

CAVERNOUS ANGIOMA OF THE CAVERNOUS SINUS

Imaging findings

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ABSTRACT - Cavernous angiomas (cavernomas) of the cavernous sinus are uncommon, with only scattered reports in literature. Unlike their parenchymatous counterparts, they are intensely enhancing para-sellar masses, iso/hypointense in T1- and hyperintense in T2-weighted images. Differential diagnosis with parasellar meningiomas and schwannomas can be difficult. We report three cases of this condition, describing findings of diffusion-weighted imaging in this kind of lesion for the first time in literature.

KEY WORDS: cavernous angioma, cavernous sinus, magnetic resonance imaging, computed tomography, angiography.

Angioma cavernoso do seio cavernoso: achados aos exames de imagem

RESUMO - Angiomas cavernosos (cavernomas) do seio cavernoso são lesões incomuns, com poucos relatos na literatura especializada. Ao contrário dos cavernomas parenquimatosos, são massas para-selares intensamente captantes, isointensas a hipointensas em T1 e hiperintensas em T2 nas imagens de ressonância magnética. O diagnóstico diferencial com meningiomas e schwannomas para-selares pode ser difícil. Relatamos os achados de imagem de três casos desta entidade, descrevendo os achados da ressonância magnética ponderada em difusão neste tipo de lesão pela primeira vez na literatura.

PALAVRAS-CHAVE: angioma cavernoso, seio cavernoso, ressonância magnética, tomografia computadorizada, arteriografia.

Cavernous angioma of the cavernous sinus is an extremely rare condition, and its differential diagnosis with tumors, namely para-sellar meningiomas and schwannomas, is often difficult. They are richly vascularized lesions, made up of a network of dilated, thin-walled vessels, and are responsible for less than one percent of all intracranial masses. The advent of magnetic resonance imaging (MRI) raised new diagnostic perspectives for this condition as we report in the study.

METHOD

This study was approved by the committee of Ethics of Clinica Radiologia Vila Rica, Brasilia DF, Brazil.

Three female patients, with 42-years-old (patient 1), 45-years-old (patient 2) and 37-years-old (patient 3), are, respectively, presented with complaints of right-sided cranial nerves deficits (III nerve [patients 2 and 3], V1 nerve [patient 2] and VI nerve [patients 1 and 2]) and hea-

daches. All of them underwent magnetic resonance imaging and cerebral digital subtraction angiography (DSA). Patients 2 and 3 were also submitted to computed tomography (CT). In all patients, MRI revealed well-delimited right para-sellar lesions, uniformly isointense in T1-weighted images and hyperintense in T2-, T2- and FLAIR-weighted images, brightly enhancing after intra-vascular infusion of gadolinium. Diffusion-weighted sequence, performed in patient 3, revealed an isointense mass.

RESULTS

In all cases, internal carotid artery (ICA) was encircled by the lesions, without any significant stenosis (Figs 1, 2 and 3). CT images showed fairly well-circumscribed para-sellar masses, slightly to moderately hyperdense in non-enhanced scans, intensely and almost uniformly enhancing after infusion of intravascular iodinated contrast media (Figs 4 and 5). On magnetic resonance angiogra-

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Received 19 March 2004, received in final form 9 June 2004. Accepted 29 July 2004.

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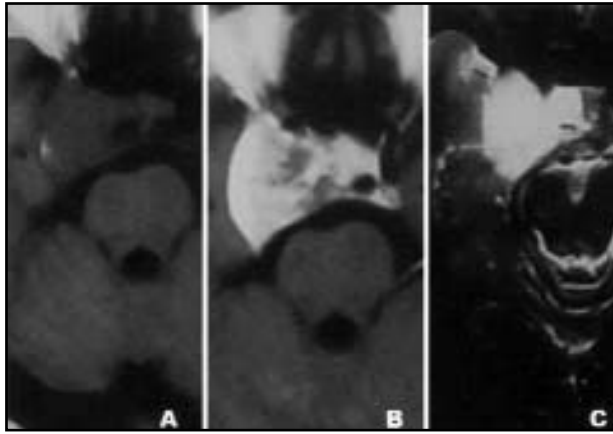


Fig 1. Patient 1. Well-circumscribed right para-sellar and supra-sellar mass, slightly hypointense in T1-weighted sequence (1A), showing intense enhancement after gadolinium infusion (1B) and high signal intensity in T2-weighted image (1C). A small hemorrhagic focus is seen peripherally located, due to previous biopsy. Lesion encircles right internal carotid artery.

