JOURNAL OF NEUROSURGERY:
Case Lessons

J Neurosurg Case Lessons 8(10): CASE24227, 2024
DOI: 10.3171/CASE24227

Cavernous hemangioma within the cavernous sinus: illustrative case

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BACKGROUND Cerebral cavernous hemangiomas (CHs) are the most common vascular malformations and can be found in many locations in the brain. The most common extra-axial locations are the intrasellar and parasellar regions. Both locations are rare for CH.

OBSERVATIONS A 41-year-old female who had experienced headaches for about a year presented to the authors' institution because of a mass located in the left cavernous sinus (CS). It was confirmed that it was not causing any loss in the visual field and that there was no pituitary irregularity. Surgery was planned with a preliminary diagnosis of CH. An endoscopic endonasal approach (EEA) was undertaken with the otorhinolaryngology team. The dura mater was opened following excision of the back wall of the sphenoid sinus. A blue-purple vascular lesion was observed, filling the left CS. Gross-total resection (GTR) was achieved. In the literature, there were 10 cases in which GTR had been performed using the EEA.

LESSONS Patients with CHs located in the sellar region present with various complaints. The preference for endoscopic surgery over cranial surgery for such lesions requires more comprehensive studies, but it is thought that this approach can reduce surgical complications and the time to discharge for the patient.

https://thejns.org/doi/abs/10.3171/CASE24227

KEYWORDS cavernous hemangioma; cavernous sinus; endoscopic endonasal surgery; total excision

Cavernous sinus (CS) cavernous hemangiomas (CHs) are rare, intracranial benign lesions. They constitute approximately 2%–3% of all CS tumors.[1,2] CHs can occur in intra-axial or extra-axial areas of the brain. The most common extra-axial locations are the intrasellar and parasellar regions. However, intrasellar and parasellar CHs are quite rare.[3–5] Symptoms are usually caused by mass effect. Headache, cranial nerve paralysis, and vision loss can occur.[6] We report this case in accordance with the CARE reporting checklist.

Illustrative Case

History and Examination

A 41-year-old female without any known disease consulted a neurologist at another center with complaints of intermittent headache that had started a year earlier. Brain magnetic resonance imaging (MRI) had been done. A mass filling the left CS had been observed on MRI. The patient was then referred to the neurosurgery department for advanced examination and treatment. She had no symptoms except for intermittent headache during admission. No neurological deficit was observed in the patient's physical examination, which included MRI. No positive finding was found in the physical examination. Although the visual field was natural with confrontation, she was evaluated by an ophthalmologist and a visual field test was administered. No loss in the visual field was observed. An endocrinological evaluation was done due to mmass's proximity to the pituitary gland. No hormonal irregularity or abnormality was observed. On dynamic contrast-enhanced MRI of the pituitary gland, a mass was noted to fill the left CS, extending to the left half of the sella, wrapping the cavernous segment of the internal carotid artery (ICA) on the left, and with widely clear hyperintense areas on T2-weighted images. After intravenous contrast material injection, an 18 × 17 × 14–mm extra-axial mass was seen to have smooth-lobulated, contoured, millimetric nodular pathological contrast retention in the center. Pituitary gland dimensions were within normal limits. The pituitary gland parenchyma contrasted homogeneously after intravenous contrast material injection, and no nodular lesion was detected. However, the infundibulum was deviated to the right. No sign of pressure on the optic chiasma was detected (Fig. 1). A prediagnosis of CH was considered because there was hyperdensity on computed tomography and a hypointensive ring around the mass on T2-weighted sections (Fig. 2). On brain MRI, the mass was isointense on T1 imaging and exhibited heterogeneous contrast

ABBREVIATIONS CH = cavernous hemangioma; CS = cavernous sinus; EEA = endoscopic endonasal approach; ICA = internal carotid artery; MRI = magnetic resonance imaging.

