Critical Fractures of the Face

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Facial Trauma

3 Million US facial injuries annually

Majority males (4:1) in 2nd or 3rd decade

Assaults, MVCs, falls, sports-related-injuries

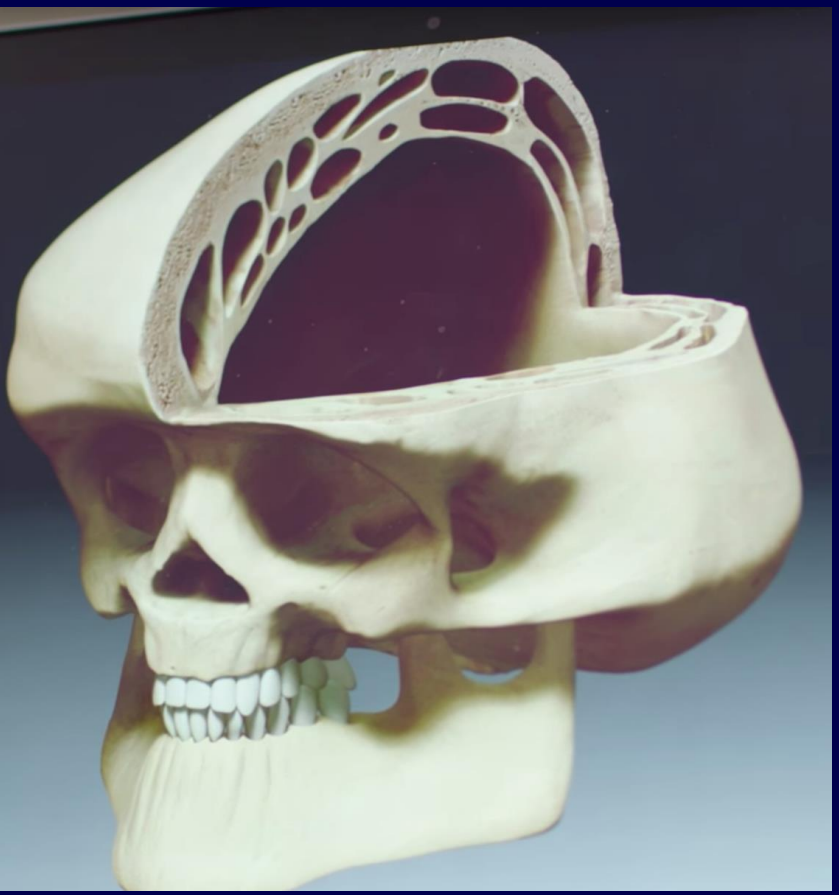
Ludi EK, Rohatgi S, Zygmont ME, Khosa F, Hanna TN (2016) Do radiologists and surgeons speak the same language? A retrospective review of facial trauma. AJR Am J Roentgenol 207(5):1070–1076
Interpersonal violence and facial fractures KH Lee J Oral Maxillofac Surg, 2009
Bakardjiev A, Pechalova P (2007) Maxillofacial fractures in Southern Bulgaria—a retrospective study of 1706 cases. J Craniomaxillofac Surg 35(3):147–150

