

Orbital & Anterior Cranial Fossa Trauma and Hemorrhage

Allan Taylor, David Le Feuvre

Trauma:
General

ACF/Orbital
Anatomical
pathology

Clinical
Features

Treatment of
Vascular
Trauma



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Epidemiology

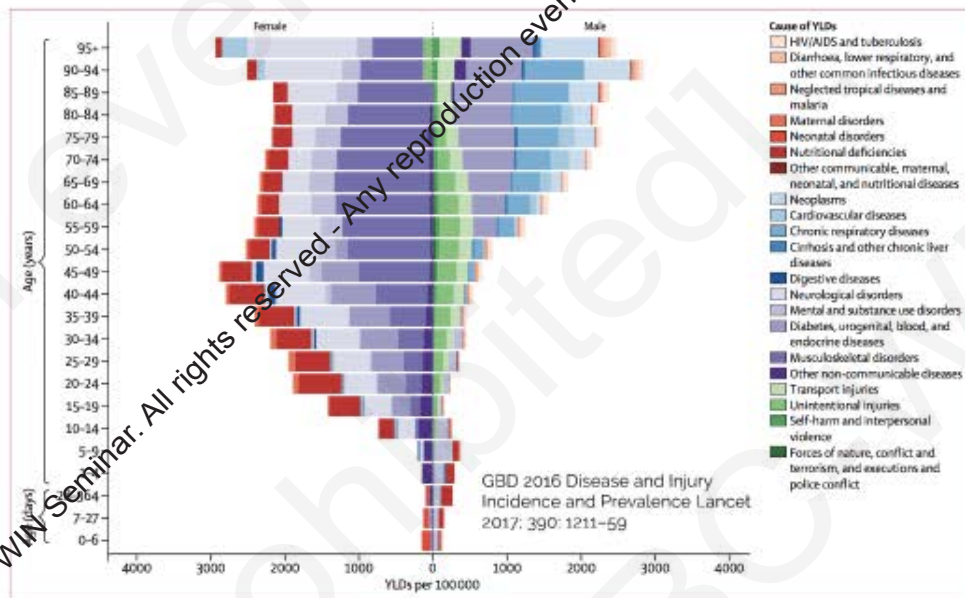
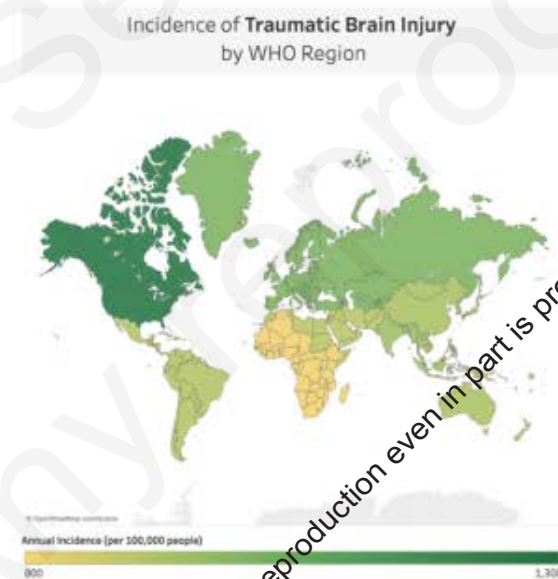


Figure 5: Sex difference in global YLD rates per 100 000 for 21 Level 2 causes by age, 2016
YLDs=years lived with disability.



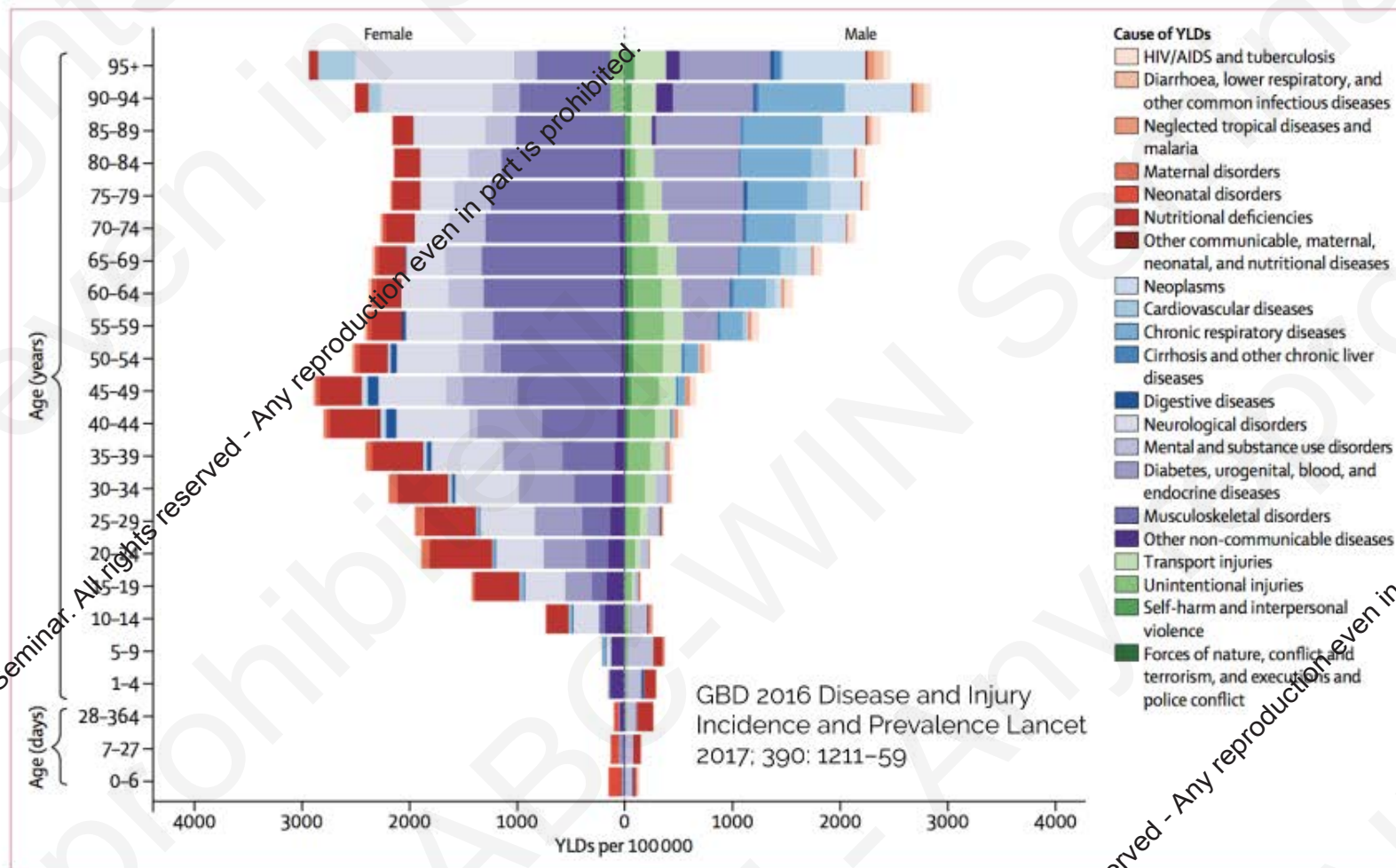
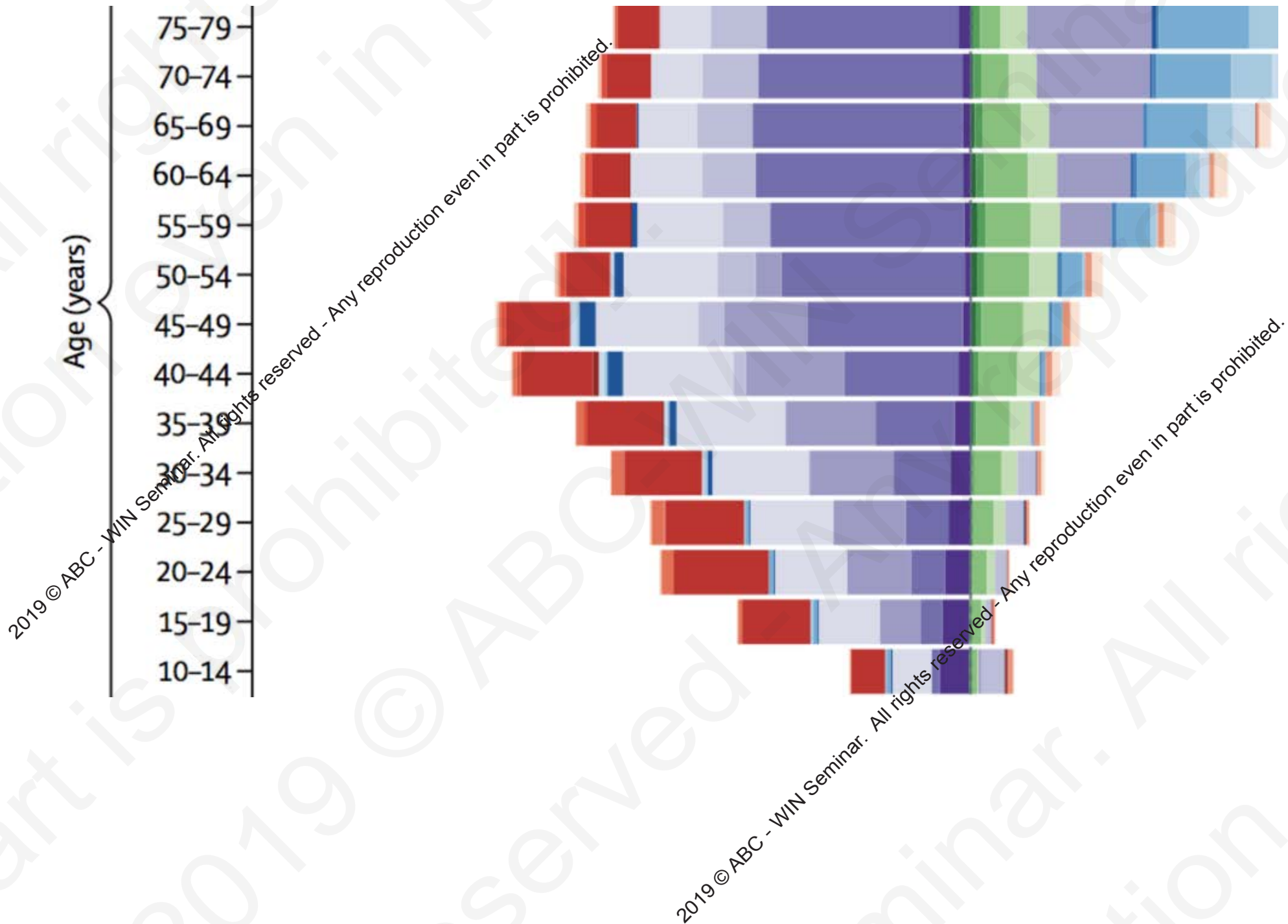
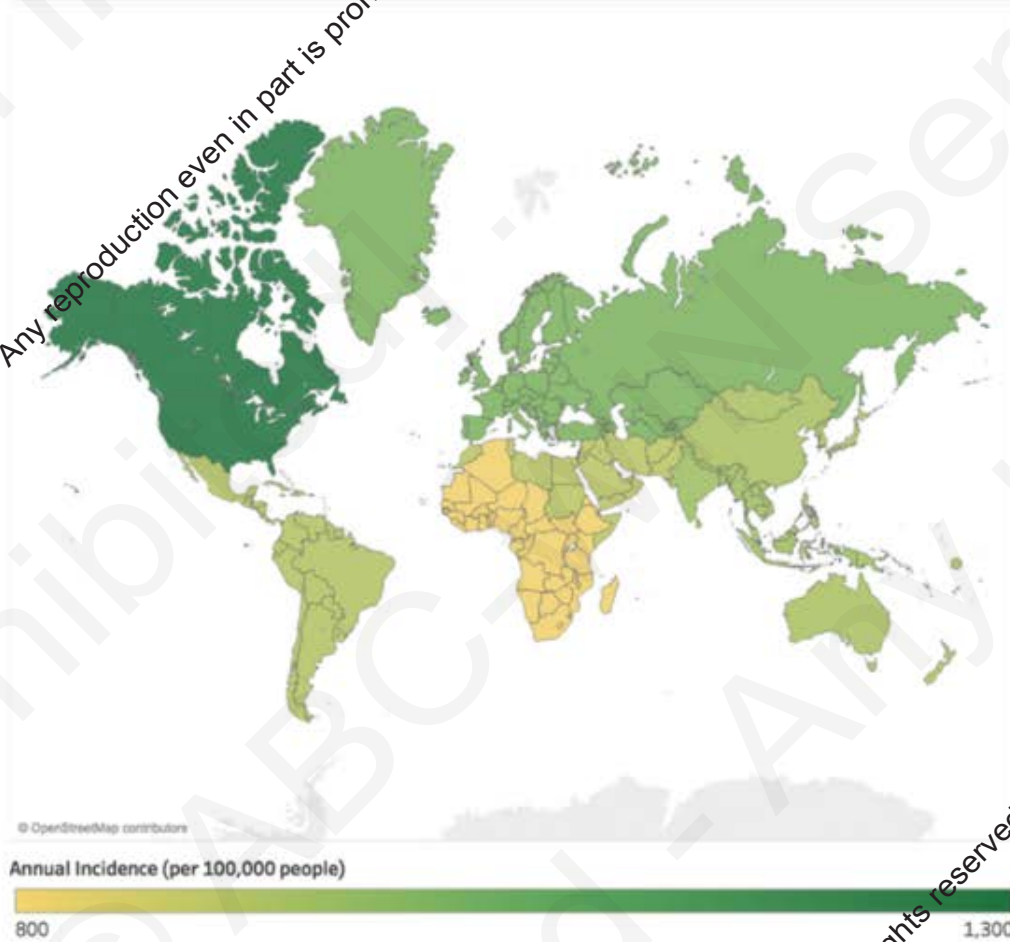


Figure 5: Sex difference in global YLD rates per 100 000 for 21 Level 2 causes by age, 2016
YLDs=years lived with disability.



Incidence of Traumatic Brain Injury by WHO Region



- ~33% of trauma related deaths are from TBI
- Incidence of blunt TCVI is ~1%
- Incidence of penetrating TCVI is ~2.5%

Fusco. Neurosurgery 68:517-530, 2011
Kobata. Neurol Med Chir (Tokyo) 57, 410-417, 2017

Trauma is an acquired condition

Injury to normal vessel / young person

- good collateral flow at COW and microcirculation
- capacity for vessel wall healing (~6 weeks)

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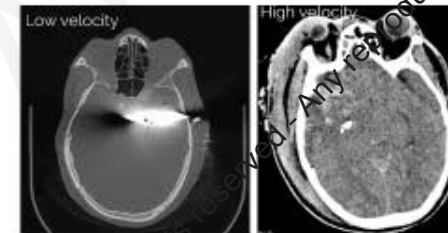
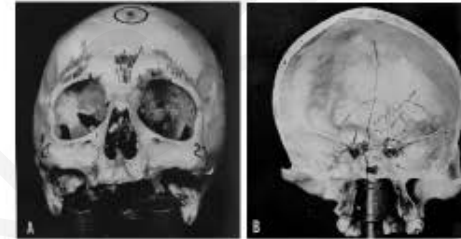
ACF/Orbital mechanism of injury

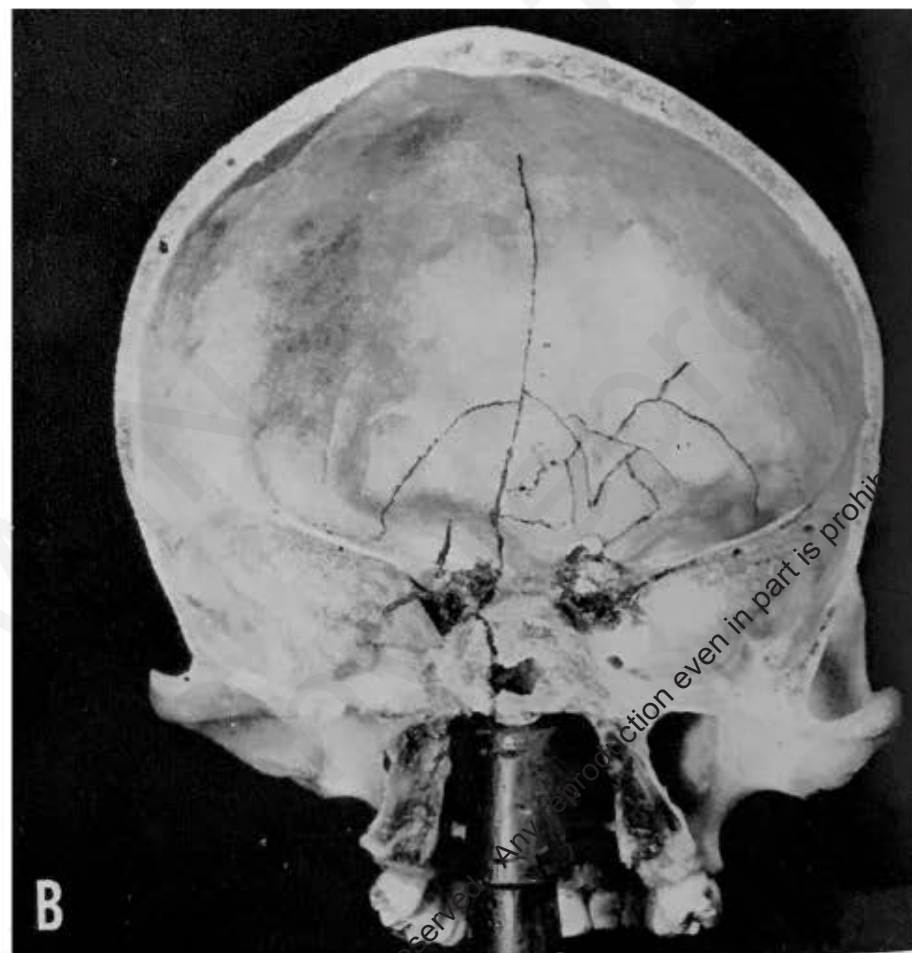
Blunt Injury (fracture)

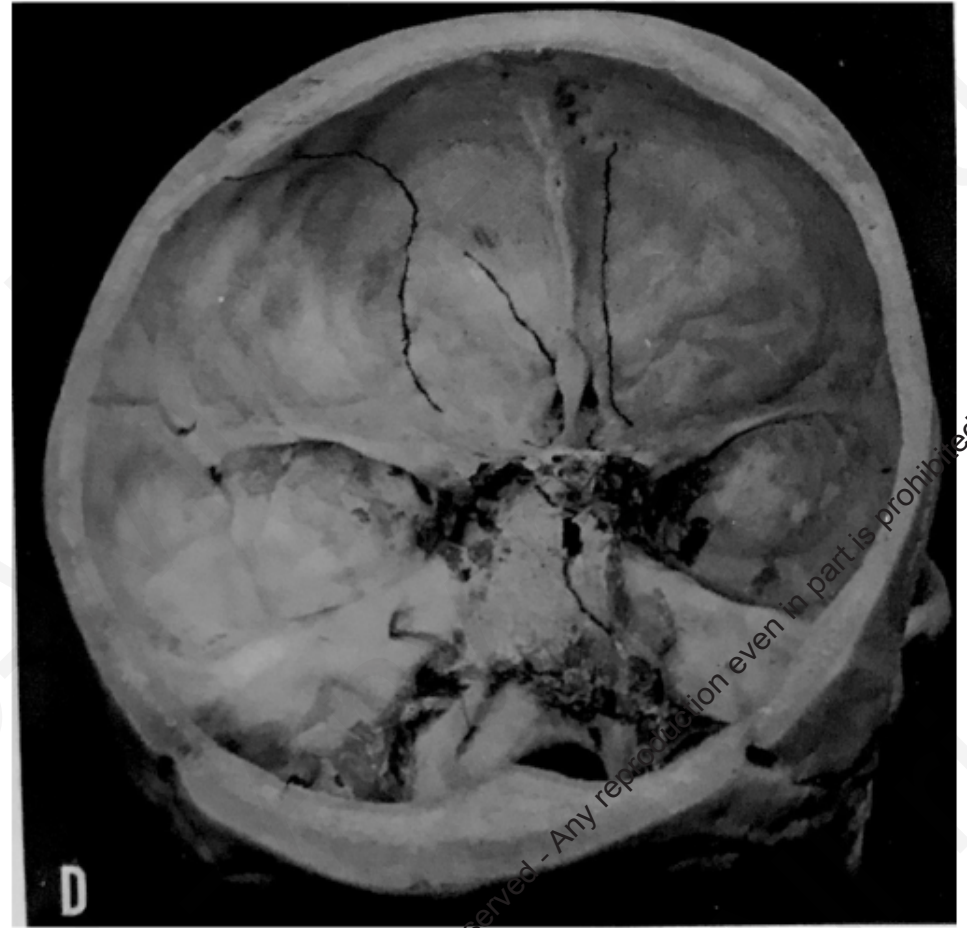
- dynamic loading 4,6 m/s
- static loading 32 kg/cm²

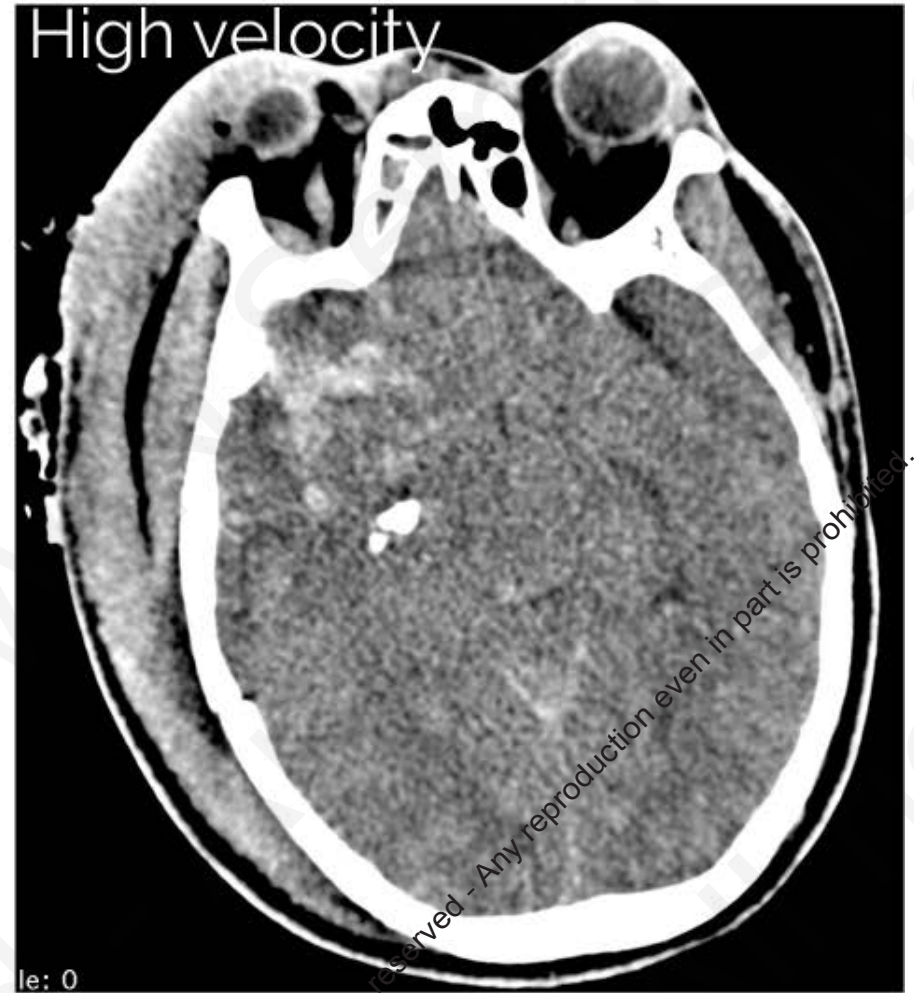
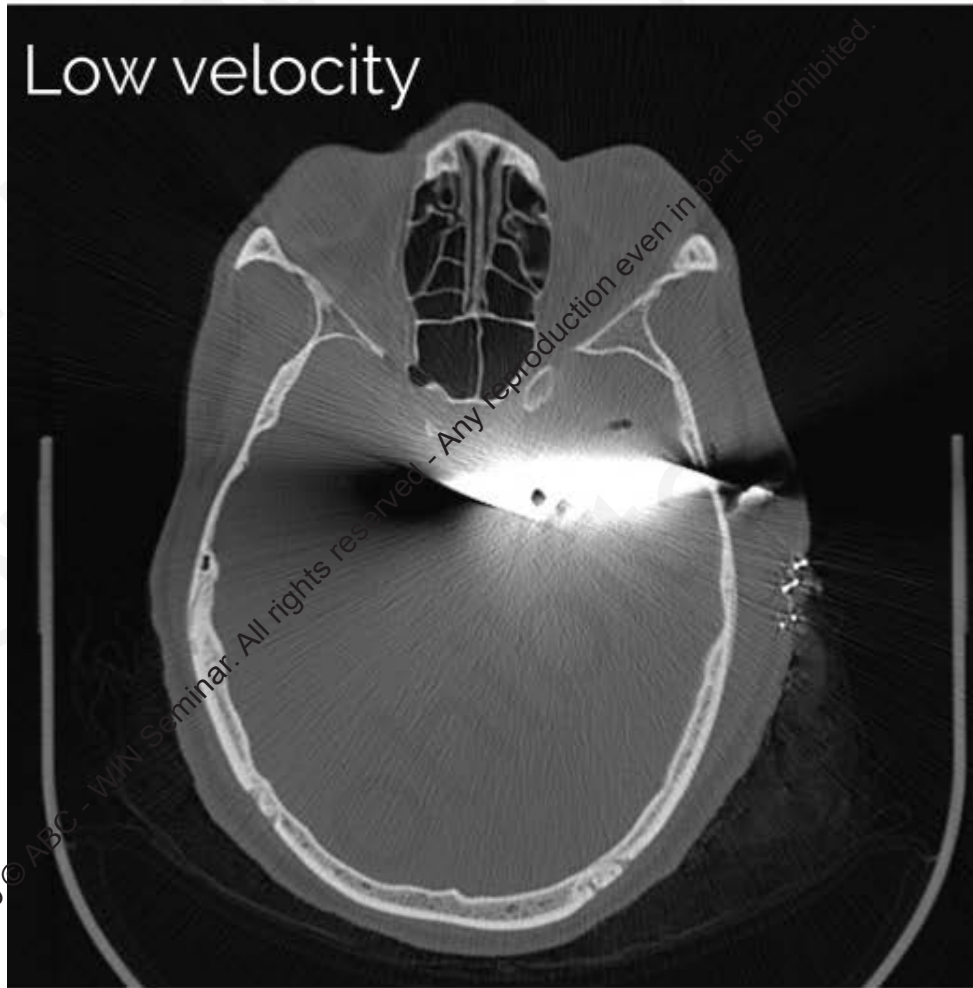
Penetrating Injury

- low velocity
- high velocity









Facial injury

Facial skeleton protects the brain from trauma

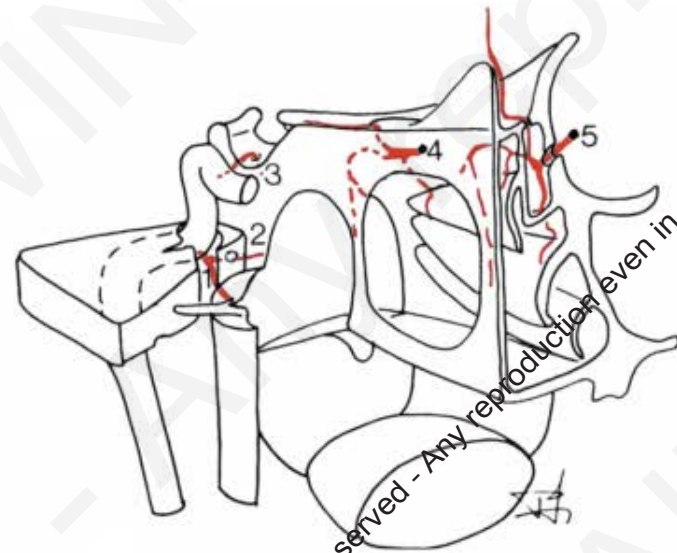
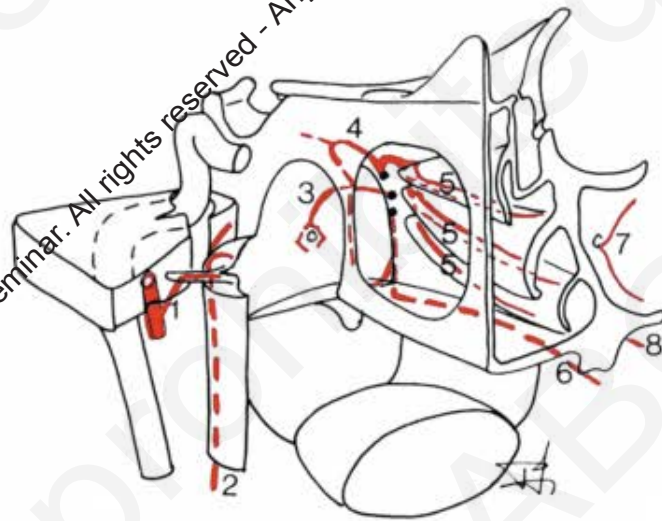


