Arteriovenous Malformation Causing Anterior Skull Base Erosion

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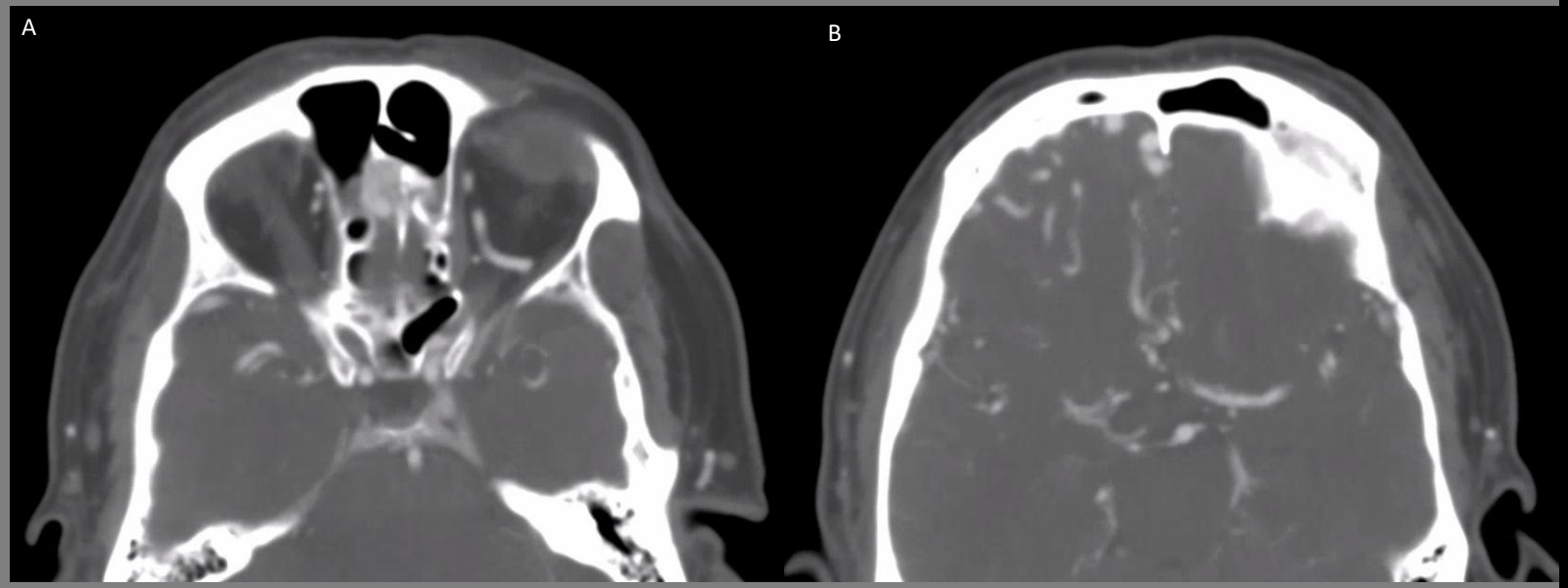
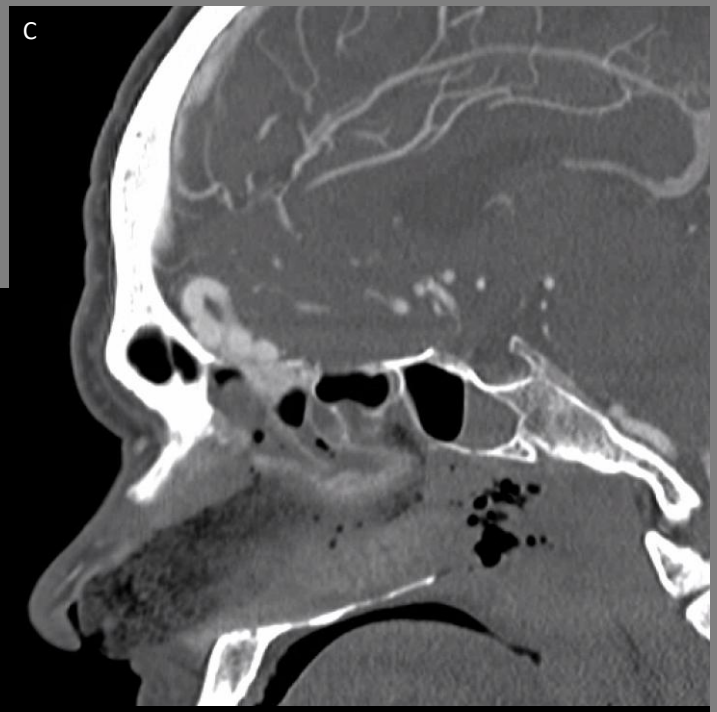
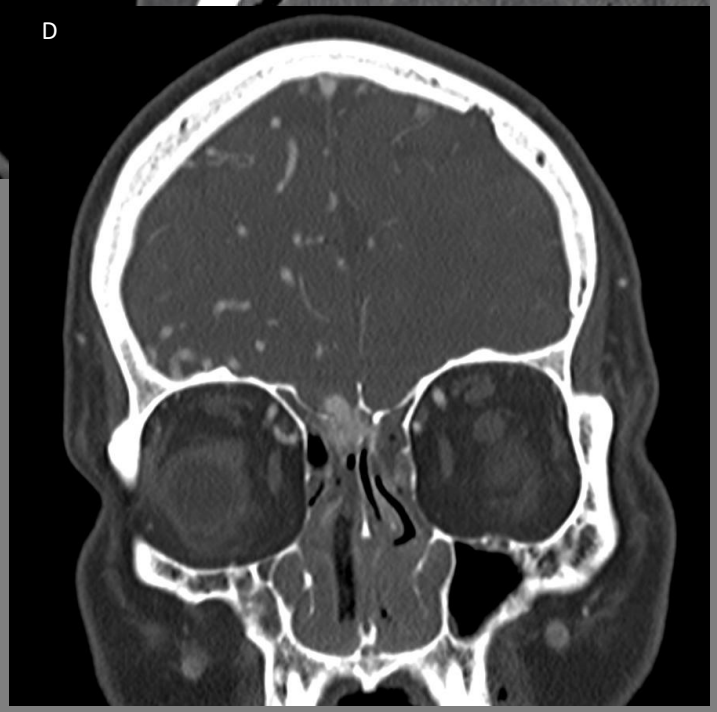
Clinical Presentation