What we might look like if we were built to survive on our roads

www.meetgraham.com.au

Our cars have evolved faster than our bodies

Monash University Accident Research Centre



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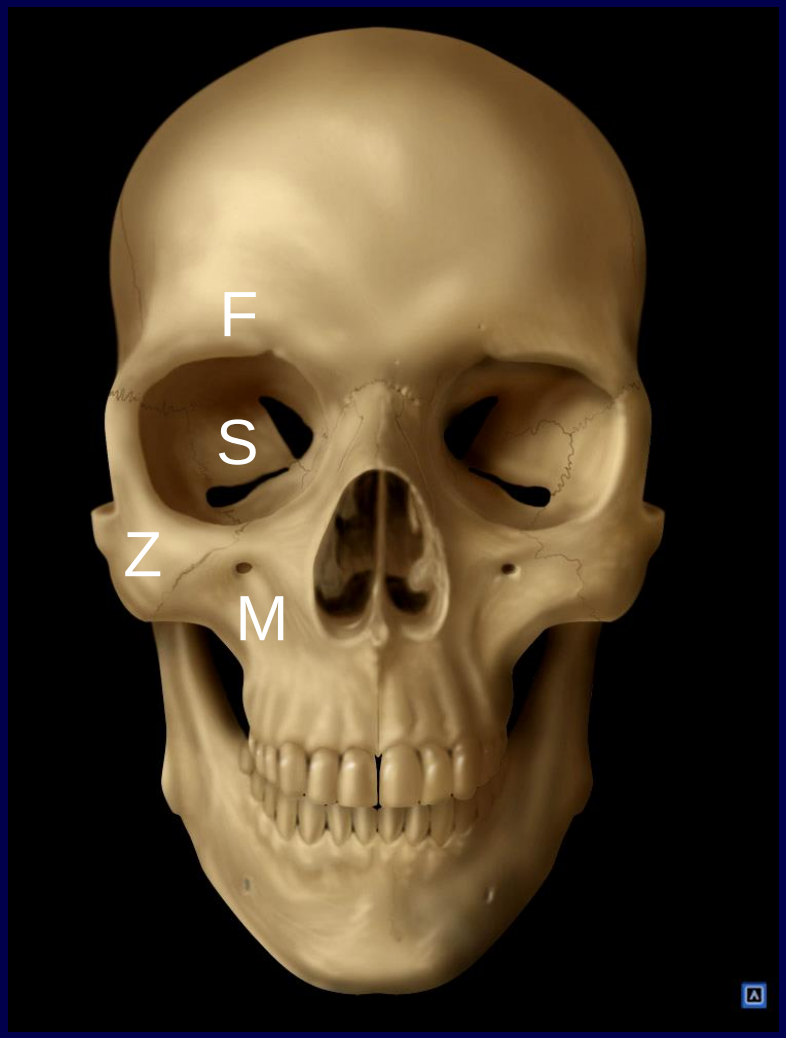
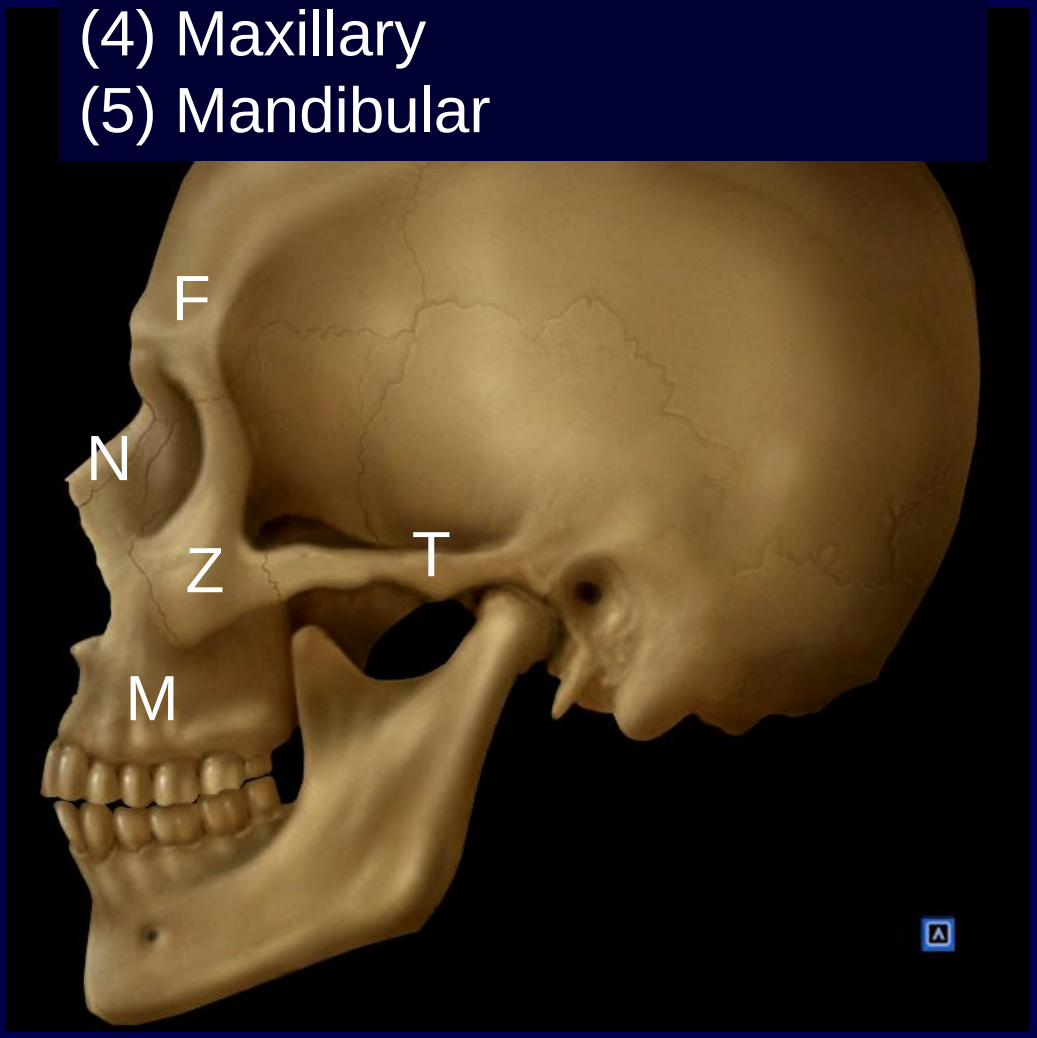
Overview

