Surgical Management of a Right Parasagittal Venous Aneurysm from a Complex AV Fistula

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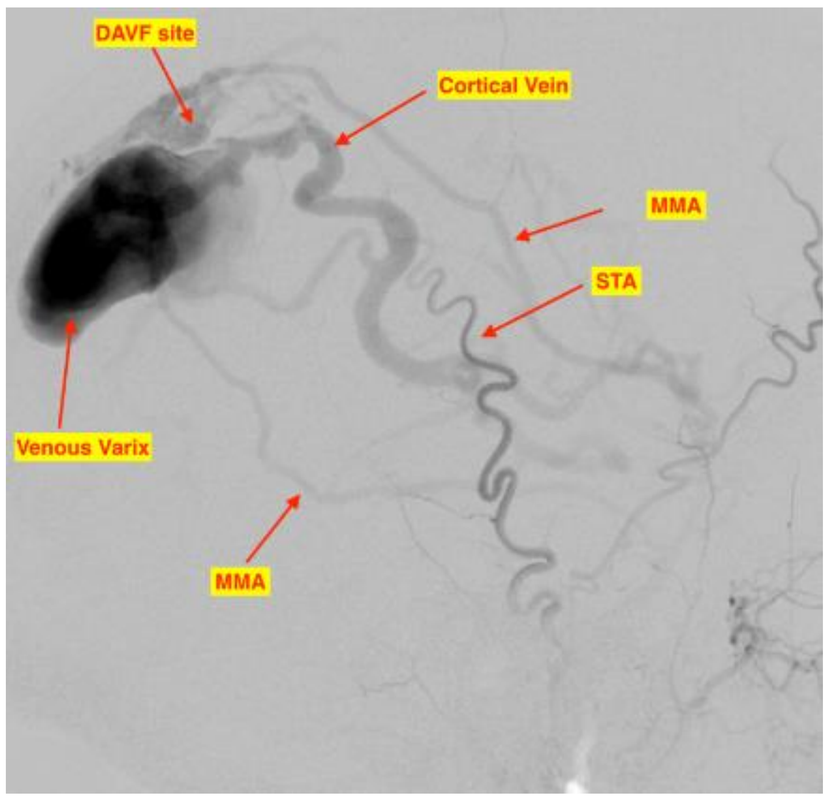
Introduction

- Dural AV fistulas (dAVFs) are abnormal connections between dural arteries and venous sinuses or cortical veins, comprising 10–15% of cerebral vascular malformations. Clinical risk is largely determined by venous drainage pattern, particularly retrograde cortical venous drainage.
- Clinical presentations range from asymptomatic to seizures, parkinsonism, and cognitive decline. Pulsatile tinnitus is common in transverse/sigmoid sinus lesions, while cavernous sinus lesions often cause visual impairment, ophthalmoplegia, and retro-orbital pain.
- Angiography is the diagnostic gold standard for defining shunt architecture and venous drainage. Management options include observation, endovascular therapy, surgery, and radiosurgery depending on disease severity

Case Presentation

- A 62-year-old male with past medical history of hypertension and no family history of vascular disorders was admitted for a seizure episode involving left lower extremity numbness and shaking that spread to left abdominal muscles. The patient was then unresponsive for several minutes.
- Angiogram and CT revealed a large parasagittal Borden type III dural arteriovenous (AV) fistula measuring 4.8 x 2.6 cm, with arterial feeders arising from bilateral middle meningeal, occipital, and superior temporal arteries. A large venous varix arose from the cortical draining vein with significant venous congestion throughout the right hemisphere
- Neurointerventional management was first attempted with a partial left middle meningeal artery embolization of fistula point, but the fistula remained patent and neurosurgery continued management of this patient.



