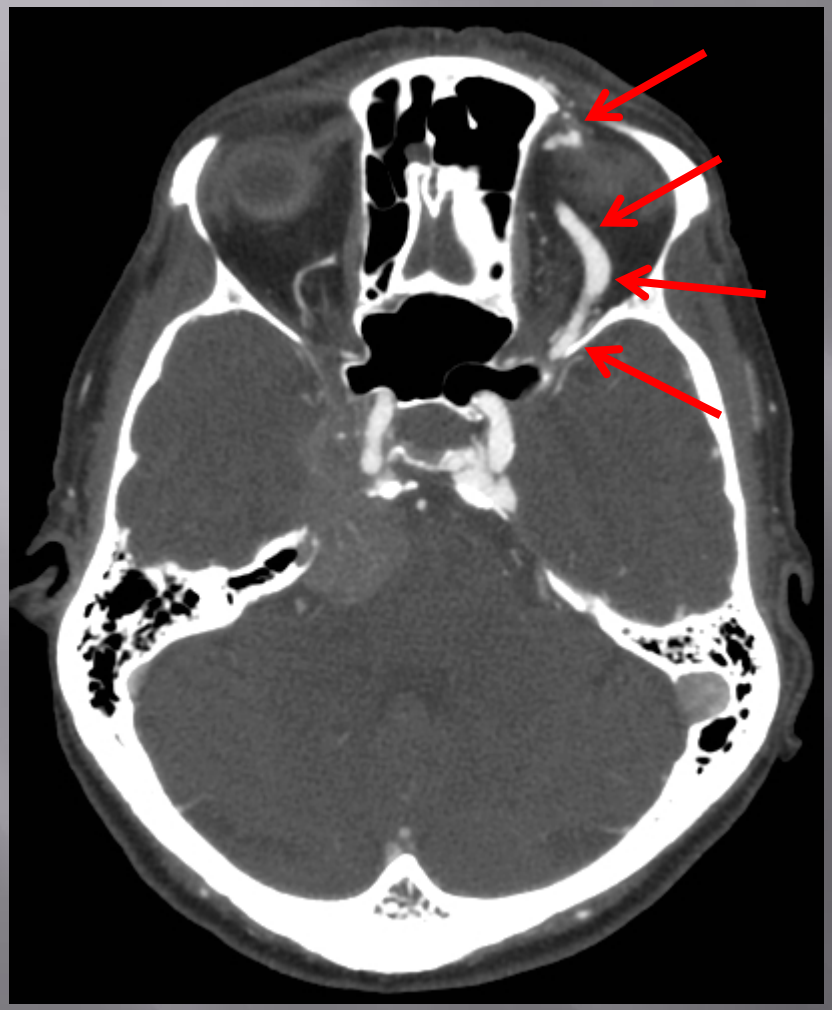
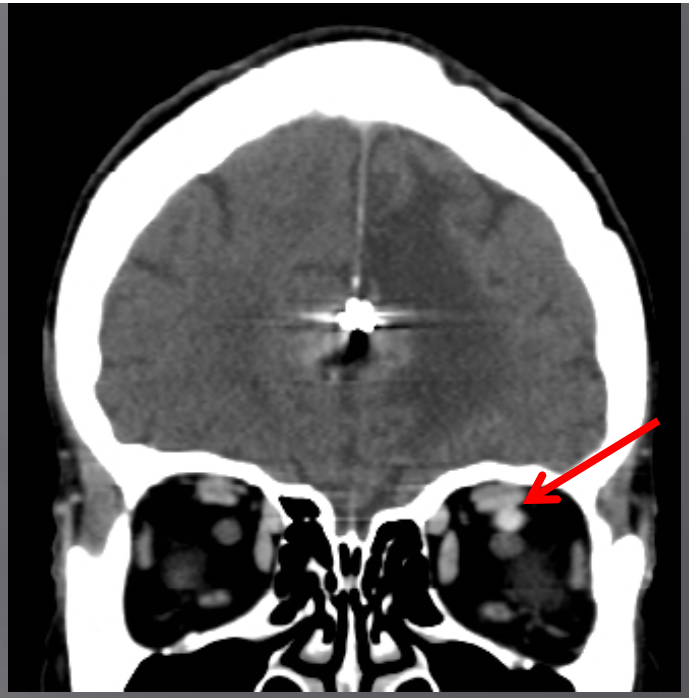
CASE OF THE DAY
FEBRUARY 2015

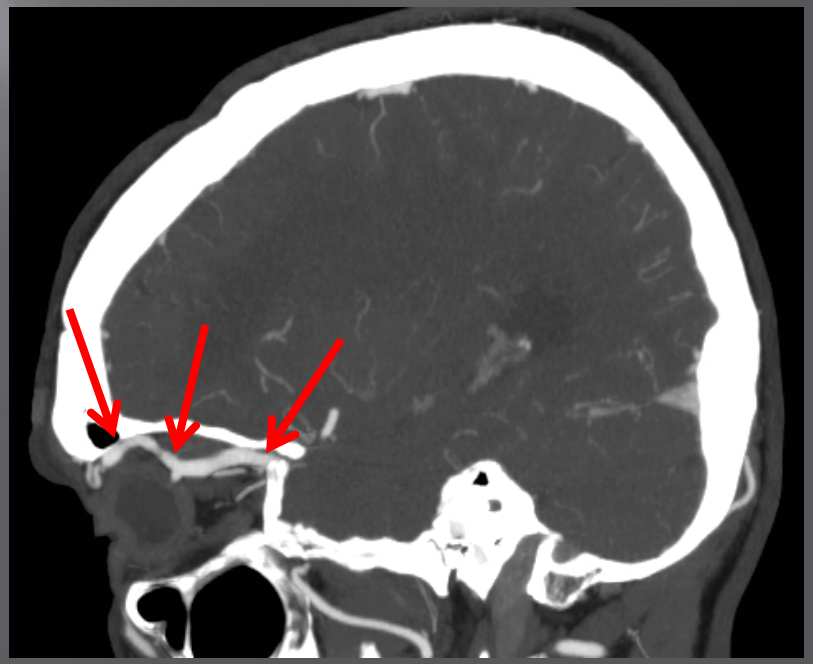
Case Courtesy of Drs. Mollie Ferris, Rene van Dijk, Garnette Sutherland and Muneer Eesa

- 67 year old female presented with tinnitus of 2 months & diplopia of 2 weeks duration
- Physical examination revealed left chemosis, proptosis, orbital pain & ophthalmoplegia
- PMHx: aneurysm rupture with prior surgical clipping of the ACA aneurysm in 1992

CTA







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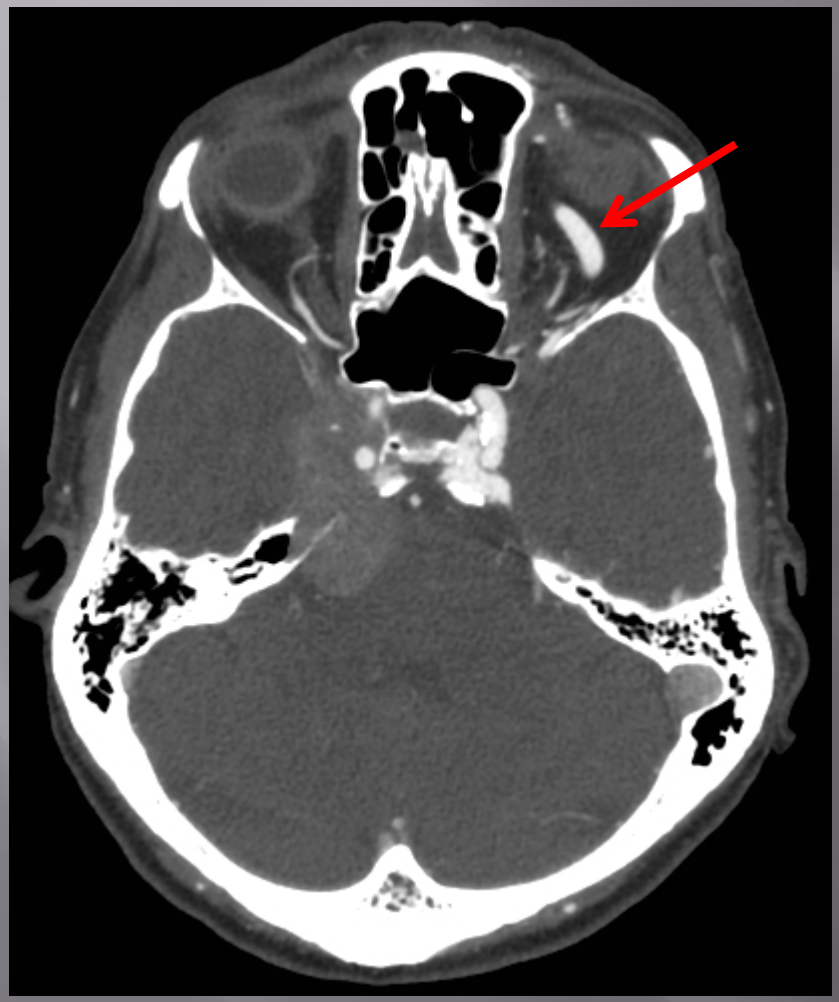