- Avoid the “laundry list”
- Rank by clinical importance
- Organize
    - Fracture planes
    - Fracture complexes
    - Surgically relevant information

The Facial Skeleton

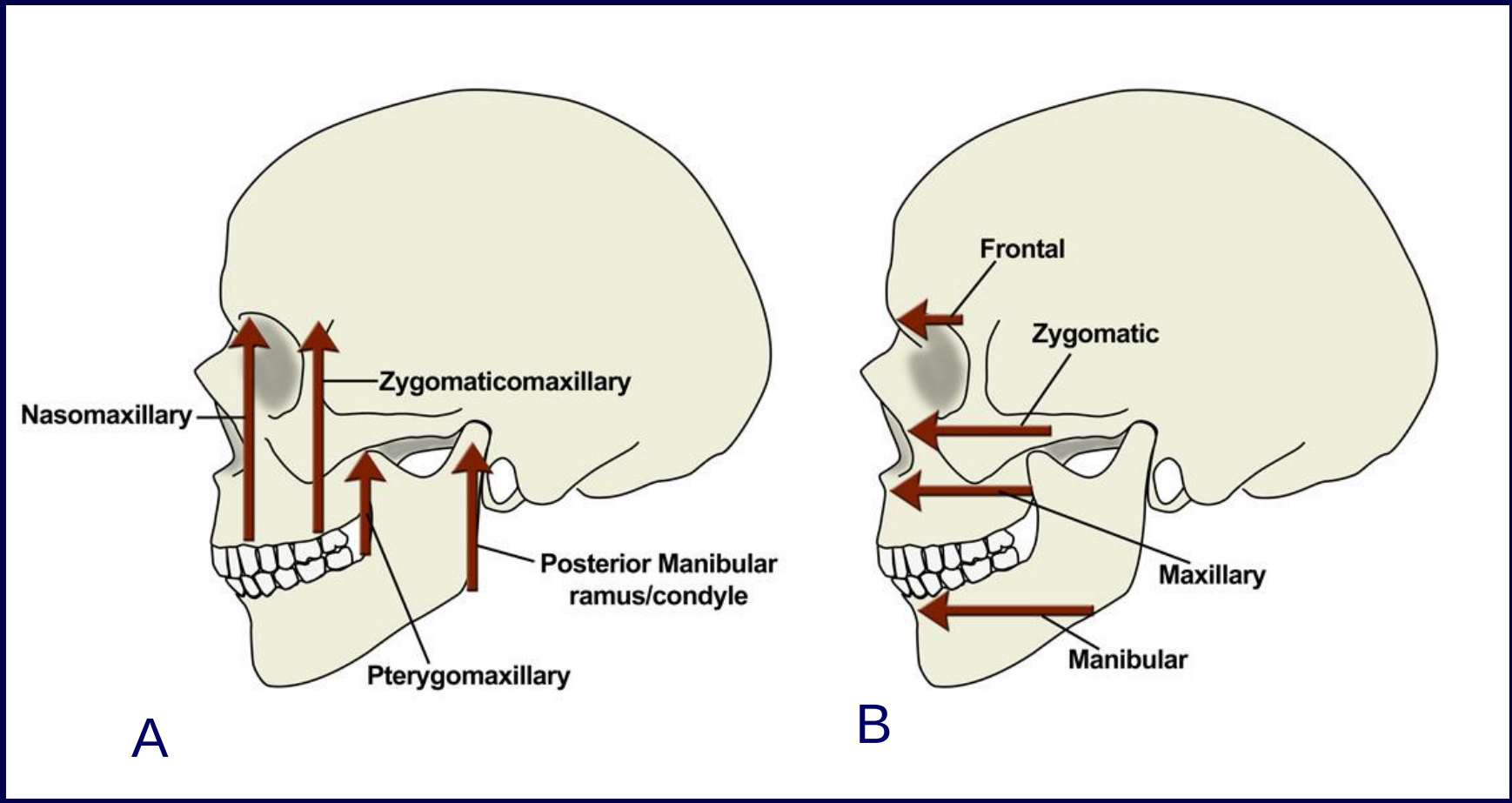
Five distinct anatomic regions:
(1) Nasal
(2) Orbital
(3) Zygomatic
(4) Maxillary
(5) Mandibular





