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Background

While an extremely rare complication, transsphenoidal pituitary surgery can increase the risk for venous air embolism due to the slight reverse Trendelenburg intraoperative positioning and adjacent venous anatomy. The following case describes this rare phenomenon and subsequent peri-operative management.

Case Description

Preoperative Course

A 53-year-old female patient with no relevant past medical history presented with several days of severe headaches and sudden-onset visual changes. CT (Figure 1 A and B) and MRI (Figure 1 C and D) revealed a hemorrhagic sellar mass consistent with pituitary apoplexy with adjacent subarachnoid hemorrhage. Physical exam was remarkable for near-total blindness bilaterally and a non-reactive right pupil. Her preoperative biochemical evaluation was consistent with panhypopituitarism. The patient was placed on stress-dose hydrocortisone and taken emergently to the OR for endoscopic transsphenoidal resection of the mass.

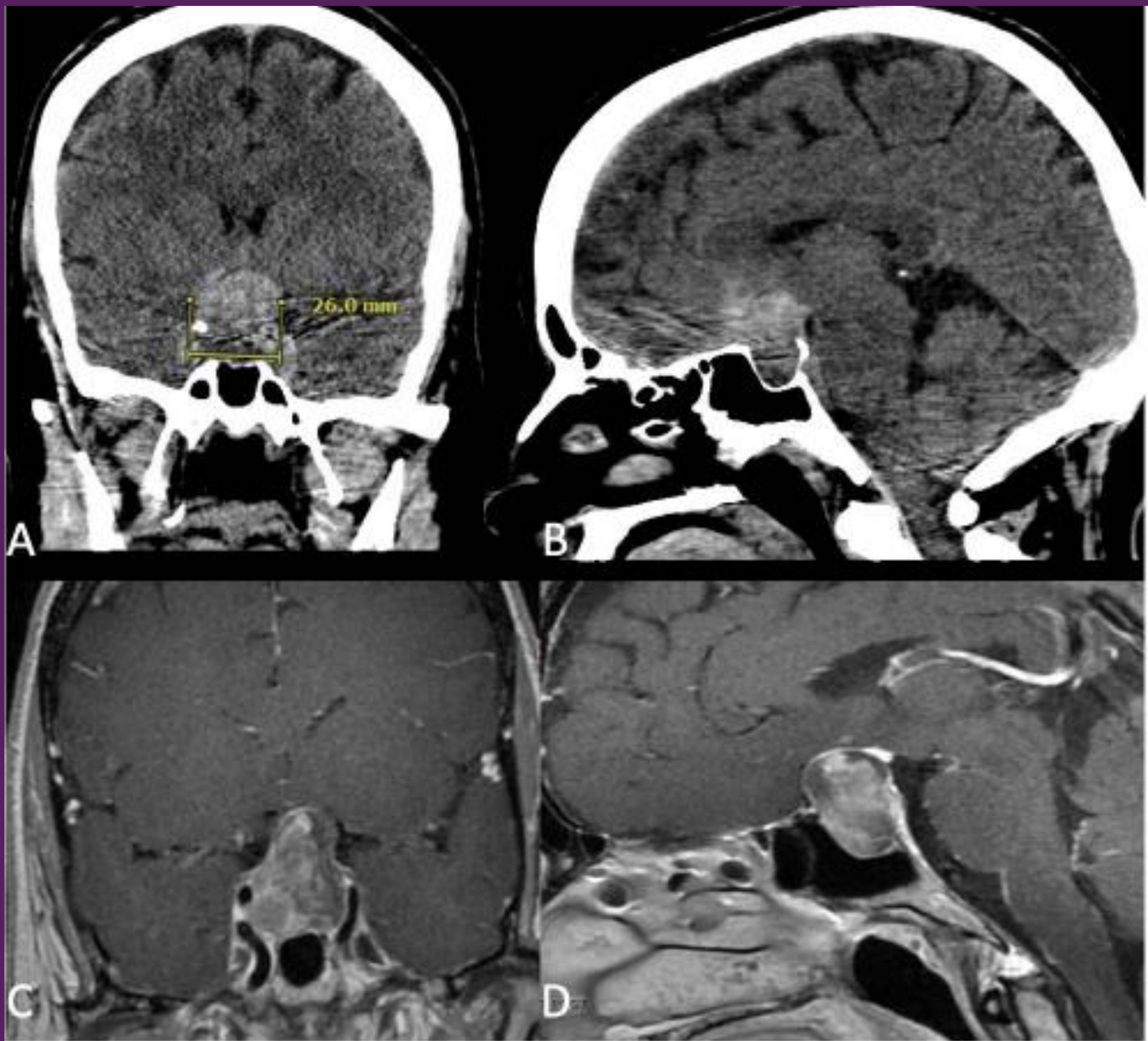


Figure 1: A and B) Preoperative coronal and sagittal CT scans showing hemorrhagic sellar mass with adjacent subarachnoid hemorrhage. Figure 1: C) Preoperative Coronal T1-weighted MRI with contrast showing heterogeneously enhancing sellar mass with optic chiasm compression and invasion of the cavernous sinuses R > L. D) Sagittal T1-weighted MRI with contrast showing heterogeneously enhancing sellar/supra-sellar mass.