INCLUDE WHEN CITING Published September 2, 2024; DOI: 10.3171/CASE24227.
SUBMITTED April 3, 2024. **ACCEPTED** May 30, 2024.
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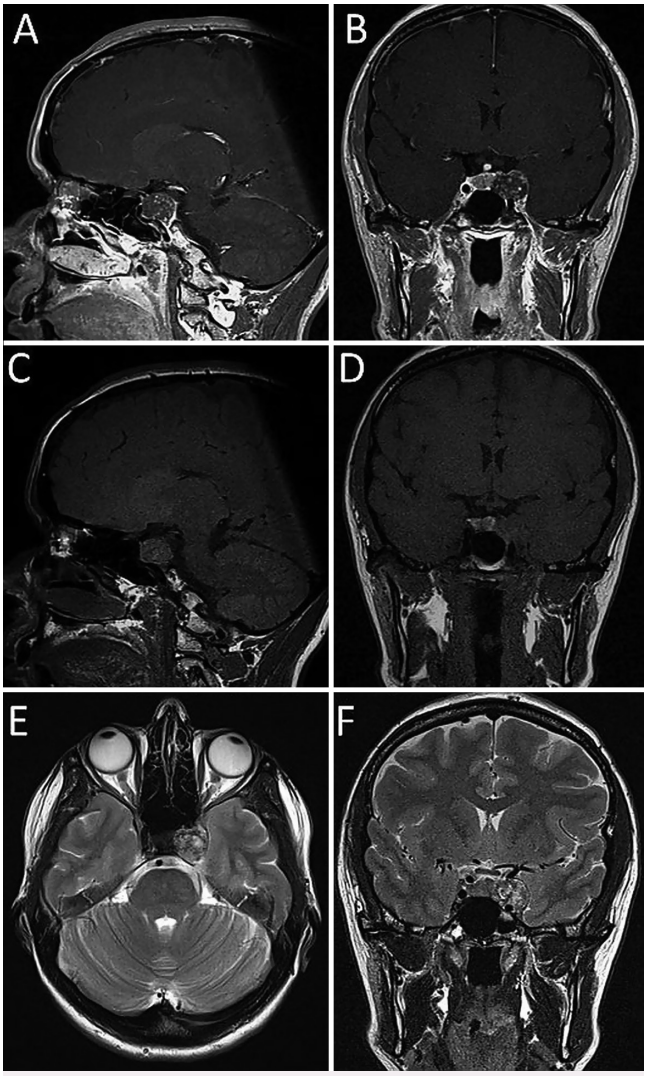


FIG. 1. Preoperative dynamic contrast-enhanced MRI of the pituitary gland. Sagittal (**A**) and coronal (**B**) T1-weighted sections after contrast injection, sagittal (**C**) and coronal (**D**) T1-weighted sections before contrast injection, and axial (**E**) and coronal (**F**) T2-weighted sections.

in gadolinium sections. Surgical treatment was recommended. Because of the lesion location, endoscopic transnasal surgery was preferred. The procedure is shown in Video 1.

VIDEO 1. Clip showing the surgery. Adrenalized cotton was placed lateral to the middle turbinate in the left nasal passage and medial to the middle turbinate in the right nasal passage for decongestion. The maxillary sinus ostium was entered and expanded. The sphenoid sinus ostium behind it was entered. The ethmoid bulla was opened and cleaned down to the basal lamella, and an anterior ethmoidectomy was performed. We noted that the cavernous mass protruded through the back wall of the sphenoid sinus. Following excision of the back wall of the sphenoid sinus, the sellar dura was opened. The vascular lesion was found to be blue-purple with a soft consistency and smooth boundaries, filling the left CS and pushing the pituitary gland medially. The mass was mobilized with forceps. The dural defect was widened. The mass was removed in one piece with forceps. Click here to view.

Surgical Technique

An endoscopic endonasal approach (EEA) was planned and performed with the otorhinolaryngology team. After induction of general anesthesia, a lumbar drain was placed. Adrenalized cotton was placed lateral to the middle turbinate in the left nasal passage and medial to the middle turbinate in the right nasal passage. After waiting 15 minutes for decongestion, the operation was started. The uncinate process was removed on the left side. The maxillary sinus ostium was entered and expanded. The middle turbinate was lateralized, and the upper turbinate was made visible. The superior turbinate was cut and removed. The sphenoid sinus ostium behind it was entered. The sphenoid sinus ostium was expanded with a rongeur. The middle turbinate was medialized, the ethmoid bulla was opened and cleaned down to the basal lamella, and an anterior ethmoidectomy was performed. The lower part of the middle turbinate was cut and removed. The back part of the septum was removed. The sphenoid ostium on the right side was opened and combined with the left side. We noted that the cavernous mass protruded through the back wall of the sphenoid sinus. Following excision of the back wall of the sphenoid sinus, the ICA location was detected with micro-Doppler ultrasonography. The sellar dura was opened. The vascular lesion was blue-purple with a soft consistency and smooth boundaries, filling the left CS and pushing the pituitary gland medially (Fig. 3). The mass was removed totally in one piece. Hemostasis was achieved with hemostatic matrix. Synthetic dura was cut to appropriate dimensions and placed as inlay and outlay. It was supported with Spongostan. The surgery was terminated. No difficulty was experienced during the surgery.There was no difficulty experienced during the surgery. There was no loss in the patient's visual field during postoperative follow-up. No cranial nerve paralysis was observed. No disorder in hormonal regulation was observed. There was no need for additional treatment. The location of the tumor in the CS is illustrated in Fig. 4.

Patient Informed Consent

The necessary patient informed consent was obtained in this study.