With permission from Amirsys

Vertical and Horizontal Buttresses of the Face



Forces impacting the face are distributed along these buttresses giving rise to characteristic fracture patterns

Outline

- LeFort classification
- Critical fractures of the face

LeFort Fractures

- *Hallmark of Le Fort Fx: pterygomaxillary separation*
- *All 4 plates are fractured*
- *Pterygoid plates are the key to midface stability*
- *Classic LeFort Fx should be symmetric and bilateral*
- *Can be unilateral or in combination with other LeFort*

LeFort Fractures

LeFort I LeFort II LeFort III

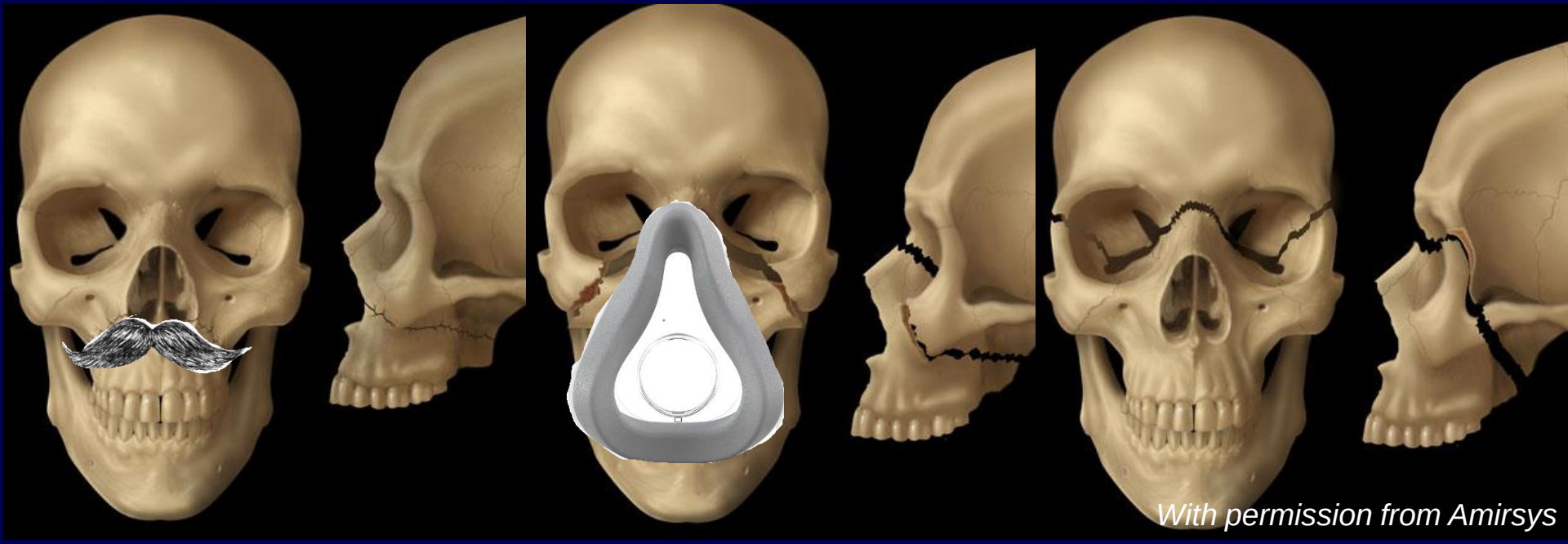
- *Hallmark of Le Fort fx: pterygomaxillary separation*
- *Pterygoid plates are the key to midface stability*
- *Can be unilateral or in combination with other LeFort*