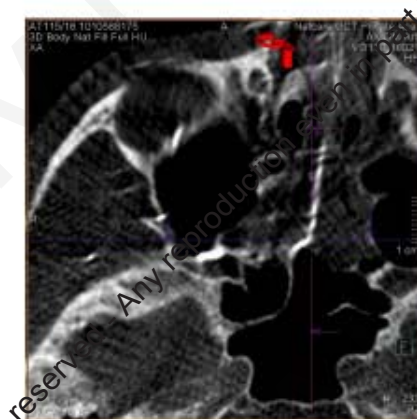
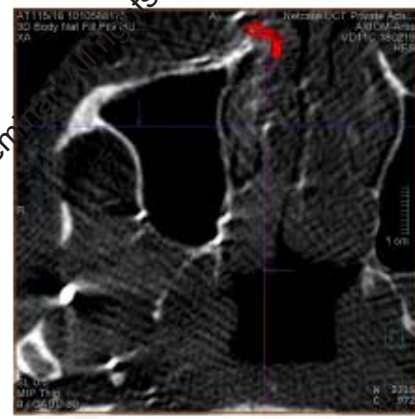
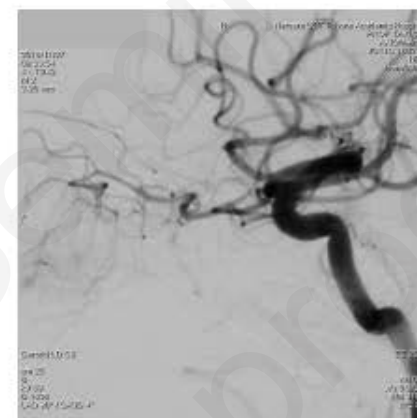
Blunt injury

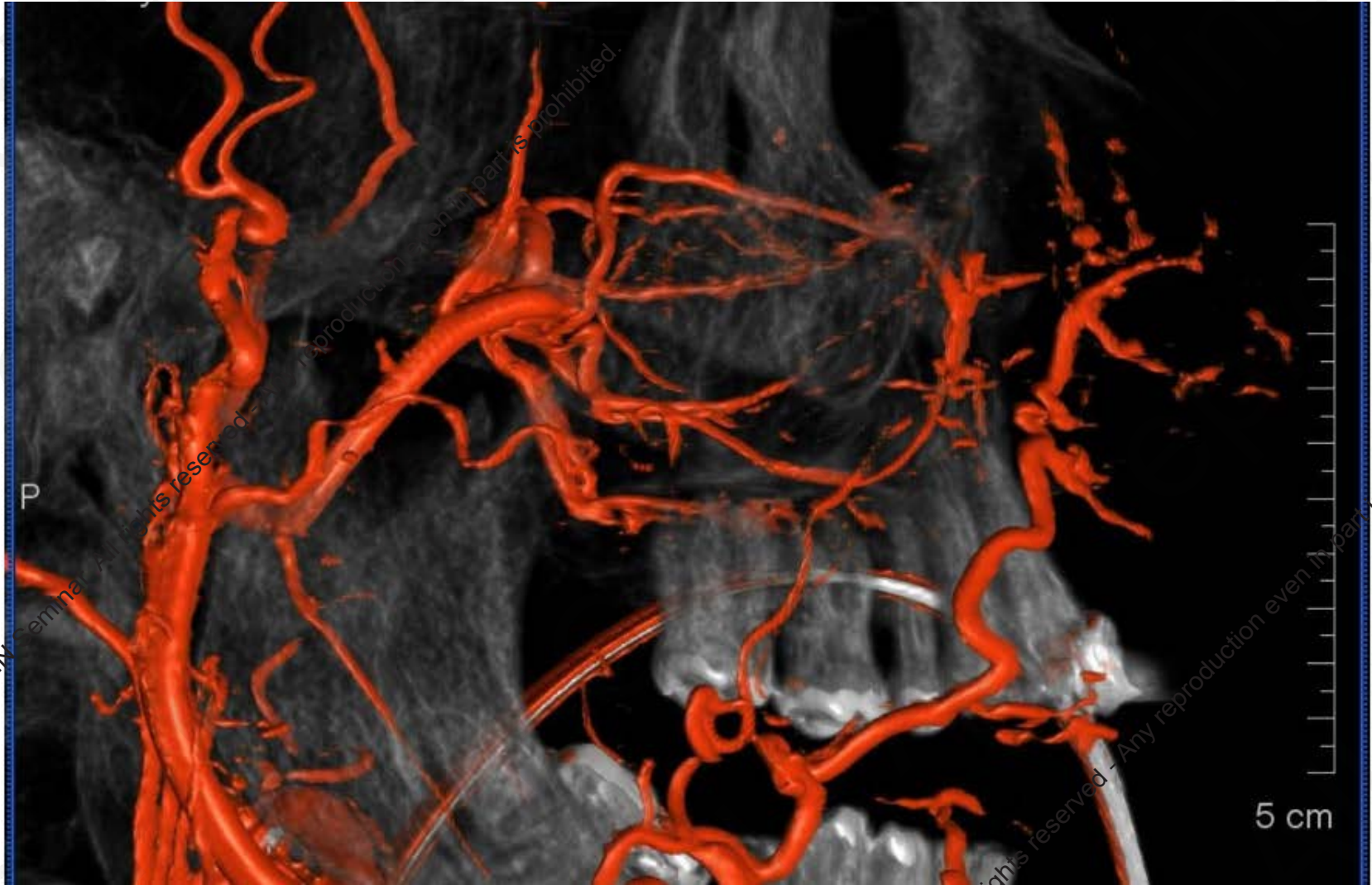
- Vascular injury uncommon without fracture

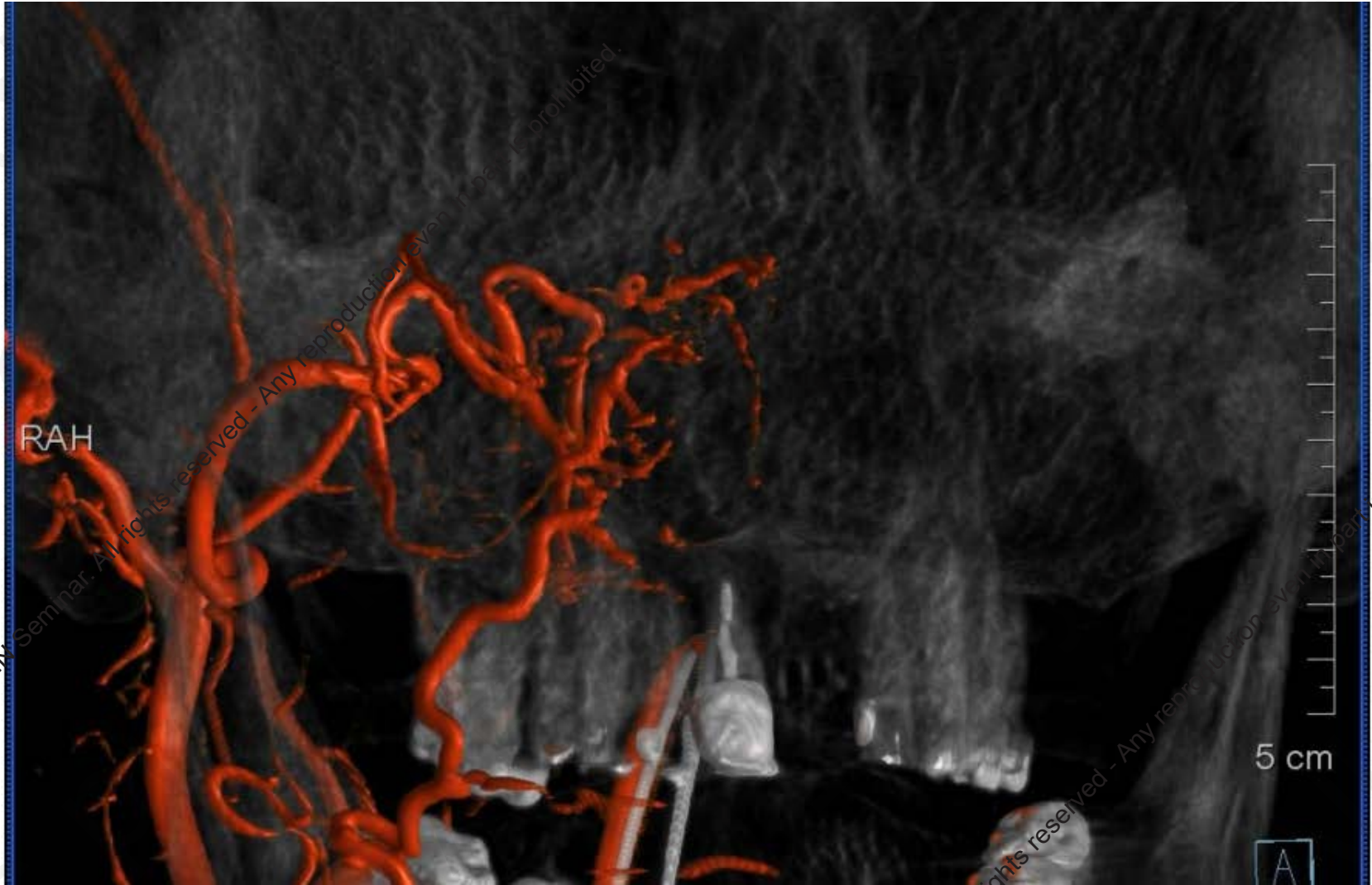
Penetrating injury

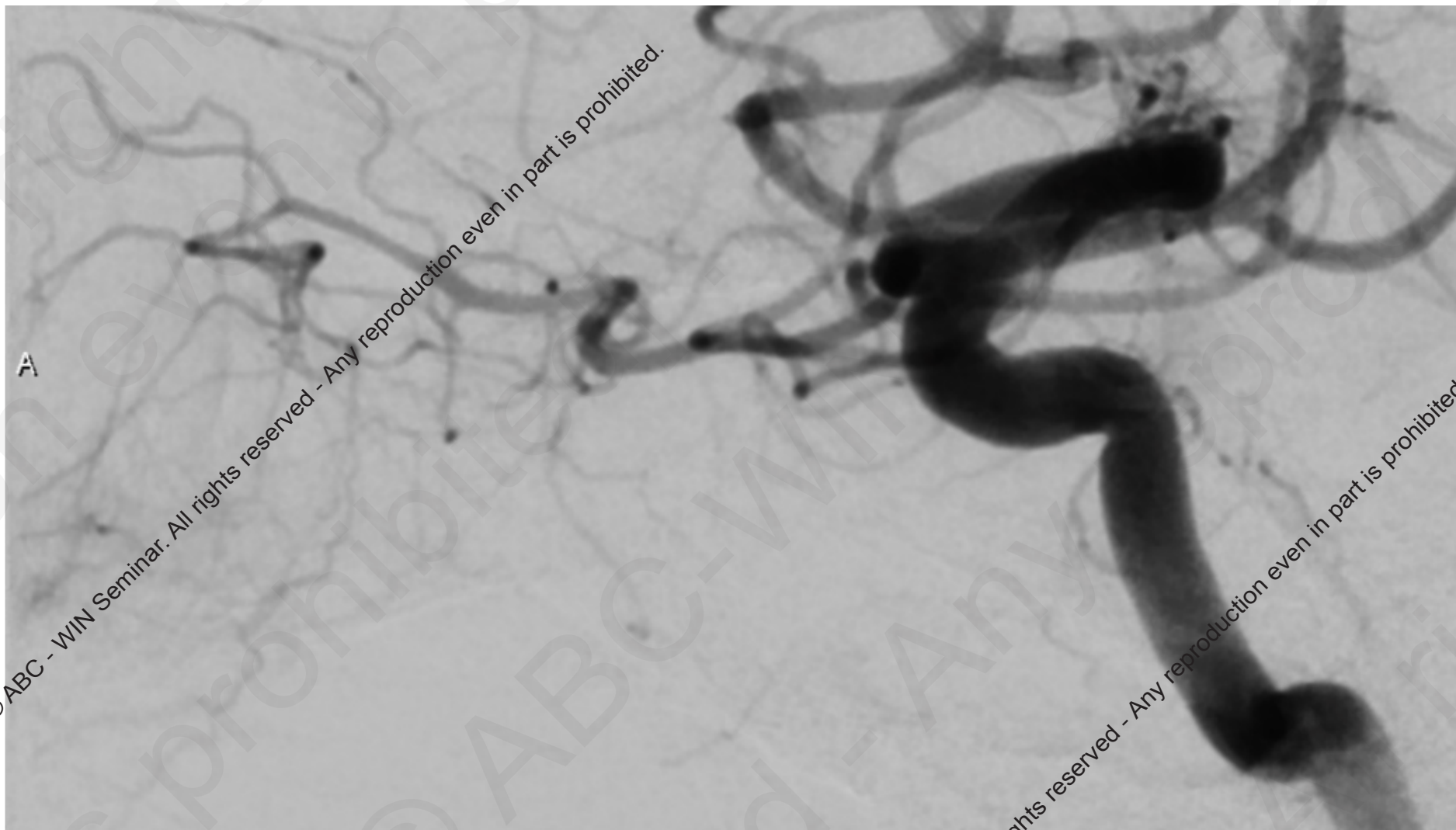
- Vessels protected by bone
- Orbital penetration carries a high risk of carotid injury





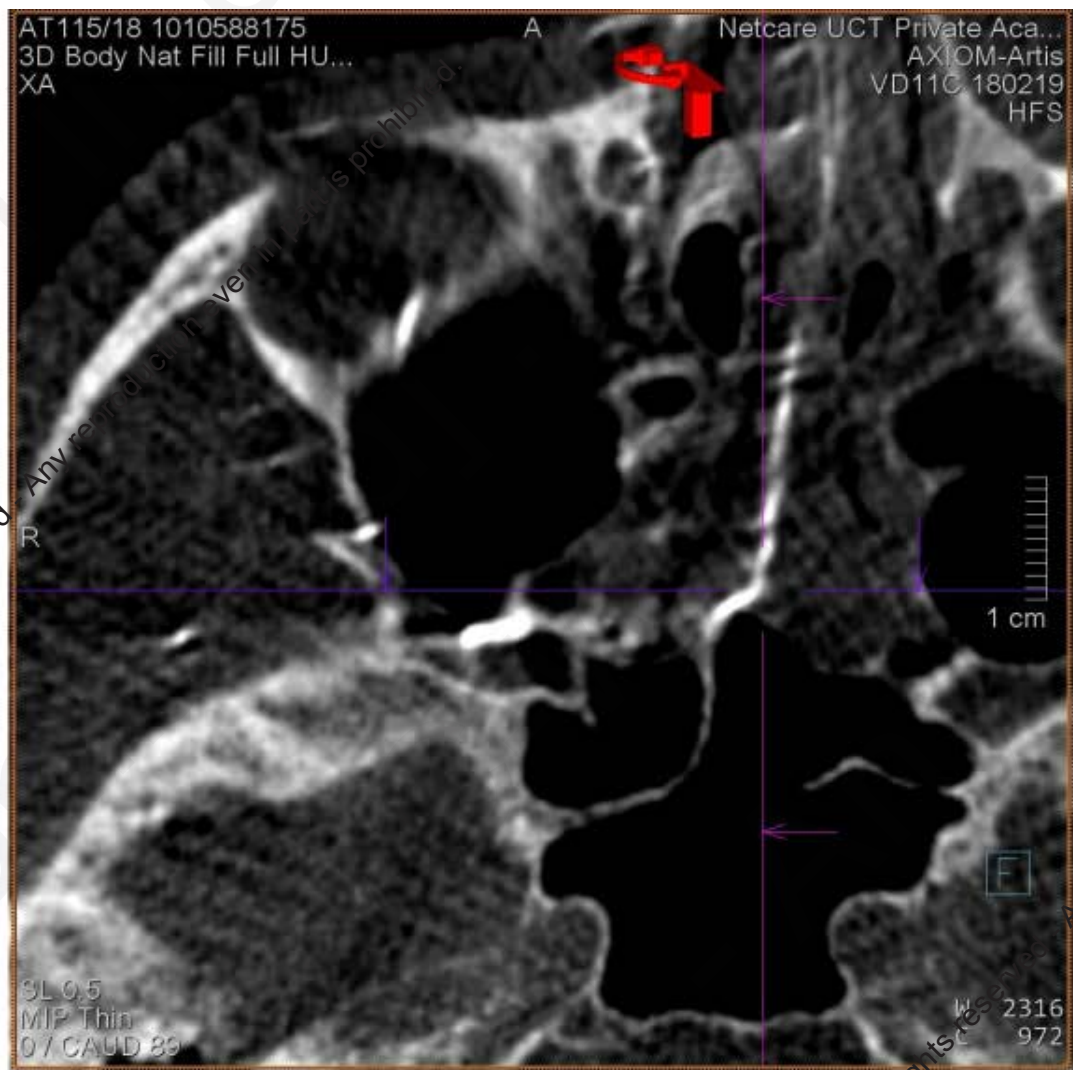












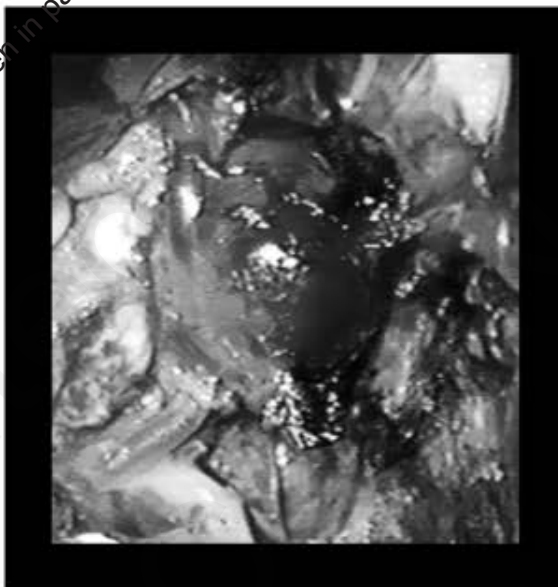
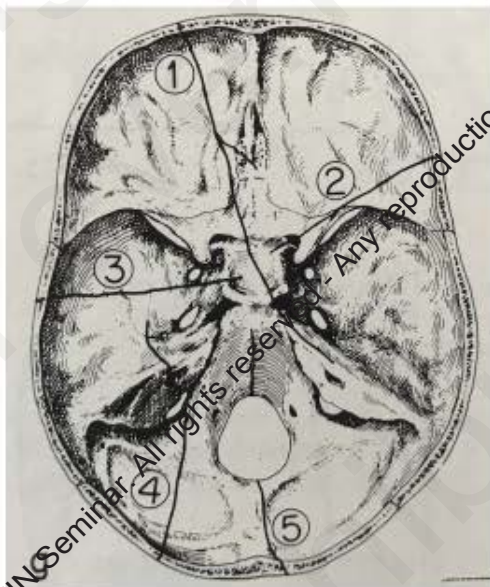
Anterior Cranial injury

Blunt injury

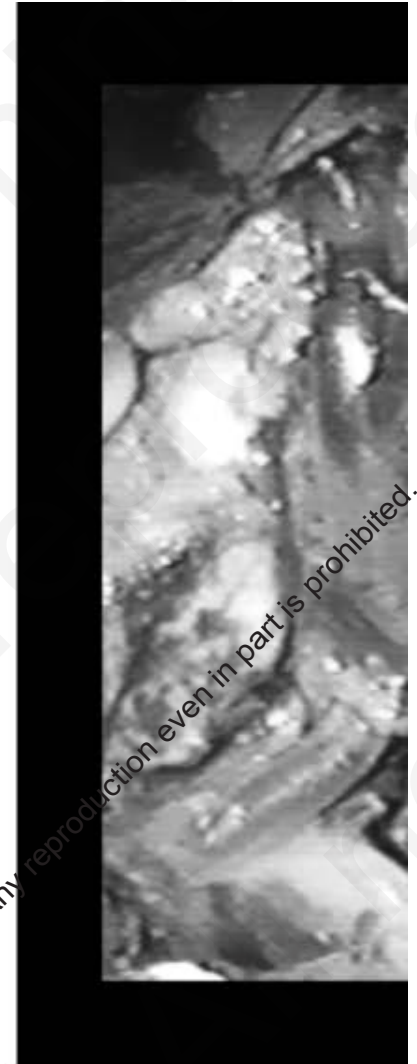
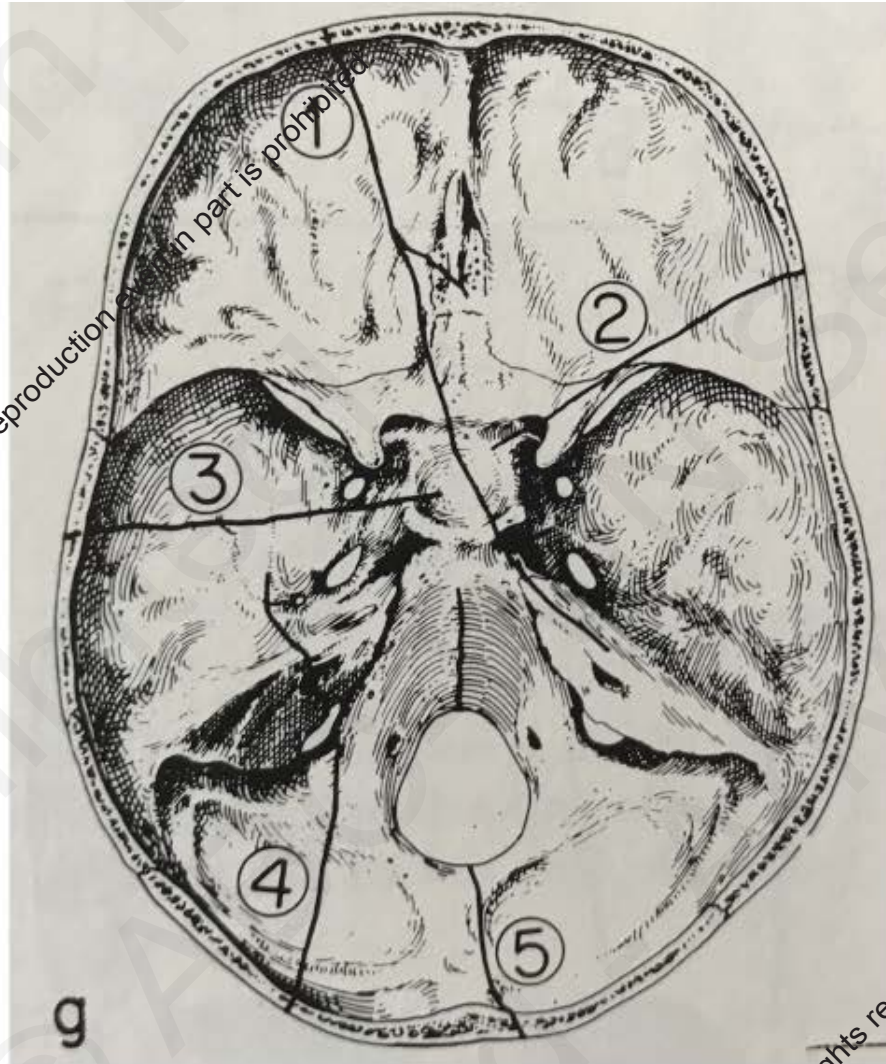
- Skull base # required for vascular injury
- ACA injury against the falx (rare)

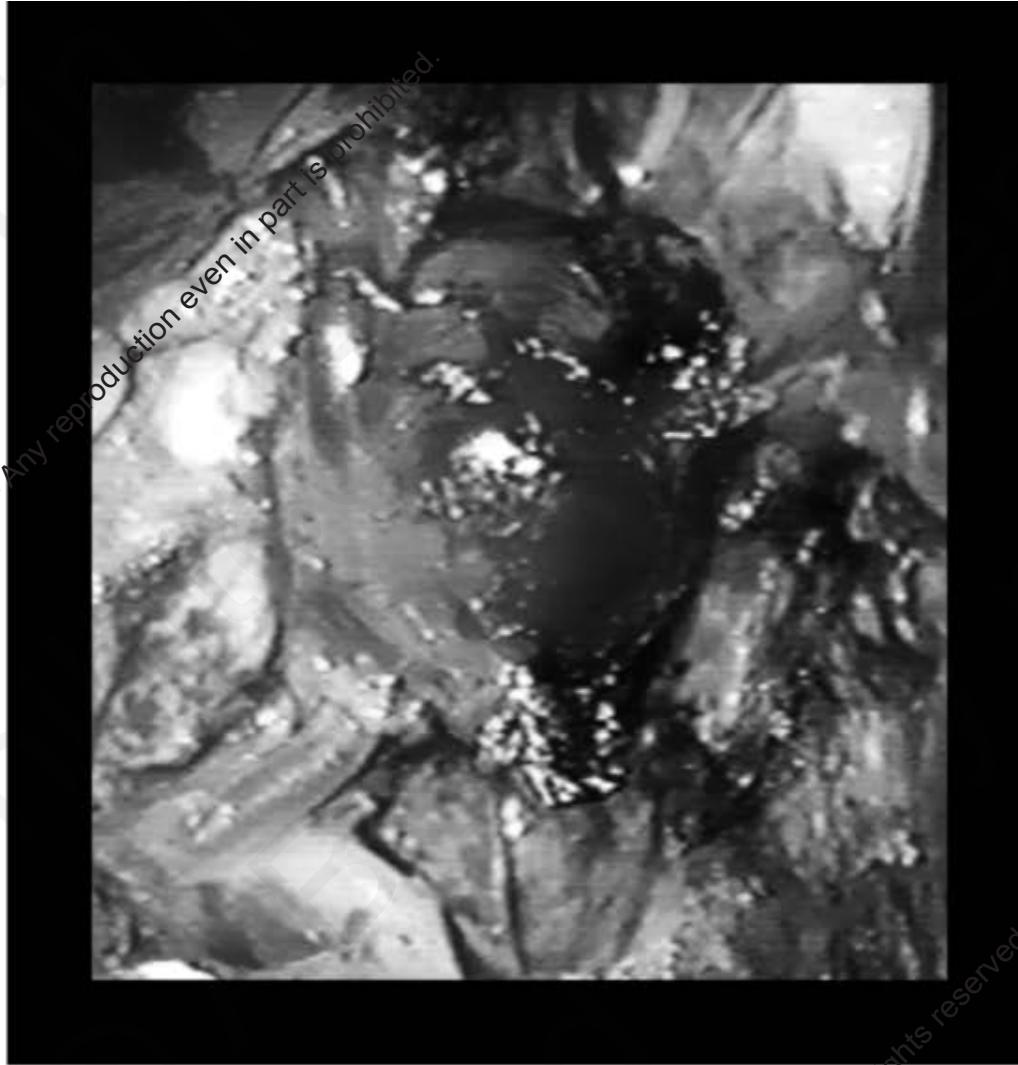
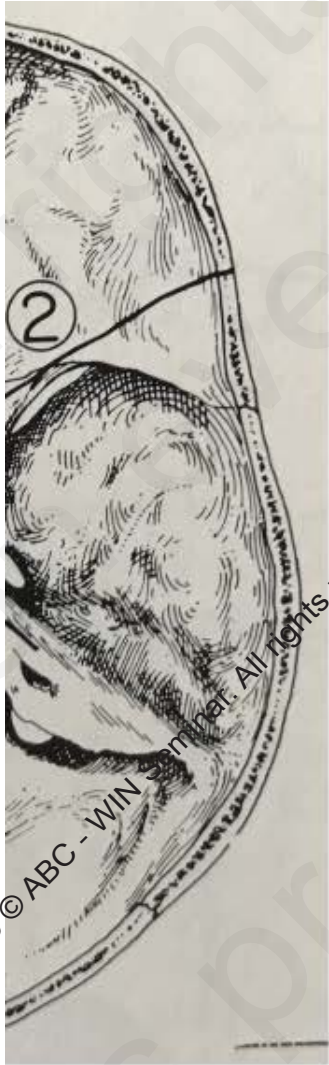
Penetrating injury