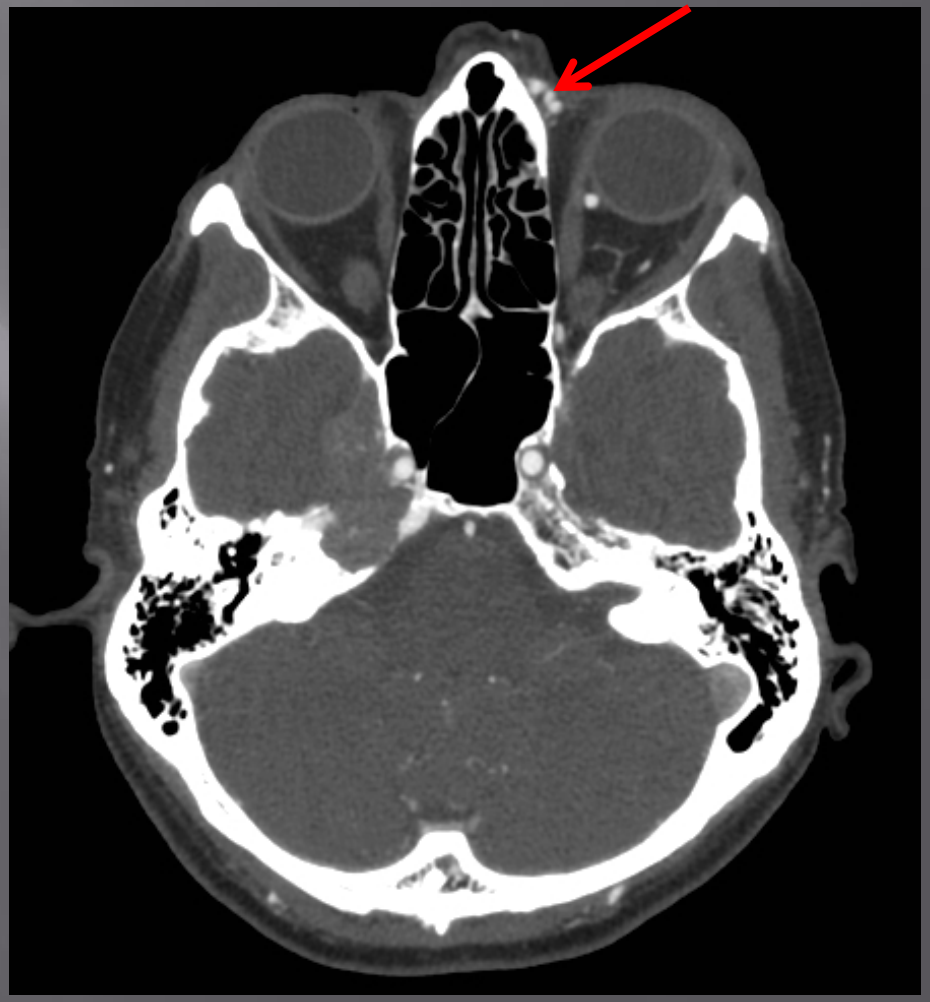

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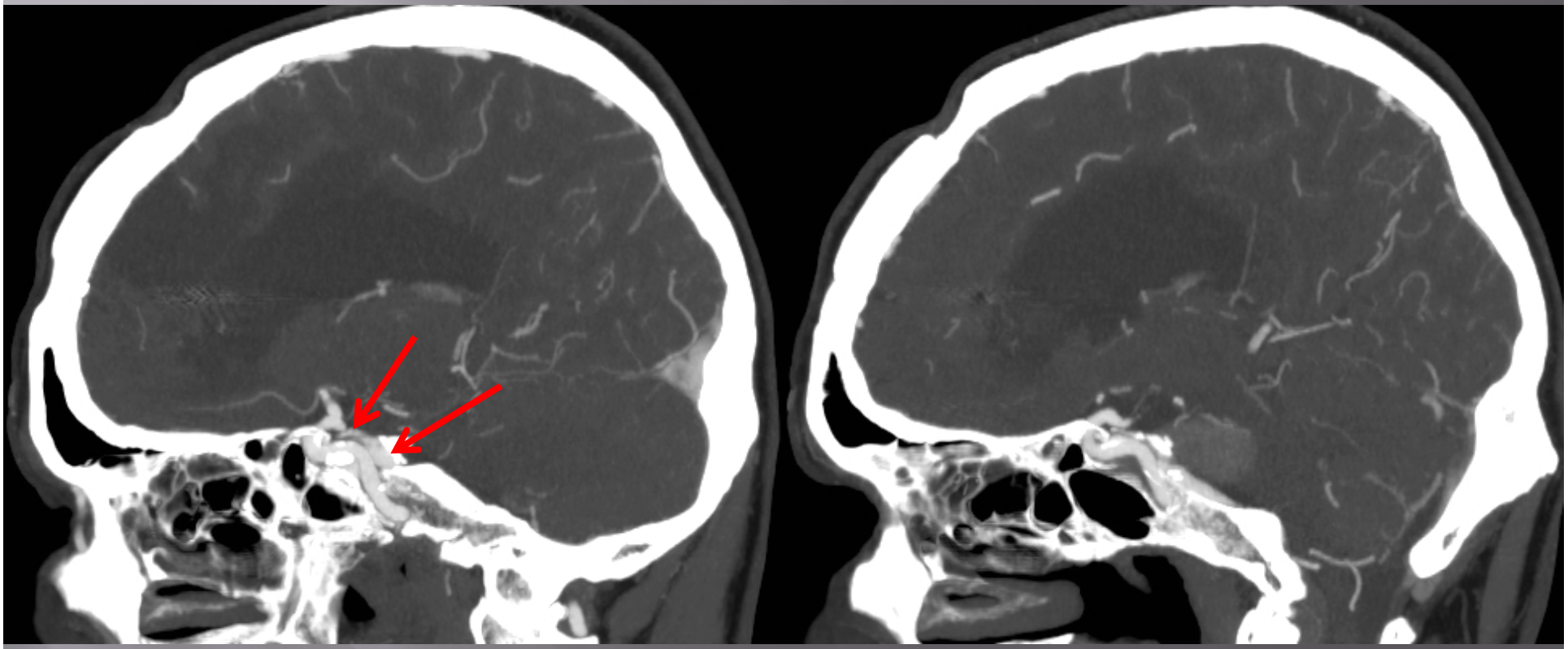


Left ICA / Cavernous Sinus

Right ICA / Cavernous Sinus

Early filling of the left cavernous sinus in the arterial phase of enhancement

3D Time-Resolved Imaging of Contrast Kinetics Angiography (TRICKS)

CT Angiography / MR TRICKS

- Arterial phase enhancement, distension and arterialized engorgement of the left superior ophthalmic vein, highly suggestive of a left sided carotid-cavernous fistula
- Incidental right cavernous sinus meningioma

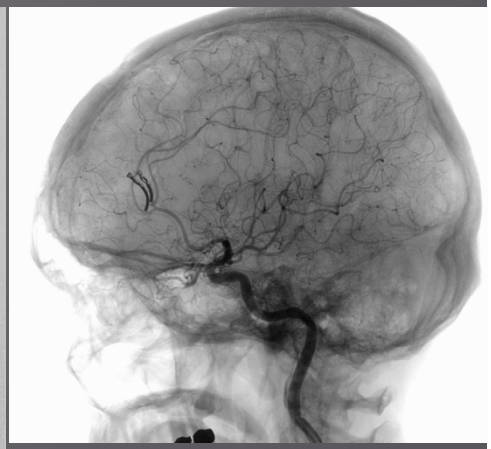
Digital Subtraction Angiography

- Right femoral artery puncture, 5F Sheath, 5F Headhunter 1 (H1) Catheter over a Terumo guidewire