LeFort Fractures

LeFort I

LeFort II

LeFort III



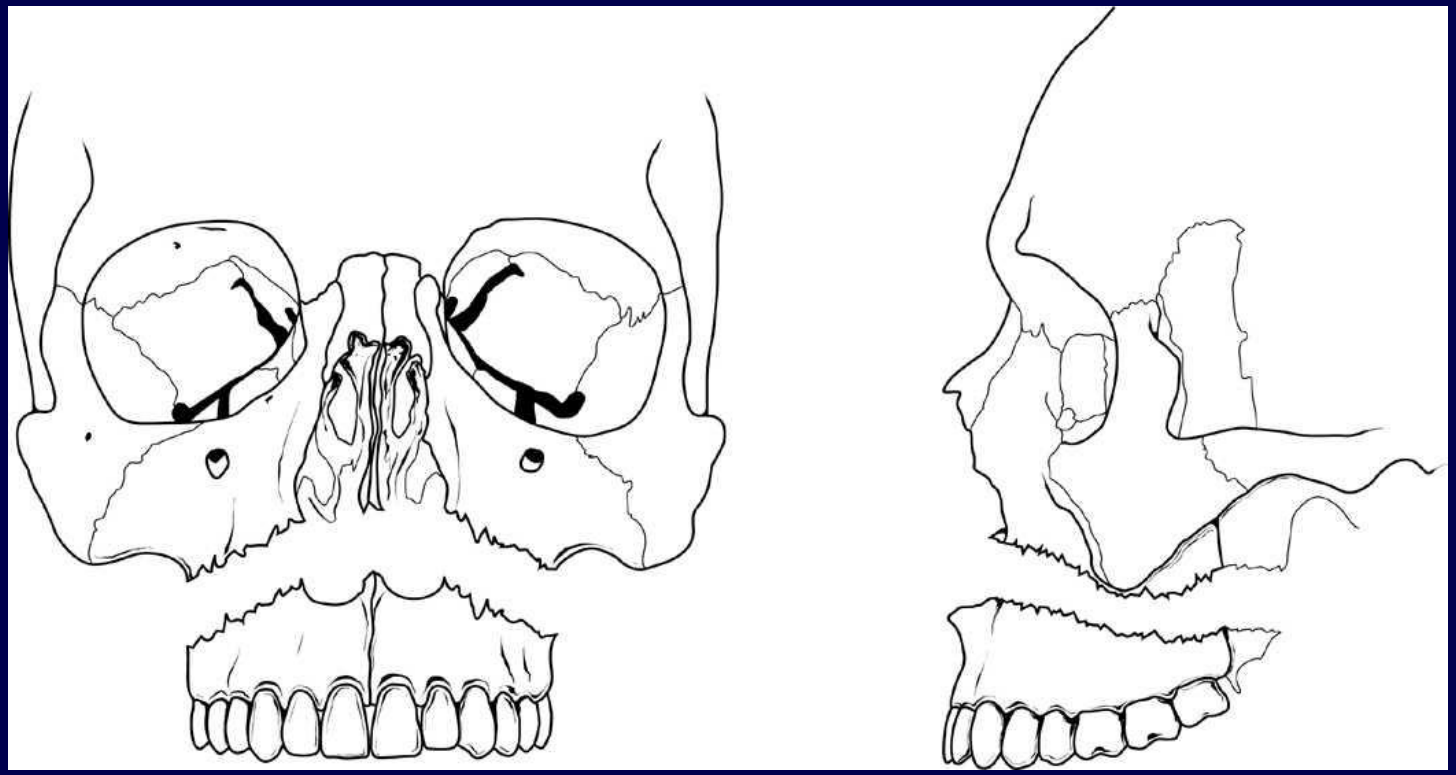
Horizontal
Floating Plate
“mustache”

Pyramidal
“oxygen mask”