Operative Management

A direct endoscopic transsphenoidal approach to the sella was performed. During resection, venous bleeding was encountered from the cavernous sinuses and was accompanied by two separate occasions of hypotension and a decrease in end-tidal CO₂. Trendelenburg positioning, copious irrigation and prompt hemostasis restored her pressure in both instances. Thus, it was felt that this was likely caused by a VAE. Sufficient decompression of the optic chiasm was completed and there was no gross evidence of residual tumor. Immediate postoperative MRI confirmed a gross total resection (Figure 2 A and B).

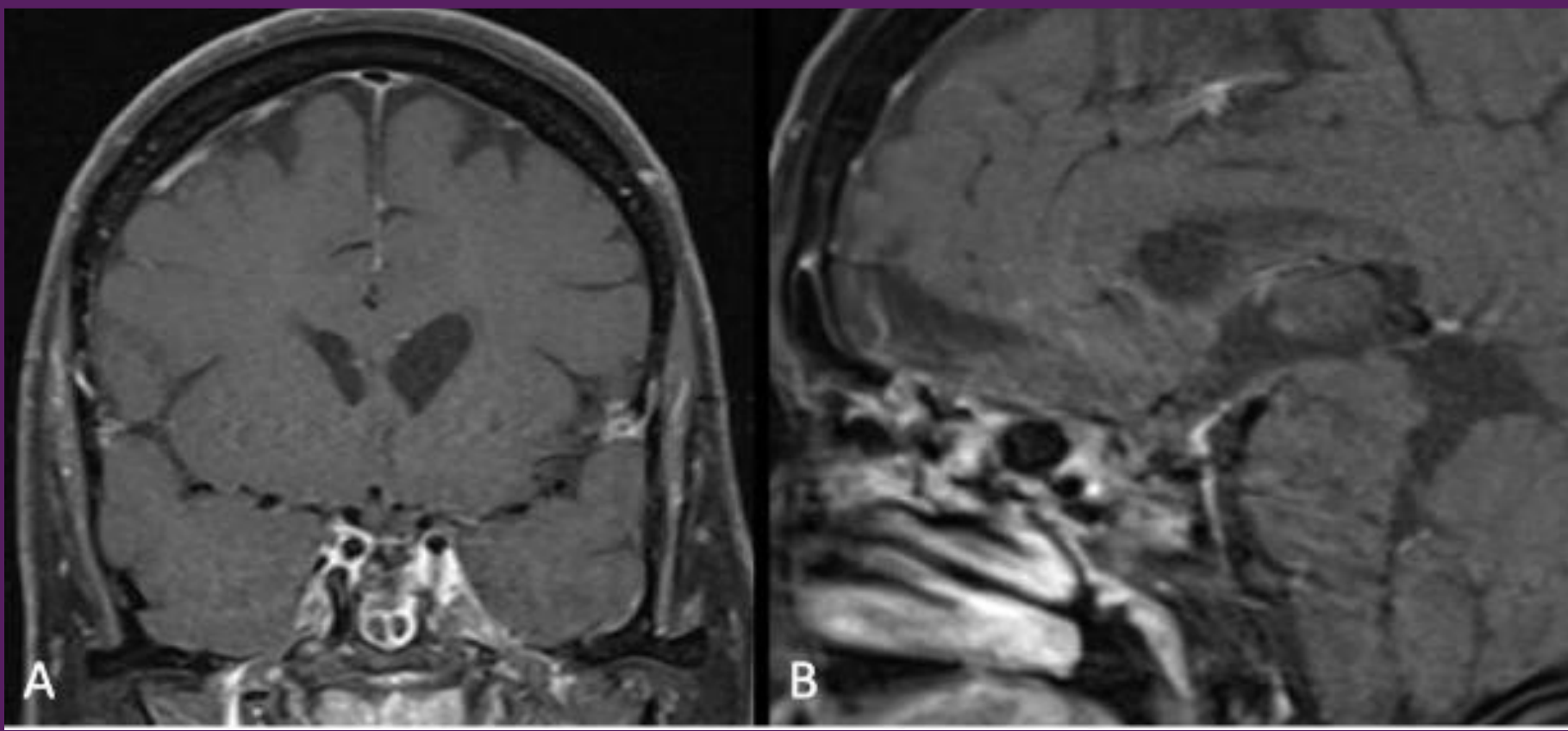


Figure 2: Postoperative Coronal A) and Sagittal B) MRI showing gross total resection of the hemorrhagic sellar mass with decompression of the optic chiasm.

