



Radiologic Clue to Cavernous Sinus Hemangioma Diagnosis

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Key words

- Cavernous sinus
- Cavernous sinus hemangioma
- Diplopia
- Intraoperative bleeding
- Magnetic resonance imaging
- Neuro-oncology

Abbreviations and Acronyms

CSH: Cavernous sinus hemangioma

T1WI: T1-weighted image

T2WI: T2-weighted image

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We describe a case of a 57-year-old woman presenting initially with diplopia who later developed retro-orbital and retroauricular pain. Examination showed right abducens nerve palsy and subsequent right trigeminal nerve hyperesthesia. Neuroimaging revealed a well-defined mass confined to the right cavernous sinus, with high T2 signal intensity and homogeneous enhancement on postgadolinium T1-weighted images. A meningioma was initially considered as the most likely diagnosis. The lesion grew over months, extending into the Meckel's cave and the pituitary fossa. Dynamic T1-weighted images revealed striking and progressive centripetal enhancement, leading to a revised diagnosis of cavernous sinus hemangioma (CSH). CSH is a rare benign extra-axial tumor, which is highly vascularized, and is frequently misdiagnosed as meningioma or schwannoma. The combination of very high T2 signal intensity and progressive centripetal contrast enhancement highly suggest CSH diagnosis. Given the significant risk of bleeding and mortality associated with surgical intervention, it is crucial to recognize CSH preoperatively to plan a meticulous surgical approach.

A 57-year-old woman presented with a 1-month history of diplopia. Neurologic examination was normal except for an incomplete right VI nerve palsy. Magnetic resonance imaging demonstrated a well-defined mass in the right cavernous sinus. The mass appeared hypointense on T1-weighted images (T1WIs), appeared hyperintense on T2-weighted images

(T2WIs), and revealed homogeneous enhancement on postgadolinium T1WIs (Figure 1). A diagnosis of meningioma was suspected, and the patient was kept under surveillance and scheduled to undergo an elective transsphenoidal biopsy.

During follow-up and before the biopsy was performed, the patient developed retro-orbital and retroauricular pain.

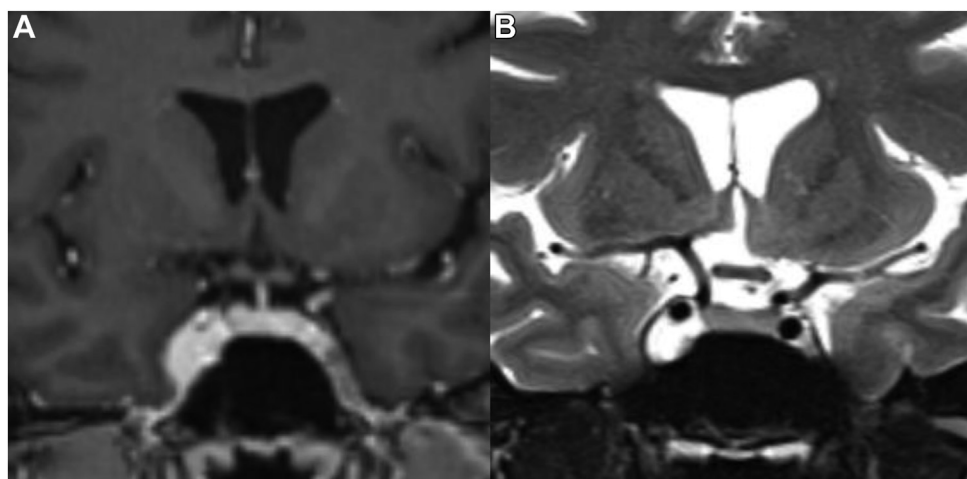


Figure 1. Coronal magnetic resonance images demonstrate a mass within the right cavernous sinus mass. The lesion exhibits homogeneous enhancement on postgadolinium T1-weighted image (A). Bright T2 signal intensity is noted (B), a feature unlikely in a

meningioma and characteristic of hemangioma. Additionally, the absence of calcifications, the lack of hyperostosis, and the preservation of cavernous internal carotid artery caliber further support this diagnosis.