Transverse

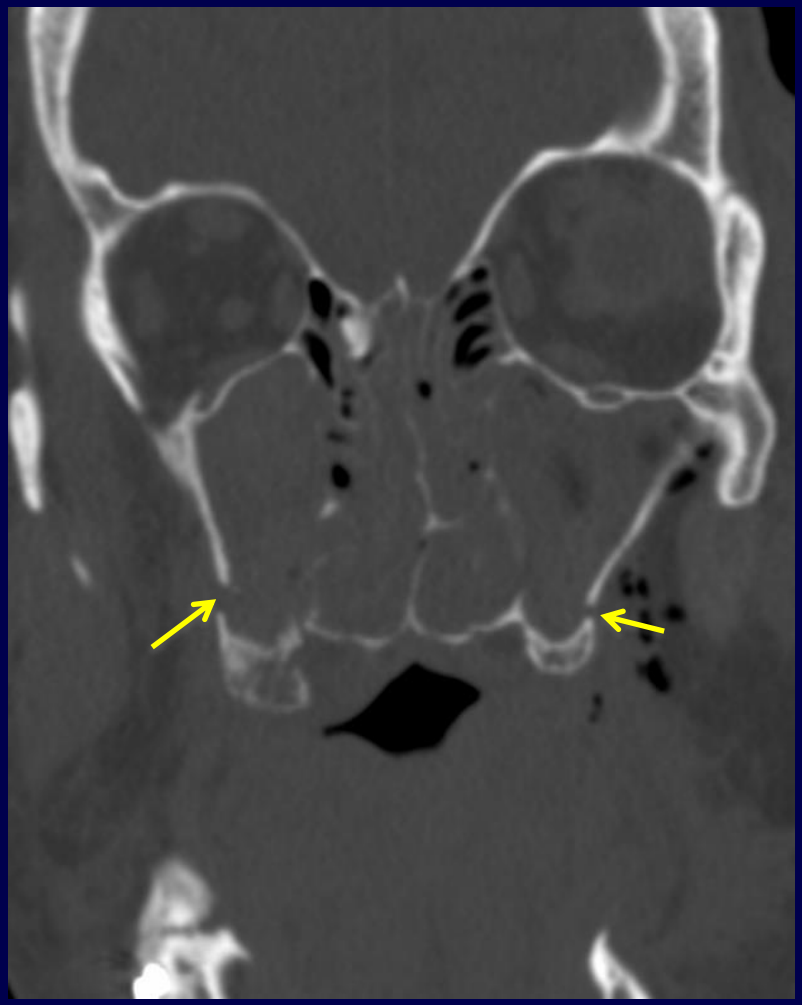
Craniofacial Dissociation

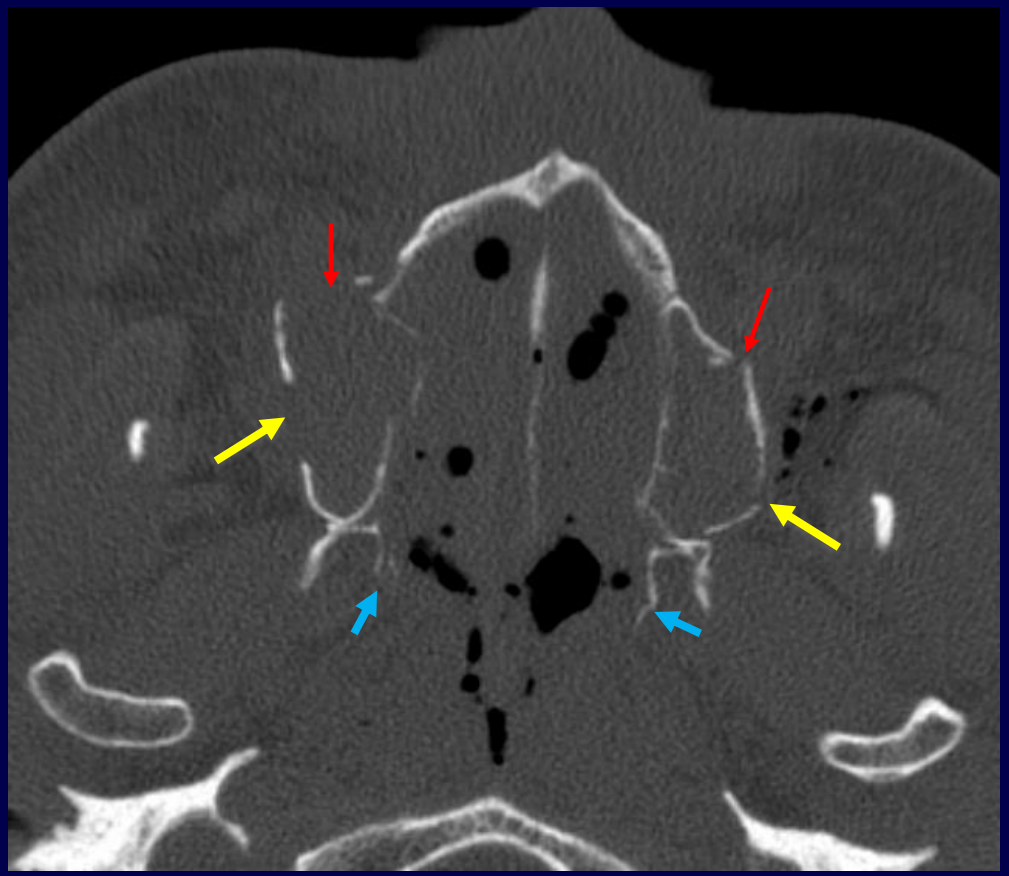
LeFort I Fracture



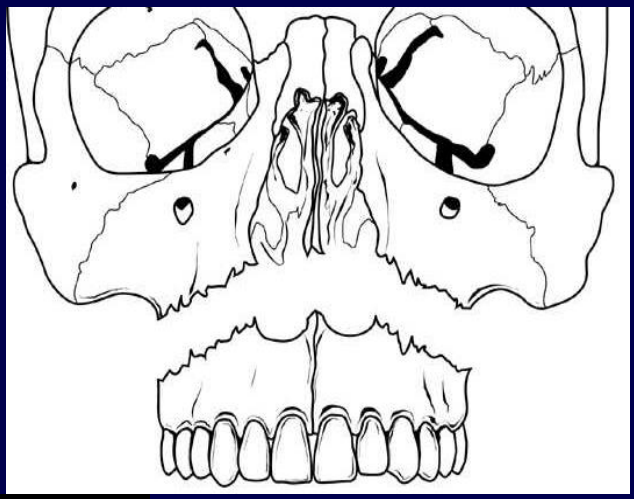
- Most common maxillary fracture
- Direct blow under the nose
- Horizontal fracture, above apices of teeth, from front of maxillae, out through the pterygoid plates
- Upper teeth and hard palate freely moveable—"Floating Plate"
- Best shown at CT on coronal images