Case Description - Continued

Postoperative Course

Postoperatively, the patient experienced transient left-sided weakness. CT angiography revealed vasospasm of the left MCA and ACA branches (Figure 3). This was managed conservatively with blood pressure augmentation, and the patient regained function of her left side. The patient also experienced a CSF leak postoperatively and was taken back for endoscopic repair after which she experienced no further CSF rhinorrhea.

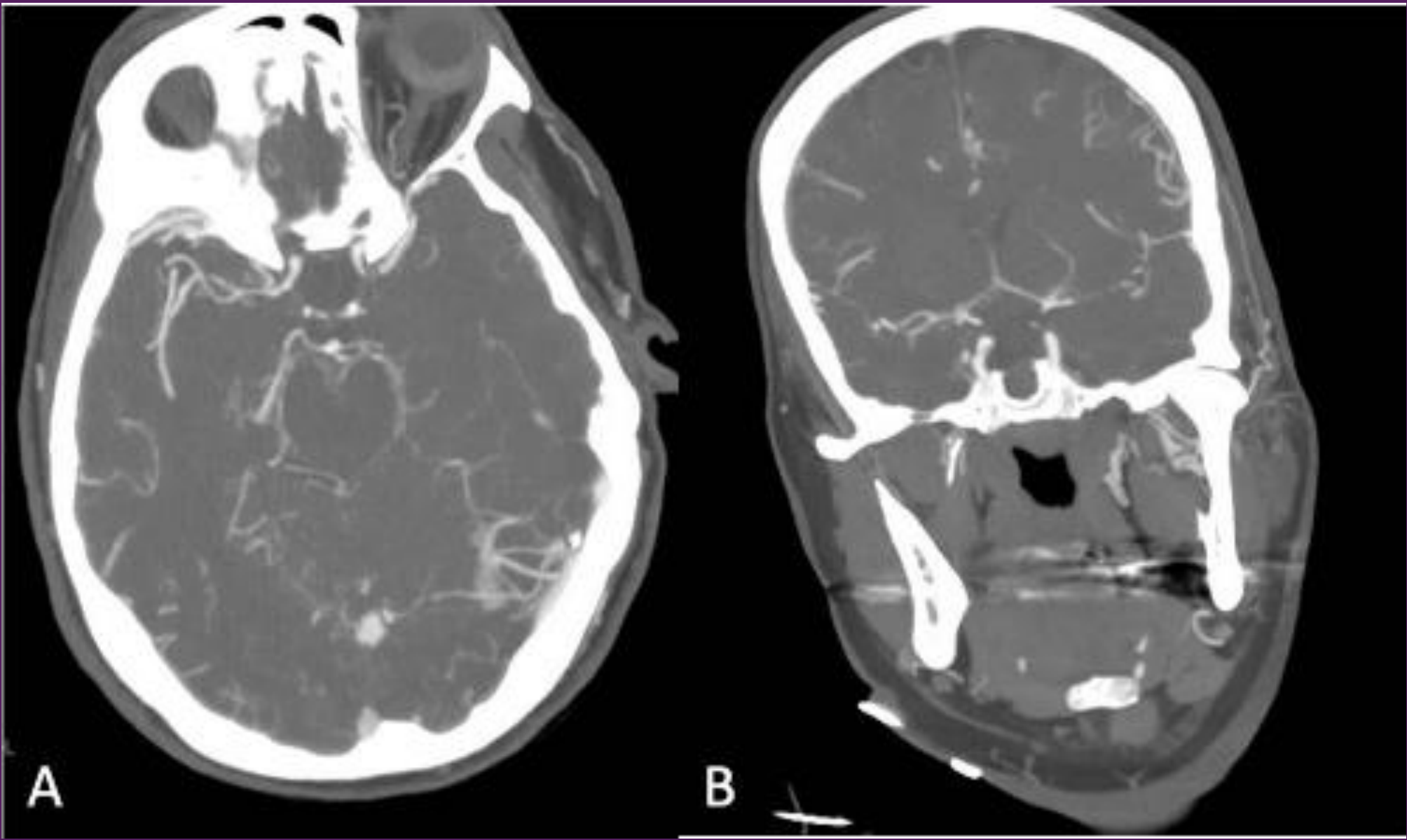


Figure 3: Axial A) and Coronal B) CT angiogram showing right MCA and ACA stenosis concerning for postoperative vasospasm with no evidence of acute infarct.

At her nine-month postoperative visit, the patient had persistent panhypopituitarism and was maintained on levothyroxine, desmopressin, and hydrocortisone. She had persistent bitemporal hemianopsia with improvement from her baseline visual function. Imaging showed no residual tumor on follow-up MRI.