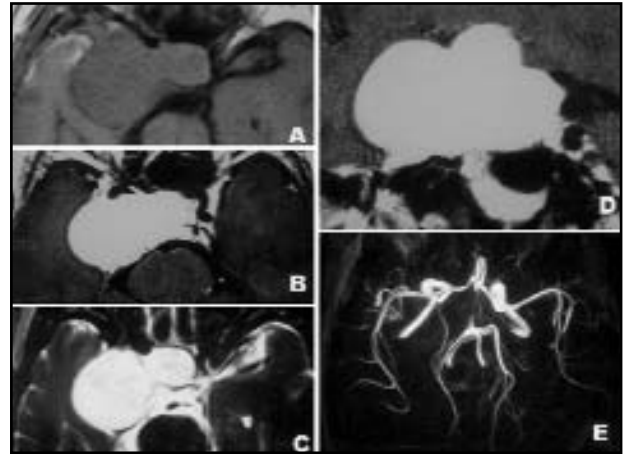


Fig 2. Patient 2. Right para-sellar and supra-sellar lesion iso/hypointense in T1-weighted image (1A), brightly enhancing after gadolinium infusion (1B and 1D) and hyperintense in T2-weighted image (1C). MRA (1E) shows displaced right-sided vessels of the circle of Willis, which have preserved flow. Right internal carotid artery is seen within lesion.

phy (MRA) of cerebral vessels with 3D-TOF technique, performed in patients 2 and 3, the right-sided components of the circle of Willis were laterally displaced by the cavernous angiomas, without any impairment of blood flow (Fig 2). DSA was normal in patient 1; patients 2 and 3 had a supra-sellar and para-sellar blush in late venous phase, once again without impairment of internal carotid flow (Figs 6 and 7). Aneurysm was excluded in all patients. Operative findings were of well-demarcated, hyperemic, reddish to brownish extra-dural para-sellar masses in all cases. These lesions were collapsible, readily refilling after release of compression. Puncture yielded freely flowing blood. Planes of cleavage with surrounding neurovascular structures were not regarded as safe, and none was resected, given the anticipated surgical bleeding.

DISCUSSION

Cavernous angiomas are also known as cavernomas and cavernous hemangiomas. They are common lesions of the cerebral hemispheres, although they can occur anywhere in the central nervous system. Extra-axial cavernous angiomas are uncommon, and the cavernous sinus is one location in this group. It is most common in women in their fifth decade of life and in Japanese people, being rarely multiple and hereditary (specially in Hispanic-American subjects)¹⁻⁸. It is, in fact, a vascular malformation, which can behave like a real tumor when it grows up to the point to compress neighbor structures. Exacerbation of symptoms in pregnant women

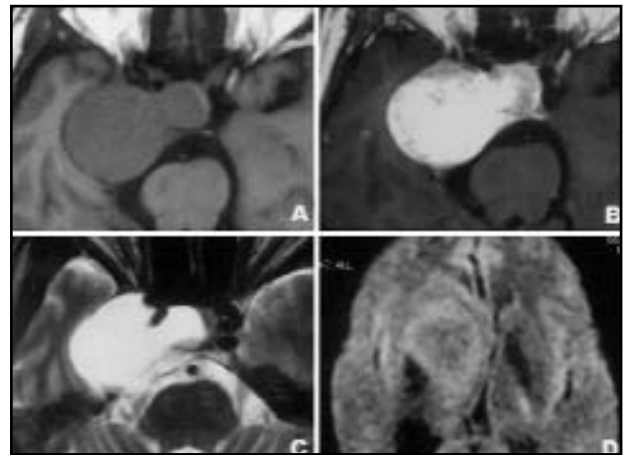
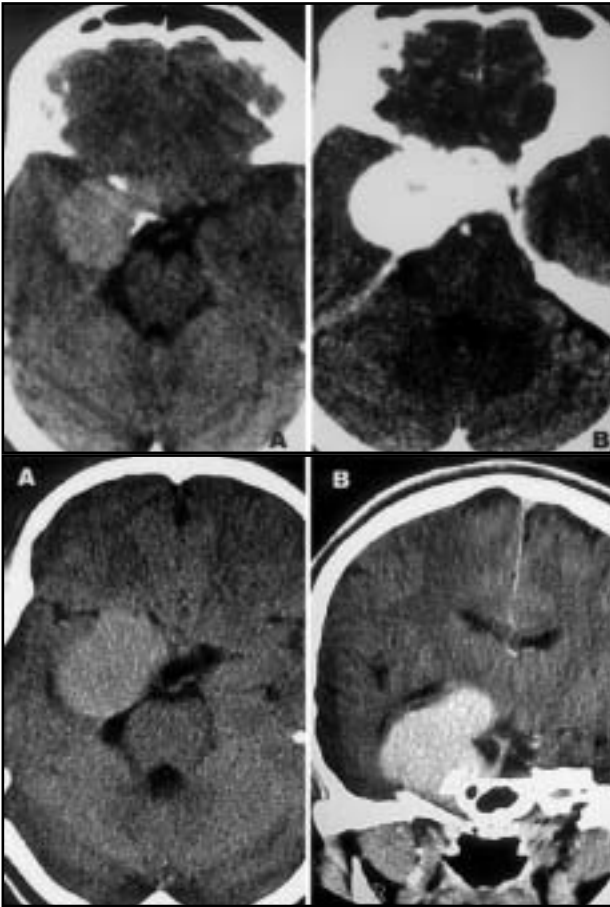


