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 para-sellar 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.

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 headaches. 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 angiography...
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)\(^1\). 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 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\(^4,6,10\). 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\(^2,4,7\).
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 cases.$^3$ 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 end-}

ced 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 enwrapping 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 heterogeneous1,3,6.

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 lesions3,7,8,10. 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 adjuvant2, 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