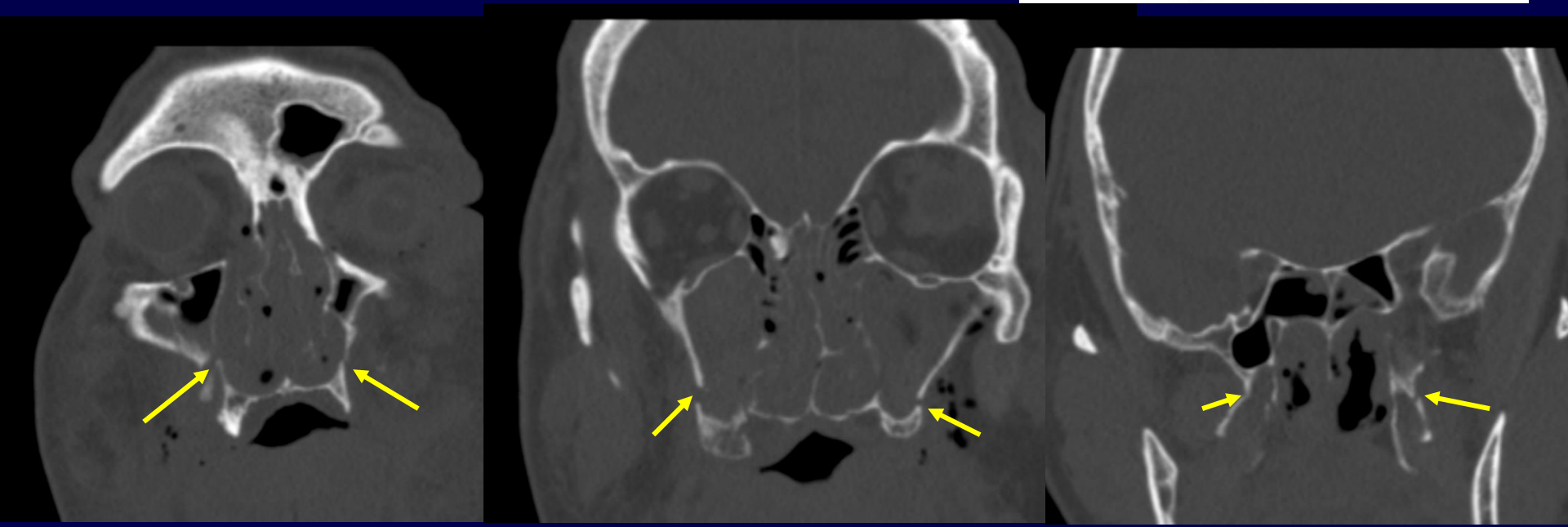
Coronal and Axial of LeFort I Fracture



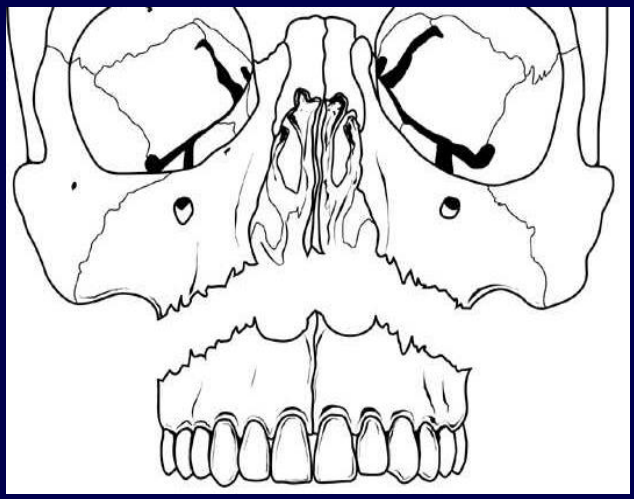


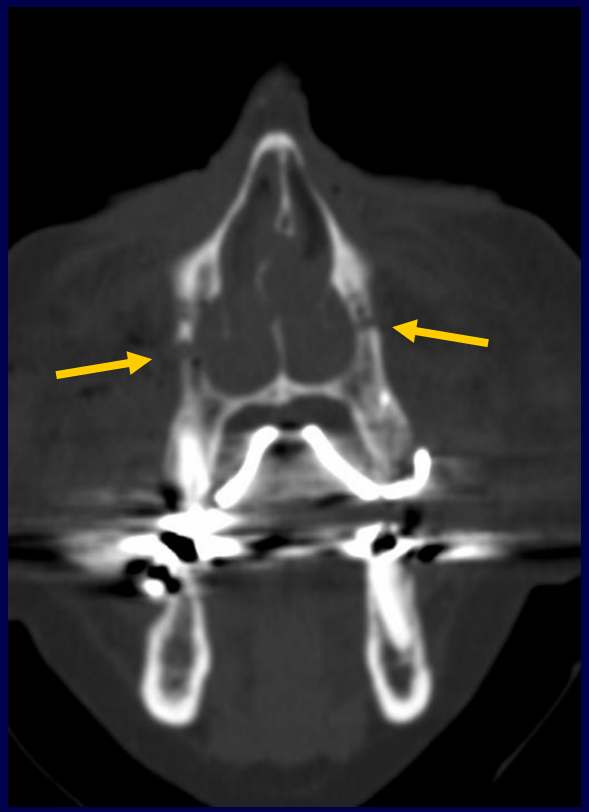