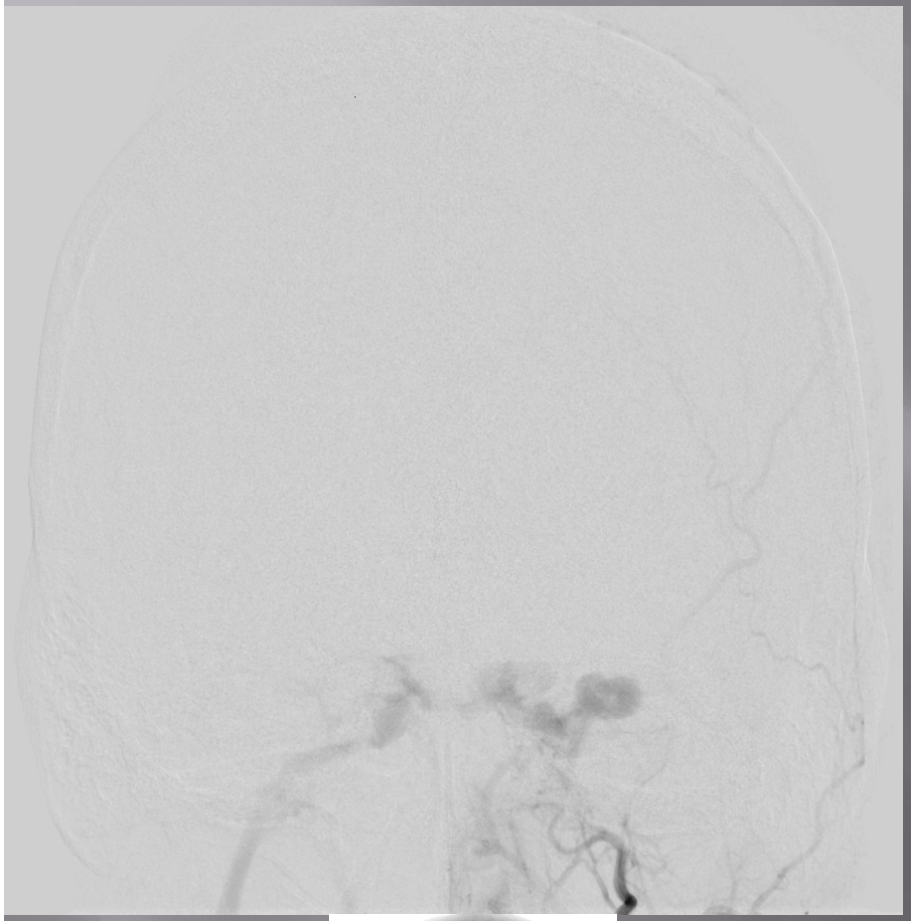
- Cerebral angiography from right ICA, right ECA, left ICA, left ECA and left vertebral artery was then performed for diagnostic and treatment planning purposes

