Direct Caroticocavernous Fistula After Head Trauma

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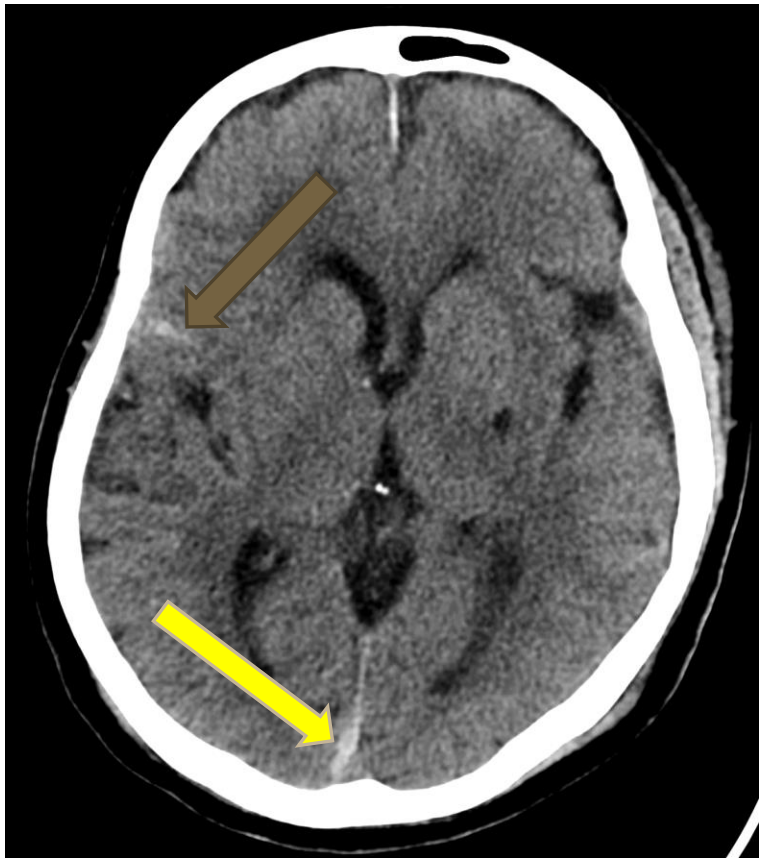
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Clinical Presentation

- 82 year old female with no relevant PMH presented to the ED four days after hitting her head on a pipe while gardening.
  - The patient developed headaches, right eye pain and swelling, nausea, and vomiting. Patient denied loss of consciousness.
- Physical examination demonstrated right eye ptosis, proptosis and erythema. Unilateral right cranial nerve III and IV palsies were identified.
- CT Head and CTA Head and Neck was ordered

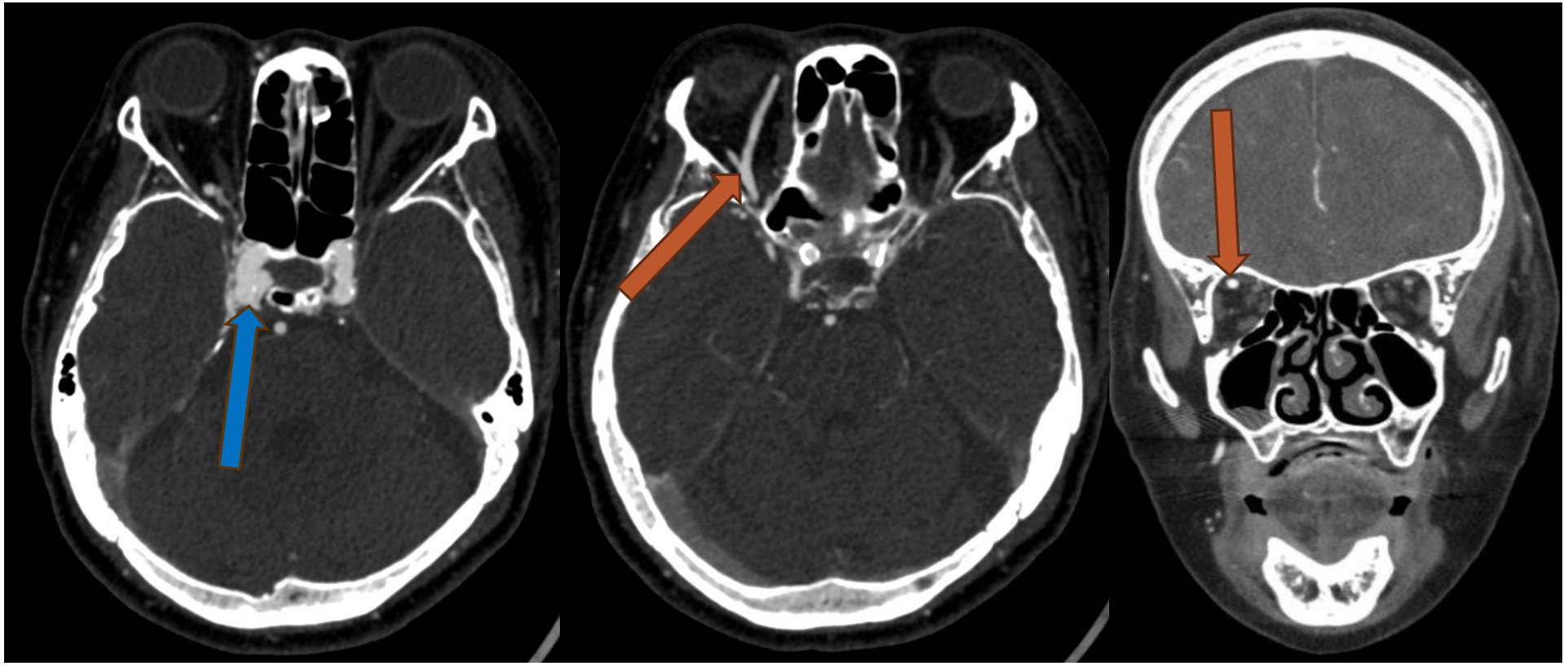
Imaging Discussion – Non-Contrast CT Head





Non-contrast CT Head demonstrates an epidural hematoma involving the left frontoparietal convexity, a right subdural hematoma along the posterior falx, and scattered right subarachnoid hemorrhage.