Fig 3. Patient 3. Right para-sellar and supra-sellar mass showing low to intermediate signal intensity in T1-weighted image (1A), brightly enhancing (1B), with high signal intensity in T2-weighted image (1C) and isointense in diffusion-weighted sequence (1D). Note the right internal carotid artery encircled by the mass.

have been reported, improving after delivery^{2,3,9}. Presentation complaints most often consist of visual disturbances (retro-orbital pain and headache accompanied of reduced ocular motricity, ptosis, diplopia, exophthalmos and impaired visual acuity), mainly due to compressive effect or enclosure of neurovascular structures, namely the cranial nerves passing through the cavernous sinus^{1-4,6,10}. Seizures, facial numbness and neuralgia may also occur^{1,3,5}. Clinical evidences of hemorrhage occur in about one third of patients, less often than with intraparenchymal lesions^{2,4,7}.



Figs 4 and 5. Patients 2 and 3. CT scans show right para-sellar and supra-sellar lesions, spontaneously hyperdense (4A and 5A), intensely enhancing after infusion of iodinated contrast media (4B and 5B).

Macroscopically, they appear as winy, well-circumscribed, multiloculated masses, richly vascularized, surrounded by a pseudocapsule. Meningiomas and schwannomas, the most important hypotheses in differential diagnosis are, unlike observed in our cases, compactly solid masses, without vascular appearance, and do not yield abundant blood when punctured. Microscopically, they are a honeycomb of vascular spaces which lack muscular and elastic components, lined by a single endothelial layer, without intervening neuronal tissue^{5,6}.

This entity appears as an iso/hyperdense mass on non-enhanced CT scans, enhancing intensely after infusion of iodinated media in most cases³. Calcification is an occasional finding, and it is most common in meningiomas^{5,6,8}. Erosion of the sphenoid bone can also be seen. DSA can be normal and show an avascular mass or a discrete to moderate tumoral blush, with feeding vessels originating from branches of the external carotid or cavernous internal carotid^{2-6,9,10}. The internal carotid artery is often encir-

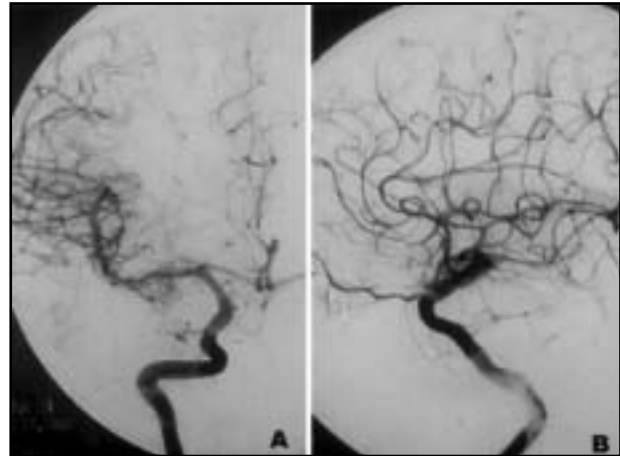


Fig 6. Patient 1. Selective right carotid angiography showing normally sized vessels, with adequate contrast flow. No mass effect could be seen (6A and 6B).

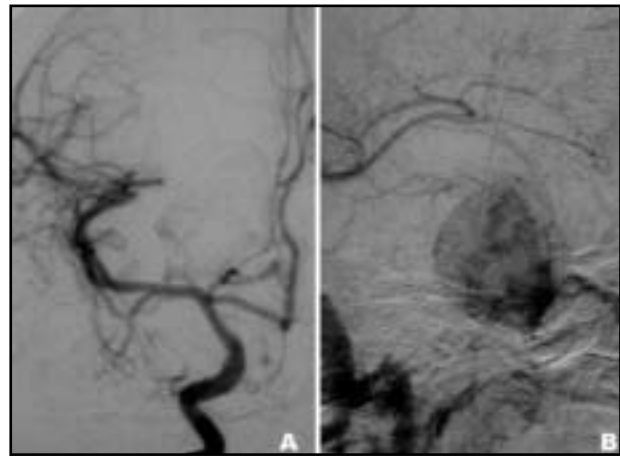


Fig 7. Patient 2. Selective right carotid angiography. Arterial phase (7A), anteroposterior view, showing only slight stretching of supraclinoid internal carotid artery and elevation of M1 segment. Venous phase (7B), lateral view, revealing a para-sellar and supra-sellar blush due to an expansile lesion of the cavernous sinus.

cled by the lesion in its cavernous portion, usually maintaining its normal caliber.