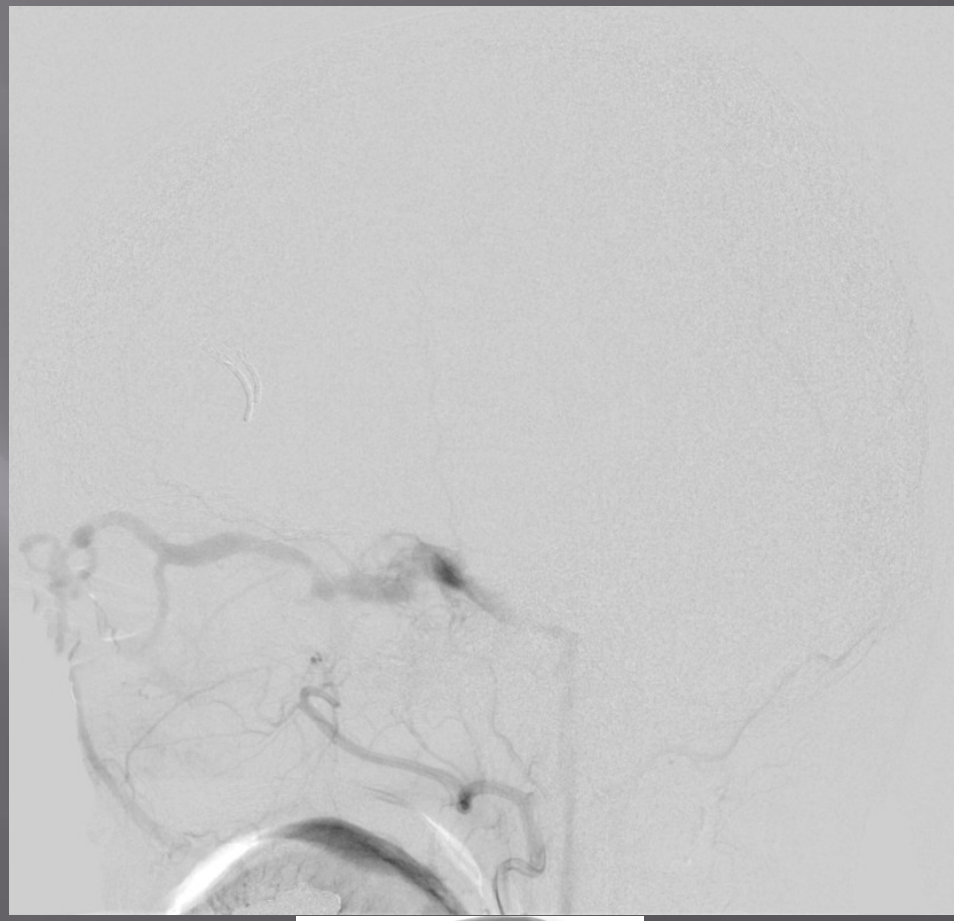
ICA Angiography - Oblique

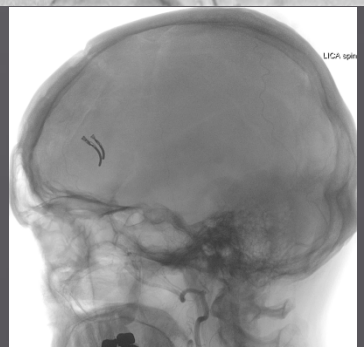
Left ICA Angiography - Lateral



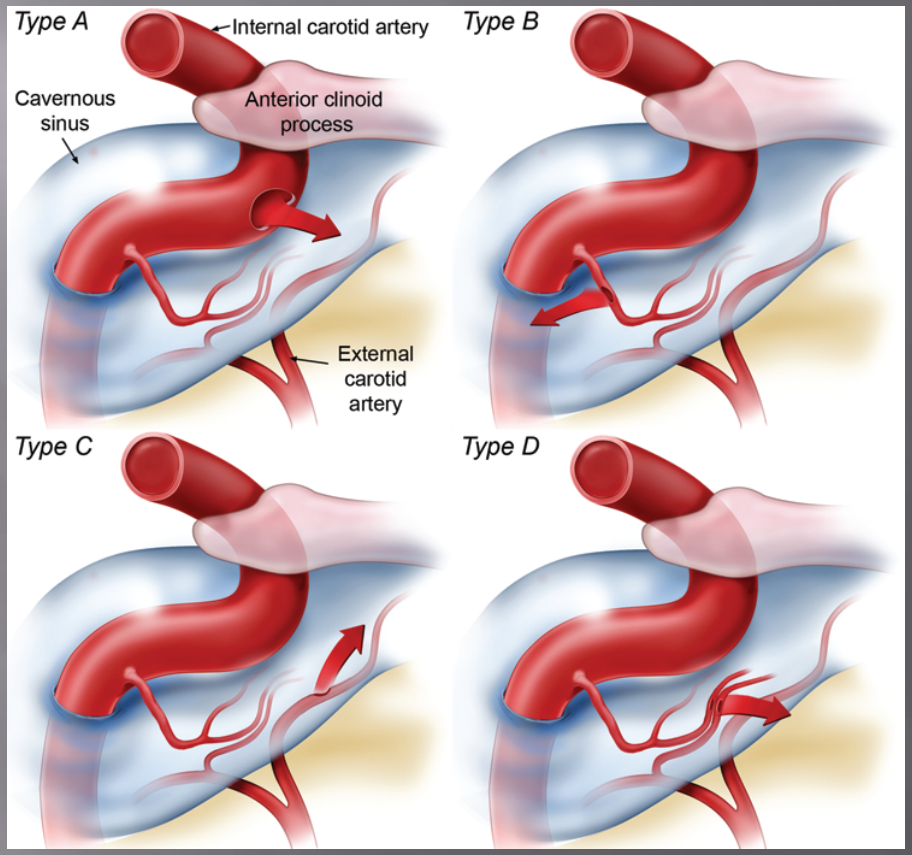
Left ECA – AP & Lateral







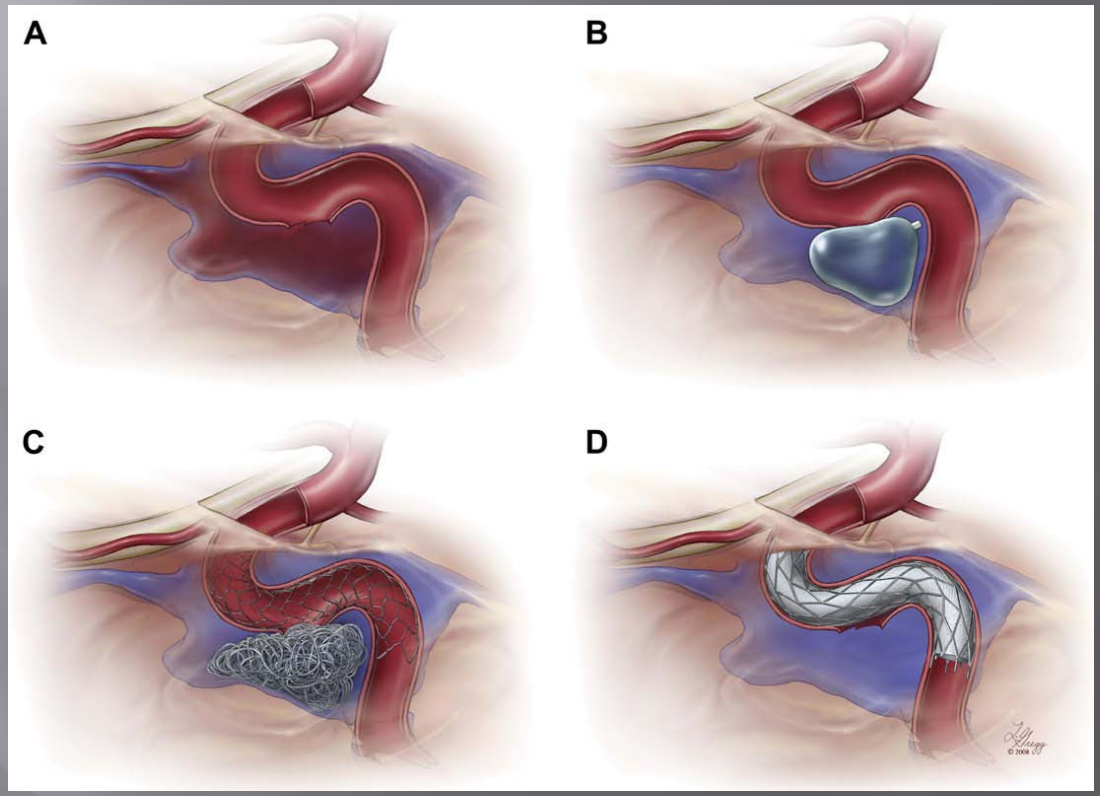
Barrow Type D Left Carotid Cavernous Fistula



Barrow D: supplied by dural branches of bilateral internal and left external carotid arteries. Venous drainage mainly by left superior ophthalmic vein.

Ellis JA et al. Neurosurg Focus, 2012

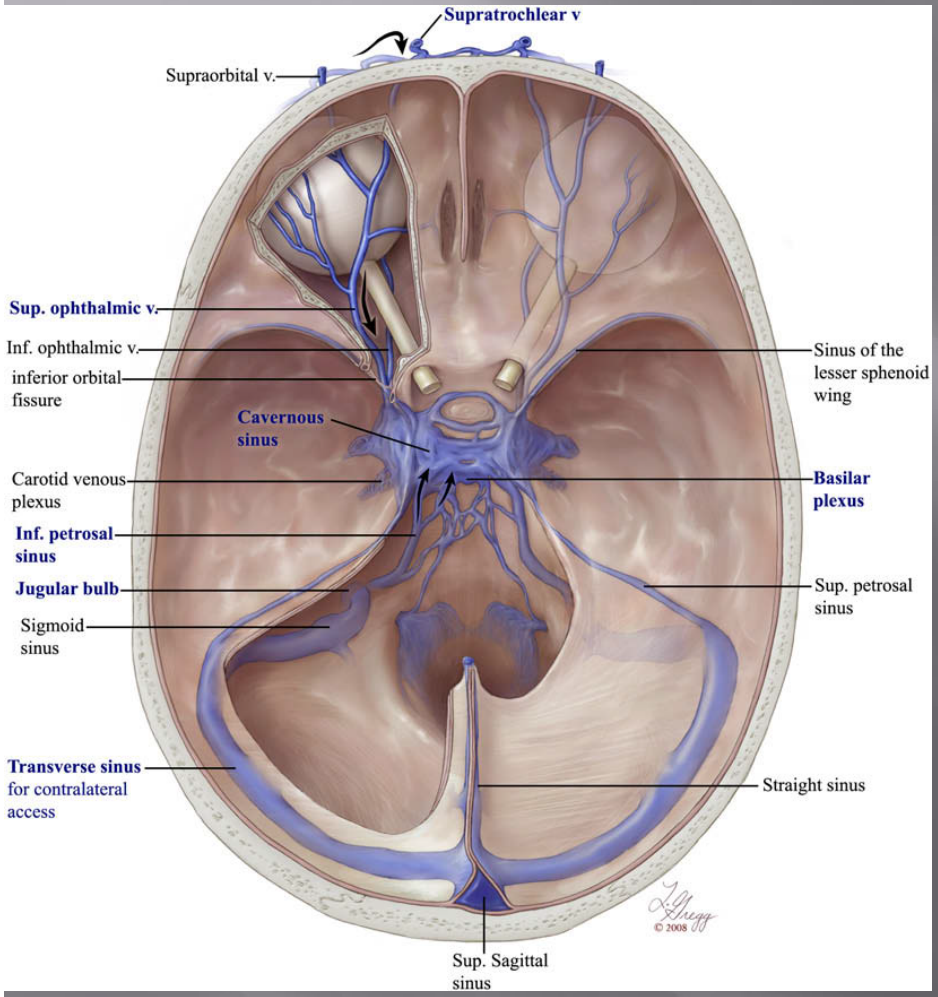
Carotid Cavernous Fistula – Endovascular Treatment



In rare cases the ICA must be sacrificed.
Complications include CVA, non-target embolization, worsening ophthalmoplegia and superior orbital nerve injury.

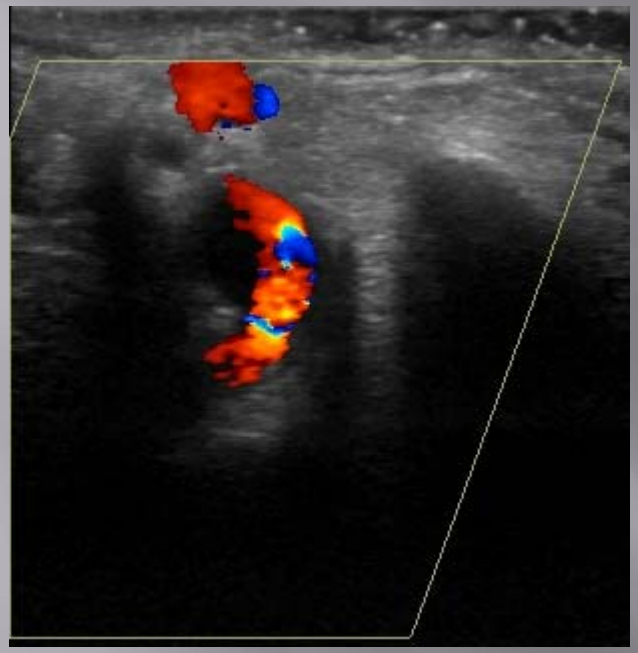
Gemmete JJ et al. Neuroimag Clin N Am, 2009