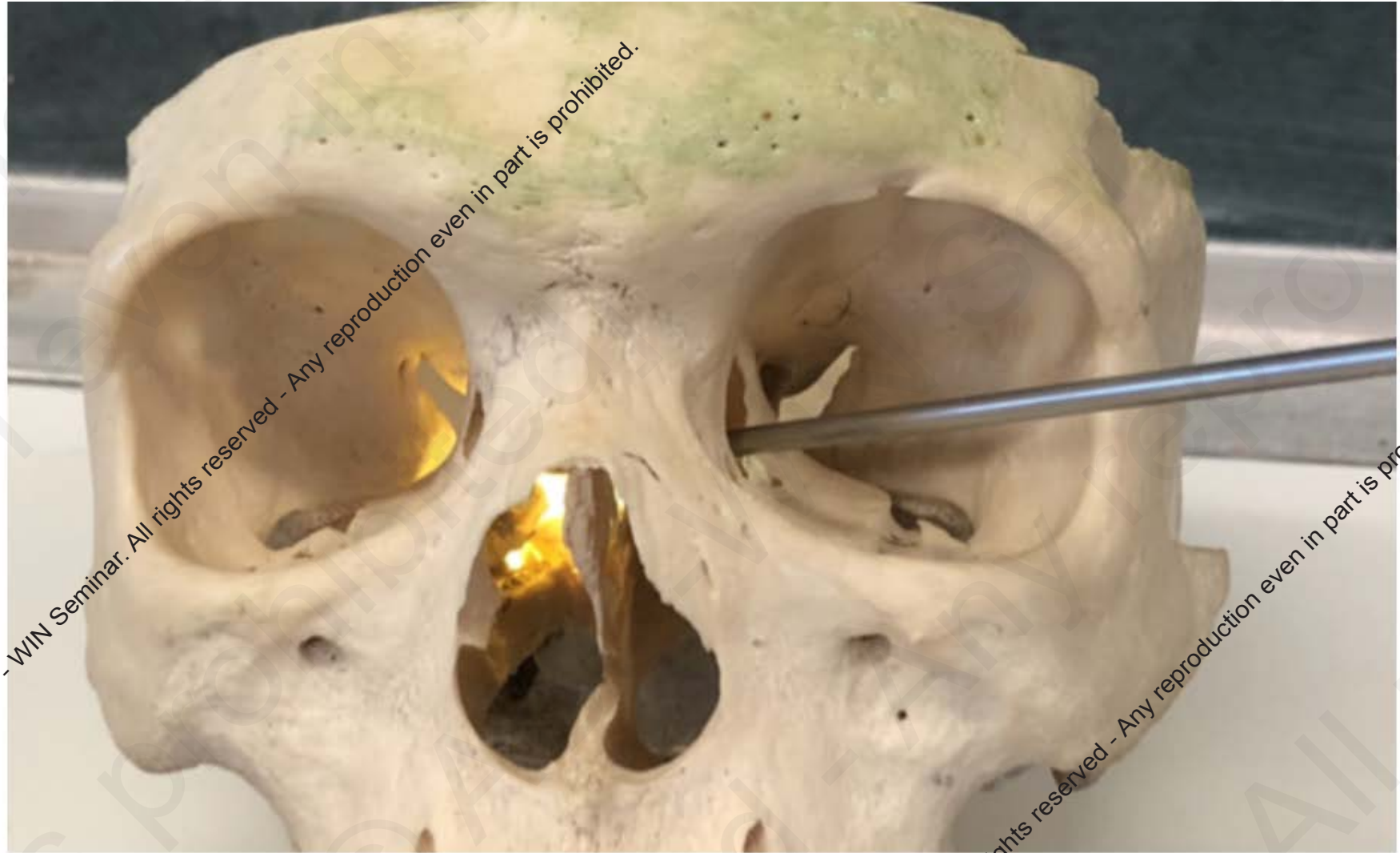
- Vascular injury uncommon unless through the orbit
except frontal orbital explosive injury



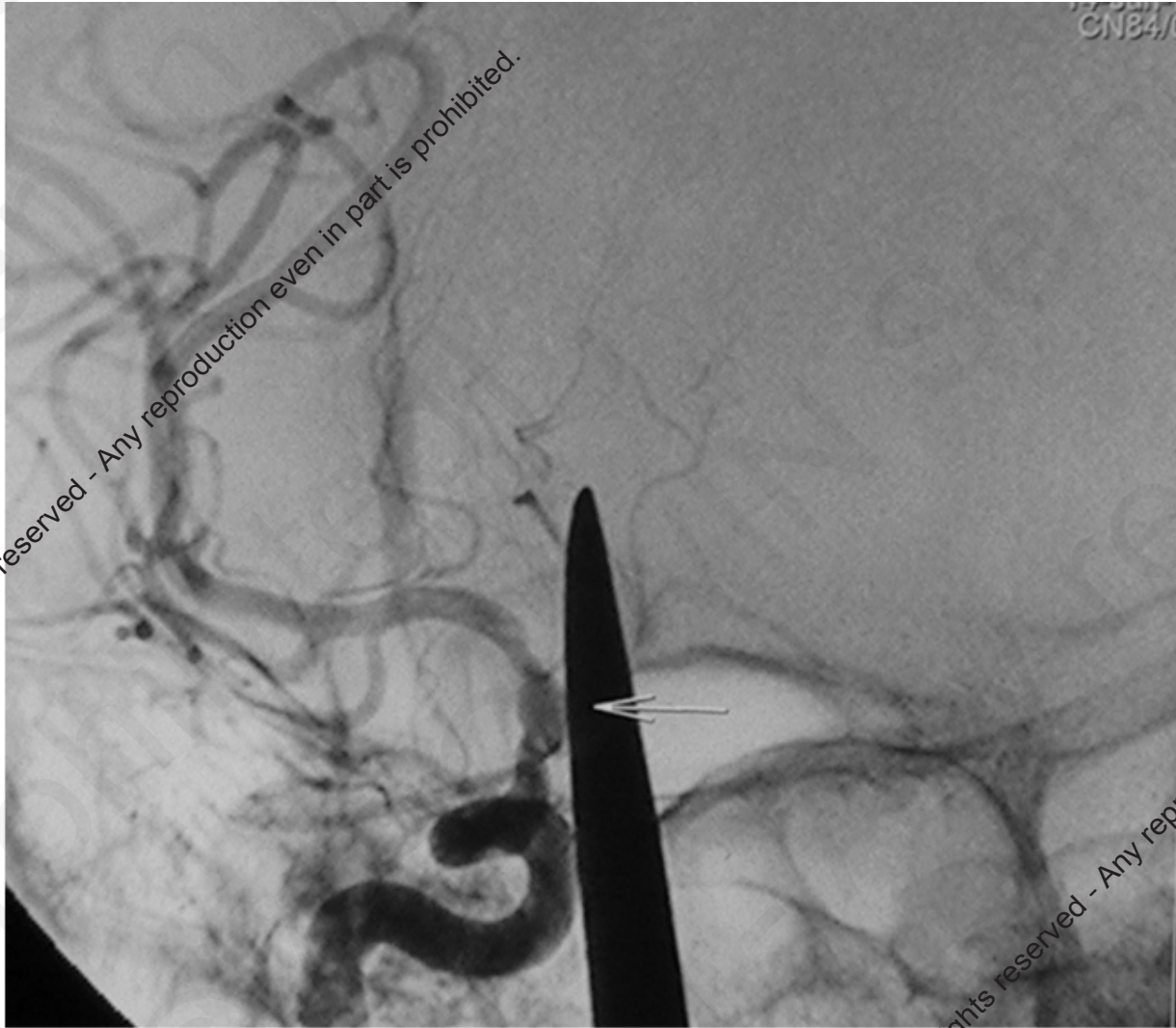
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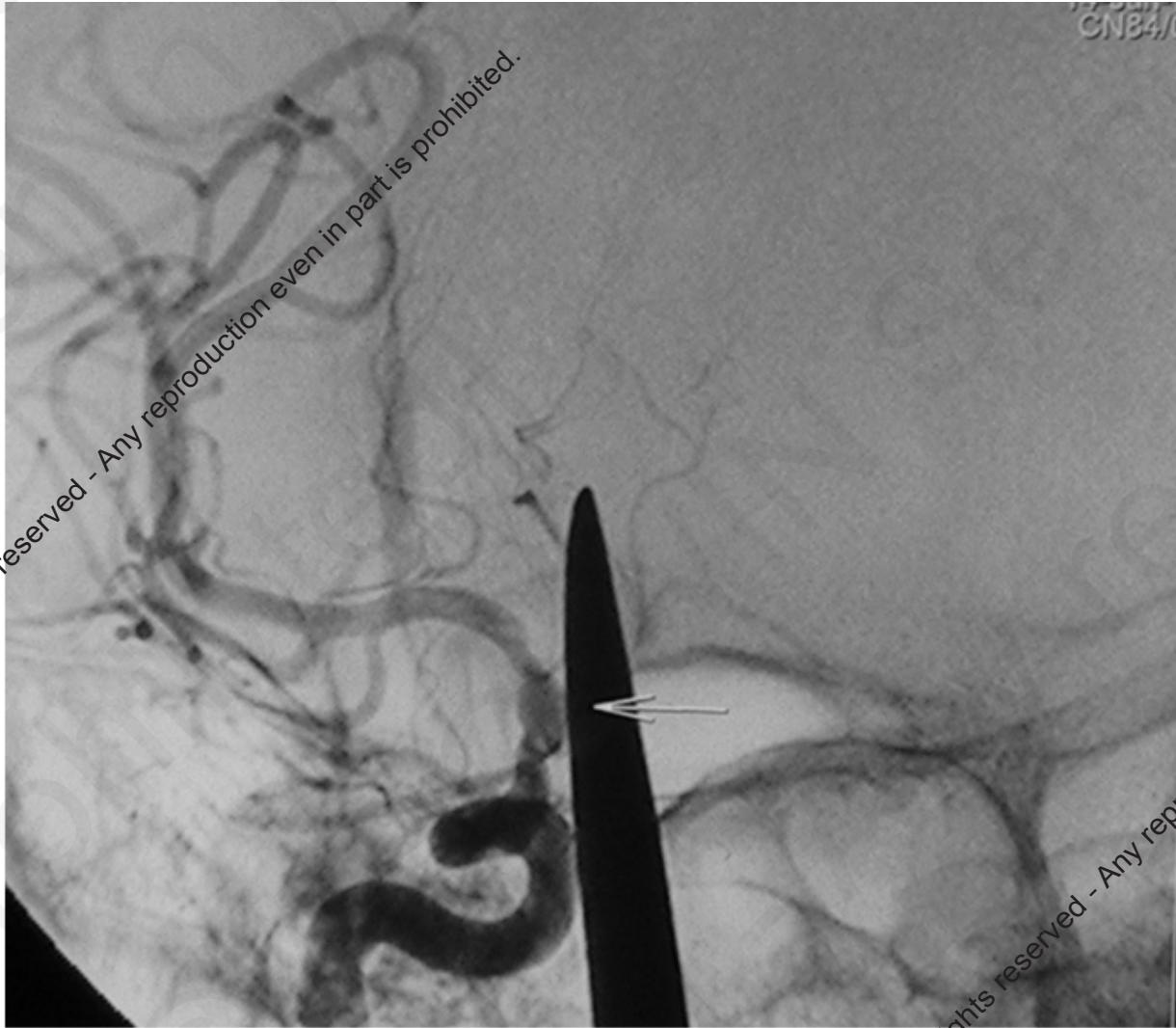


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Classification of vascular injury

Mechanism

Pathology

Angiography

Clinical

Blunt



Dissection

Stenosis
Occlusion

Ischaemia

ACF exception

Penetrating



Laceration

False aneurysm
Extravasation
Fistula

Bleeding
Swelling

UCT Experience

- 112 patients endovascularly treated for traumatic neurovascular injury over 12 years
- 29 patients with traumatic bleeding ACF / Orbit (epistaxis / ACF orbital haematoma)
- 9 patients with carotid injury
- 20 patients with IMA, sphenopalatine artery injury

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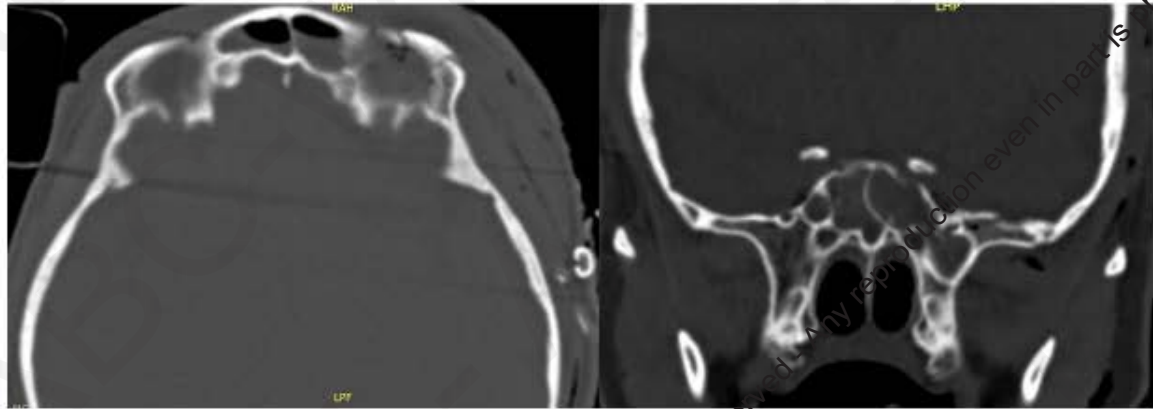
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Vascular
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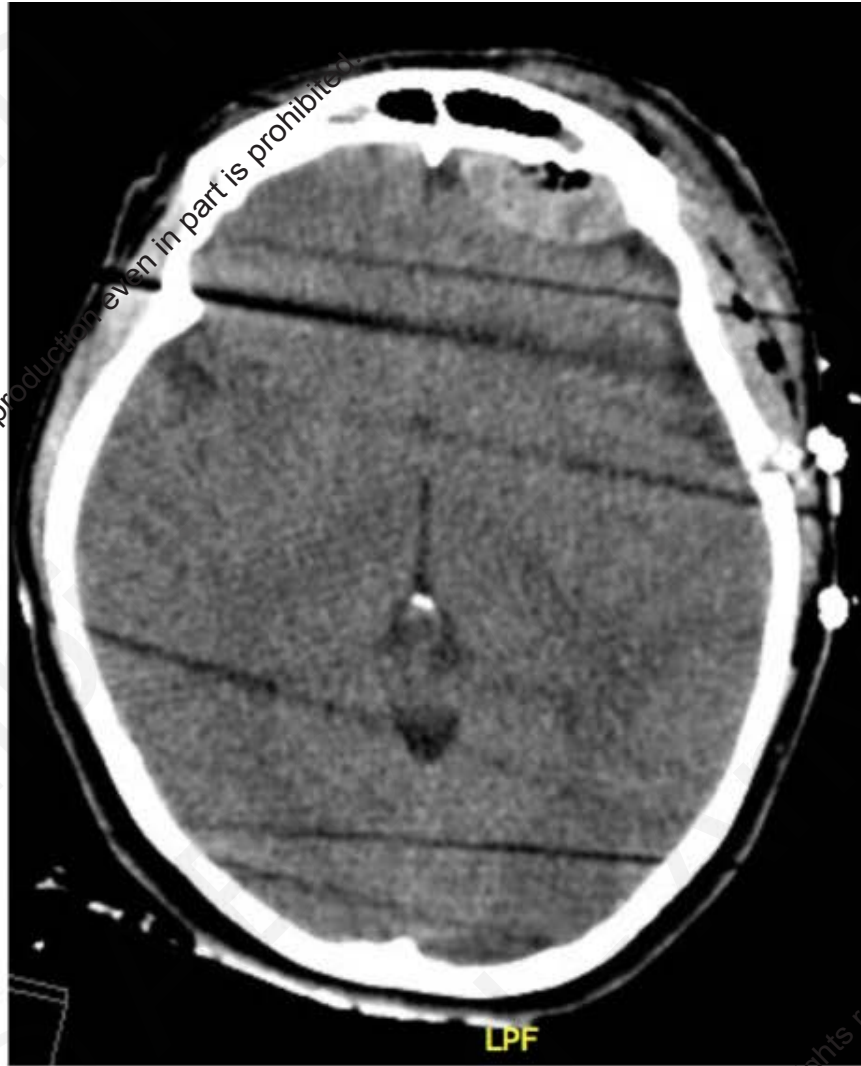


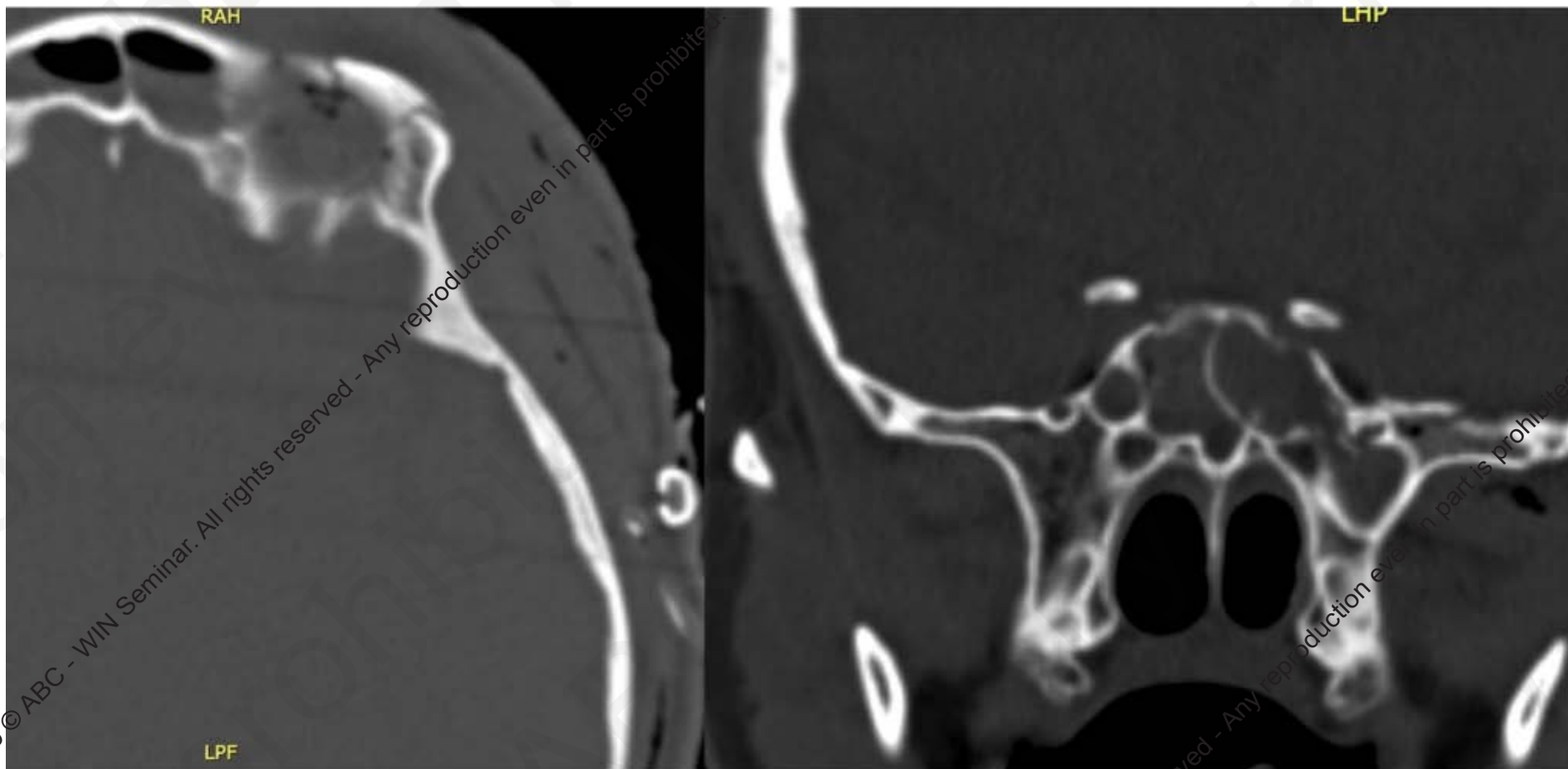
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23 year female in paragliding accident

- closed TBI with extradural
- Rib #
- 2nd degree burns
- Talus #

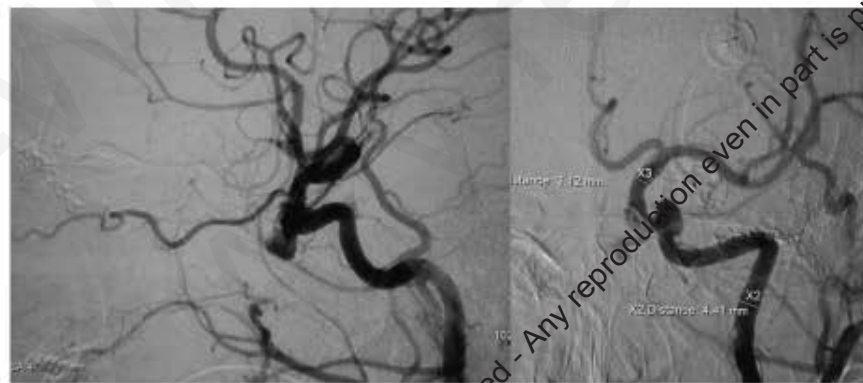
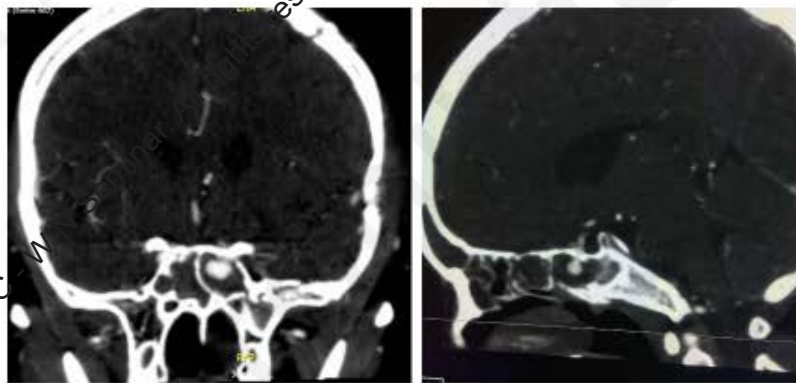


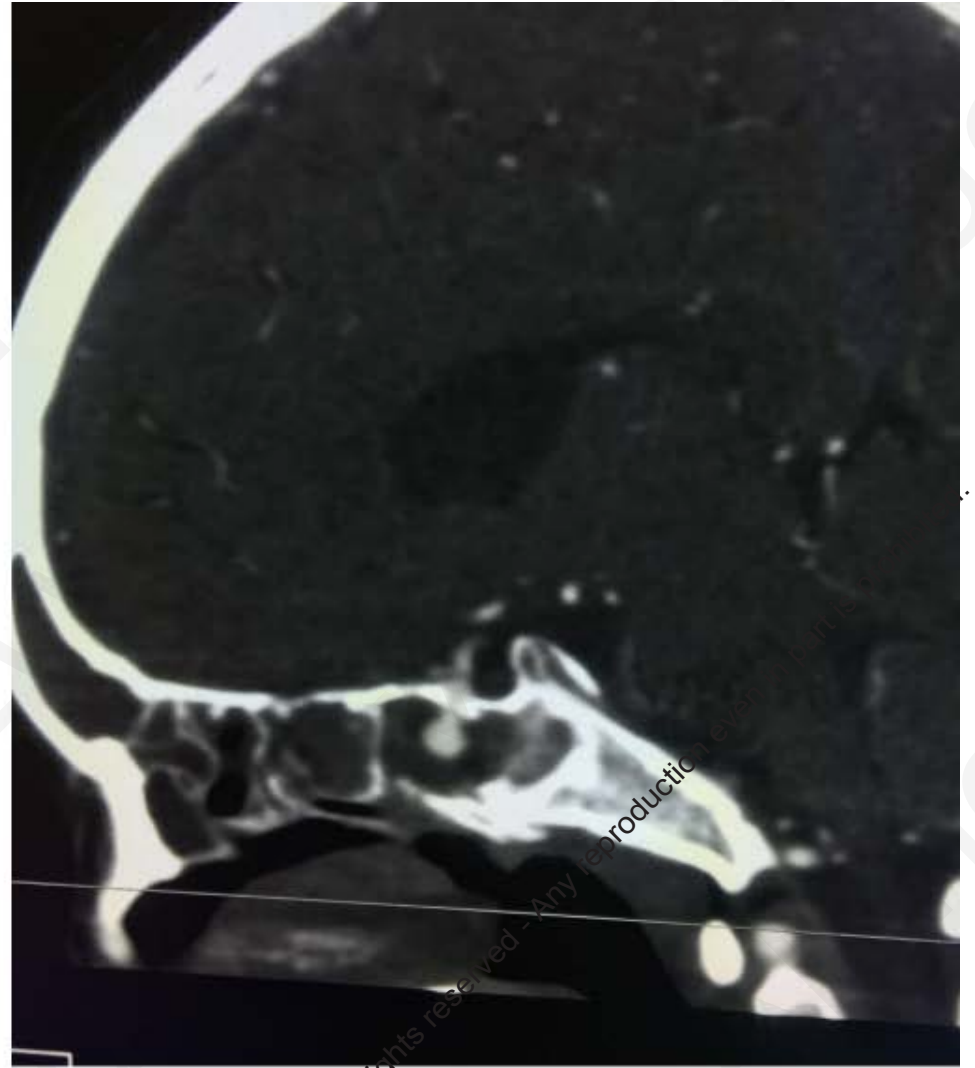
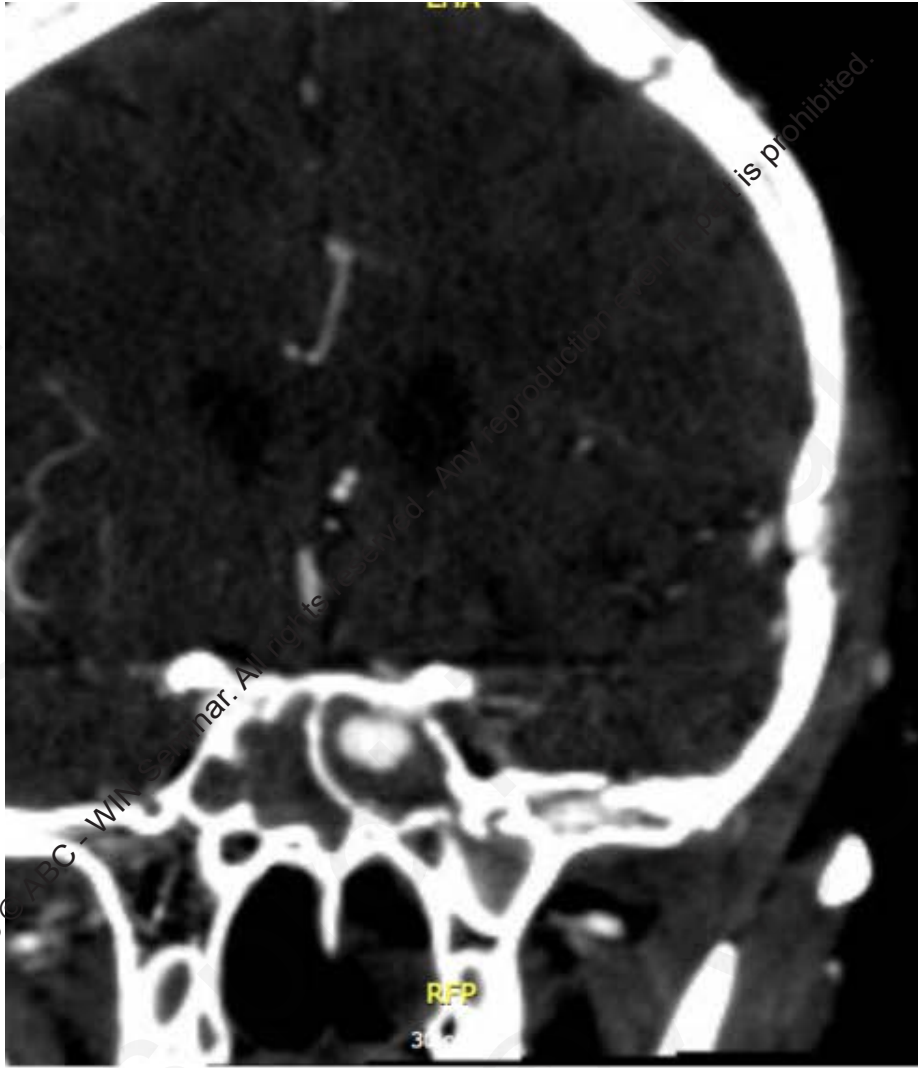