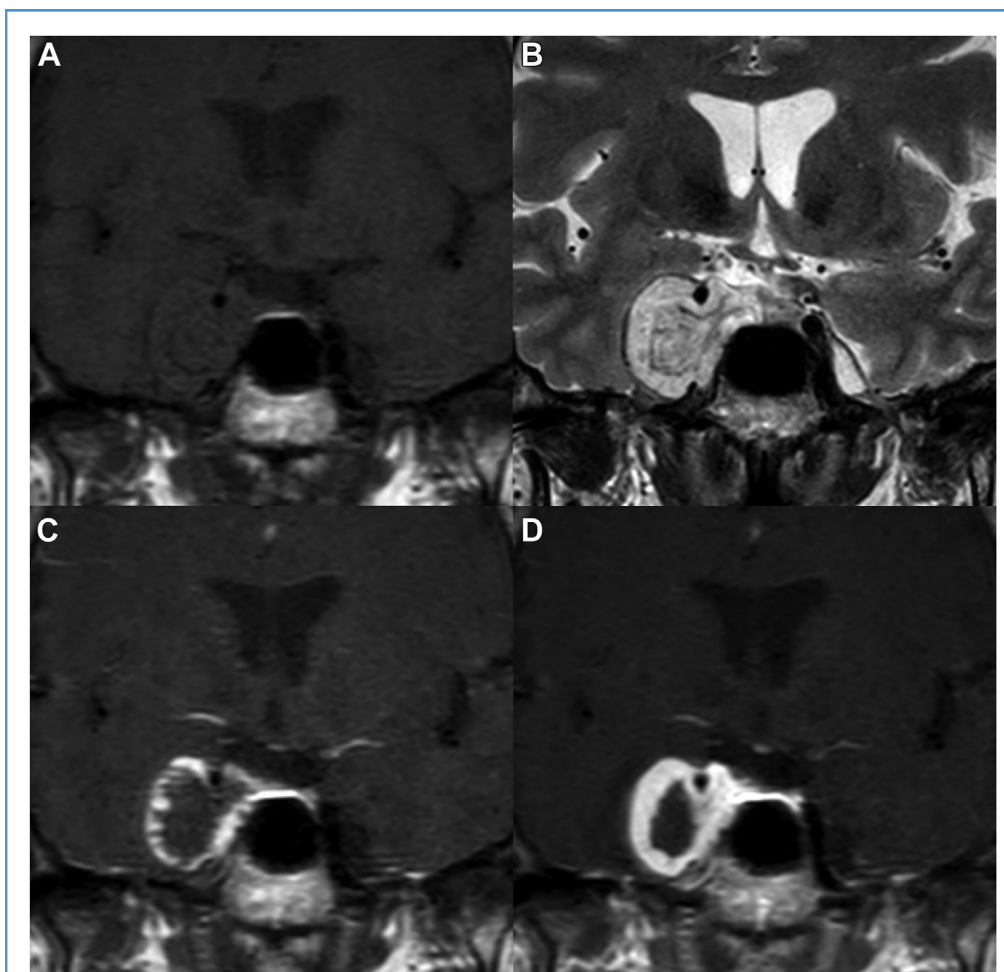


Figure 2. Follow-up radiologic images revealing growth of right cavernous sinus mass extending into the pituitary fossa and Meckel's cave. The lesion was hypointense on T1-weighted image (A) and hyperintense on T2-weighted image (B), with hypointense linear structures within, possible blood

vessels. The absence of a cystic component or dumbbell morphology, along with no expansion of neural foramina, makes a diagnosis of schwannoma unlikely. Dynamic contrast-enhanced T1-weighted image (C and D) reveals a progressive centripetal filling pattern, strongly suggestive of a hemangioma.