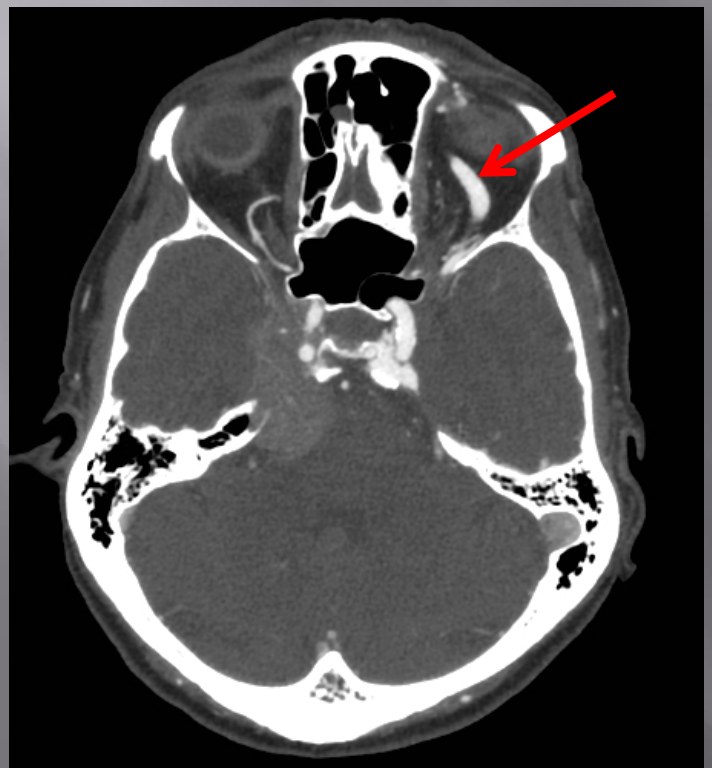
Possible Access Routes



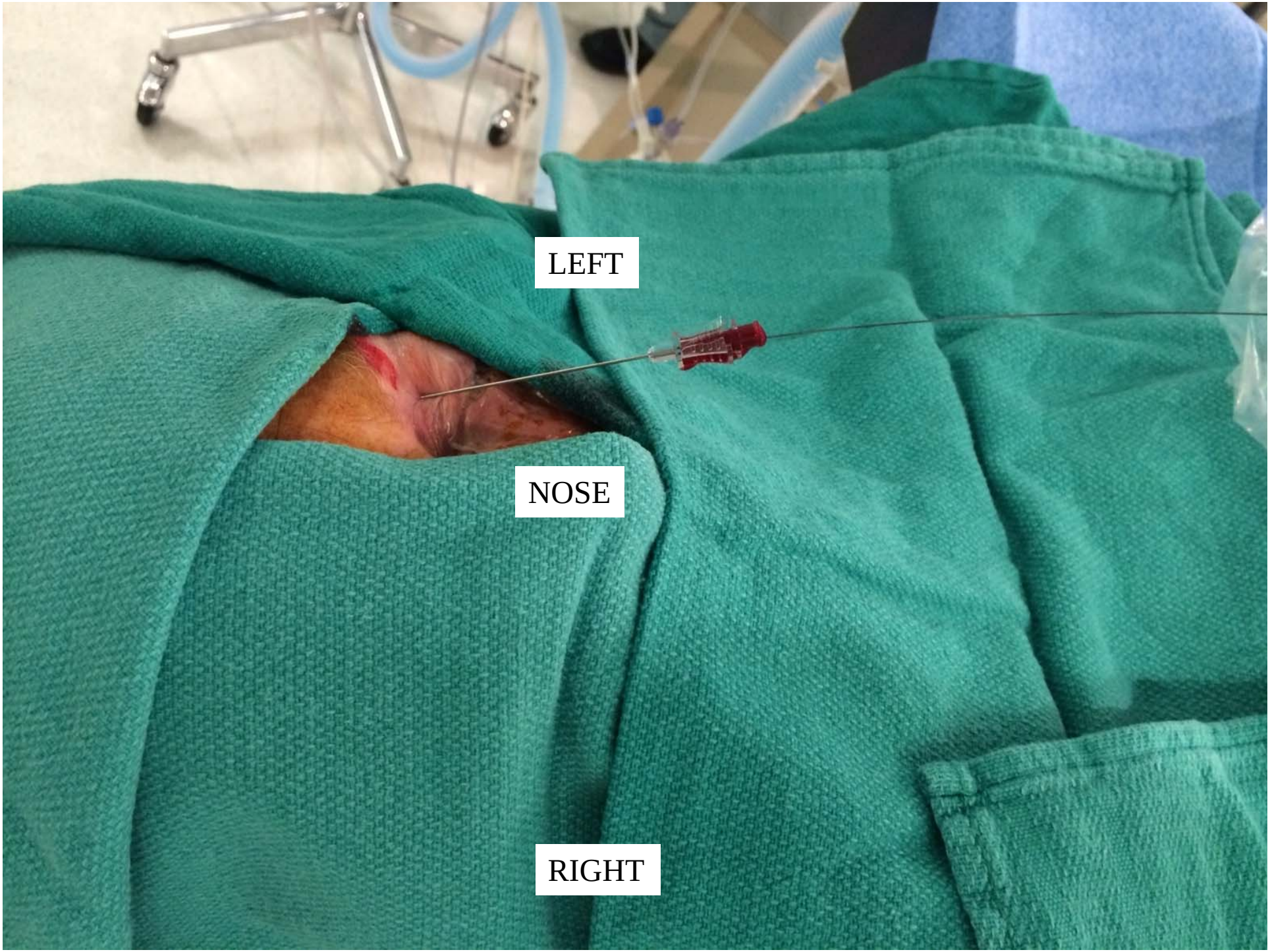
- Transvenous: preferred method for indirect CCF
  - Most often posterior venous approach through ipsilateral or contralateral internal jugular vein & into the inferior petrosal sinus
  - If inferior petrosal sinus occluded or absent, can access via pterygoid venous plexus, superior petrosal sinus, cortical veins, ipsilateral cavernous sinus, superior or inferior ophthalmic vein
- Transarterial approach
- Occasionally require a combination of surgical & endovascular access