- 57-year-old male with history of hyperlipidemia (HLD)
- Presented to ED with right-sided, high-volume epistaxis and associated hemoptysis.
- **Symptoms:**
  - No vision changes
  - Epiphora
- **Relevant Patient History:**
  - No daily medications or blood thinners
  - No history of epistaxis
  - No recent trauma or sinonasal surgery

Imaging





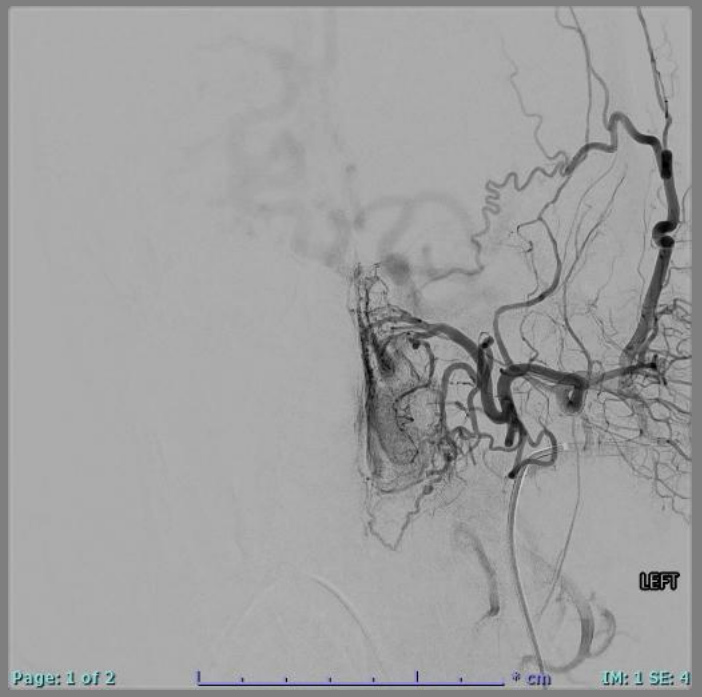


CT angiogram of the head and neck. (A) Axial ST image at the level of the anterior skull base demonstrates tortuous arterial feeders occupying the the right olfactory cleft. At this level, an enlarged left ophthalmic artery is also evident, which on DSA was shown to provide supply the dural AV fistula. (B) Additional axial ST image showing numerous enlarged draining veins along the right frontal lobe, which coalesce to form a single cortical vein that empties into the superior sagittal sinus. Sagittal (C) and coronal (D) bone kernel reformats reveal erosion of the right cribriform plate by the dural AVF. Packing within the right nasal cavity alone was ineffective in controlling the high-volume epistaxis with which the patient presented.

Imaging

DSA. Right ICA injection lateral projection (A) again reveals an enlarged ophthalmic artery giving rise to tortuous arterial feeders and a large draining vein emptying into the superior sagittal sinus. Right ECA injection AP (B) and lateral (C) projections reveal numerous arterial feeds for the anterior skull base dAVF. These are seen arising from the right sphenopalatine artery, right anterior ethmoidal artery, and right middle meningeal artery.

