomas. *Neuroradiology* 1974;7:67-82
4. Kendall BE, Lee BCP. Cranial chordomas. *Br J Radiol* 1977;50:687-698
5. Dilege D, David M. L'angiographie vertebrale. *Neurochirurgie* 1967;13:121-156
6. Falconer MA, Bailey IC, Duchon LW. Surgical treatment of chordoma of the skull base. *Neurosurgery* 1968;29:261-275
7. Wallace S, Goldberg HI, Leeds NE, Mishkin MM. Cavernous branches of the internal carotid artery. *AJR* 1967;101:34-36
8. Goldberg R, Byrd S, Winter J, Takahashi M, Joyce P. Varied appearance of trigeminal neuroma on CT. *AJR* 1980;134:57-60
9. Weisberg LA, Nice C, Katz M. *Cerebral computed tomography*. Philadelphia: Saunders, 1984:224-225
10. Namba S. Extracerebral cavernous hemangioma of the middle cranial fossa. *Surg Neurol* 1965;13:413-420
11. Kamrin RB, Buchsbaum HW. Large vascular malformations of the brain not visualized by serial angiography. *Arch Neurol* 1965;13:413-420
12. Kawai K, Fukui M, Tanaka K, et al. Extracranial cavernous hemangioma of the middle cranial fossa. *Surg Neurol* 1978;9:19-25
13. Gore R, Weinberg P, Kim K, et al. Sphenoid sinus mucocoeles presenting as intracranial masses on computed tomography. *Surg Neurol* 1980;13:375-79
14. Osborn A, Johnson L, Roberts T. Sphenoid mucocoeles with intracranial extension. *J Comput Assist Tomogr* 1979;3:335-338
15. Greenberg HS, Deck MDF, Vikram B, et al. Metastasis to the base of the skull: clinical findings in 43 patients. *Neurology* 1981;31:530-537