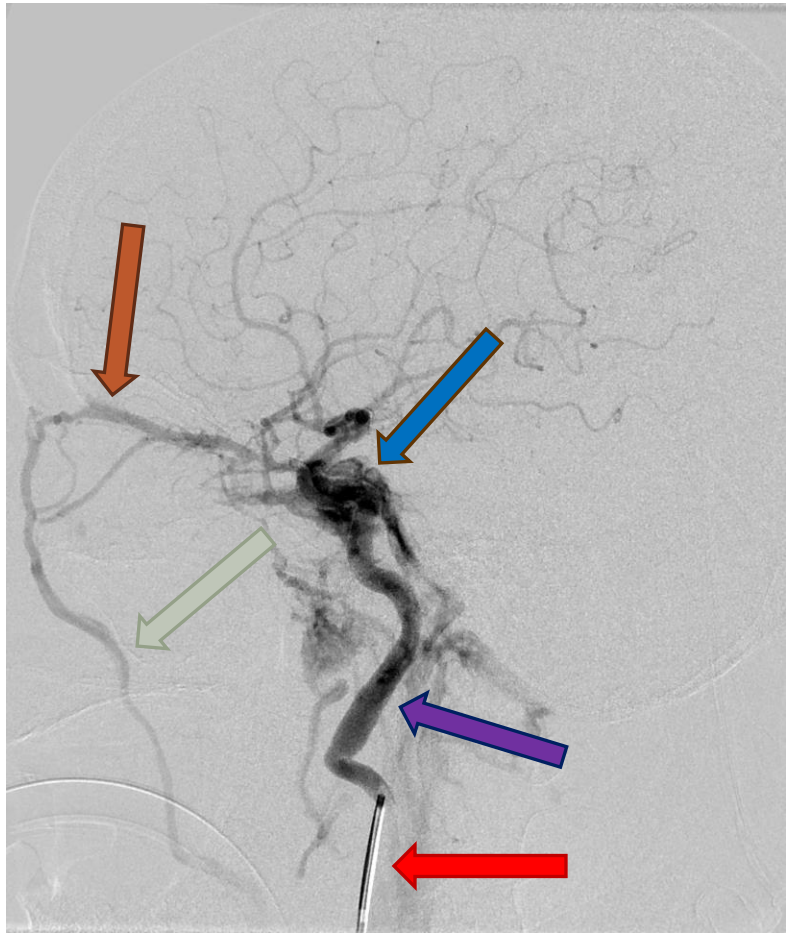
Imaging Discussion – CTA Head



CTA images through the skull base and orbit demonstrate prominent enhancement and asymmetric dilatation of the right cavernous sinus and the right superior ophthalmic vein.

Management

- Given concern for caroticocavernous fistula (CCF) , the patient was taken urgently to the neurovascular interventional radiology suite for catheter-based digital subtraction angiography (DSA).
- Cerebral DSA image demonstrates a catheter within the right internal carotid artery.
  - Upon contrast bolus, a direct connection is visualized from the right internal carotid artery to the right cavernous sinus.
  - Retrograde venous drainage is noted through the superior ophthalmic vein and inferior ophthalmic vein into the facial vein.



Outcome

- Successful transvenous coil embolization of the right direct CCF with complete obliteration of the fistula.
- Additionally (not imaged), left middle meningeal artery embolization was performed for the aforementioned left epidural hematoma.
- After neurosurgical ICU admission, the patient made a complete recovery with eventual resolution of symptoms.



Take Home Points

- In the setting of trauma, the neuroradiologist must maintain a high index of suspicion for caroticocavernous fistula.
  - Suspicious symptomology includes proptosis, chemosis, ophthalmoplegia, and orbital pain
  - Risk factors for CCF include trauma and rupture of intra-cavernous internal carotid artery aneurysm
- CT angiography is the noninvasive imaging modality of choice for evaluation
  - Imaging signs include:
    - Enlarged superior ophthalmic vein
    - Bulging cavernous sinus
    - Asymmetric enhancement and dilatation of the cavernous sinus with attenuation similar to that of the ipsilateral internal carotid artery
- Catheter-based digital subtraction angiography (DSA) is the gold standard imaging technique for definitive diagnosis and treatment.

References

1. Ellis JA, Goldstein H, Connolly ES Jr, Meyers PM. Carotid-cavernous fistulas. *Neurosurg Focus.* 2012;32(5):E9, doi:10.3171/2012.2.FOCUS1223
2. Ringer AJ, Salud L, Tomsick TA. Carotid cavernous fistulas: anatomy, classification, and treatment. *Neurosurg Clin N Am.* 2005;16(2)279-viii. Doi:10.1016/j.nec2004.08.004
3. Benson JC, Rydberg C, DeLone DR, et al. CT angiogram findings in carotid-cavernous fistulas: stratification of imaging features to help radiologists avoid misdiagnosis. *Acta Radiol.* 2020;61(7):945-952. Dio:10.1177/028418511988119
4. Gupta AK, Purkayastha S. Krishnamoorthy T, et al. Endovascular treatment of direct carotid cavernous fistulae: a pictoral review. *Neuroradiology.* 2006;48(11):831-839. Doi:10.1007/s00234-006-0132-x