3 weeks later

- massive epistaxis while in bed
- shocked







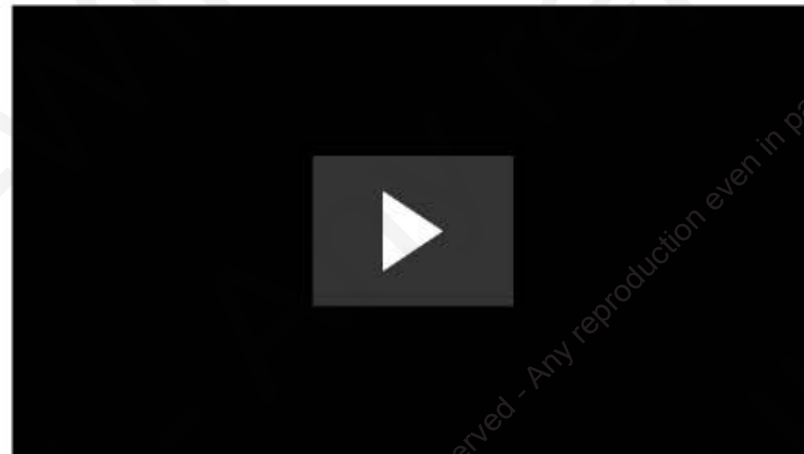
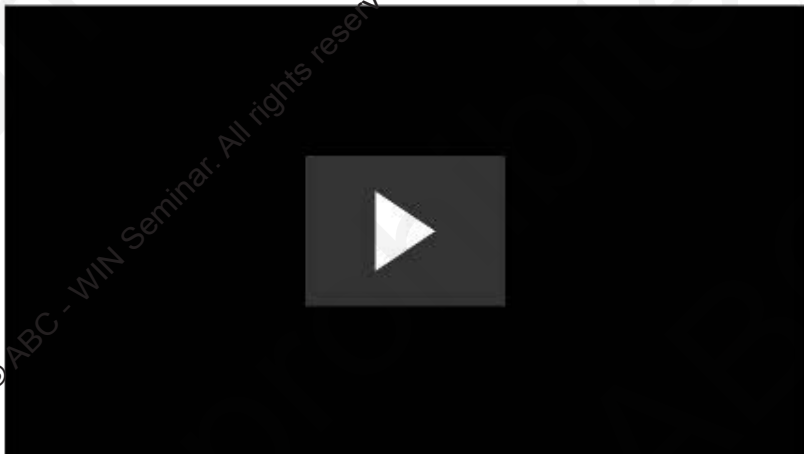
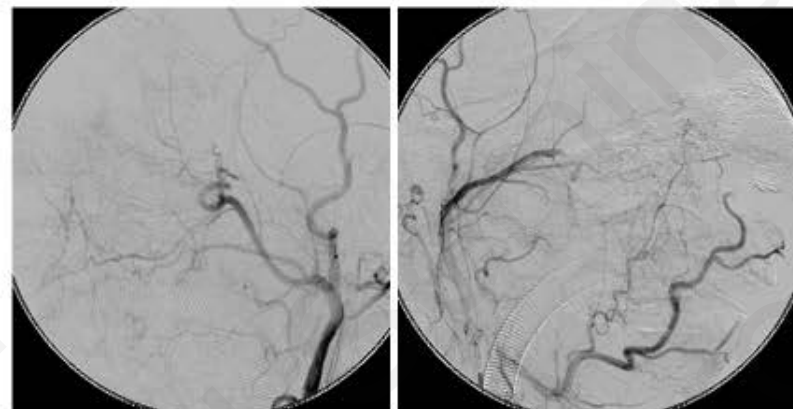
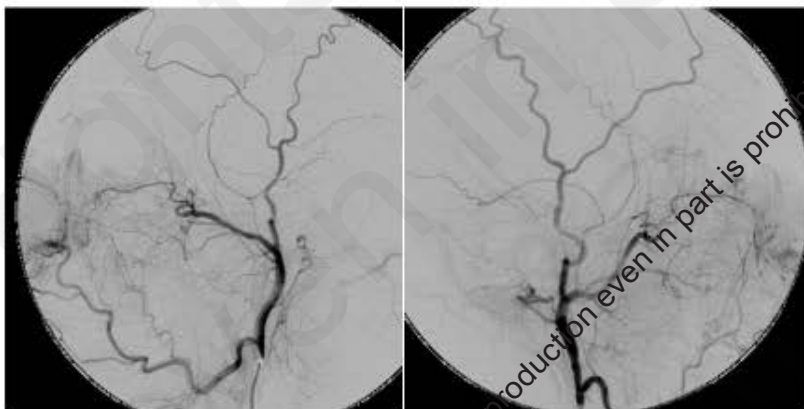
ICA sphenoid false aneurysm

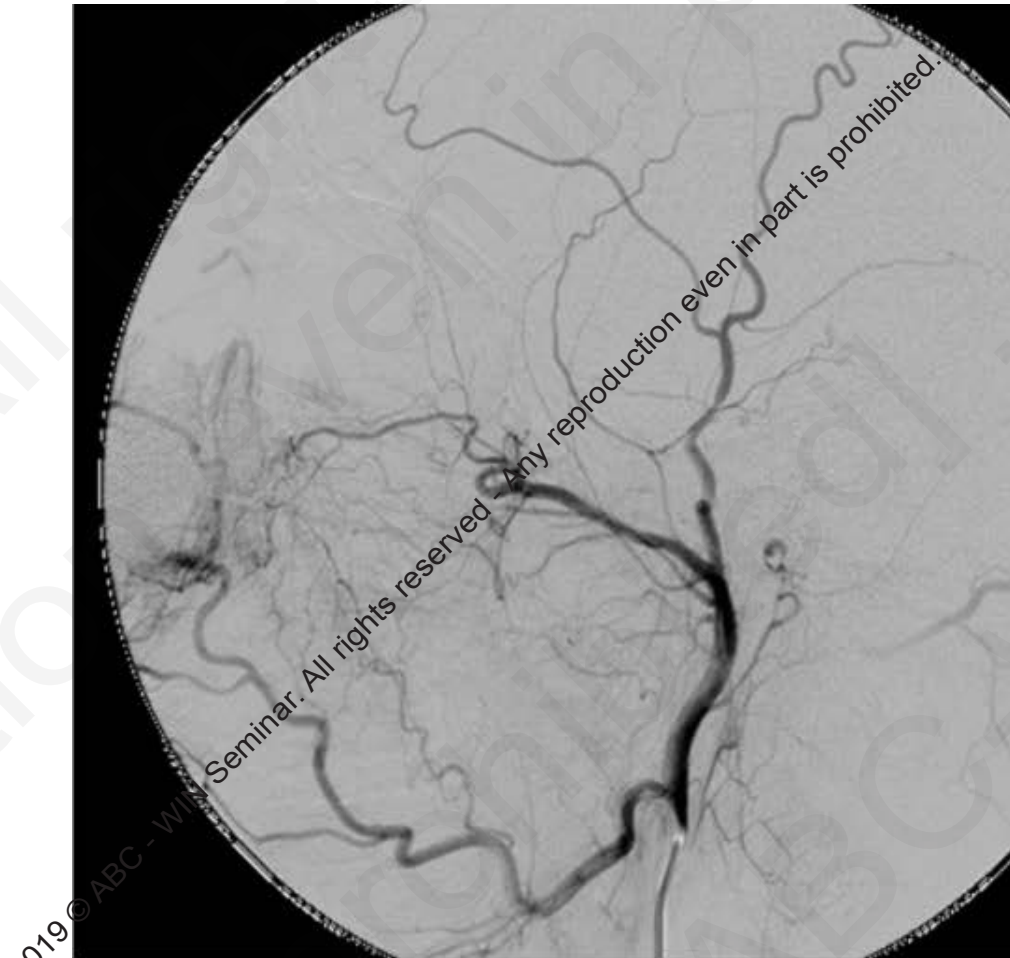
- delayed presentation
- large episodic epistaxis
- vision affected
- medially directed aneurysm

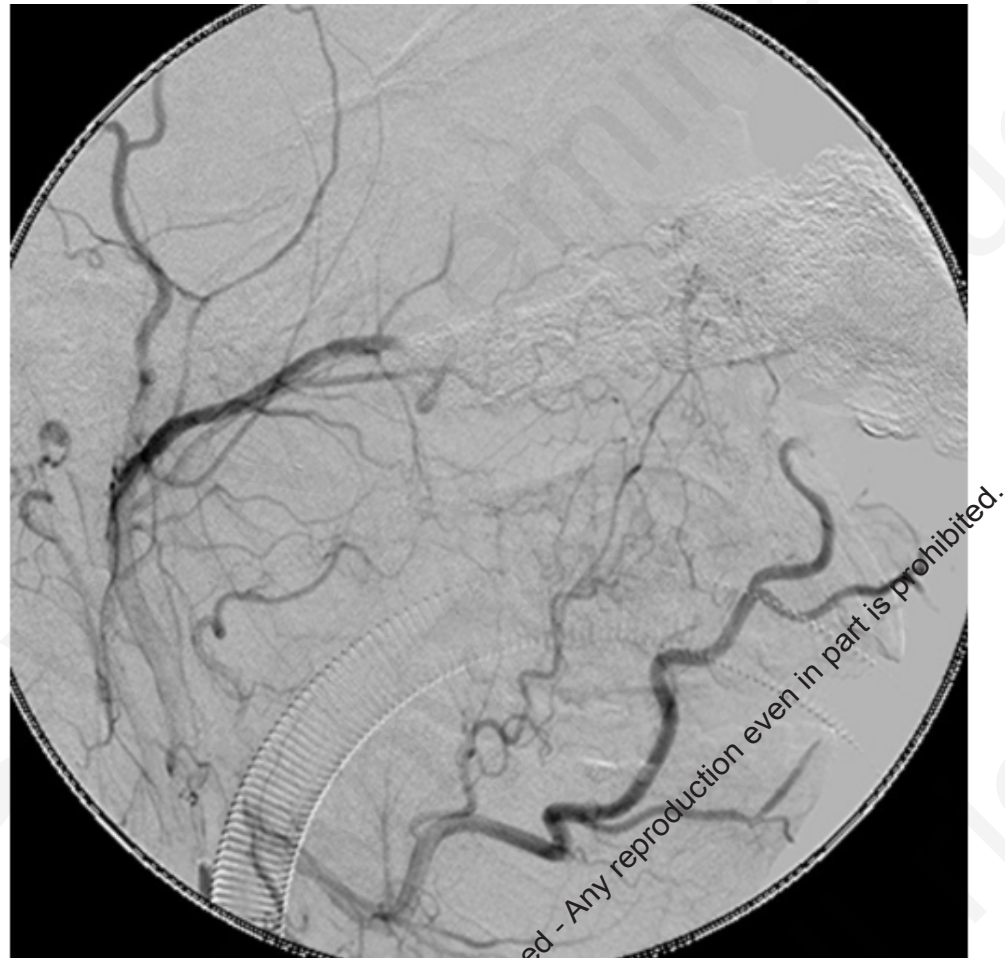
23 year male

- hit in the face while playing cricket
- epistaxis for 4 days despite nasal packing
- Hb now 7







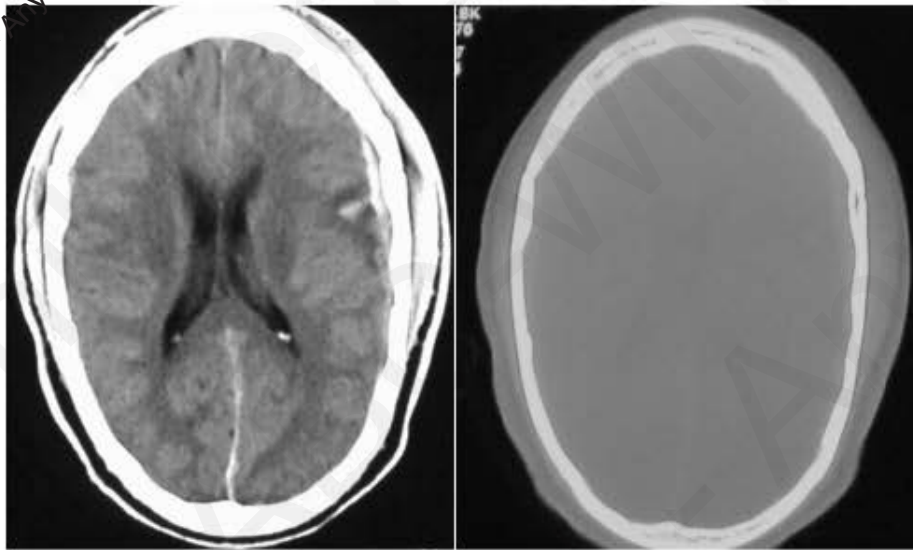


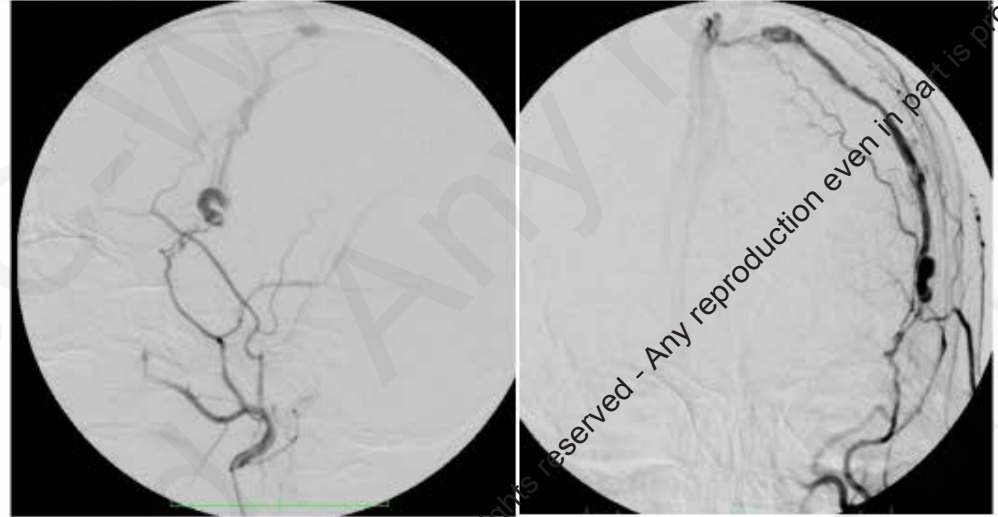
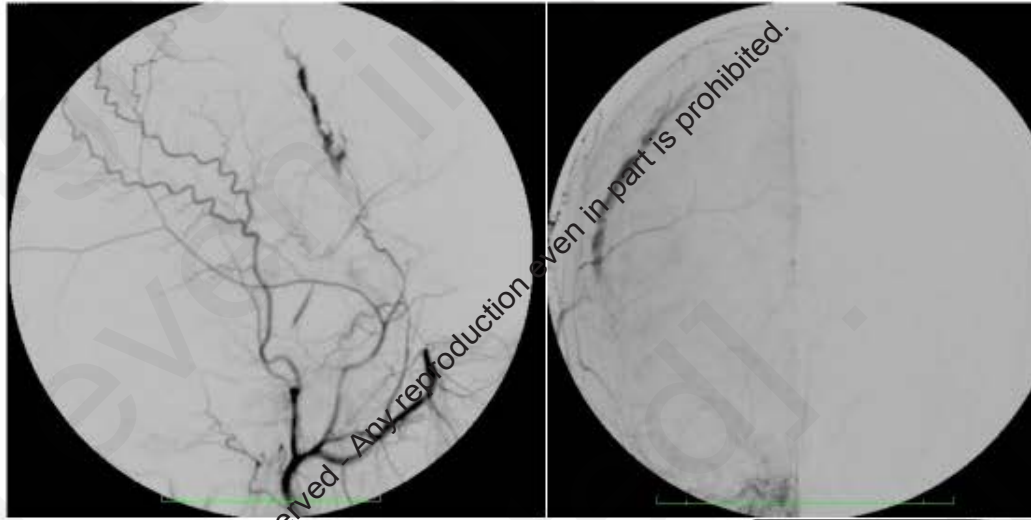
Non ICA Epistaxis

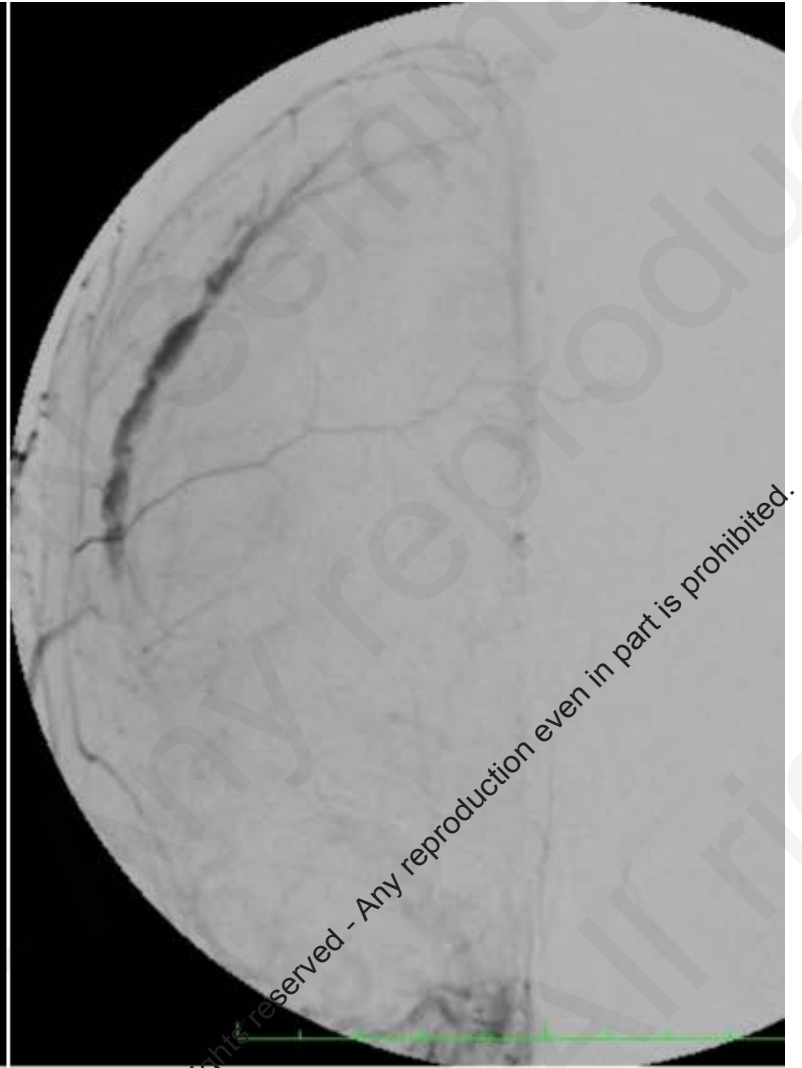
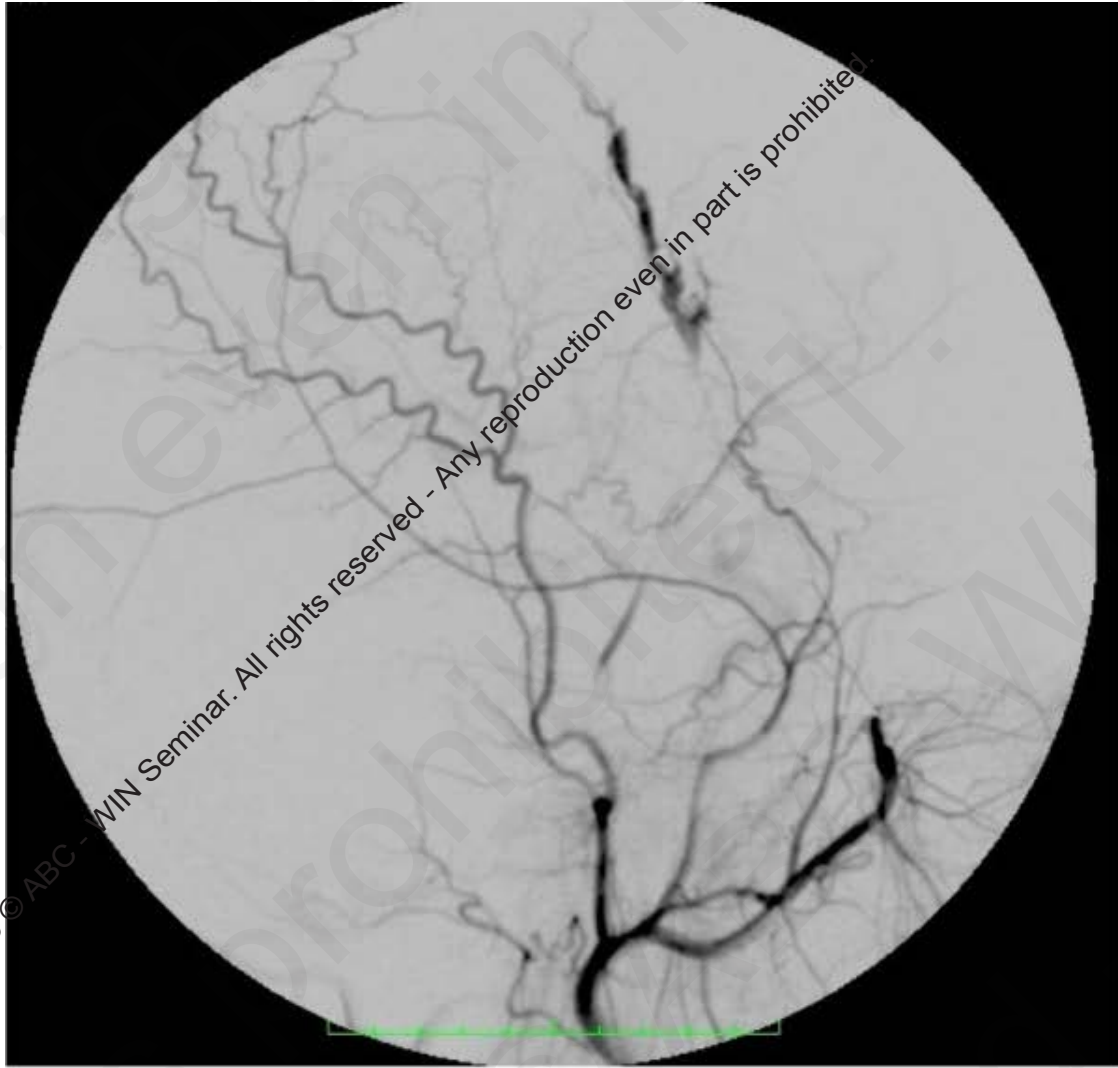
- Bleeding into nasal space or Eustacian tube
- Constant bleed, stops with packing
- Associated with facial fracture
- IMA, Accessory meningeal, Asc.pharyngeal, Greater palatine, sphenopalatine, Ethmoidal

Haematoma

Stab to left and right frontal calvarium 1 week ago





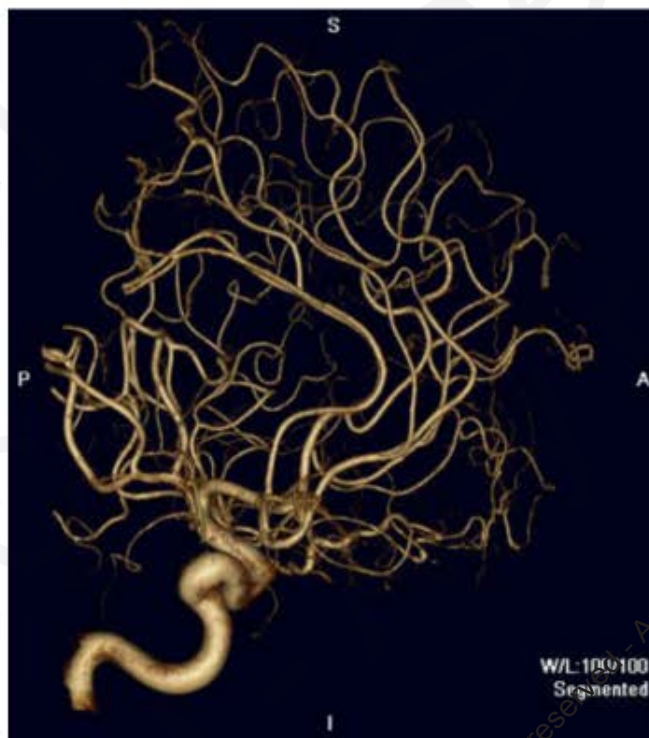
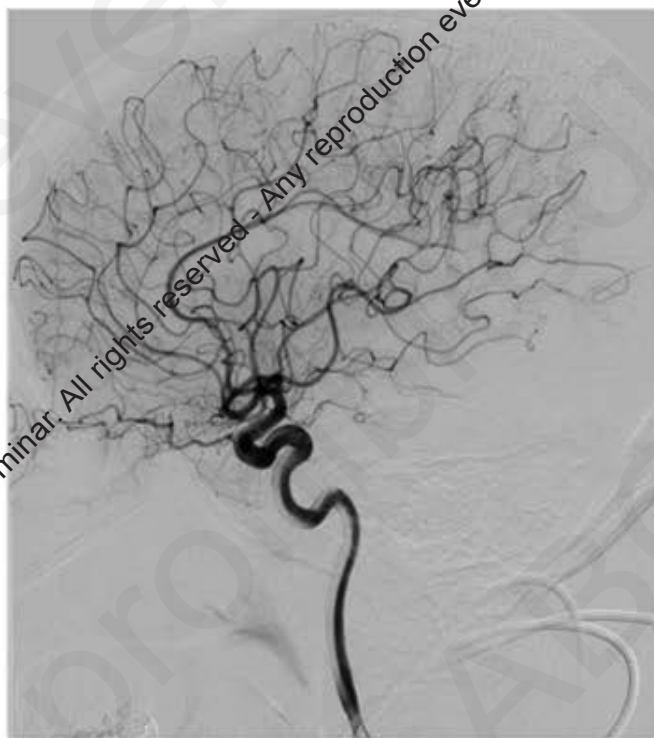