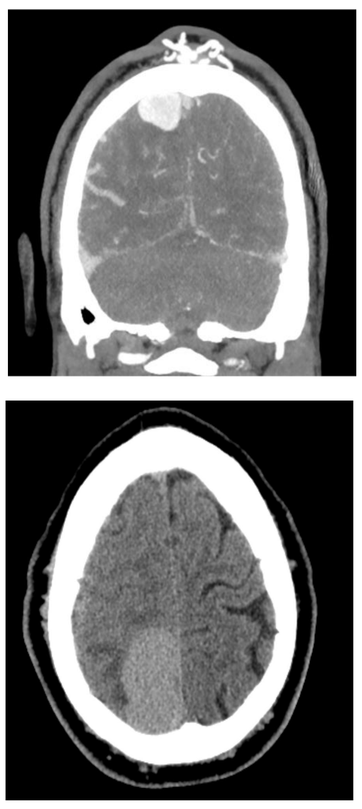


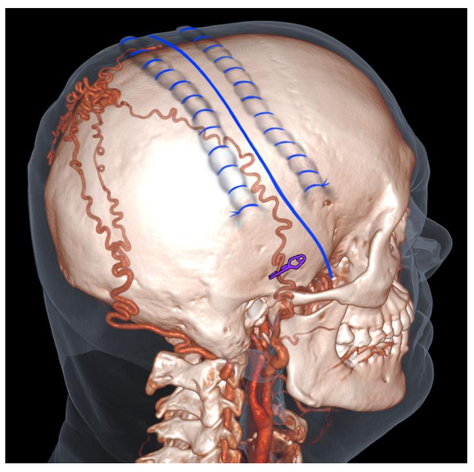
Figure 1. *Angiogram shows dAVF and associated cortical vein and venous varix. CT without contrasts demonstrates a large paramedian venous structure with superficial cerebral draining veins corresponding to angiogram findings.*

Key Operative Steps

- The skull and scalp surrounding the dural AV fistula was heavily vascularized which presented as a “lump” on the skull. This limited the traditional approach to incision and craniotomy
- A bicoronal incision just anterior to the lump of arteries was outlined and sutures were run adjacent to this to minimize bleeding.
- Bilateral superficial temporal arteries were exposed above the zygomatic arch and clipped temporarily, again to minimize bleeding.
- The skin was retracted anteriorly and posteriorly until the lump was reached. Upon reflection of the scalp, two large feeders entering the skull were encountered and coagulated.

Key Operative Steps, continued

- Neuronavigation was used to identify the superior sagittal sinus and cortical vein. A right parietal craniotomy was made lateral to the superior sagittal sinus and venous aneurysm, and enlarged with the diamond drill
- The dura was opened and retracted towards the superior sagittal sinus. Immediately following dural opening, the enlarged cortical draining vein was encountered and dissected to reveal the venous aneurysm proximally.
- After continuing dissection of the venous aneurysm medially towards the superior sagittal sinus, the fistula was identified
- Intraoperative indocyanine green (ICG) confirmed that the fistula drained into the giant venous aneurysm
- Two clips were placed to disconnect the fistula. Successful disconnection was confirmed using indocyanine green. The bone flap was replaced and incision closed per normal.



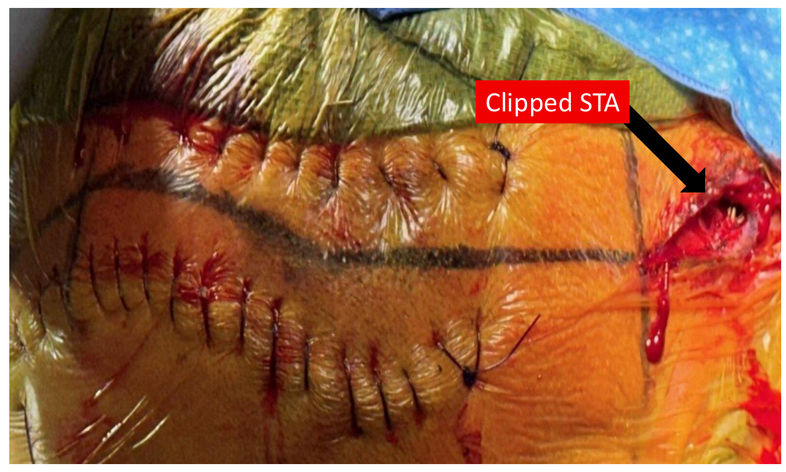


Figure 2. *Artist rendition and image of sutures run alongside incision and clipped STAs.*