Discussion

CS CHs are rare extra-axial intracranial tumors. They account for about 3% of all CS masses and are mostly seen in women between the ages of 40 and 60 years.[1,2,7] CS CHs are primarily slow-growing masses consisting of thin-walled vascular tangles. Clinical symptoms usually appear as a result of progressive growth of the mass.[1,6] Clinical symptoms can be attributable to the anatomical positions of the sellar region, pituitary gland, and CSs and include headache, dizziness, cranial neuropathy, and endocrinopathy. However, CS CHs can also be asymptomatic.[3,8,9] They are often confused with pituitary gland adenomas. Pathologically, these masses can be divided into 3 main classes: sponge-like, mulberry-like, and mixed. Sponge-like CS CHs contain a robust pseudocapsule, and homogeneous contrast retention is observed on MRI. Mulberry-like and mixed-type CS CHs contain an incomplete pseudocapsule, and heterogeneous contrast retention is observed. Unlike intra-axial CHs, extra-axially located CHs do not usually cause brain hemorrhage.[6,10,11] CHs are rarely observed in the CS, and differential diagnoses include various neoplastic, infectious, inflammatory, and vascular etiologies. Commonly observed neoplastic lesions of the CS are meningiomas and schwannomas. Metastases, lymphomas, chordomas, and CHs are rare lesions. Abscess, sarcoidosis, and Tolosa-Hunt syndrome can be counted among the infectious and inflammatory etiologies. Vascular etiologies are typically cerebral aneurysms.[6,12,13] CS CHs are rare extra-axial CHs that can

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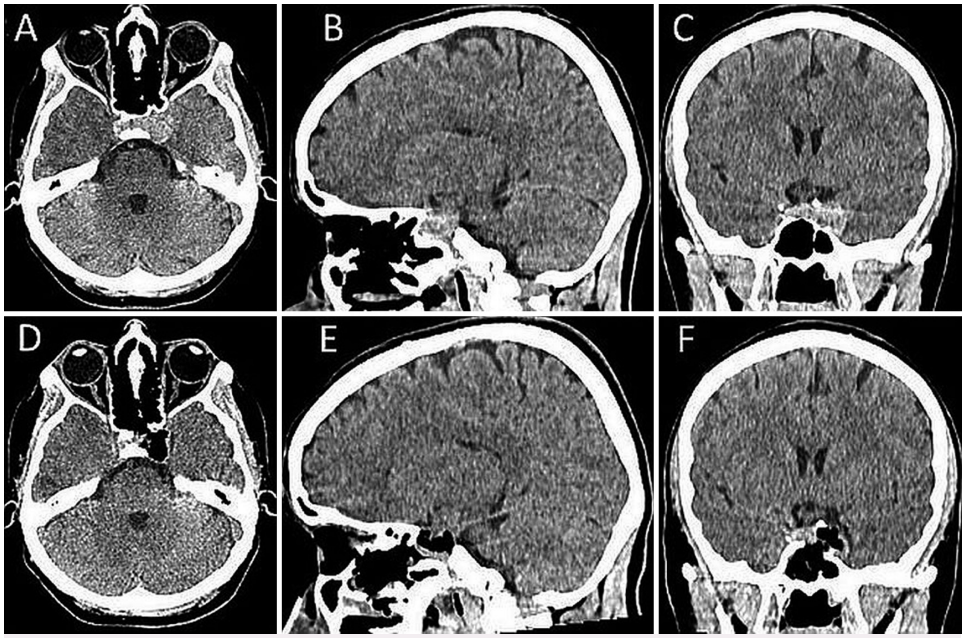


FIG. 2. Preoperative axial (**A**), sagittal (**B**), and coronal (**C**) cranial CT scans. Postoperative axial (**D**), sagittal (**E**), and coronal (**F**) cranial CT scans.

be classified into 3 types according to the origin of the tumor, expansion, and relationship with the ICA on coronal MRI: type 1 (intrasellar), confined medially to and not extending beyond the carotid line; type 2 (parasellar), beyond but not passing the carotid line medially; and type 3 (mixed), tumor expansion through both sides of the ICA.[3,9] Due to excessive intraoperative bleeding and the complex neurovascular structures of the CS, the potential for injury to the cranial nerves is high, and total resection of CS CHs is difficult.[1,14,15] In our case, total removal of the lesion was achieved. Postoperative cranial nerve paralysis and endocrinological irregularity were not observed. Moreover, an endoscopic transnasal transsphenoidal approach was used because the tumor was located in the CS and extended to the sphenoid sinus. Gross-total excision was achieved. There are 10 cases in the literature in which gross-total excision was performed using the EEA.[16–18] CH is a benign tumor, and complete removal is the optimal treatment. However, excessive intraoperative bleeding and postoperative neurological function disorder are common consequences of the surgical treatment of CS CHs. In conclusion, there are only a few cases reporting total resection in the literature.[3,16–19] Surgical mass reduction with acute cranial nerve decompression followed by Gamma