Unlike cerebral cavernous angiomas, their cavernous sinus counterparts do not have a pathognomonic appearance on MRI. Findings usually are of well-delimited para-sellar lesions, hypo or isointense in T1-weighted images and brightly hyperintense in T2-weighted images. A dumbbell-shaped mass can be seen, with a small supra-sellar component and most of lesion within cavernous sinus^{1,4}. MRI allows superb evaluation of the relationships among the cavernous angioma and the surrounding structures^{1,2}. Gradient-echo sequences may be useful to reveal hemorrhagic component. The mass was isoin-

tense in diffusion-weighted images in our only patient in which it was performed, and, to our knowledge, this paper is the first so far to report findings of this technique in cavernous angioma of the cavernous sinus. Enhancing pattern after gadolinium infusion in most cases is intense and homogeneous. The most important differential diagnosis (and the most common preoperative misdiagnosis) is para-sellar meningioma. Although differentiation between these two conditions could be difficult, a homogeneously enhancing mass enveloping the internal carotid artery without significant reduction of its caliber should lead diagnosis towards cavernous angioma. Other possible hypothesis in this context is para-sellar schwannoma. Meningiomas usually are isointense with gray matter both in T1- and T2-weighted images, while schwannomas tend to have lower signal than gray matter in T1- and higher signal in T2-weighted images. Enhancement is prominent both in meningiomas and schwannomas, but tends to be slightly heterogeneous^{1,3,6}.

Although parenchymal cavernomas are easily resected in most cases, surgical excision of cavernous angiomas is often challenging because of abundant operative bleeding, due to the vascular nature of these lesions^{3-5,7,8,10}. Predominantly vascular masses and mostly organized ones can be found⁹. Despite successful resections carried out, high mortality rates still remain, and conservative treatment should be also considered. The possibility of a cavernous angioma must be kept in mind, because

of different surgical approaches possibly utilized. Radiotherapy may be a useful complement as the primary therapy or as a preoperative adjuvant^{2,4}.

In conclusion, no-demarcated, homogeneously enhancing, avascular/hypovascular masses of the middle fossa, which are iso/hypointense in T1- and hyperintense in T2-weighted images should raise the hypothesis of cavernous angiomas, despite the higher frequency of para-sellar meningioma. Because of the high mortality when attempting to remove these lesions, radiologists should alert surgeons for this possibility.

REFERENCES

1. Sohn CH, Kim SP, Kim IM, Lee JH, Lee HK. Characteristic MR imaging findings of cavernous hemangiomas in the cavernous sinus. *AJNR* 2003;24:1148-1151.
2. Bristol R, Santoro A, Fantozzi L, Delfini R. Cavernoma of the cavernous sinus: case report. *Surg Neurol* 1997;48:160-163.
3. Momoshima S, Shiga H, Yuasa Y, Higuchi H, Kawase T, Toya S. MR findings in extracerebral cavernous angiomas of the middle cranial fossa: report of two cases and review of the literature. *AJNR* 1991;12:756-760.
4. Suzuki Y, Shibuya M, Baskaya MK, et al. Extracerebral cavernous angiomas of the cavernous sinus in the middle fossa. *Surg Neurol* 1996;45:123-132.
5. Gliemroth J, Missler U, Sephernia A. Cavernous angioma as a rare neuro-radiologic finding in the cavernous sinus. *J Clin Neurosci* 2000;7:542-560.
6. Tannouri F, Divano L, Caucheteur V, et al. Cavernous haemangioma in the cavernous sinus: case report and review of the literature. *Neuroradiology* 2001;43:317-320.
7. Meneses MS, Dalloolmo VC, Kondageski C, Ramina R, Hunhevicz S, Pedrozo AA. Cirurgia estereotáxica guiada para angiomas cavernosos. *Arq Neuropsiquiatr* 2000;58:71-75.
8. Andrade GC, Prandini MN, Braga FM. Cavernoma gigante: relato de dois casos. *Arq Neuropsiquiatr* 2002;60:481-486.
9. Shi J, Hang C, Pan Y, Liu C, Zhang Z. Cavernous hemangiomas in the cavernous sinus. *Neurosurgery* 1999;45:1308-1312.
10. Goel A, Muzumdar DP, Nitta J. Surgery on lesions involving cavernous sinus. *J Clin Neurosci* 2001;8(Suppl 1):S71-S77.