Imaging

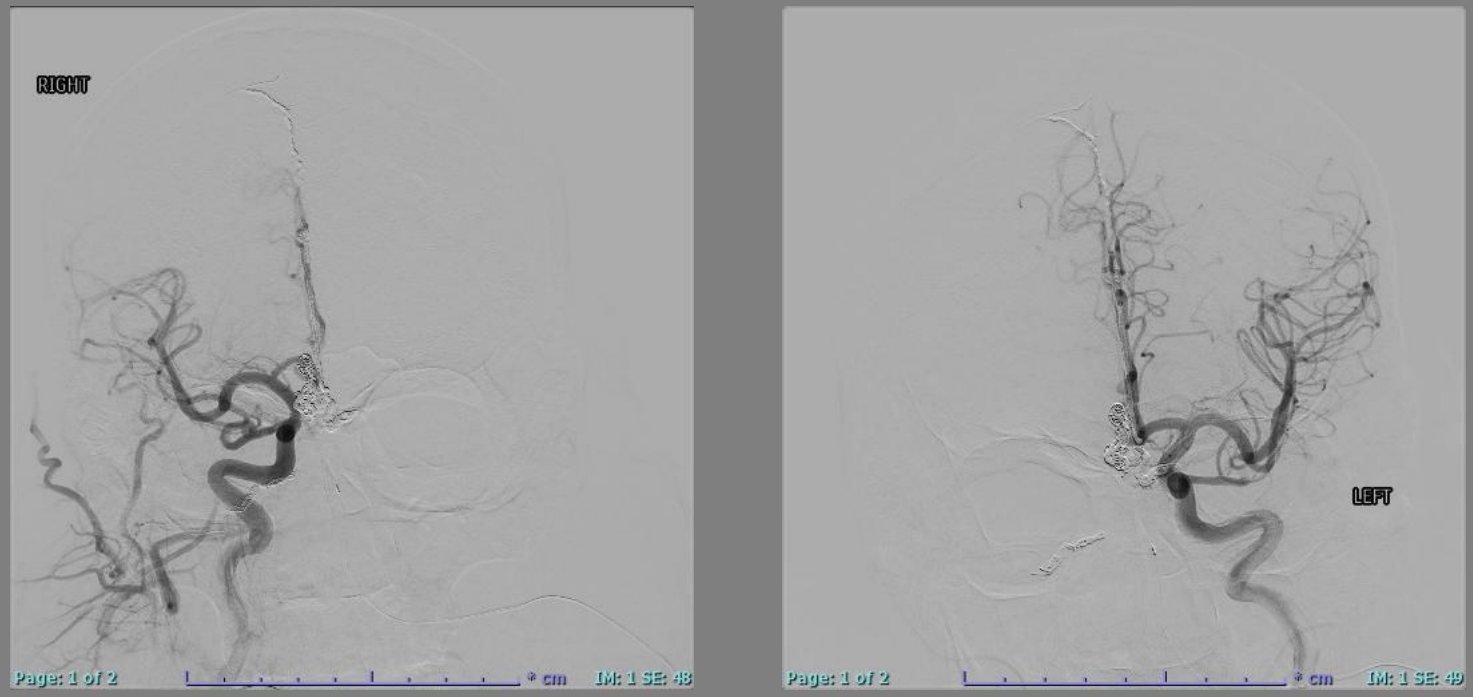


DSA. Left ICA injection AP (A) and lateral (B) similarly reveal an enlarged ophthalmic artery giving rise to tortuous arterial feeders and a large draining vein emptying into the superior sagittal sinus. Left ECA injection AP (C) projection reveal numerous arterial feeds for the anterior skull base dAVF. These are also seen arising from the left sphenopalatine artery, left anterior ethmoidal artery, and left middle meningeal artery.

Management

- Digital subtraction angiography confirmed arteriovenous malformation
- Interventions:
  - Coil embolization of right sphenopalatine artery
  - Onyx embolization of right middle meningeal artery
  - Transvenous coiling of point of fistulization
  - Confirmation run post-procedure demonstrated obliteration of anterior skull base arteriovenous fistula

Imaging



DSA. After super-selective transarterial and transvenous embolization, no residual opacification of the dural AV fistula is seen on AP projections with right CCA and left ICA injections.

Outcome

- No visual disturbances or recurrence of epistaxis reported post arteriovenous fistula obliteration
- No evidence of CSF leak on endoscopy
- Patient remains clinically stable

Take Home Points

- Dural arteriovenous fistulas (dAVFs) are abnormal shunts between dural venous sinuses and meningeal arteries.
- Most found in adults and typically acquired (i.e. not congenital)
- Presentation related to location of nidus and venous drainage
  - Posterior fossa: tinnitus, bruit
  - Cavernous sinus: proptosis, chemosis, retro-orbital pain
- Lesion was a very unexpected and atypical cause for epistaxis.