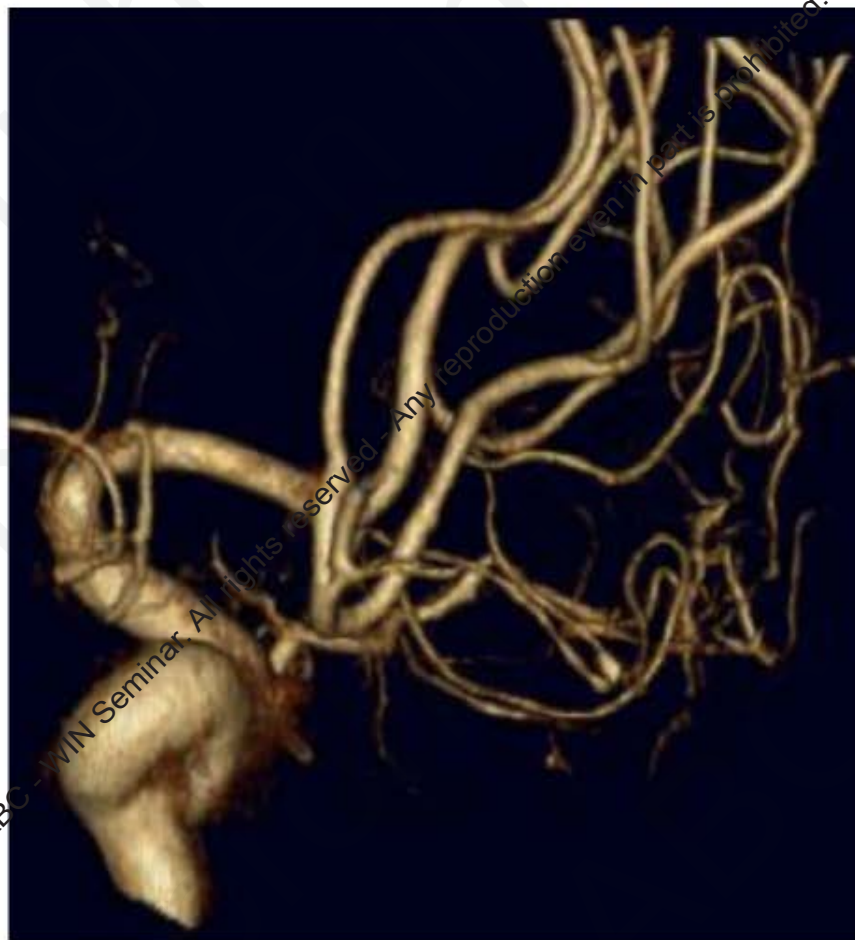


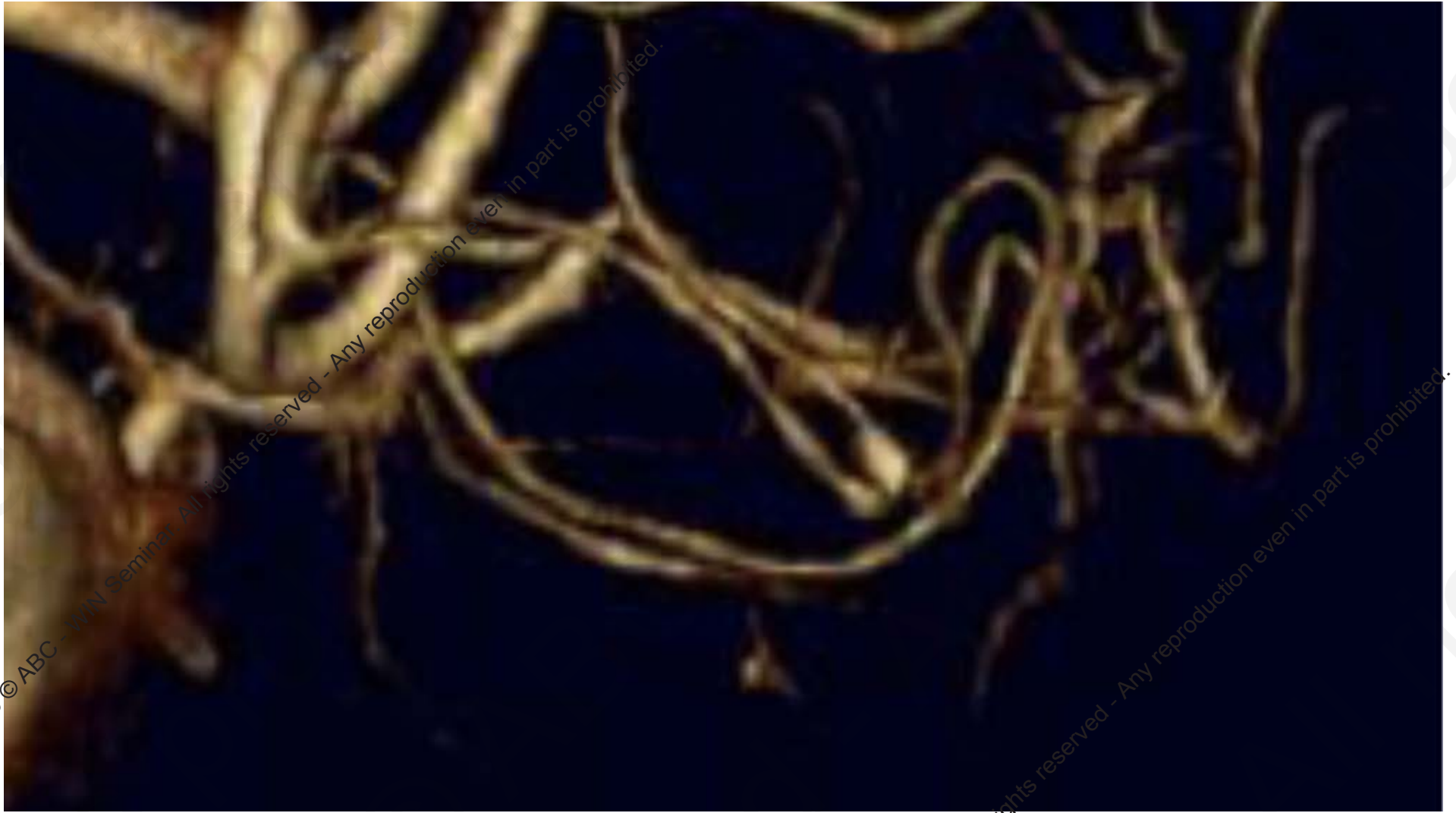
34 female.

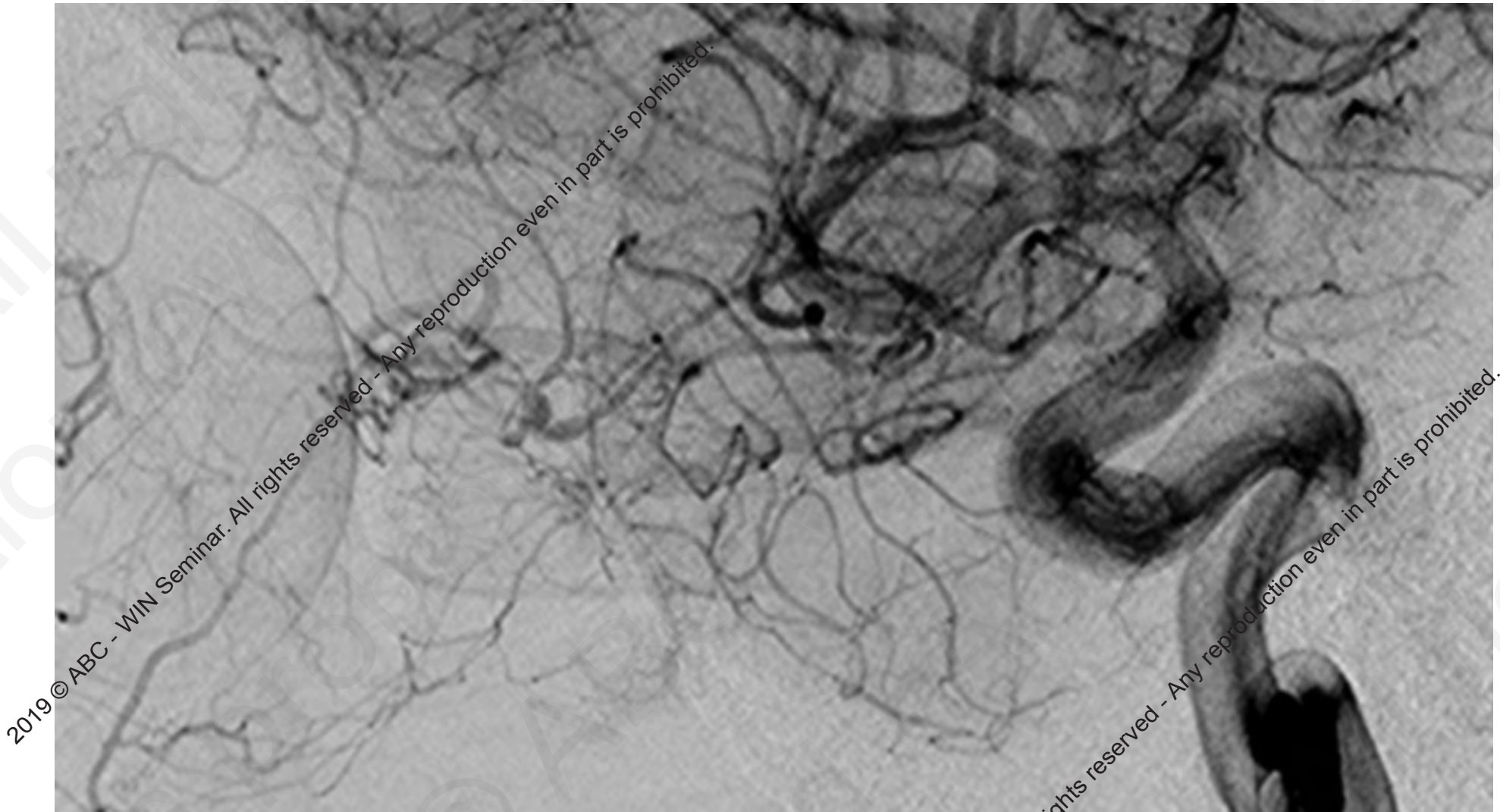
case courtesy of Timo Krings

Intracranial bleed after sinus polyp removal

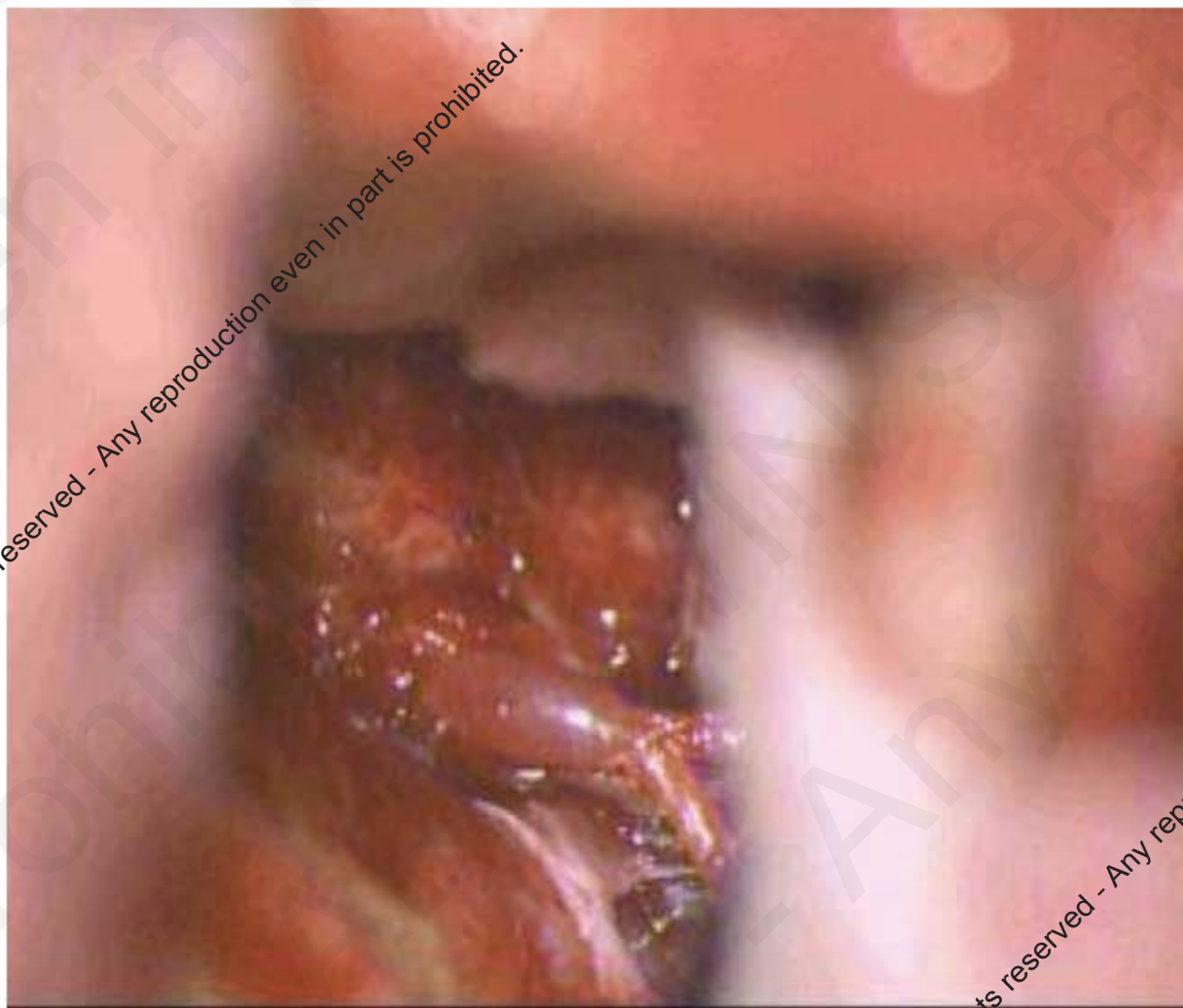








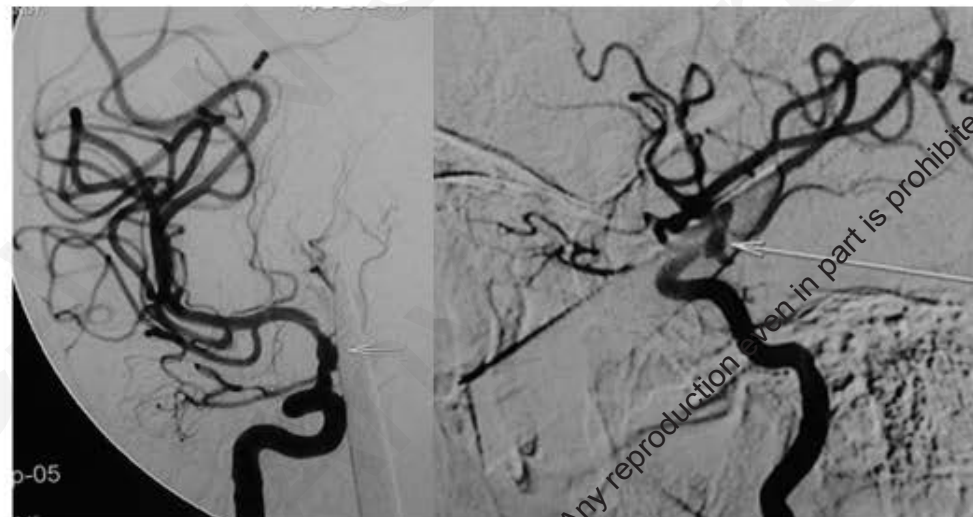
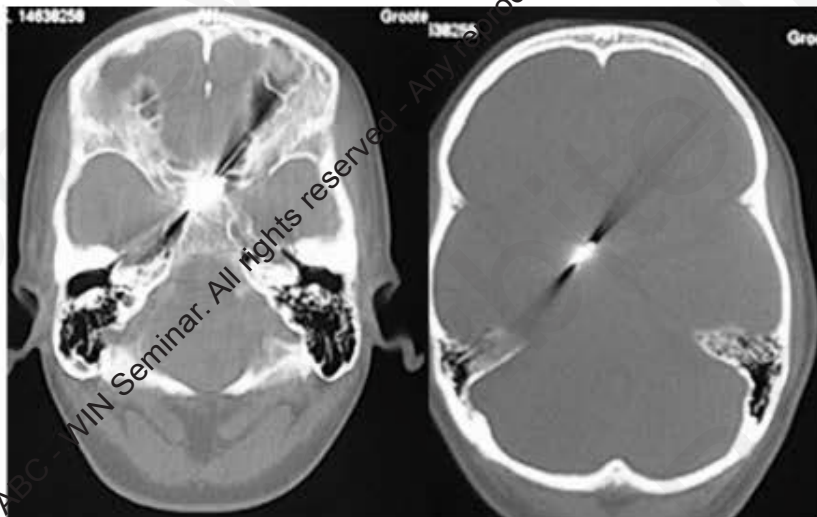
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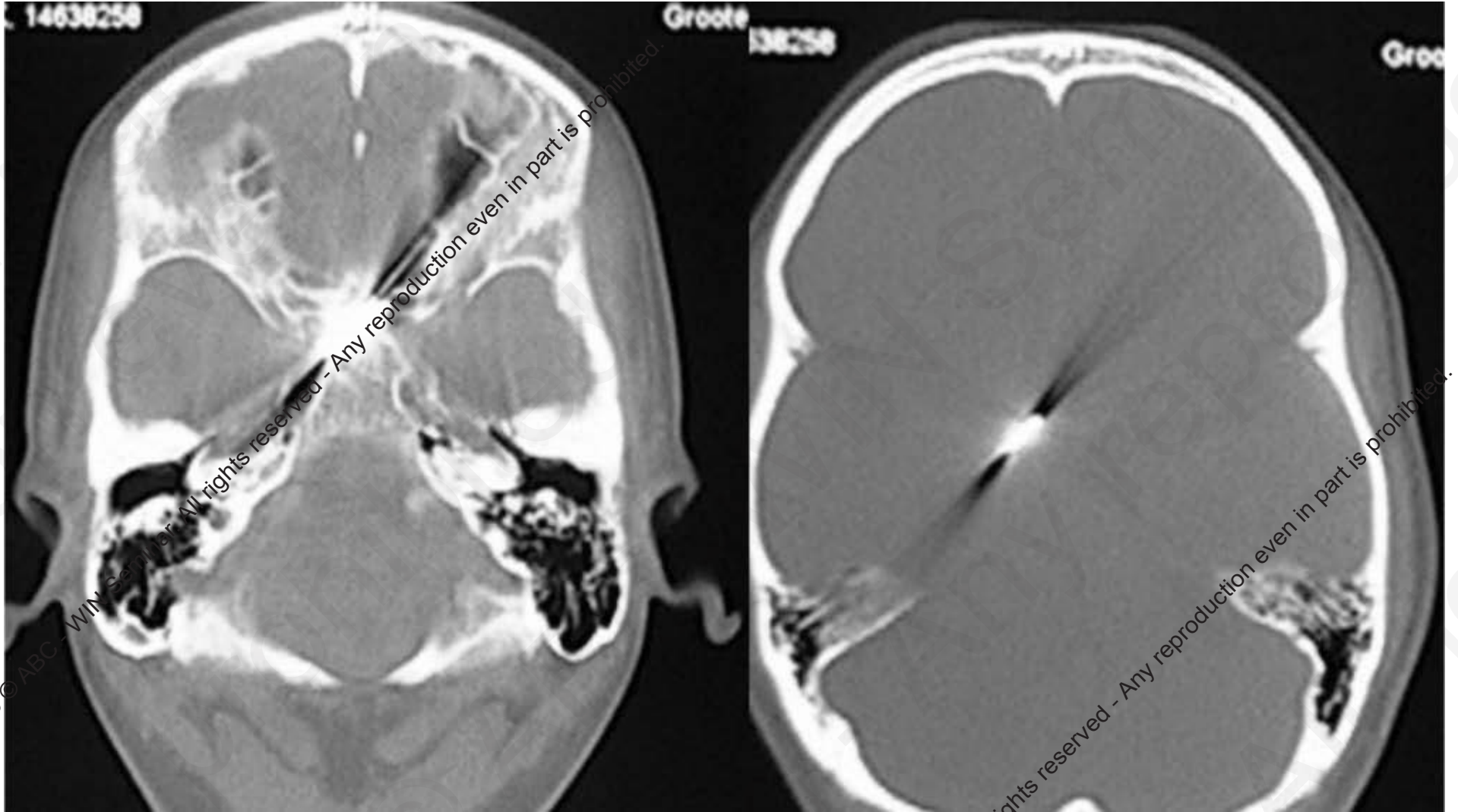


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- Symptomatic intracranial hematoma can be ED, SD or Parenchymal
- MMA or Pial arteries can be injured
- Traumatic orbital hematoma rare

Retained penetrating object



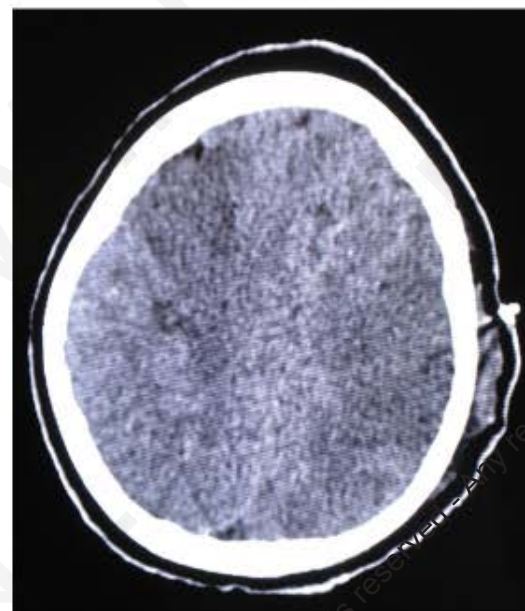
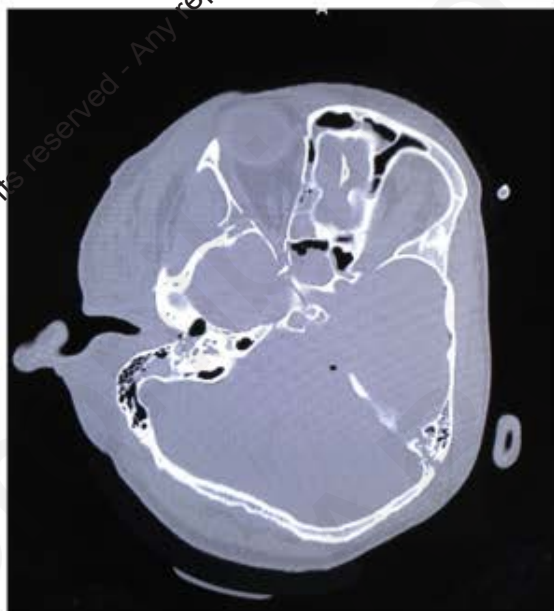




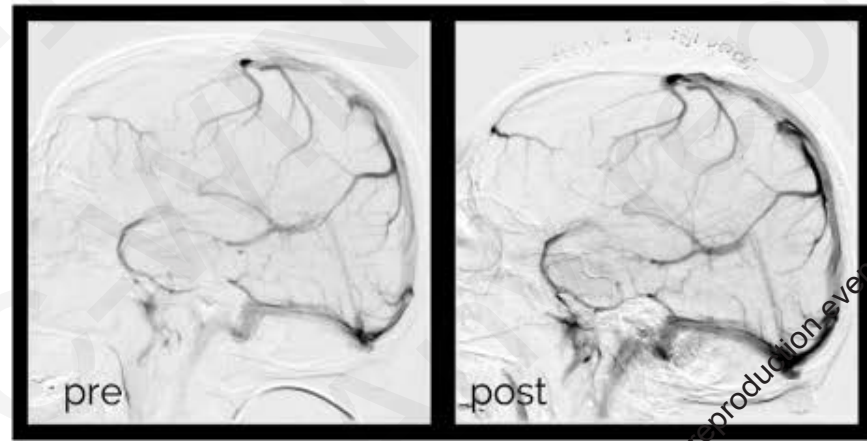
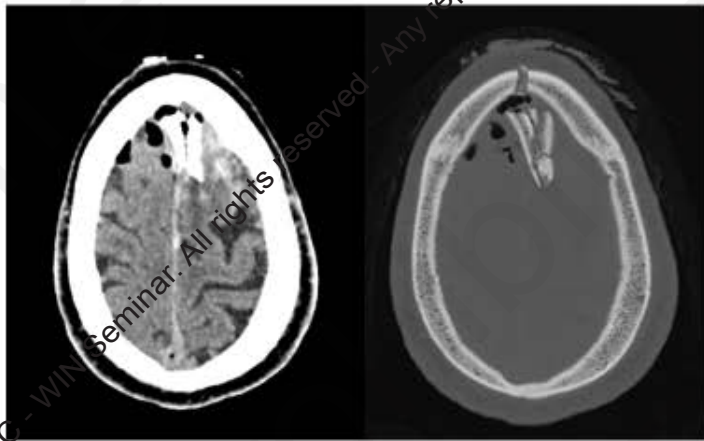
- high risk of vascular injury with orbital penetration
- explosive shrapnel injuries associated with intracranial vascular injury
- injury often occult (asymptomatic)

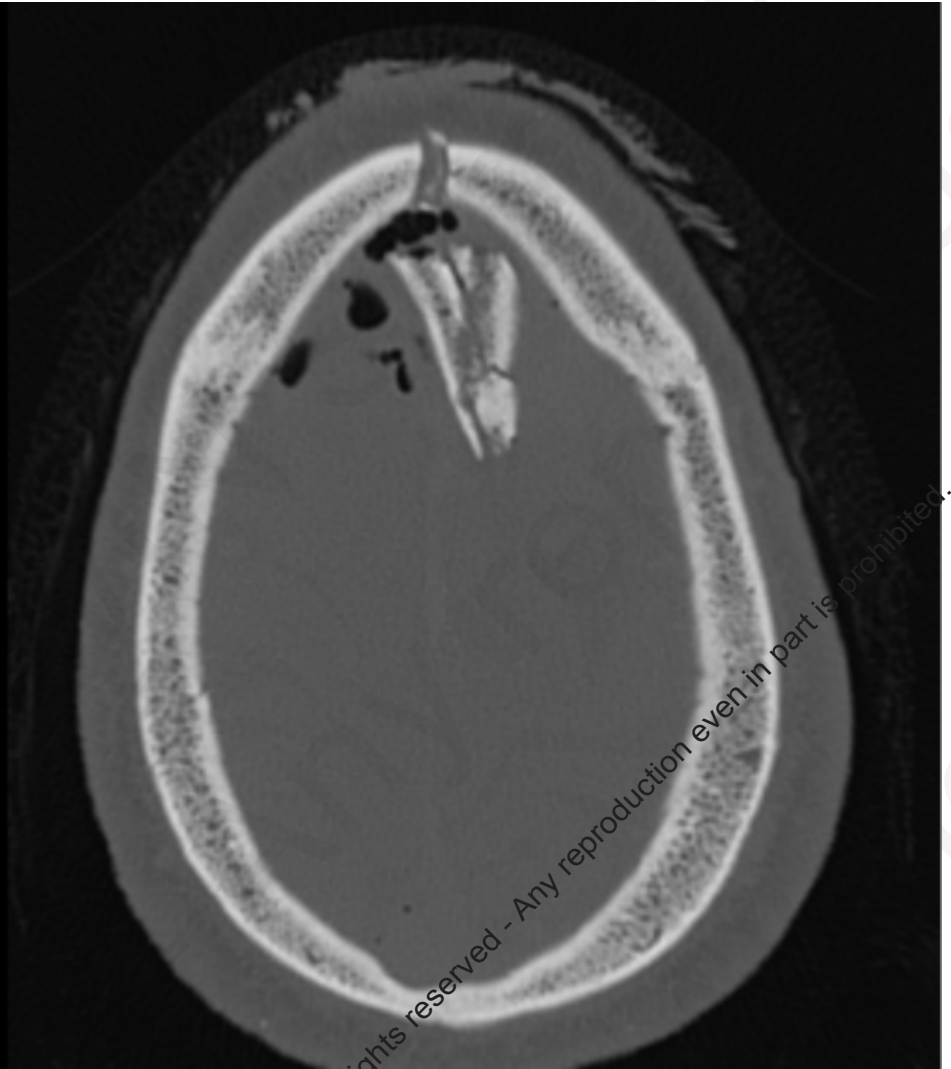
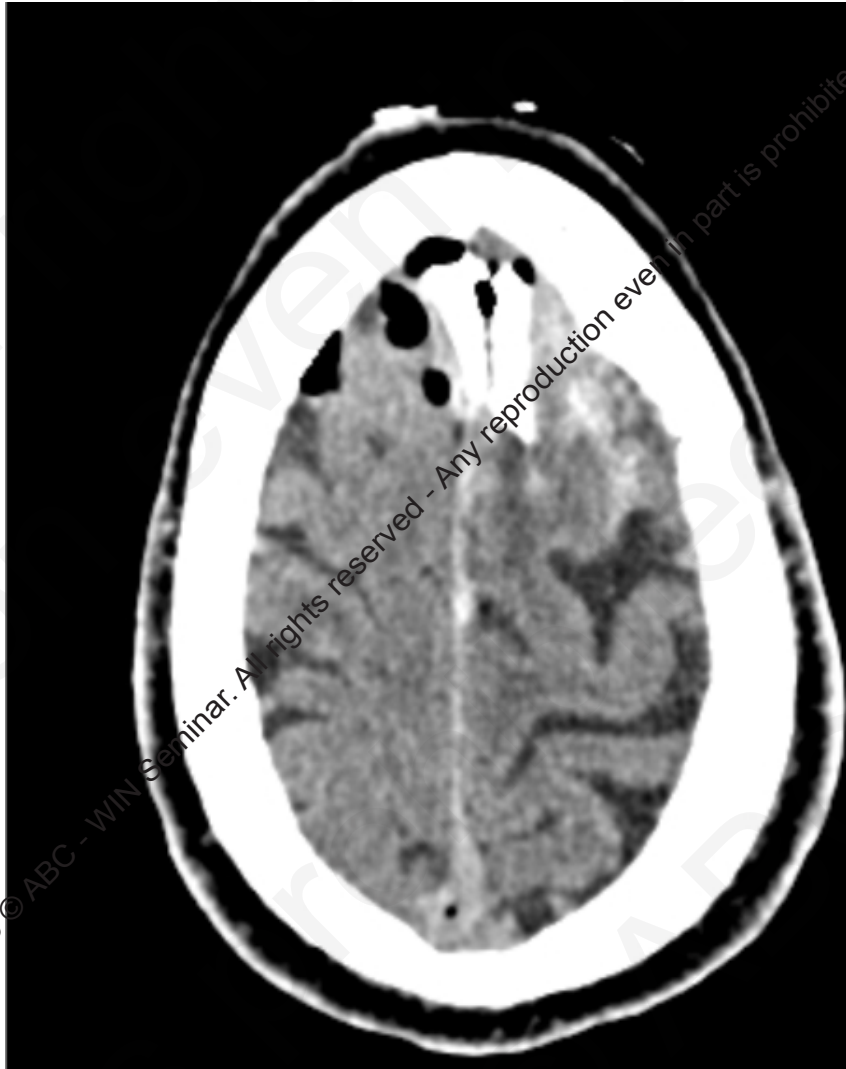
Stroke