Discussion

The most plausible cause of this phenomenon is drawing of air into the venous system due to the pressure gradient which exists between the right heart and cranium in the reverse Trendelenburg position commonly employed for endoscopic pituitary surgery. Other theories for the etiology of VAE include the presence of variable venous anatomy within the cavernous sinus which includes potential sites of entry for an air embolus during transsphenoidal surgery (Figure 4).

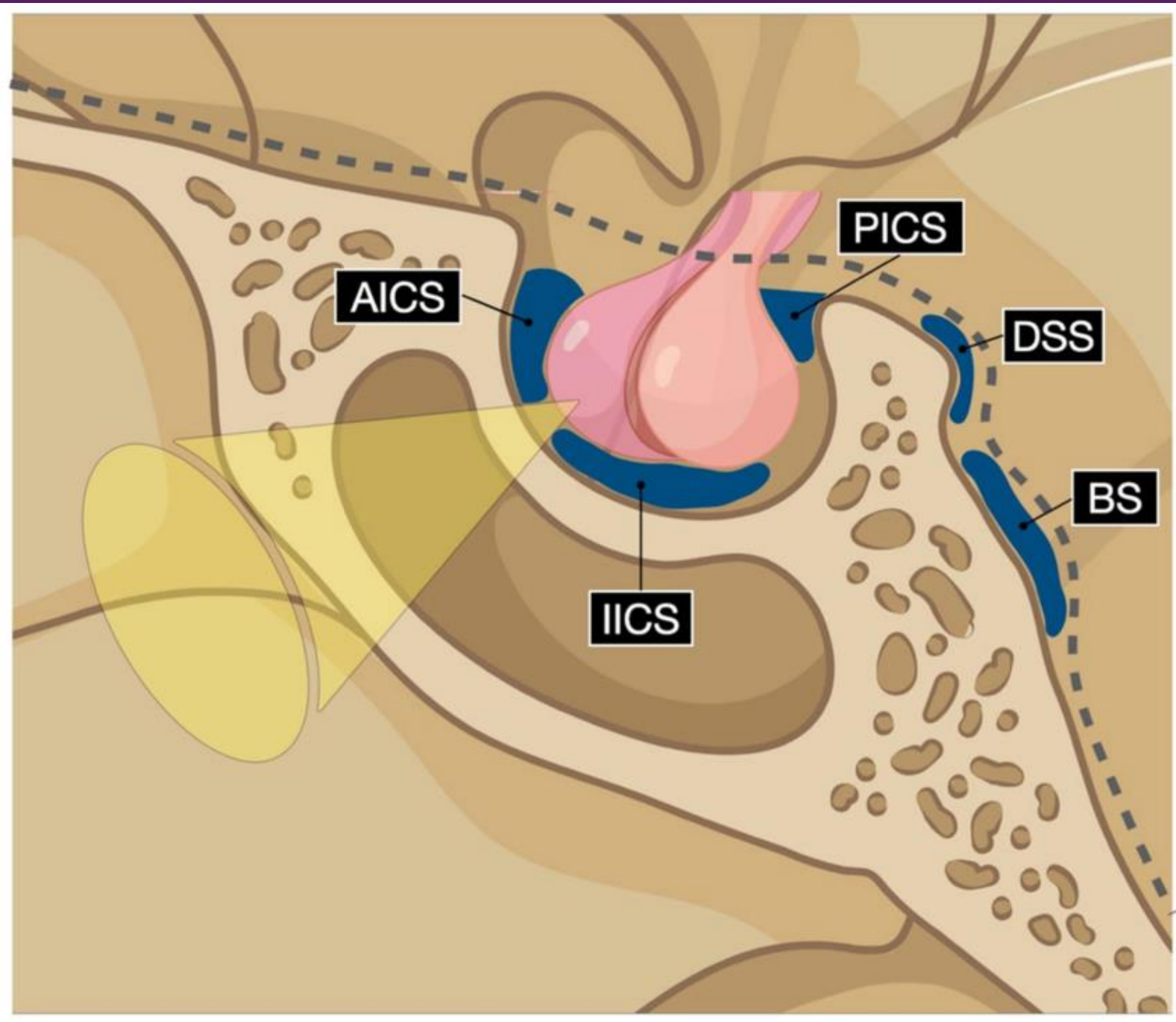


Figure 4: Parasellar venous anatomy including the anterior intercavernous sinus (AICS), inferior intercavernous sinus (IICS), posterior intercavernous sinus (PICS), dorsal sphenoid sinus (DSS), and the basilar sinus (BS).⁵

Conclusion

VAE during pituitary surgery is an extremely rare but potentially serious complication. Techniques and principles for reversal of VAE which are applied during open surgeries are an effective way to manage this complication and may allow for continued resection of the tumor if the patient stabilizes.

References

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