- Imaging modalities for investigation include CT/CTA, MR/MRA and digital subtraction angiography
  - All were performed in this case along with maxillofacial CT to evaluate the integrity of the anterior SB

Dural AV Fistula Classification

Cognard

- Grade 1: within sinus wall, normal antegrade venous drainage
- Grade 2A: within sinus with reflux into sinus but no cortical veins
- Grade 2B: retrograde drainage to cortical veins
- Grade 3: Direct cortical venous drainage, no venous ectasia
- Grade 4: Direct venous cortical drainage and venous ectasia
- Grade 5 (spine): spinal perimedullary venous drainage

Borden

- Type I: dural arterial supply with antegrade venous sinus drainage
  - Ia: Simple dAVF with single meningeal arterial supply
  - Ib: Complex dAVF with multiple meningeal arterial supply
- Type II: dural arterial supply with cortical venous reflux
- Type III: dural arterial supply with drainage into cortical veins

Take Home Points

- Unusual case due to large bilateral arterial feeders (ECA & ICA branches) draining into superior sagittal sinus via an enlarged frontal cortical vein; Cognard 2B, Borden II.
- Erosion of the anterior skull base can occur in many cases, but rarely due to large vascular malformations as presented here.
- Neuroradiologists play a crucial role in the diagnosis, treatment planning, and long-term surveillance of dAVFs.
- MRI & CT imaging enable noninvasive mapping of dAVF supply/drainage thus guiding catheter angiography.

References

1. Gandhi D et al: Intracranial dural arteriovenous fistulas: classification, imaging findings, and treatment. AJNR Am J Neuroradiol. 33(6):1007-13, 2012
2. Reynolds MR et al: Intracranial dural arteriovenous fistulae. Stroke. 48(5):1424-1431, 2017.