Klisch J et al. Neurosurgery, 2003
Gemmete JJ et al. Neuroimag Clin N Am, 2009

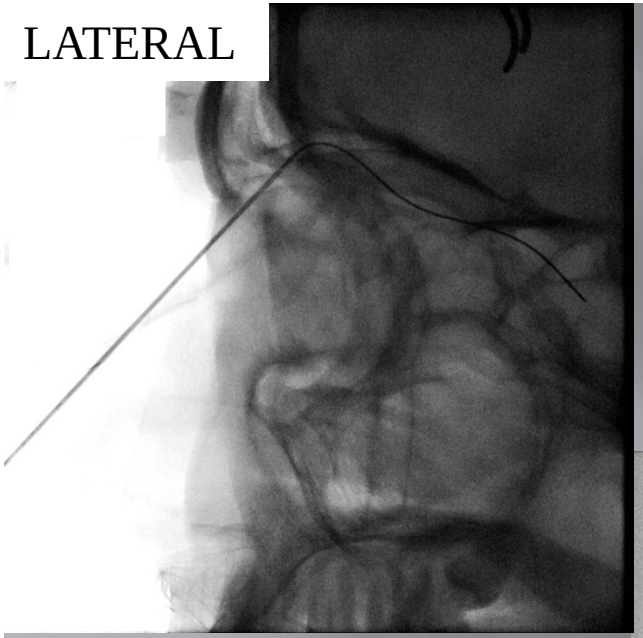


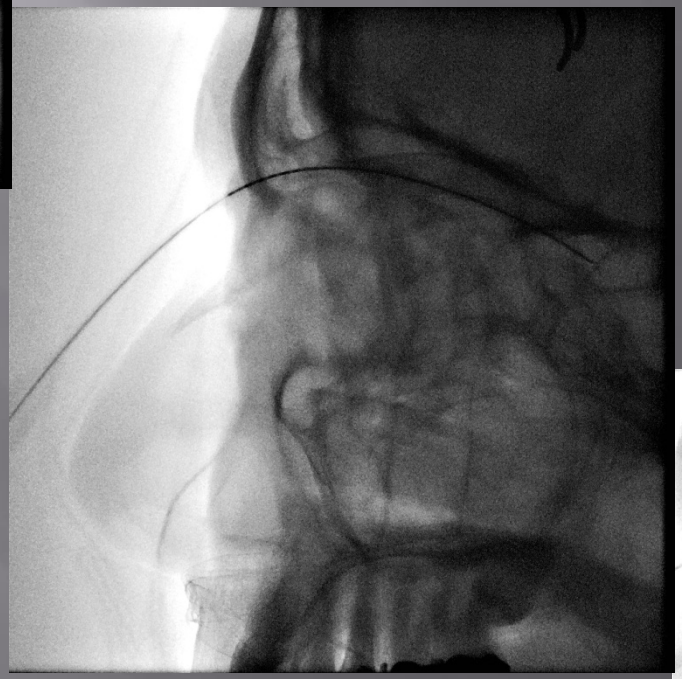


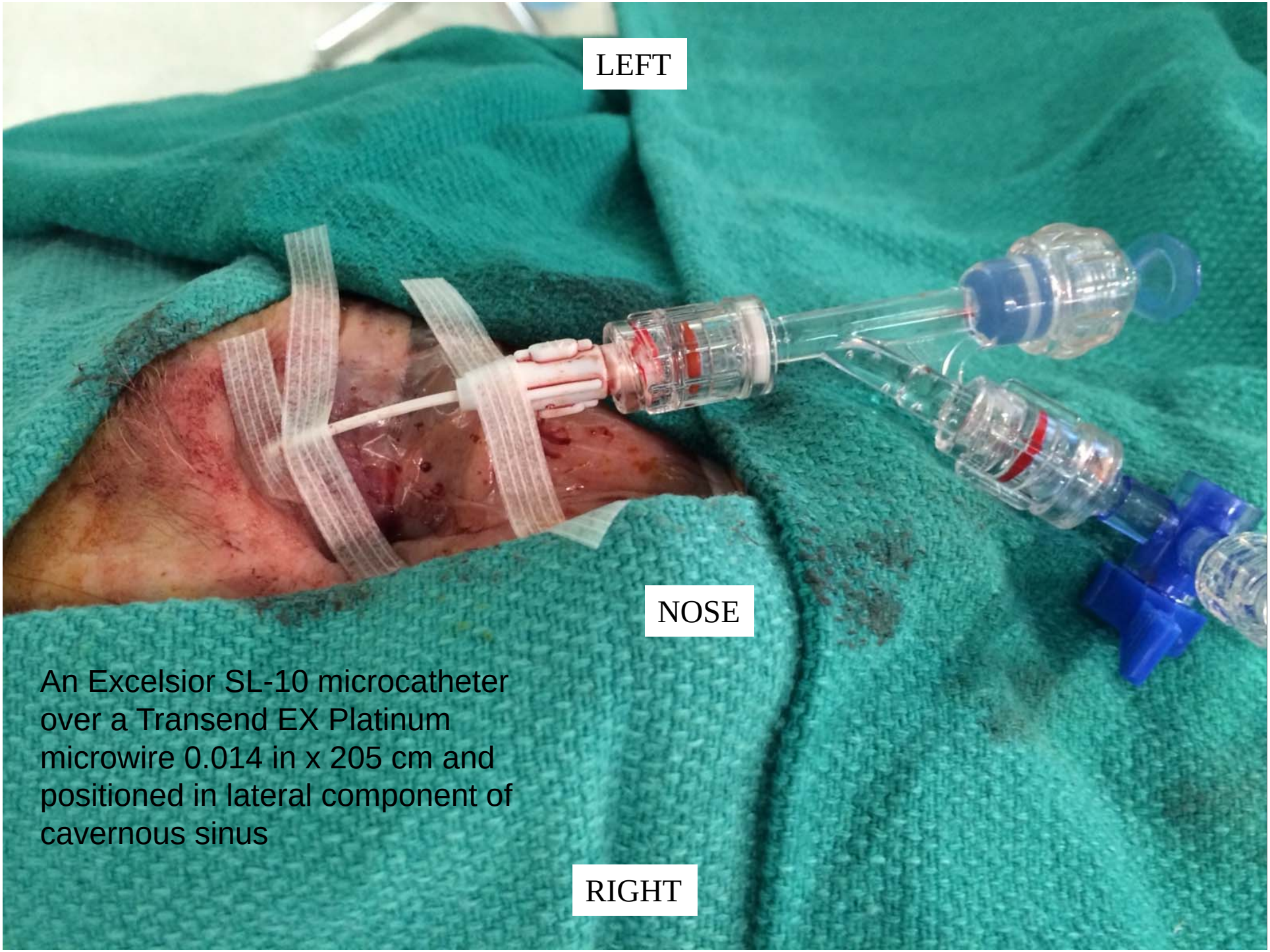
- Next day, under GA, left femoral artery puncture, 4F sheath introduced, 4F Glidecath over a Terumo glidewire to left ICA
- US guided puncture of the enlarged left superior ophthalmic vein using a Vaxcel Mini Stick micropuncture kit