Neurologic examination showed worsening right VI nerve palsy and right V2 and V3 nerve hyperesthesia. Neuroimaging revealed growth of the right cavernous sinus lesion, which extended to the ipsilateral Meckel's cave and pituitary fossa. The lesion maintained high T2 signal intensity, but now exhibited hypointense linear structures, suggestive of intralesional blood vessels. A dynamic contrast-enhanced study revealed a vivid progressive centripetal enhancement. No internal carotid artery stenosis or bone sclerosis was observed (Figure 2). A presumptive diagnosis of cavernous sinus hemangioma (CSH) was considered. Given the size of the lesion and assumed bleeding risk of CSH, a

pterional craniotomy approach was chosen for biopsy. Histologic examination confirmed the diagnosis of CSH (Figure 3).

CSH is a rare benign extra-axial tumor, frequently misdiagnosed as meningioma or schwannoma. A very high T2 signal and progressive centripetal contrast enhancement on dynamic contrast-enhanced T1WI are highly suggestive of this diagnosis.¹⁻⁴ Computed tomography demonstrates limited diagnostic accuracy, remaining valuable for differential diagnosis in identifying calcifications and assessing bone structures (e.g., erosion, hyperostosis).⁵ Although the distinction between CSH and certain subtypes of meningioma (e.g., microcystic meningioma) can be

challenging due to their similar appearance on T1WIs and T2WIs, the absence of calcifications or hyperostosis and a preserved lumen of the cavernous internal carotid artery do not favor a diagnosis of meningioma.⁵ To definitively differentiate between these 2 entities, dynamic contrast-enhanced T1WI should be performed when hemangioma is suspected because the characteristic pattern of progressive centripetal enhancement is highly indicative of CSH.^{1,5}

Surgery can reduce tumor volume and lead to symptomatic relief. Both open and endonasal endoscopic procedures are suitable, with possible subsequent radiotherapy. Surgical treatment is challenging,

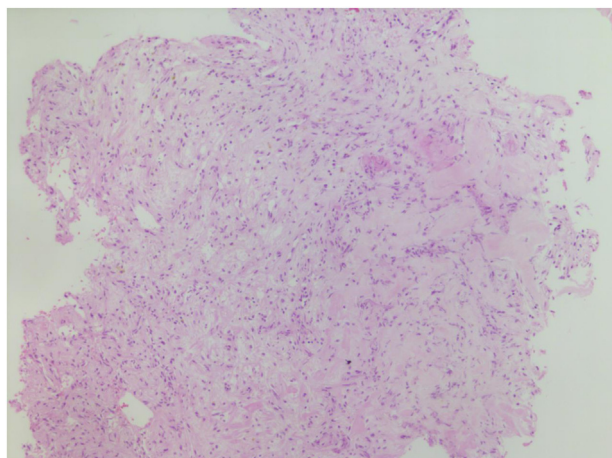


Figure 3. Hematoxylin and eosin 10× 10: mesenchymal lesion with multiple small capillary-sized vessels and some sinusoidal channels lined with single-layer endothelial cells. Diffuse expression of CD34 and immunonegativity to S100, EMA, SSTR2A, and STAT6 (immunohistochemistry not shown).

considering the multiple surrounding critical neurovascular structures.¹⁻³ Importantly, CSH is highly vascularized, with a significant risk of intraoperative bleeding and mortality, particularly with the endonasal/transsphenoidal approach. Therefore, recognizing this entity preoperatively is essential to plan a safe and effective surgical strategy.¹⁻³

CRedit AUTHORSHIP CONTRIBUTION STATEMENT

Cristiano Esteves: Writing — original draft, Resources, Methodology, Investigation, Formal analysis, Data curation.

David Berhanu: Writing — review & editing, Data curation, Conceptualization.
Carla Guerreiro: Writing — review & editing, Supervision, Conceptualization.

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