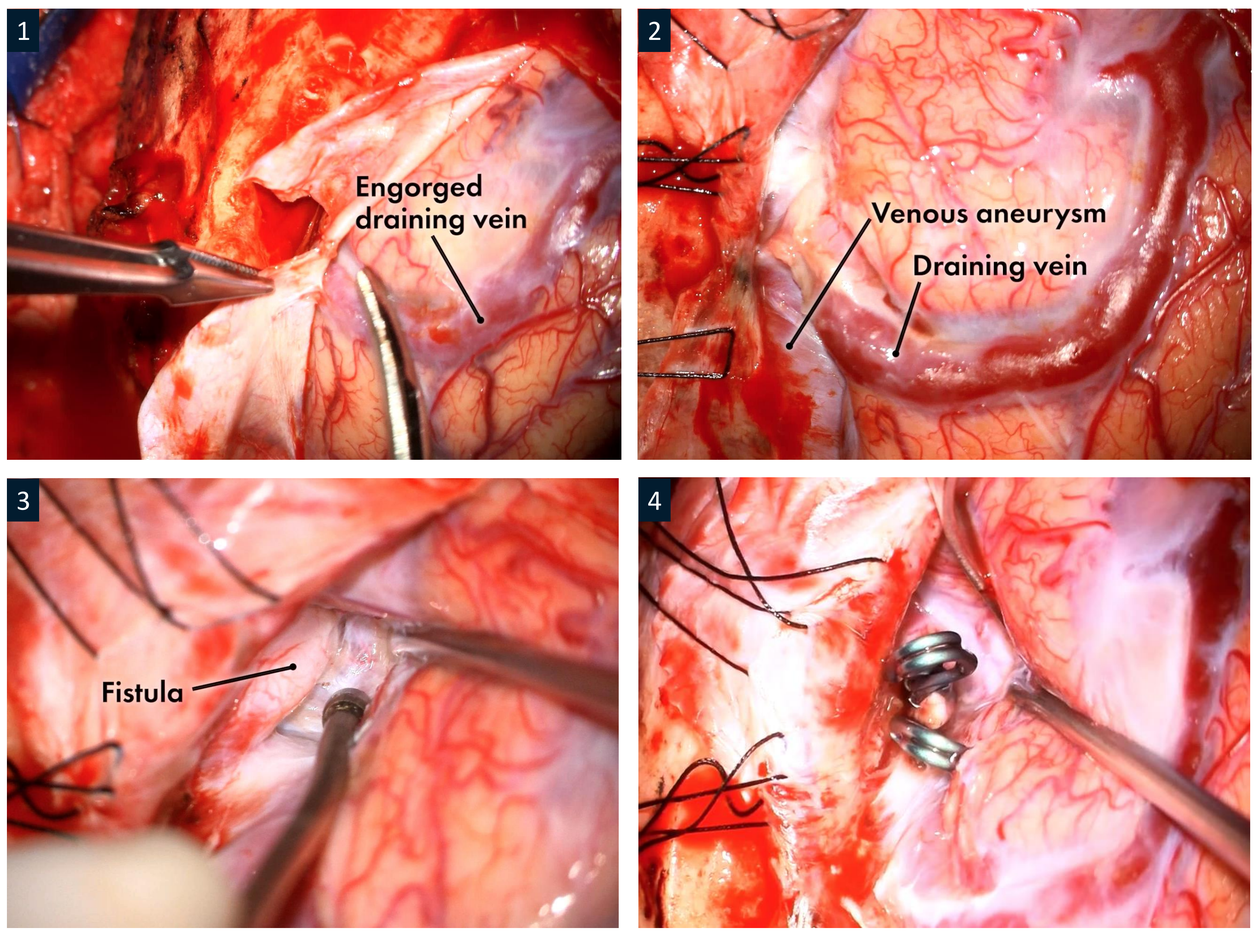


Figure 3. *Draining vein (1), venous aneurysm (2), and dural AVF (3) identification, and final clipping of dAFV (4).*

Patient Outcomes

- Post-operative angiogram and CT showed no opacification of the venous varix post ligation.
- Significant reduction in arterial feeder and central vein calibers was observed.
- The patient recovered well with no recurrence of seizures and remains neurologically intact.

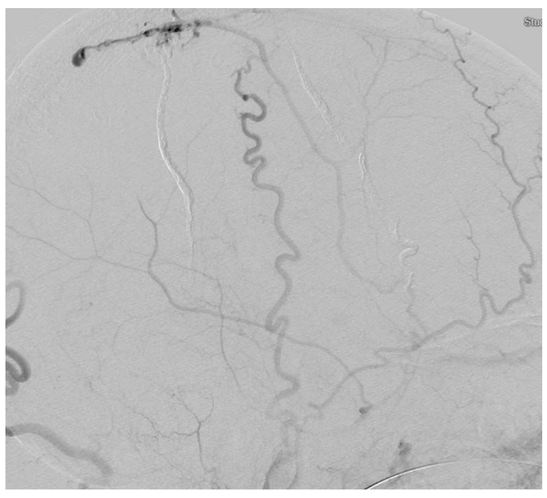


Figure 4. *Post-operative angiogram*

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