LEFT
NOSE
RIGHT

LATERAL

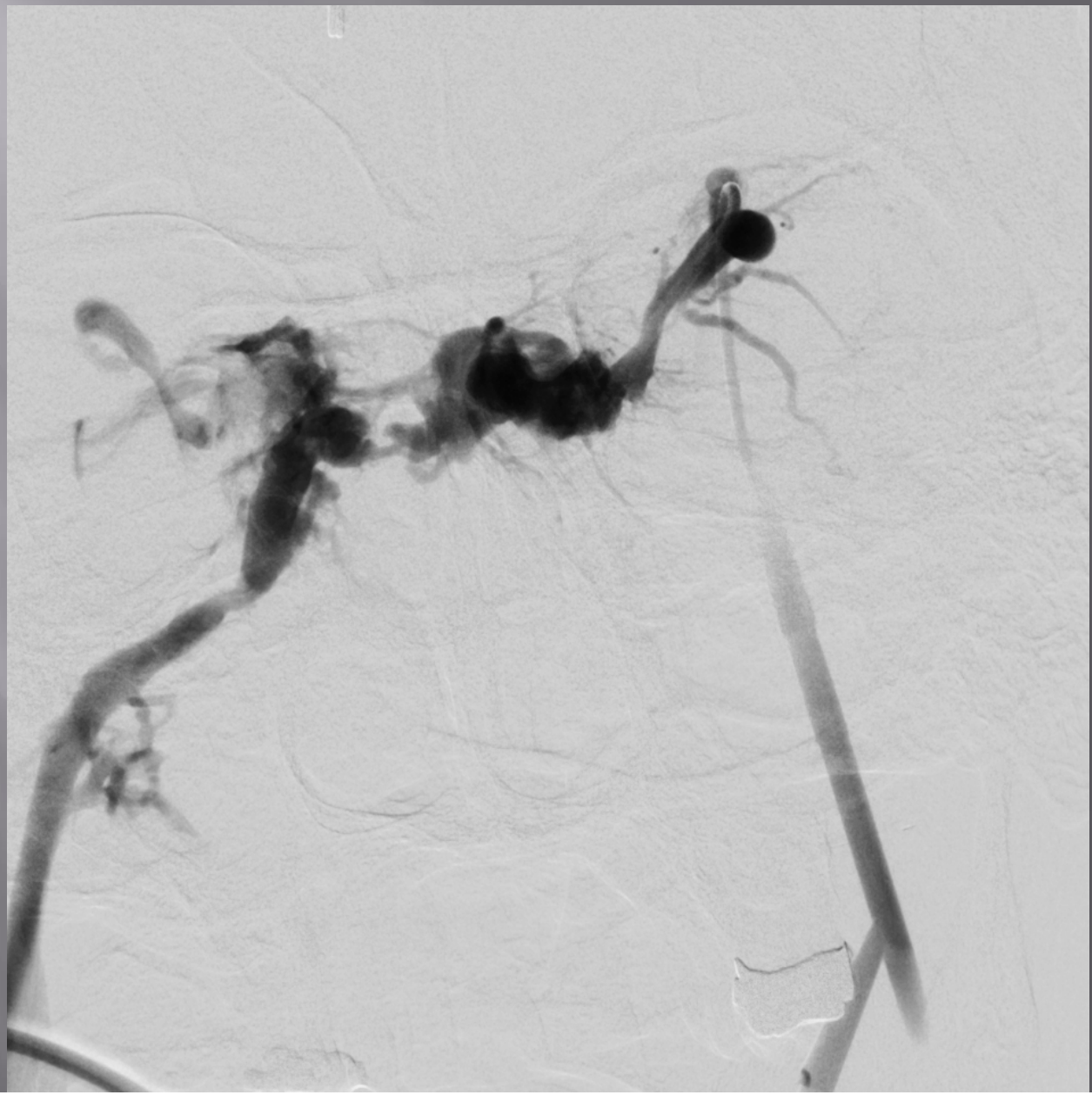




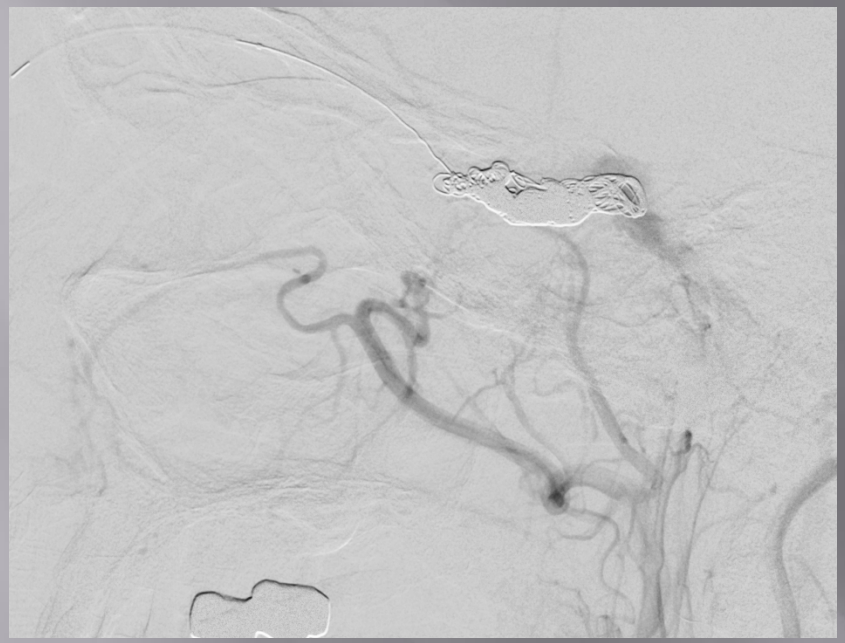


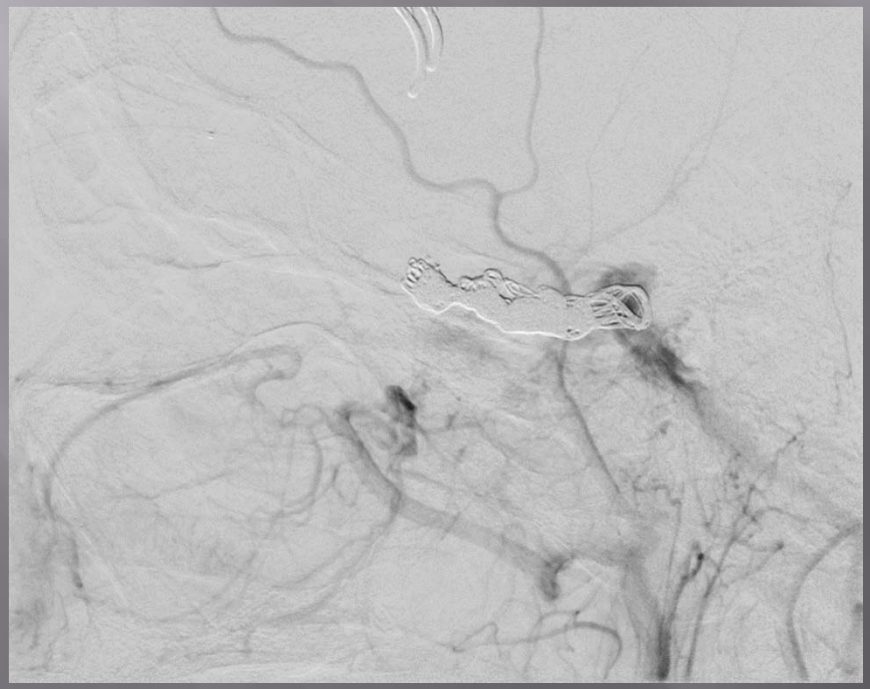
An Excelsior SL-10 microcatheter over a Transend EX Platinum microwire 0.014 in x 205 cm and positioned in lateral component of cavernous sinus

Superior Ophthalmic Venography - AP

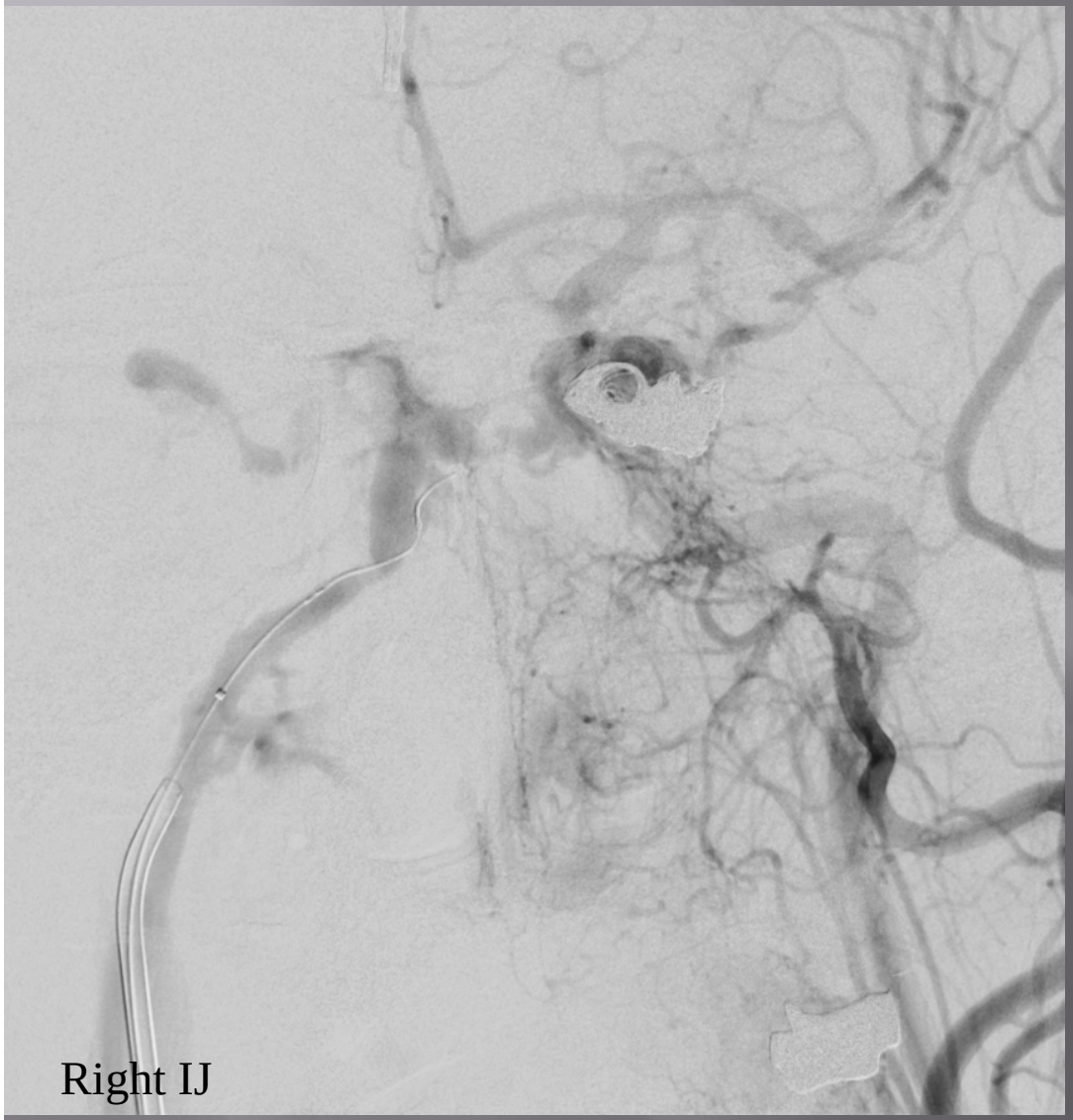


Superior Ophthalmic Venography - Lateral

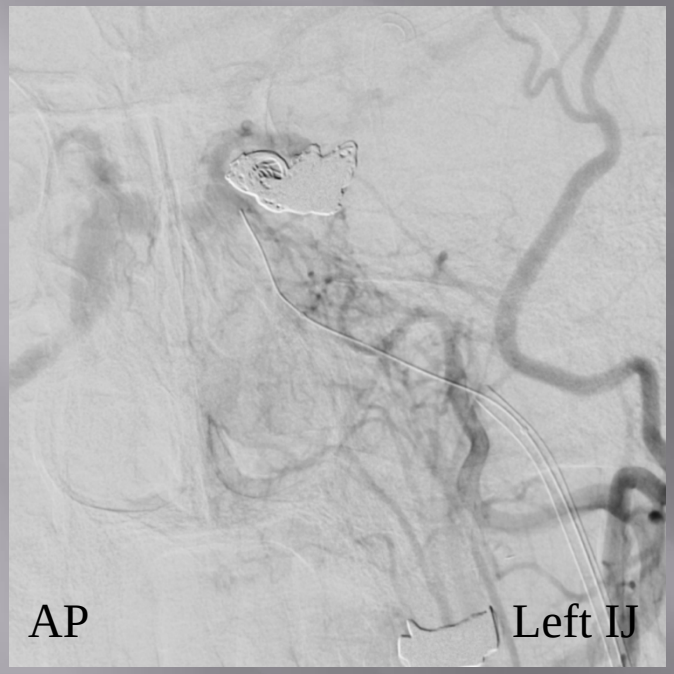


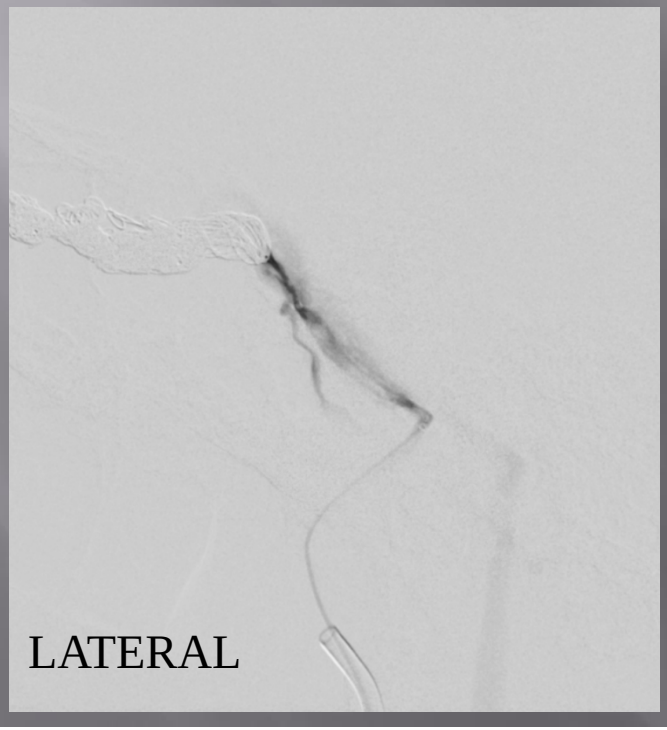


- Microcatheter positioned in lateral component of cavernous sinus
- 10 x Target 360 soft coils were deployed
- Angiogram showed superior ophthalmic vein separated from fistula