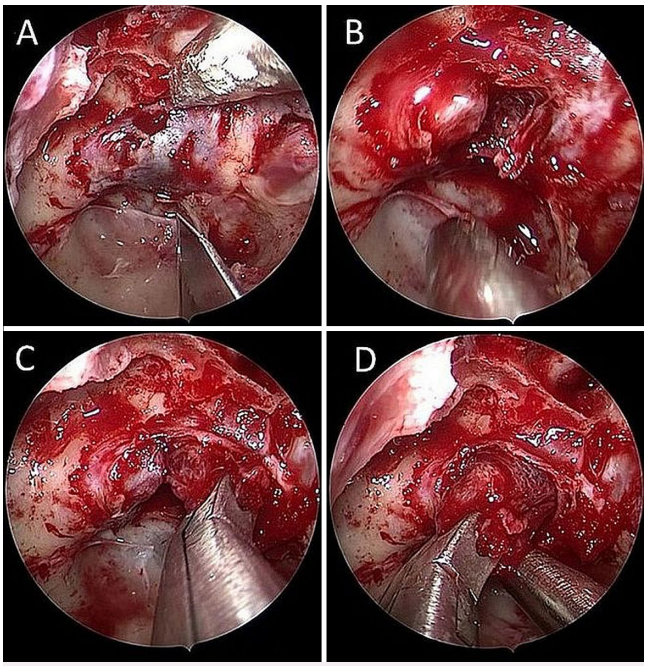


FIG. 3. Intraoperative endoscopic images from the moment of mass removal. **A:** The sellar dura before it is opened with a scalpel. **B:** After the sellar dura is opened, the normal pituitary tissue and the mass on its left side can be seen. **C:** The tumor is mobilized with a punch. **D:** After dissection is achieved from all directions, the tumor is excised in one piece with a punch.

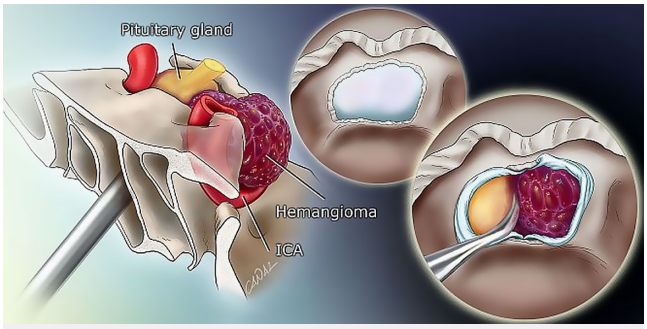


FIG. 4. Illustration showing the relationship of the tumor, pituitary gland, and ICA.

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Knife radiosurgery is accepted as a safe and effective treatment option for intracavernous hemangiomas.[3,5,8,9] In some cases that can be diagnosed according to imaging findings, radiosurgery can also be performed directly (without biopsy).[3,9] Stereotactic radiosurgery is a treatment option for patients with nonoperative lesions or limited subtotal resection. Gamma Knife radiosurgery is known to significantly reduce tumor size and volume, as well as alleviate some neurological symptoms associated with CS CHs.[6,20]

Observations

We reported a rare case of CH in the CS. Treatment options were evaluated specifically for surgery, and surgical method preferences and reasons were discussed. CHs located within the CS are rare, and total resection is difficult. In the cases reported in the literature, radiosurgery, transcranial surgery, and transsphenoidal endonasal surgeries were performed, and the number of cases in which endonasal endoscopic total resection was performed is quite low. In this case report, endoscopic endonasal surgery was performed in a patient with a CH located in the CS, and the lesion was completely excised.

Lessons

CS CHs are rare, extra-axial benign tumors that often present with headache, diplopia, proptosis, or extraocular nerve paralysis.[6] Although total resection is the optimal treatment, aggressive surgery can cause deficits because of the location of the lesion. The challenging anatomy of the sinus makes it difficult to completely remove lesions located in this region. There are very few case reports indicating that total resection can be performed with endoscopic endonasal surgery, considering the location of the lesion. A preferrence for endoscopic surgery over cranial surgery for such lesions requires more comprehensive studies, but it is thought that the procedure may reduce surgical complications and the time to discharge for the patient. A treatment decision should be made in consultation with the patient, based on the size and location of the lesion, as well as the symptoms and findings.

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Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: all authors. Acquisition of data: Celtikci, Bozkurt, Sahin. Analysis and interpretation of data: Celtikci, Bozkurt, Sahin. Drafting the article: Celtikci, Bozkurt. Critically revising the article: all authors. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Celtikci. Statistical analysis: Celtikci. Administrative/technical/material support: Celtikci, Sahin. Study supervision: all authors.

Supplemental Information

Videos

Video 1. https://vimeo.com/953575713.

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