13 year male. Motor accident



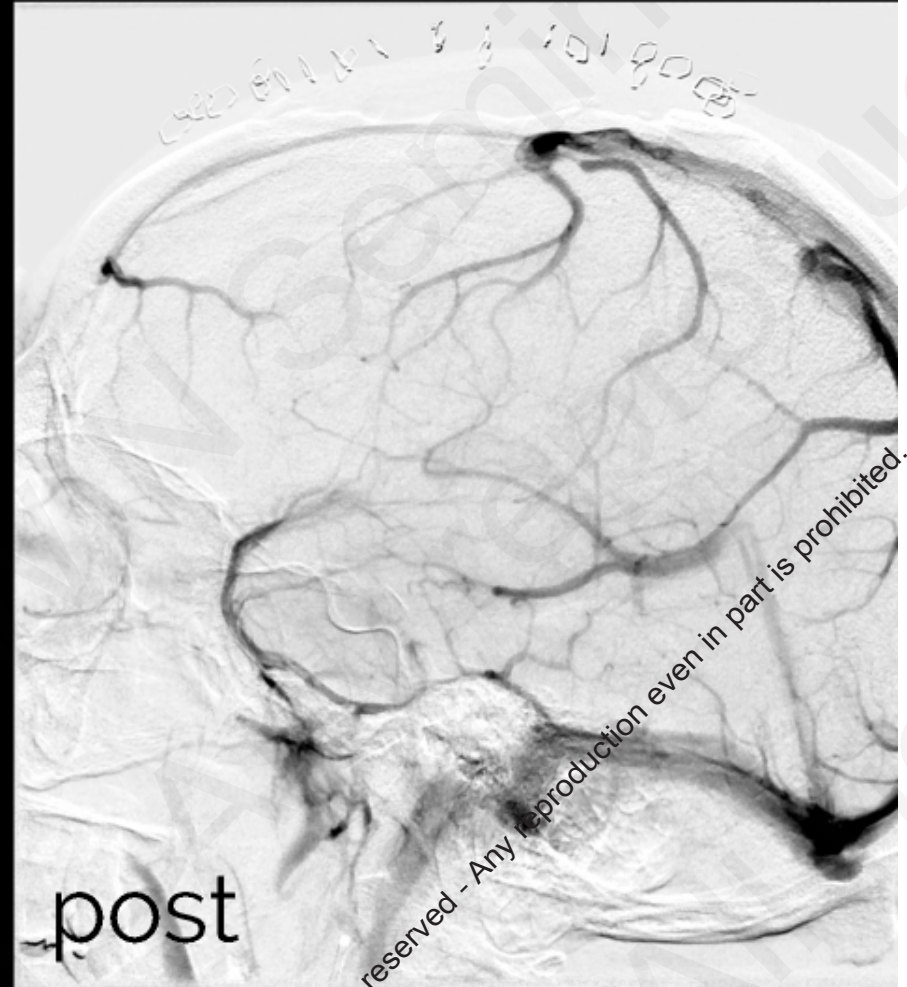
50 male. Assaulted with axe in robbery
Increasing drowsiness, dysphasia





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pre



post

- Arterial stroke rare with ACF injury, more likely with cervical injury
- Venous injury often missed

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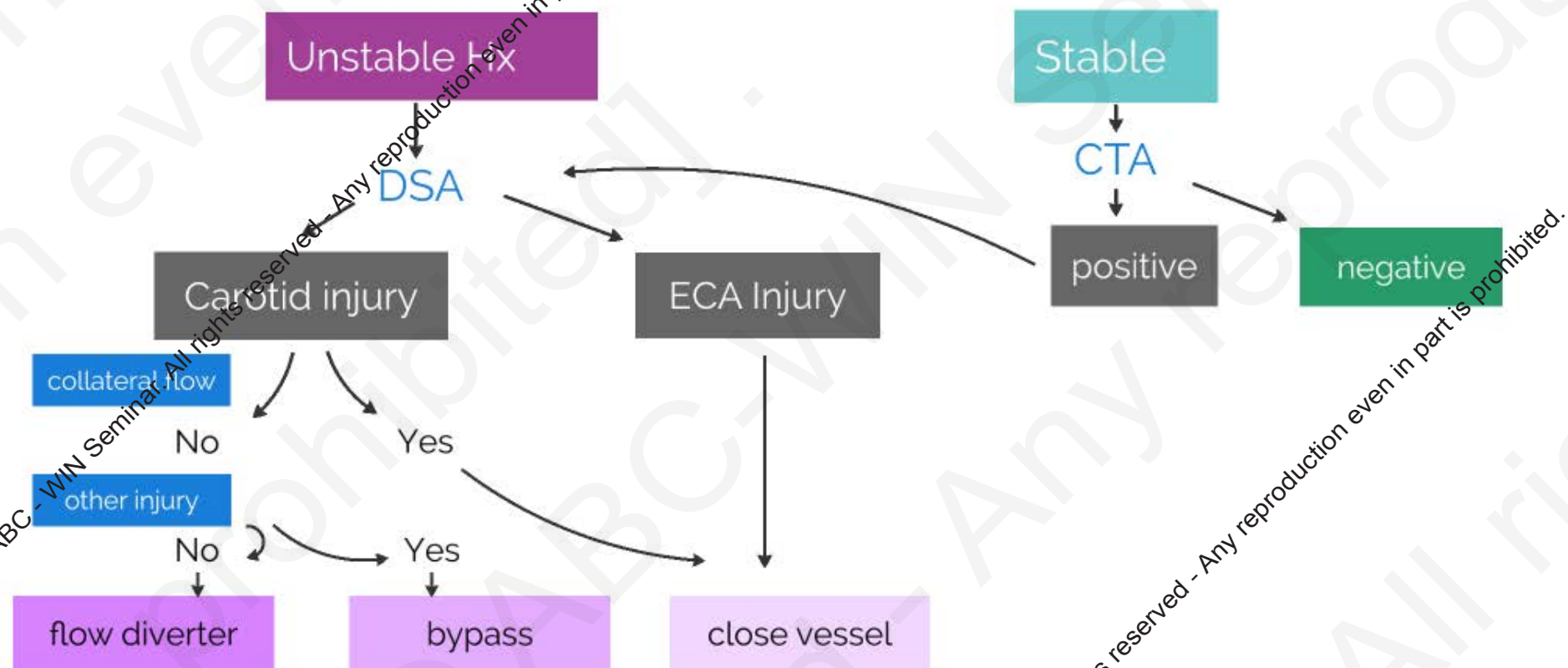
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Endovascular Treatment of Trauma



Stable

CTA

positive

negative

Unstable Hx

DSA

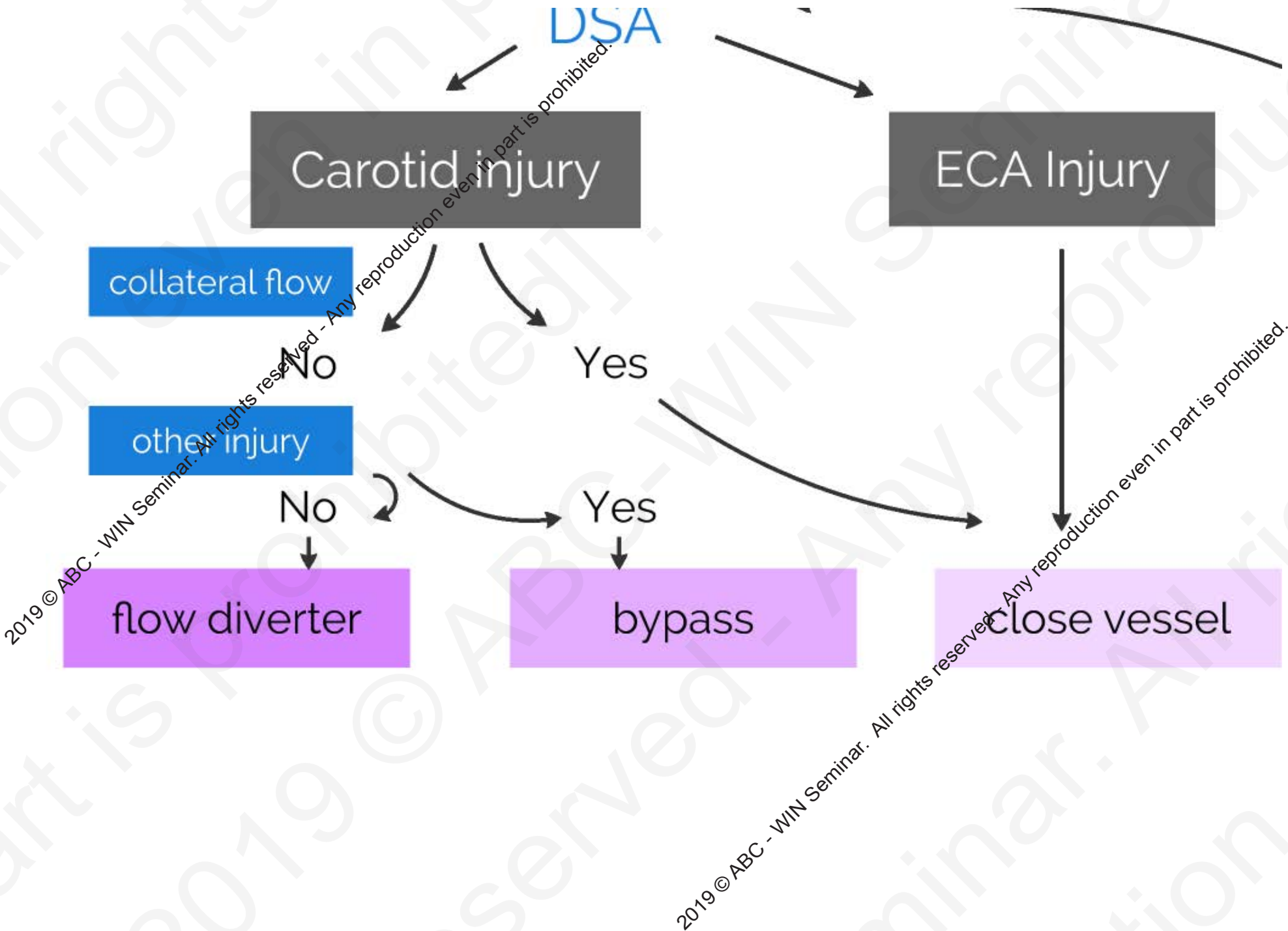
Carotid injury

ECA Injury

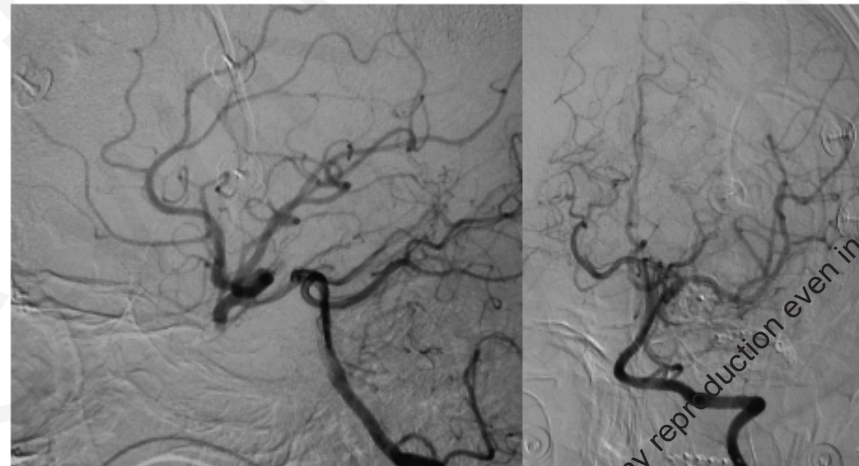
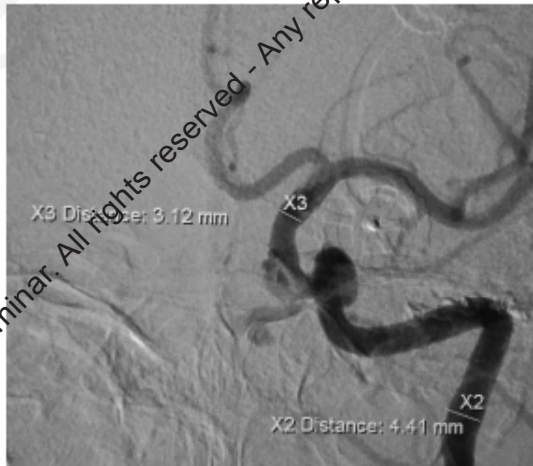
collateral flow

No

Yes



ICA preservation - Flow diverter

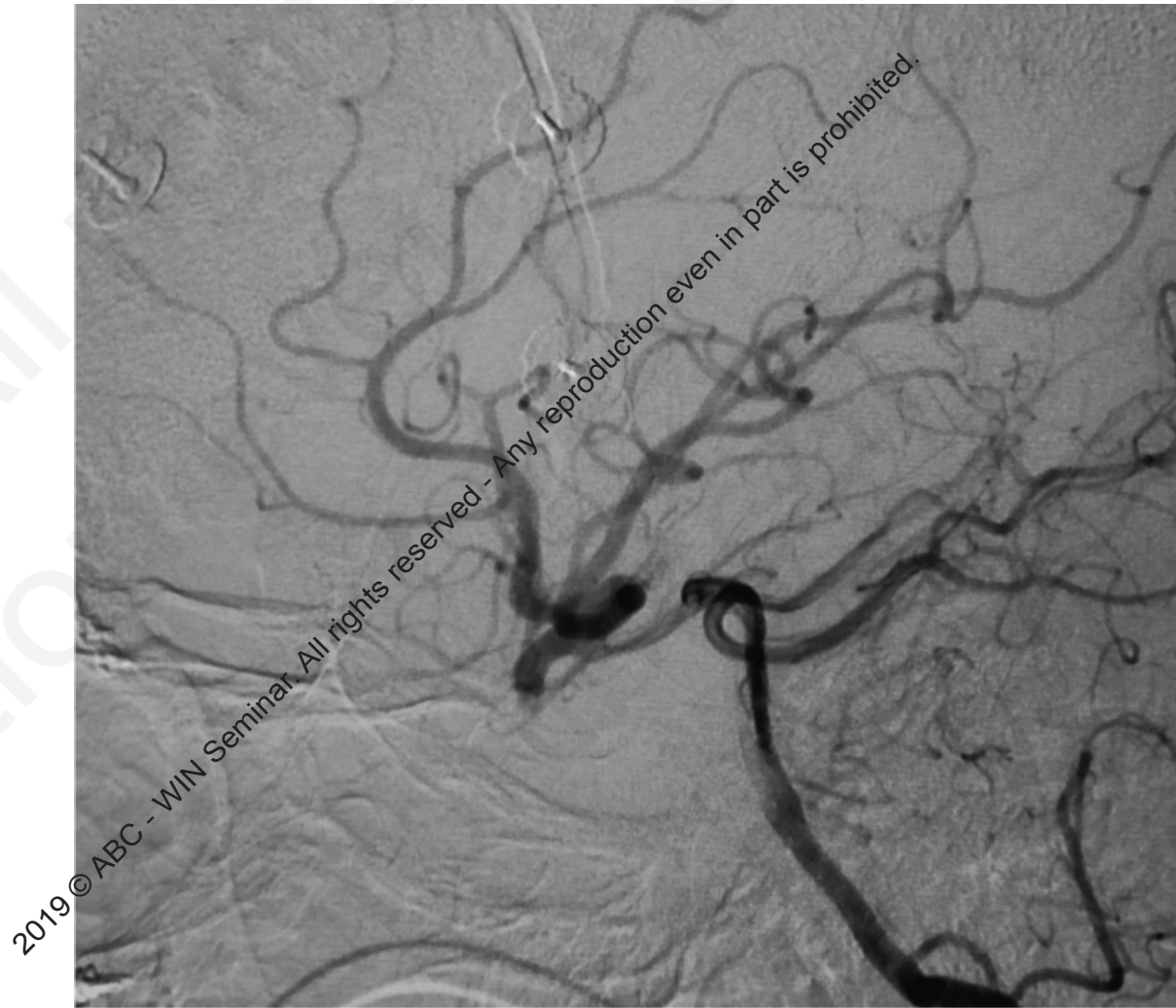


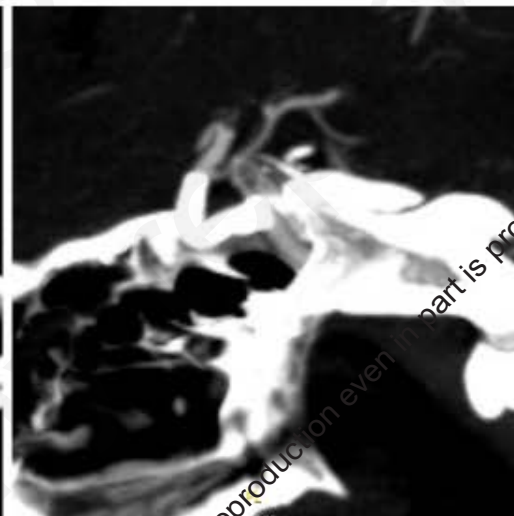
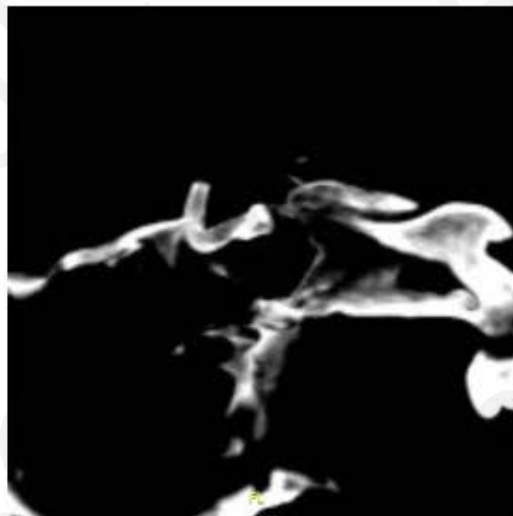
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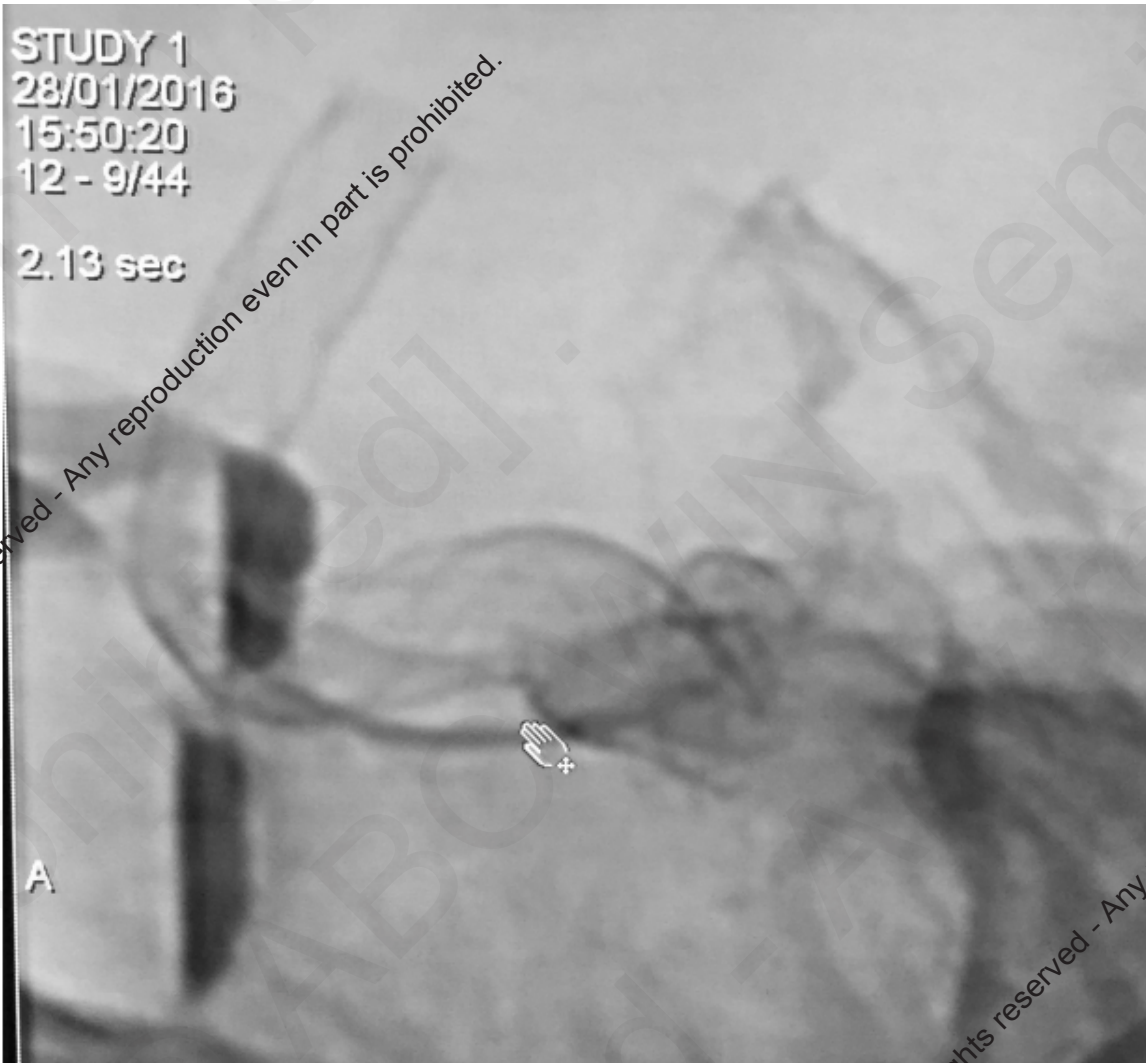


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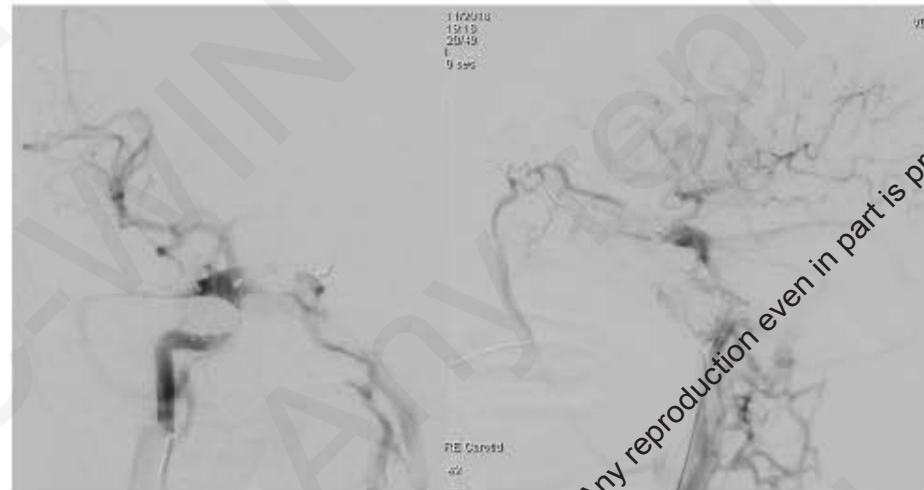
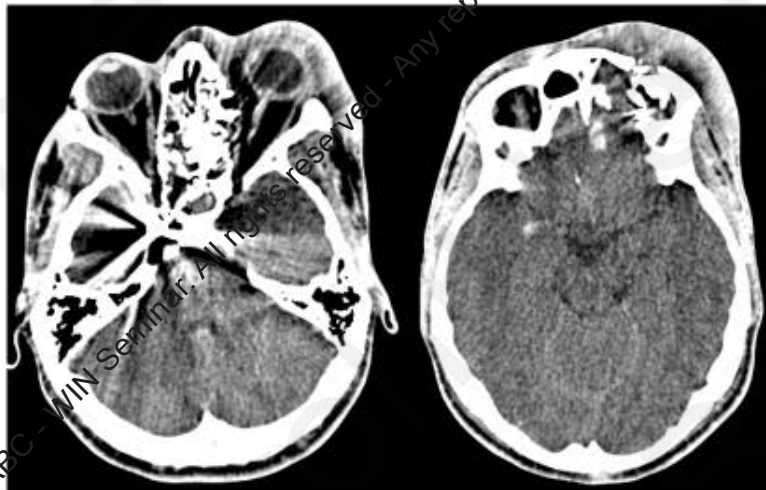


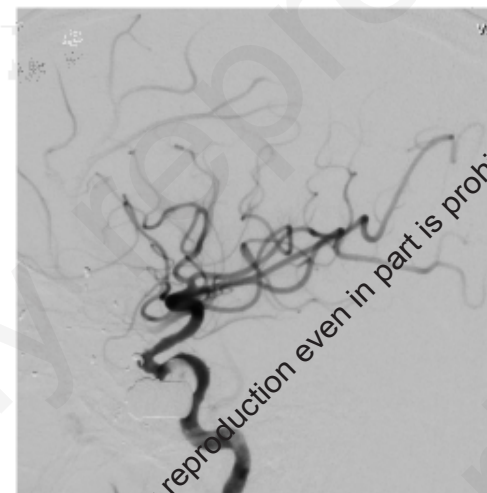
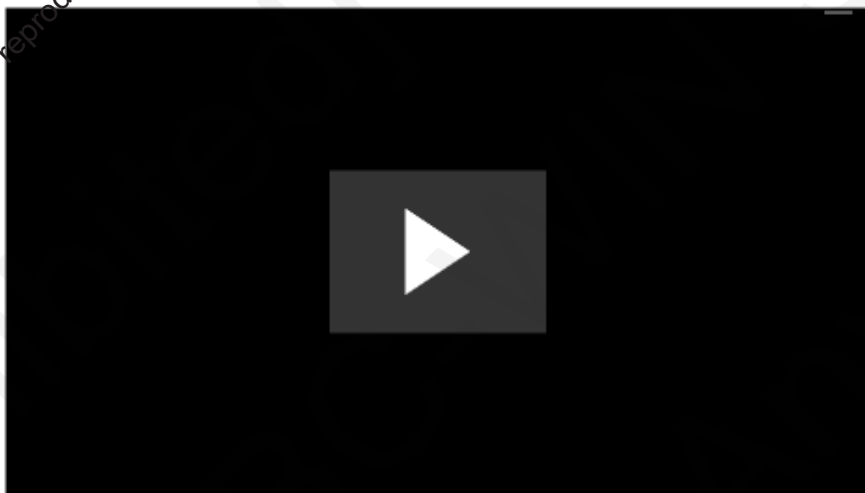
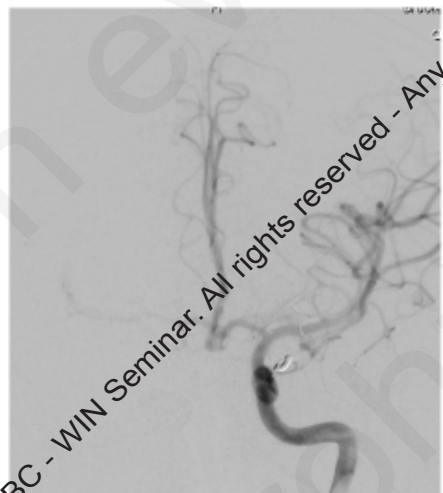