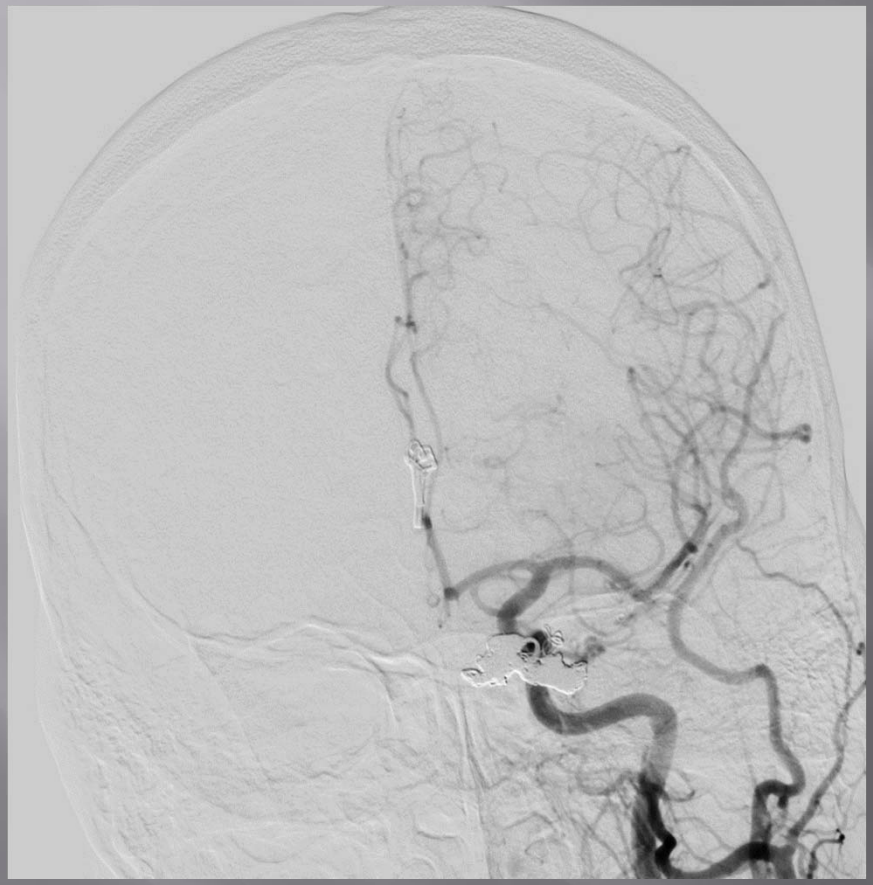
- Carotid cavernous fistula continued draining across midline to right cavernous sinus, inferior petrosal sinus and right superior ophthalmic vein
- Right femoral vein puncture and 6F sheath introduced, 6F Envoy catheter over Terumo guidewire to right internal jugular vein
- Excelsior SL 10 microcatheter over Transend microwire through right inferior petrosal sinus into right cavernous sinus but could not cross midline to left cavernous sinus

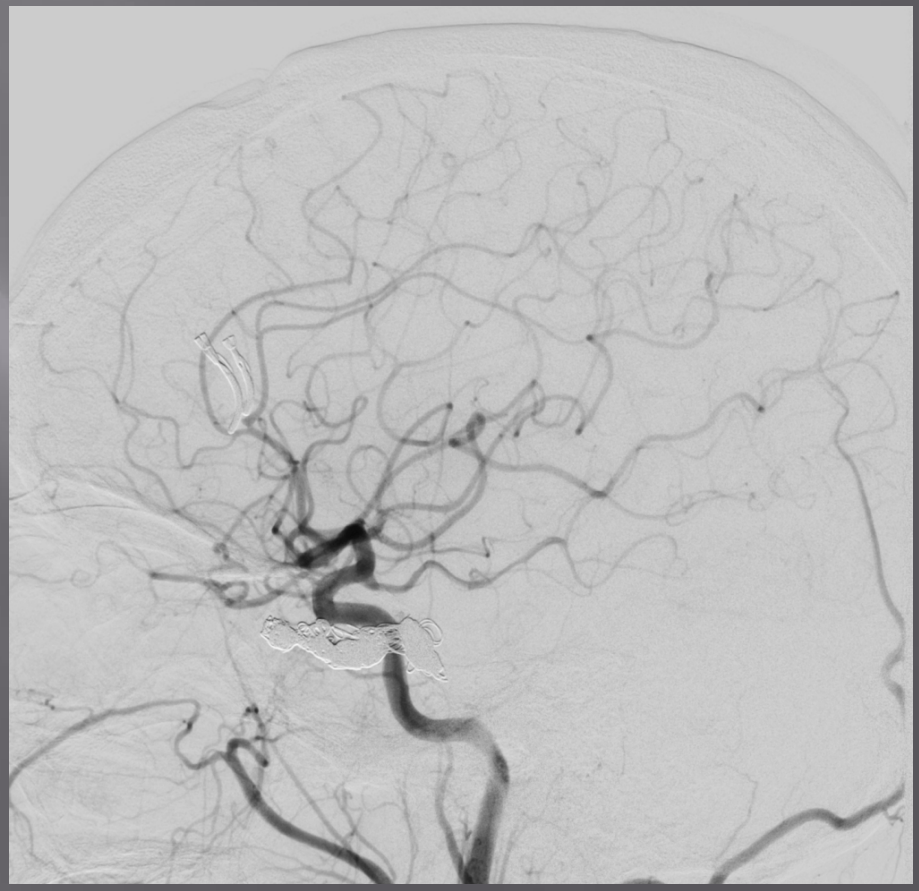




- Envoy catheter repositioned into the left internal jugular vein, SL 10 microcatheter positioned in the left inferior petrosal sinus but could not advance to the left cavernous sinus
- Using an Excelsior 1018 microcatheter over a 90 degree 0.016 headliner microwire the left cavernous sinus was catheterized
- 6 coils were deployed in the medial and inferior left cavernous sinus

Successful Embolization LCCF





Patient was discharged home 2 days later in stable condition

Pre-Treatment

3 Months
Post-Treatment

Summary

- Carotid cavernous fistula is rare but can be sight-threatening & rarely life-threatening
- Complete cure rate for indirect carotid cavernous fistula: 70-90%
- Endovascular treatment is effective
- Multiple different access sites are possible & more than one may need to be considered to achieve treatment success

Barry RC et al. J Clin Neurosci, 2011

Gemmette JJ et al. J Neuro-Ophthalmol, 2009

References

- Ellis JA, Goldstein H, Connolly ES, Meyers PM. Carotid-cavernous fistulas. Neurosurg Focus. 2012; 32: E9, 1-11.
- Gemmette JJ, Ansari SA, Gandhi D. Endovascular treatment of carotid cavernous fistulas. Neuroimag Clin N Am. 2009; 19: 241-255.
- Klisch J, Huppertz HJ, Spetzger U, et al. Transvenous treatment of carotid cavernous and dural arteriovenous fistulae: Results for 31 patients and review of the literature. 2003; 53: 836-857.
- Gemmette JJ, Ansari SA, Gandhi DM. Endovascular techniques for treatment of carotid-cavernous fistula. J Neuro-Ophthalmol. 2009; 29: 62-71.
- Barry RC, Wilkinson M, Ahmed RM et al. Interventional treatment of carotid cavernous fistula. J Clin Neurosci. 2011; 18: 1072-9.