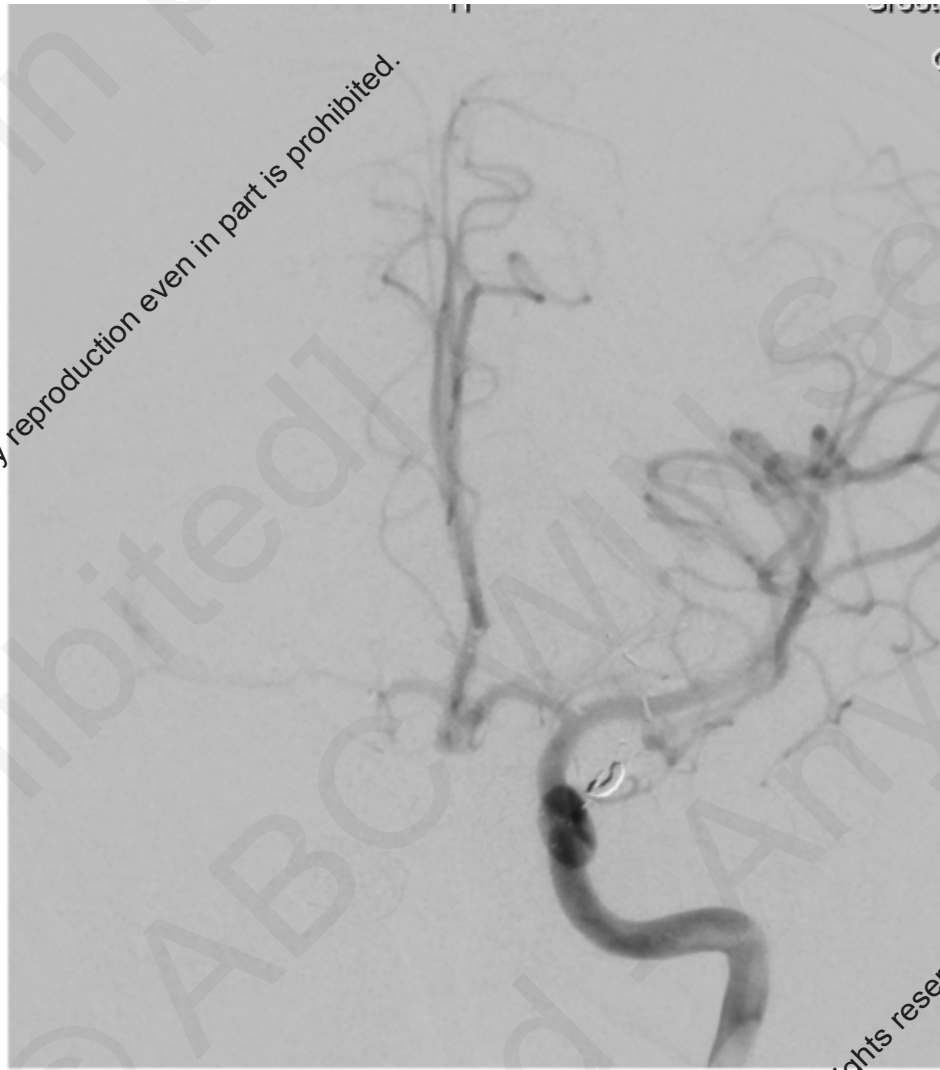
ICA preservation - Balloon

Gunshot orbit





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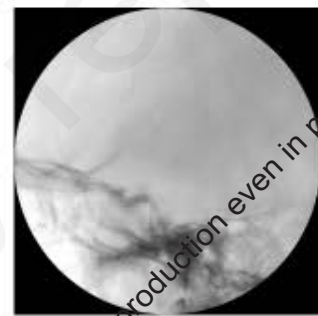
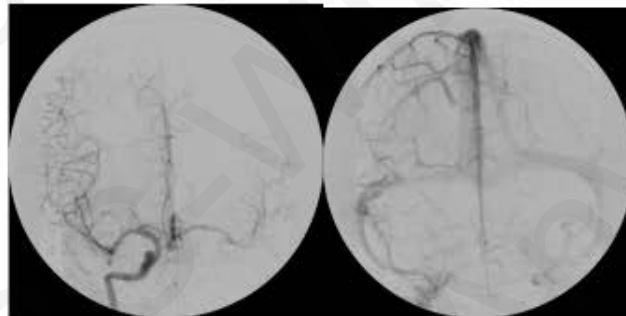
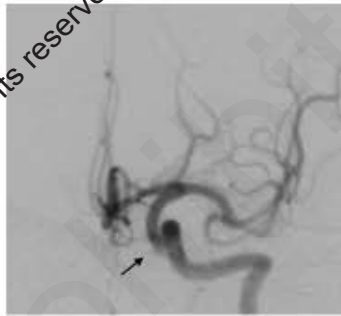
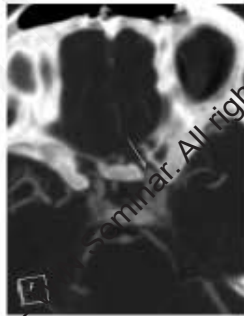


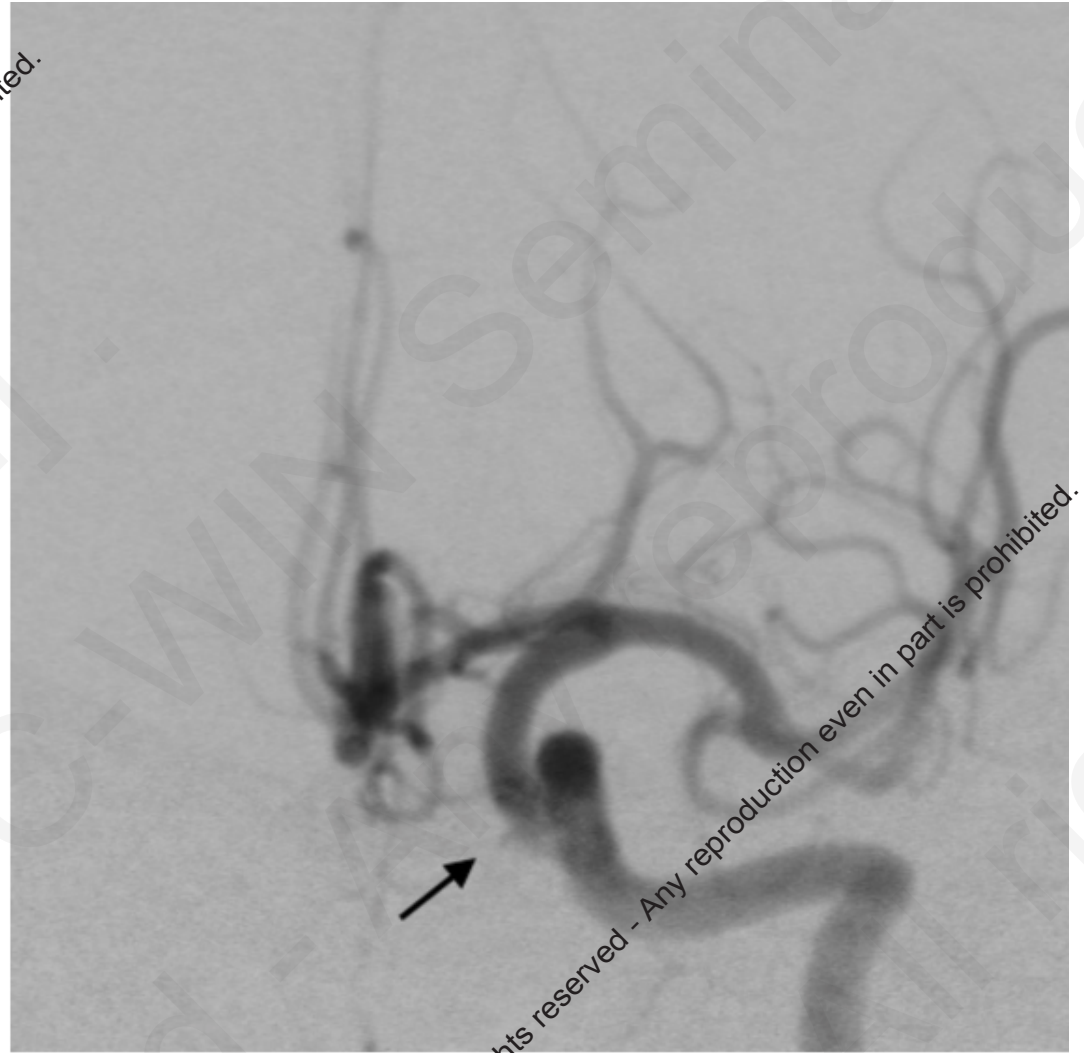
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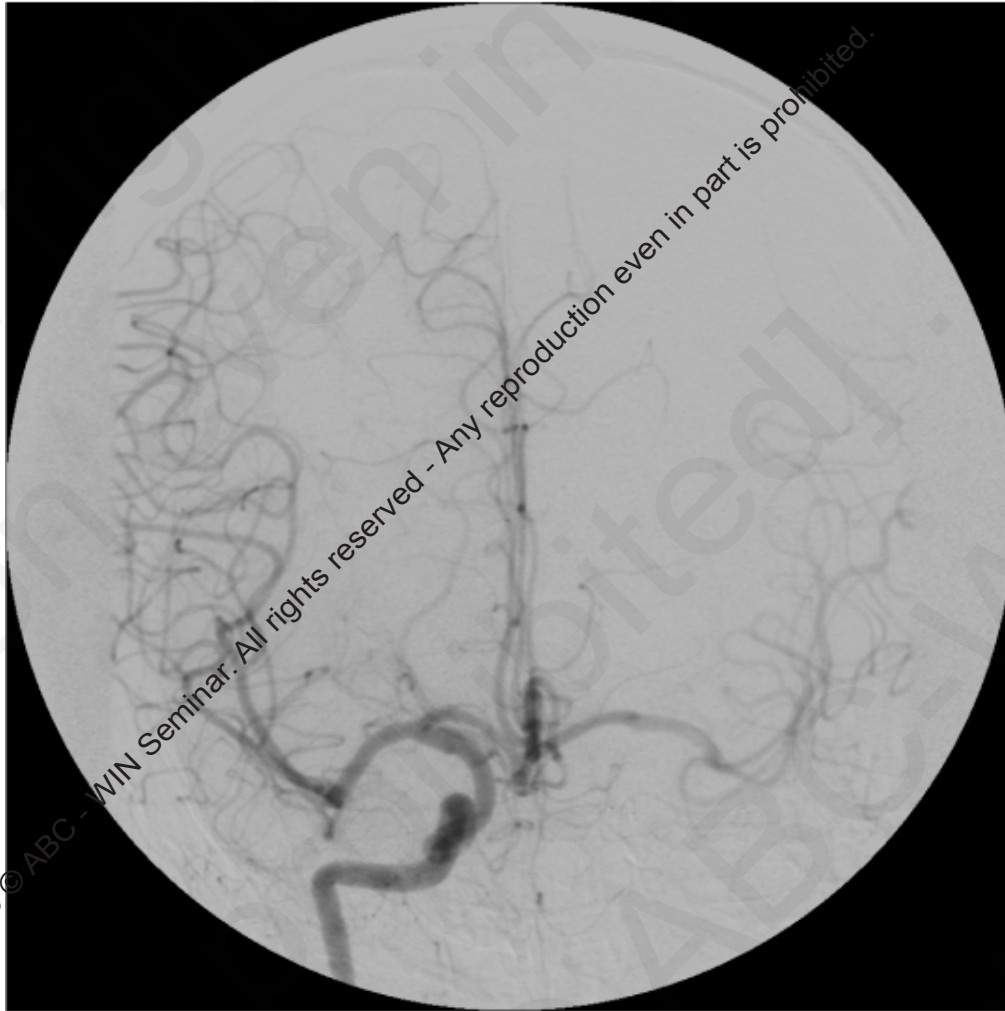


Vessel (ICA) occlusion

32 male. Assault 3 months before. 3 episodes massive epistaxis

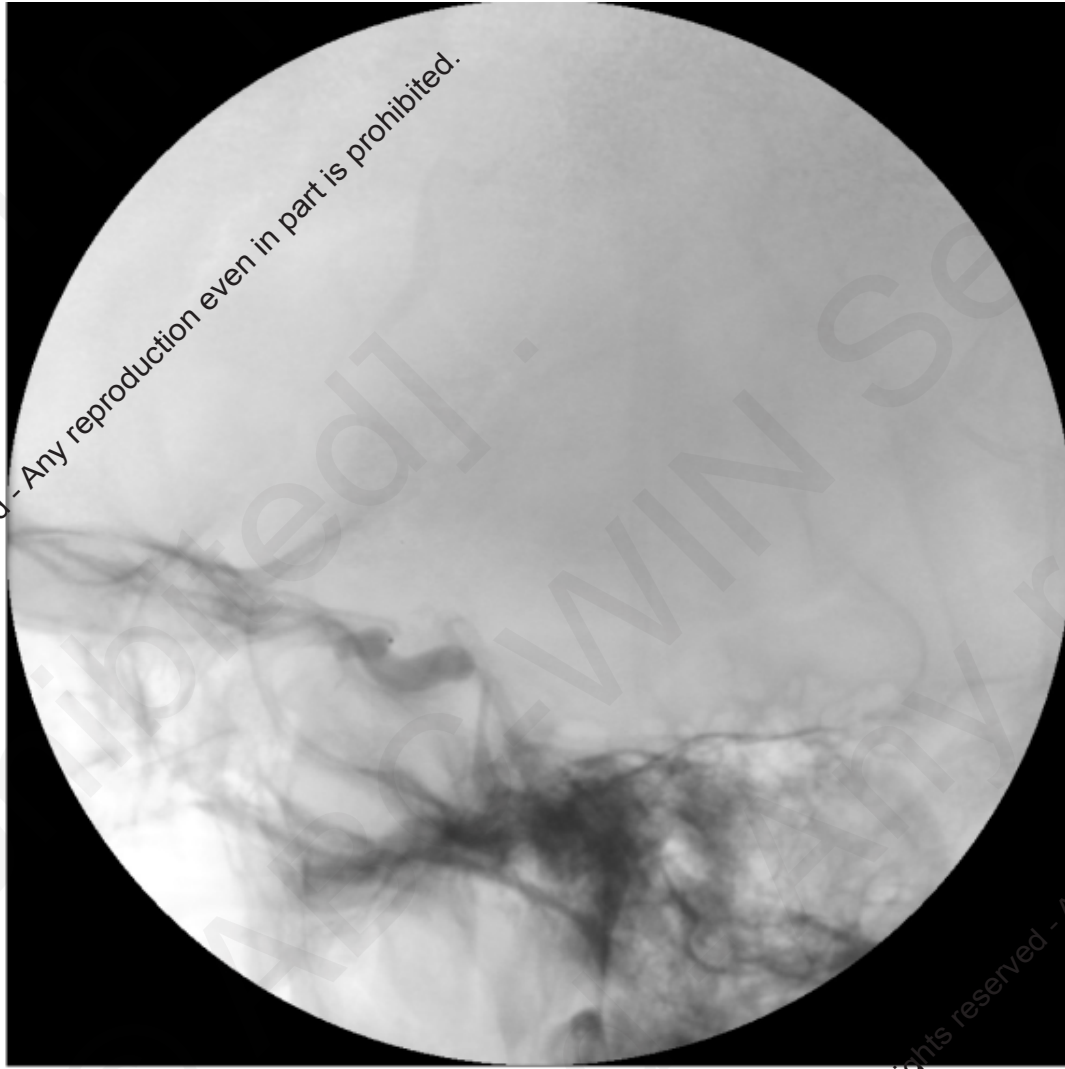








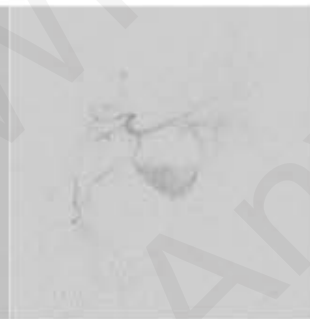
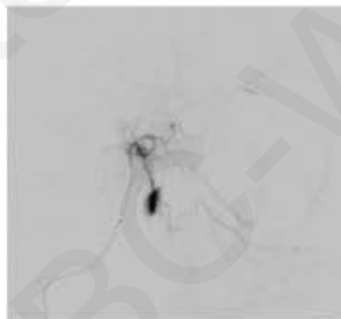
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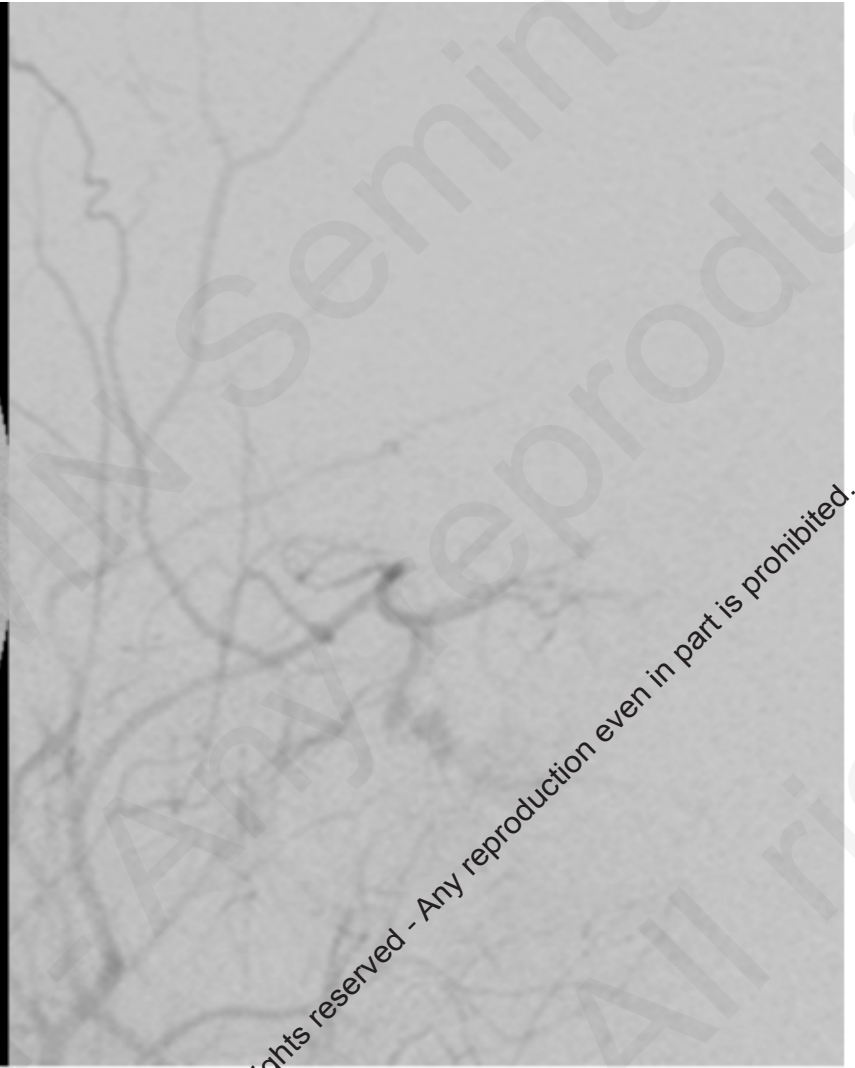
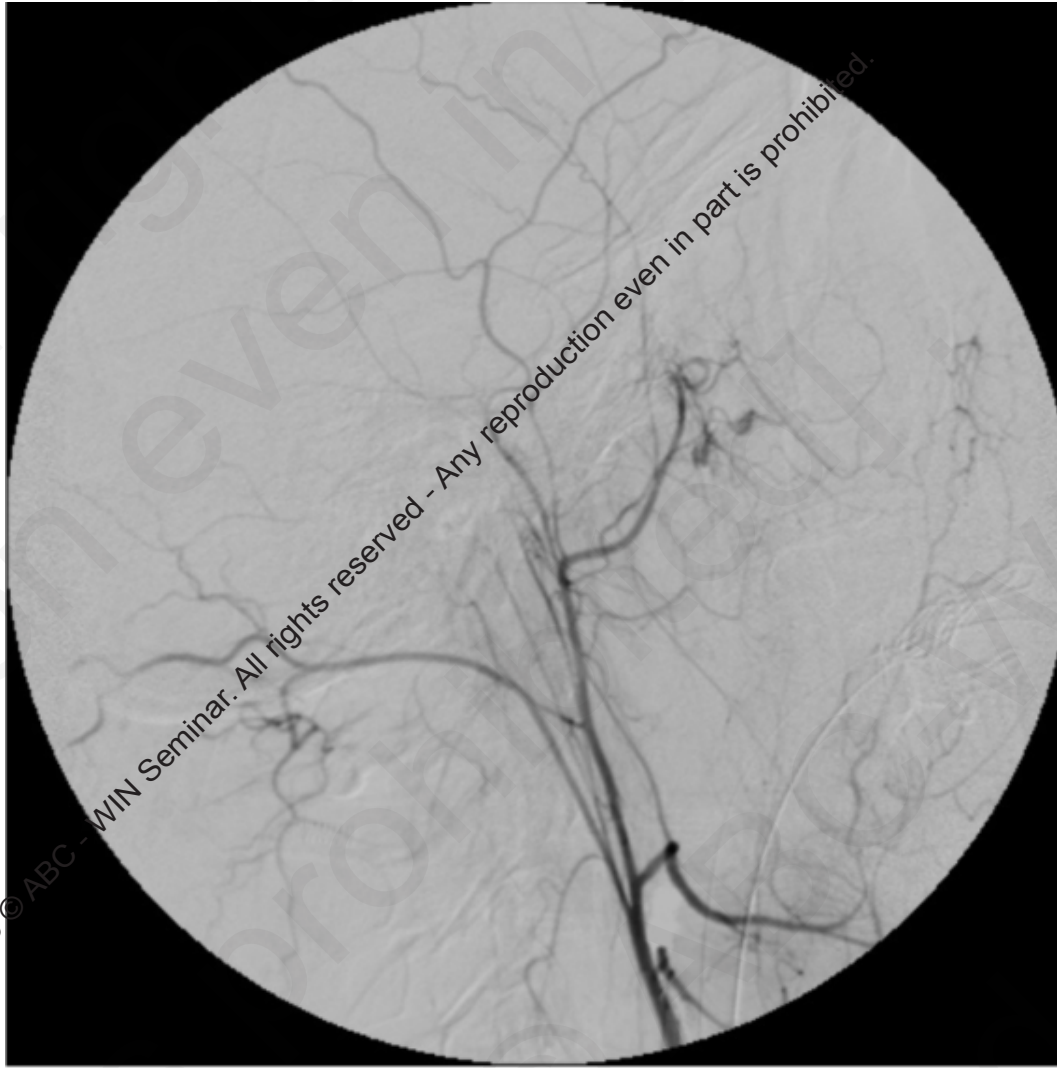


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Vessel occlusion (ECA)

42 male, gunshot face
ongoing epistaxis with pack, BP 80/, Hb 7





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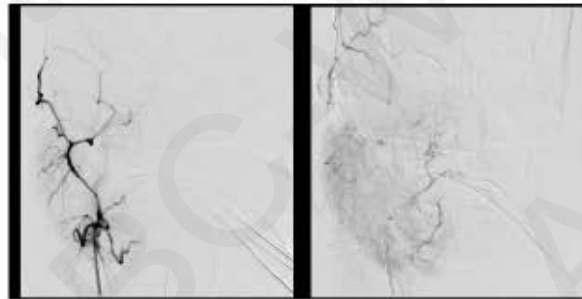
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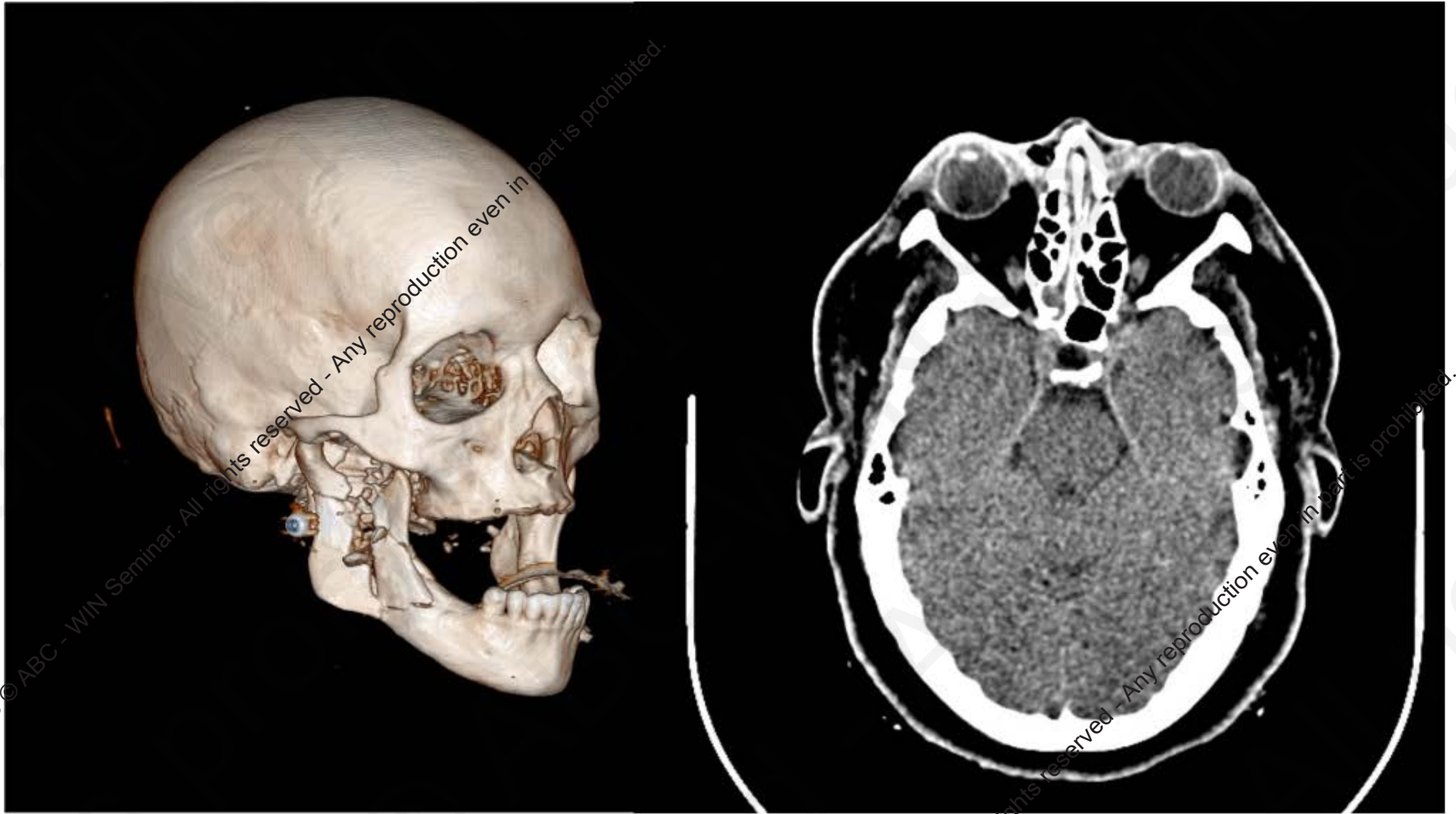
NBCA in trauma

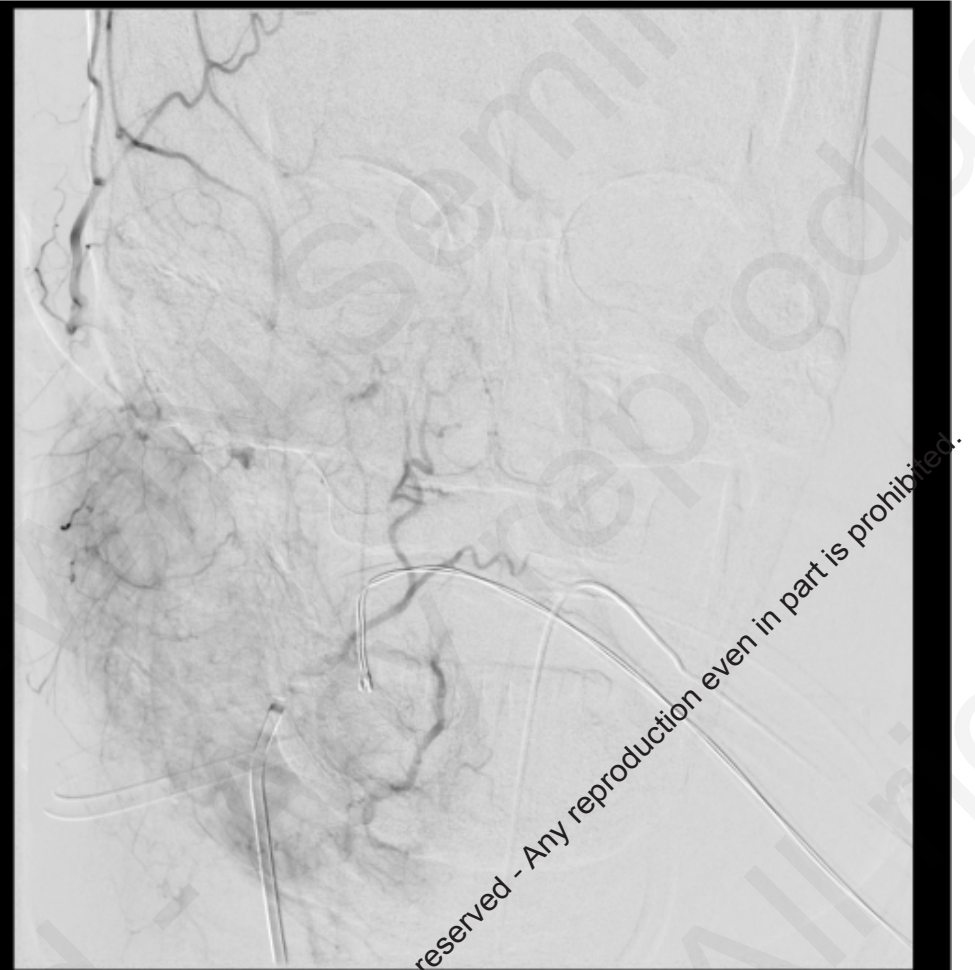
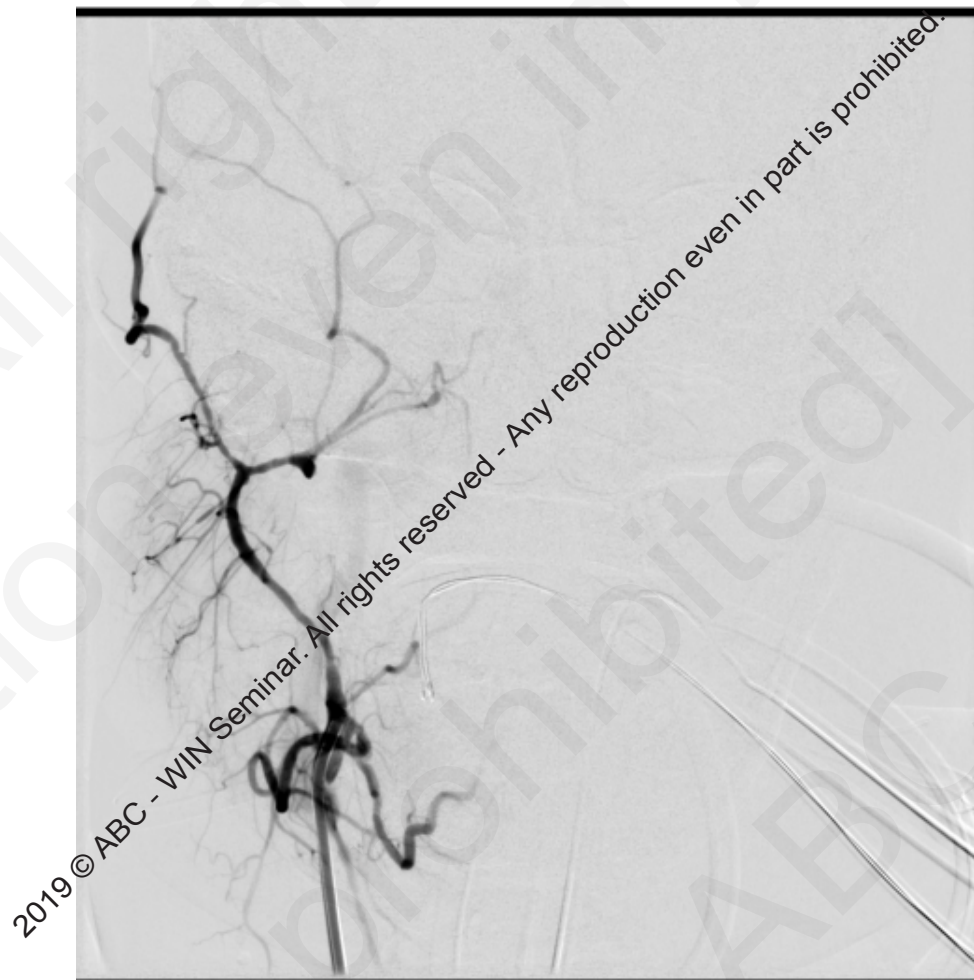
- Use 50% NBCA
- Slow injection
- dont over inject false aneurysm
- flow reversal in diastole

Vessel occlusion (ECA)

31 female, gunshot face
epistaxis







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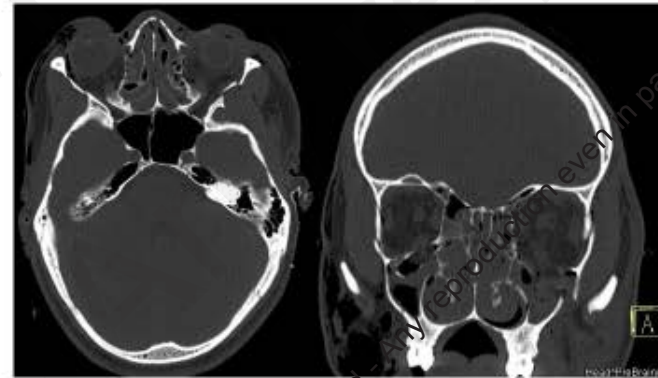


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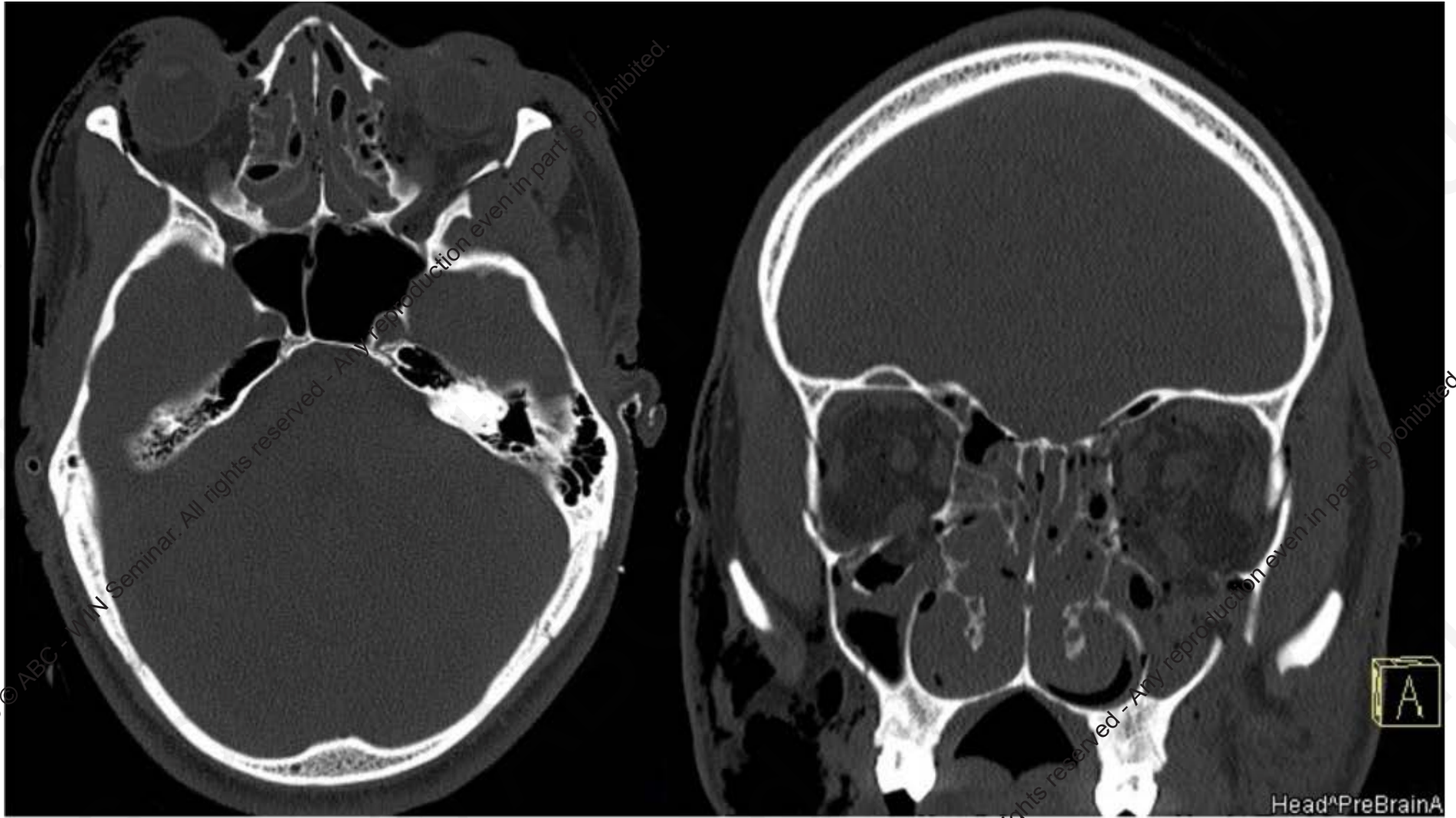
Vessel occlusion (ECA)

Young man
crush injury of face
epistaxis controlled with pack

courtesy Ebrahim Kader

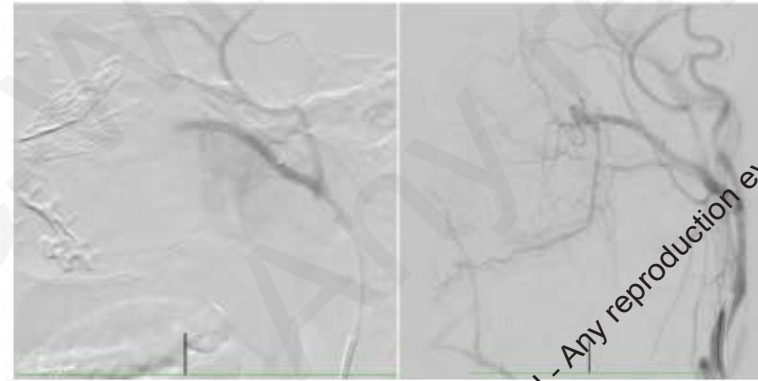
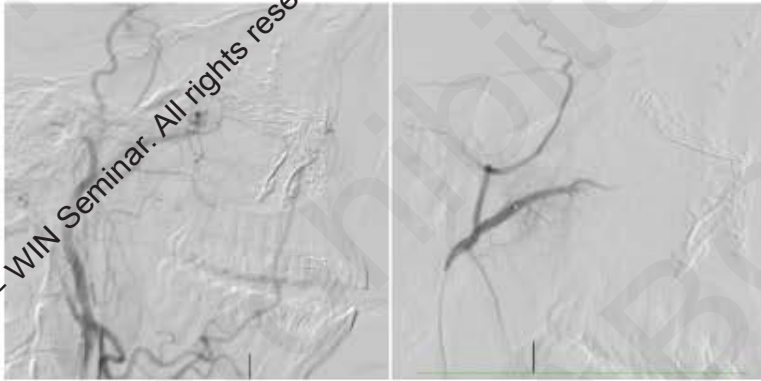
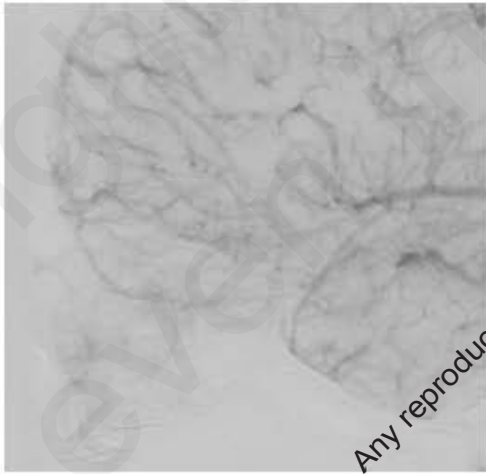




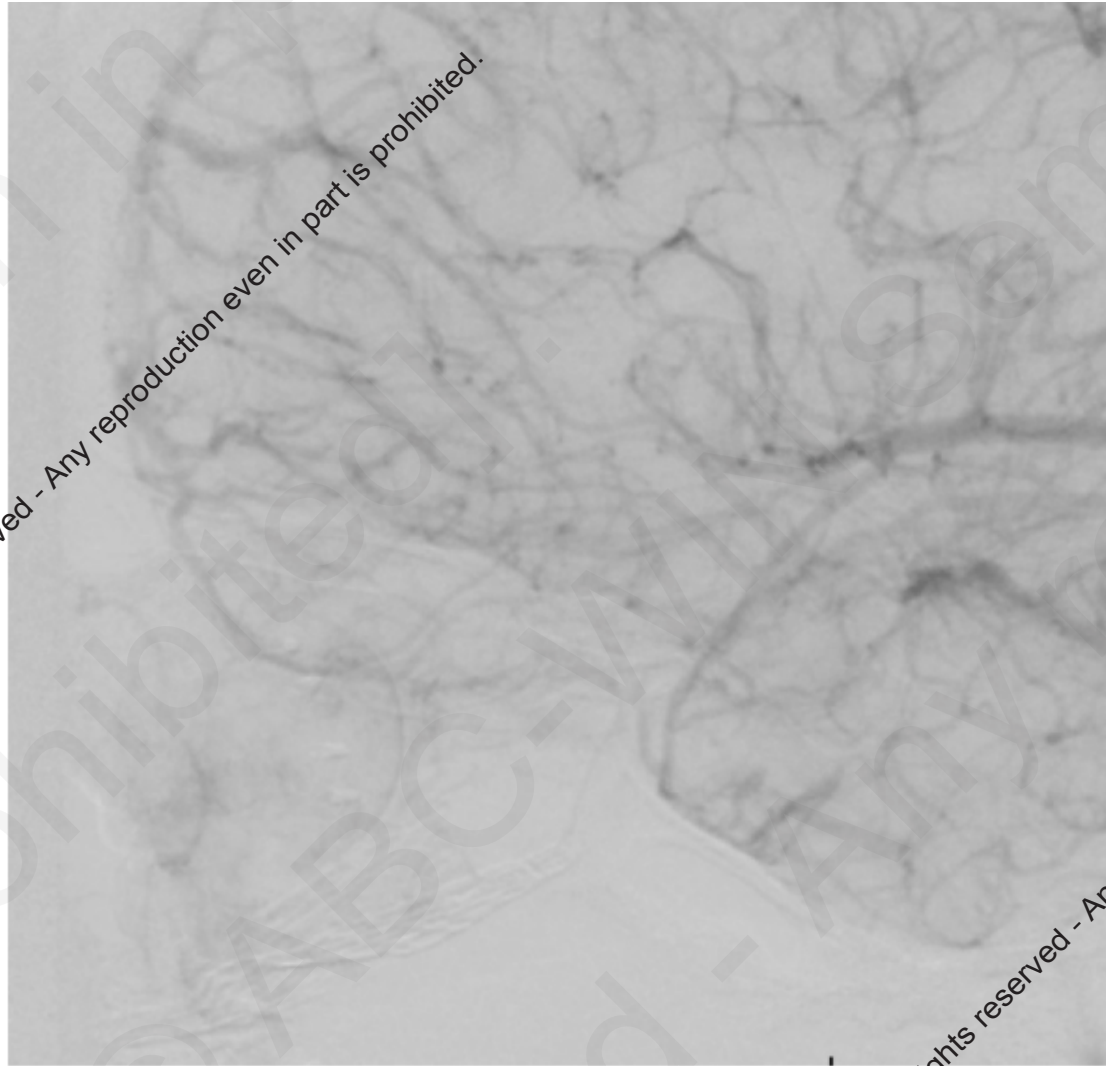


PVA embolisation

- 300 for distal IMA
- 500 for facial
- non-wedged position

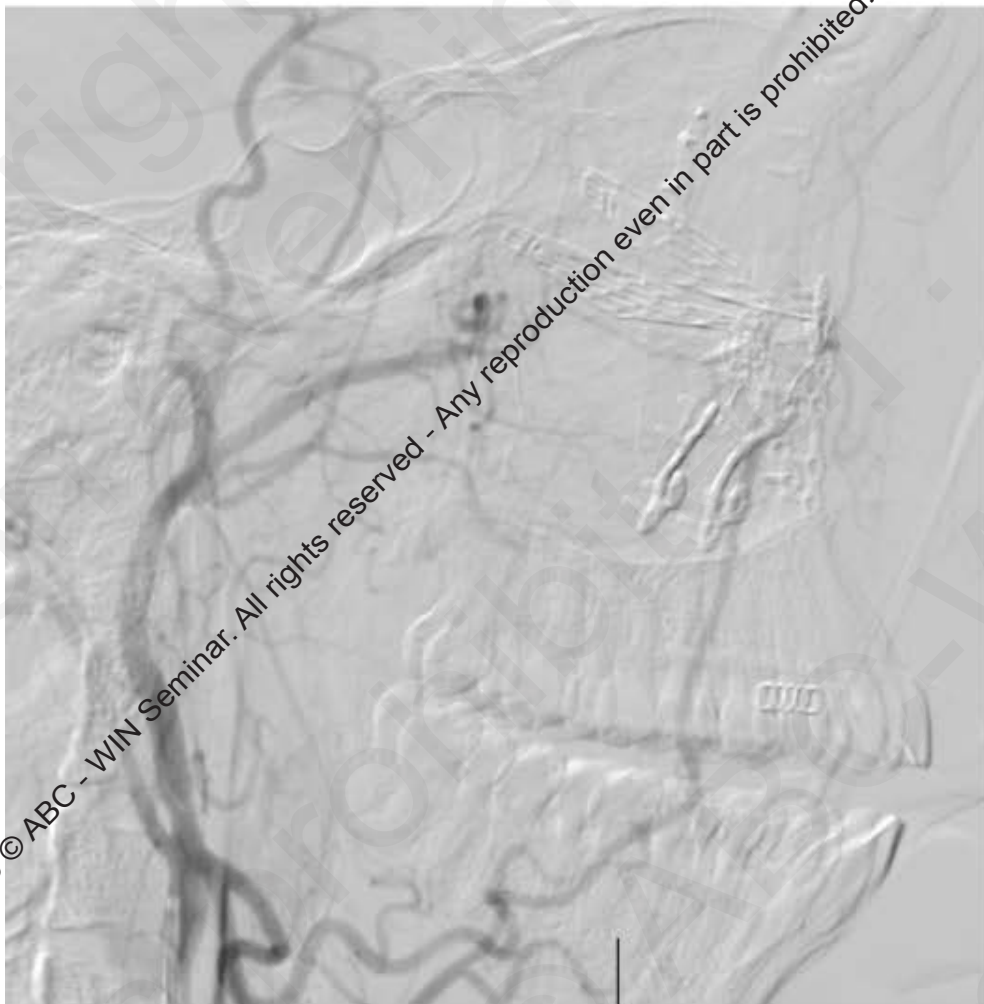


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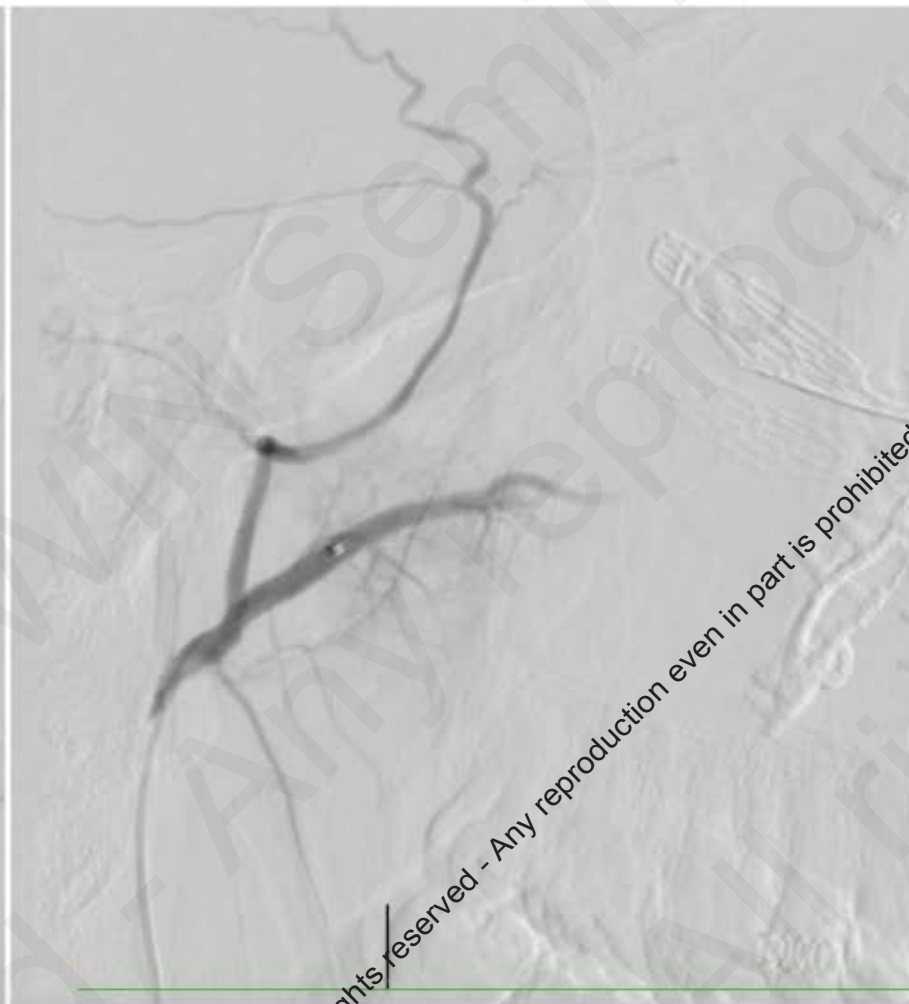


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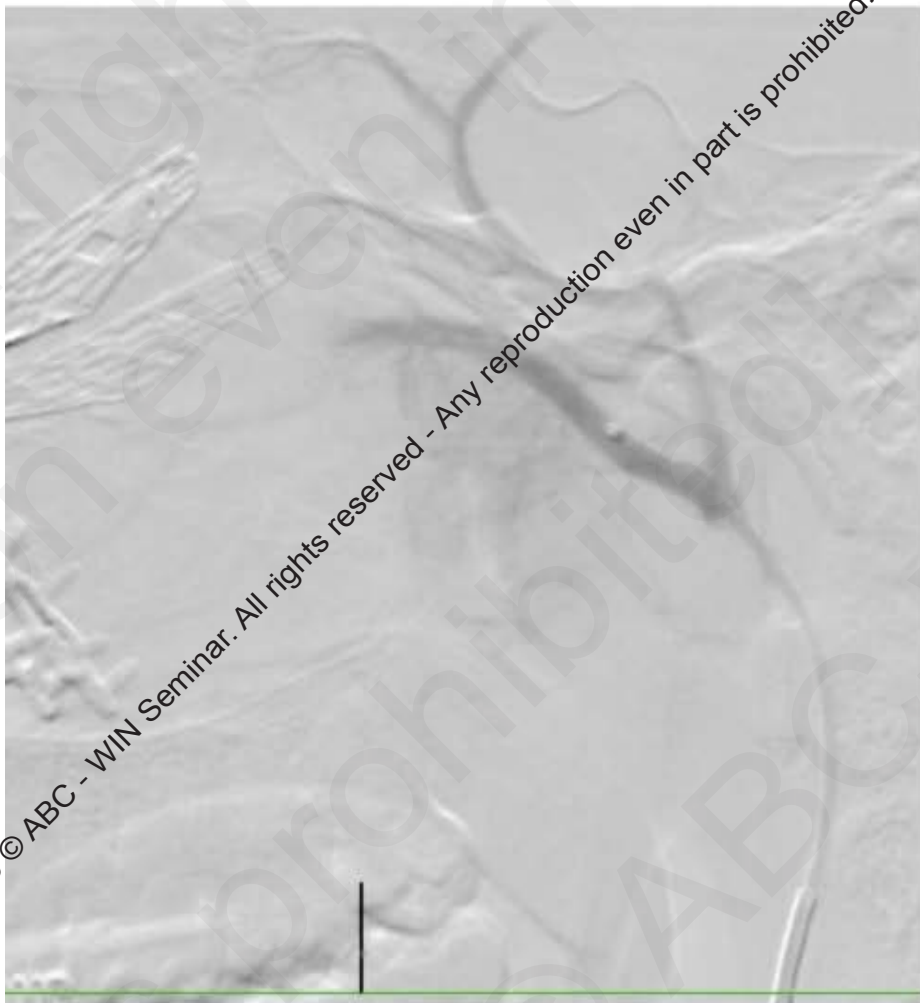
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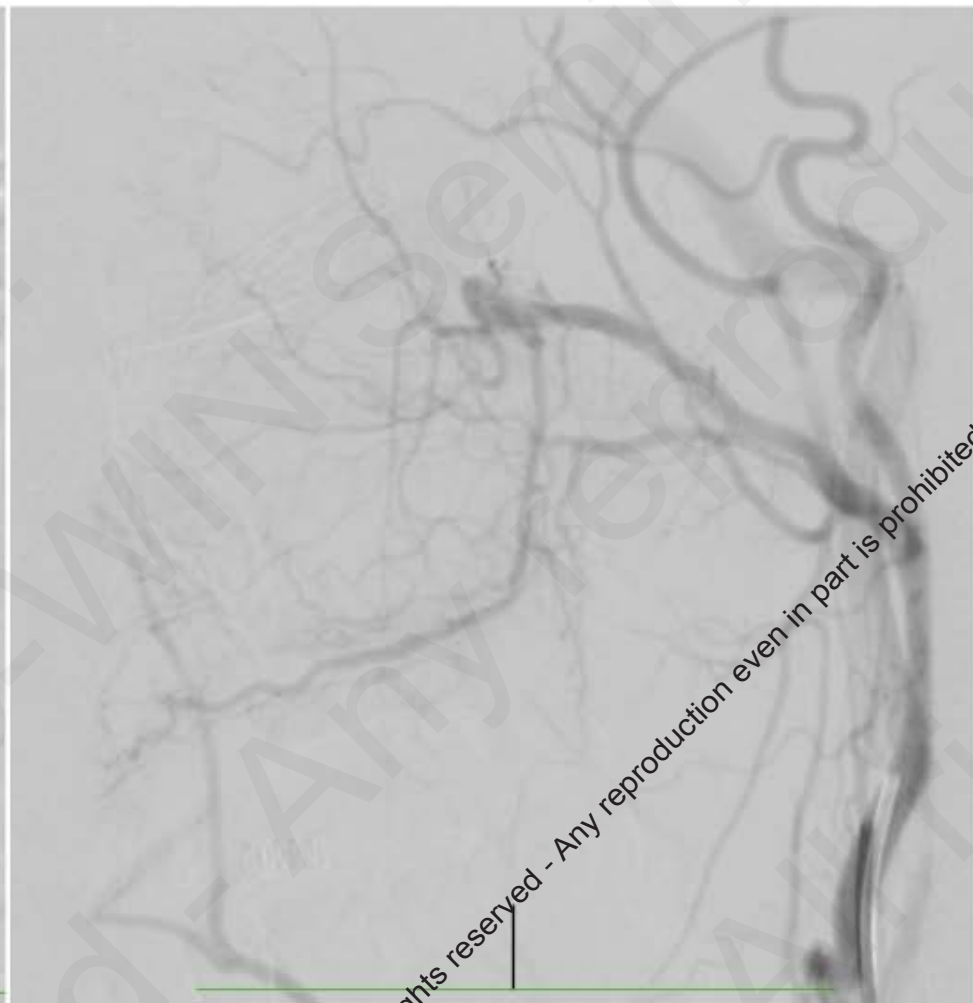
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Orbital & Anterior Cranial Fossa Trauma and Hemorrhage

Allan Taylor, David Le Feuvre

Trauma:
General

ACF/Orbital
Anatomical
pathology

Clinical
Features

Treatment of
Vascular
Trauma



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