Coronals of LeFort I Fracture

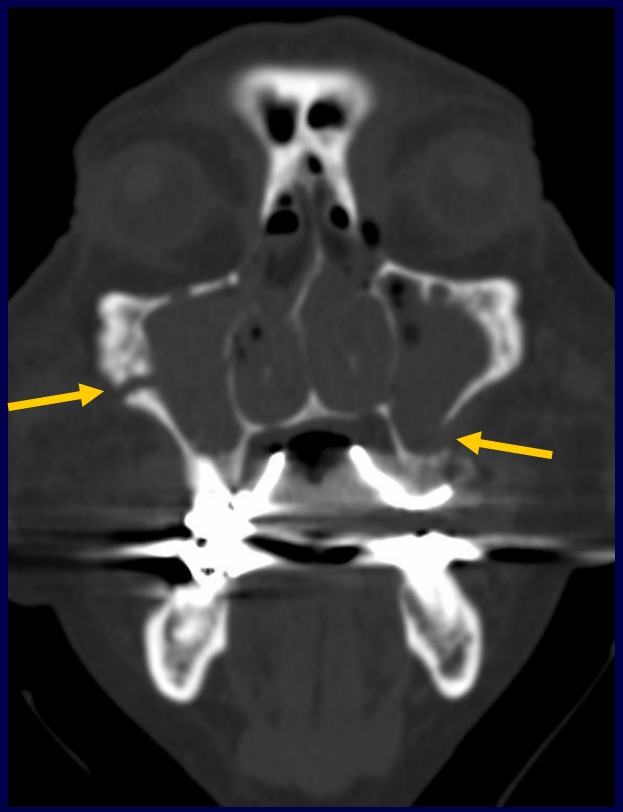


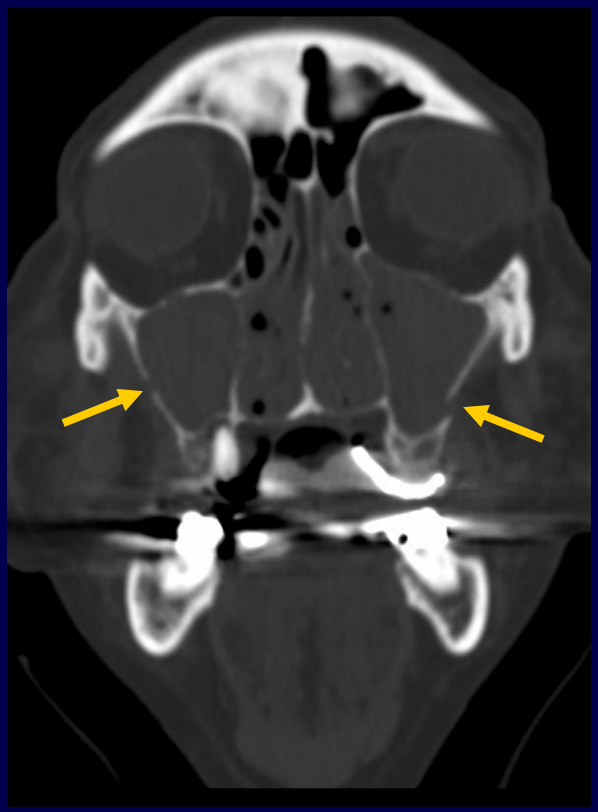


Coronals of LeFort I Fracture

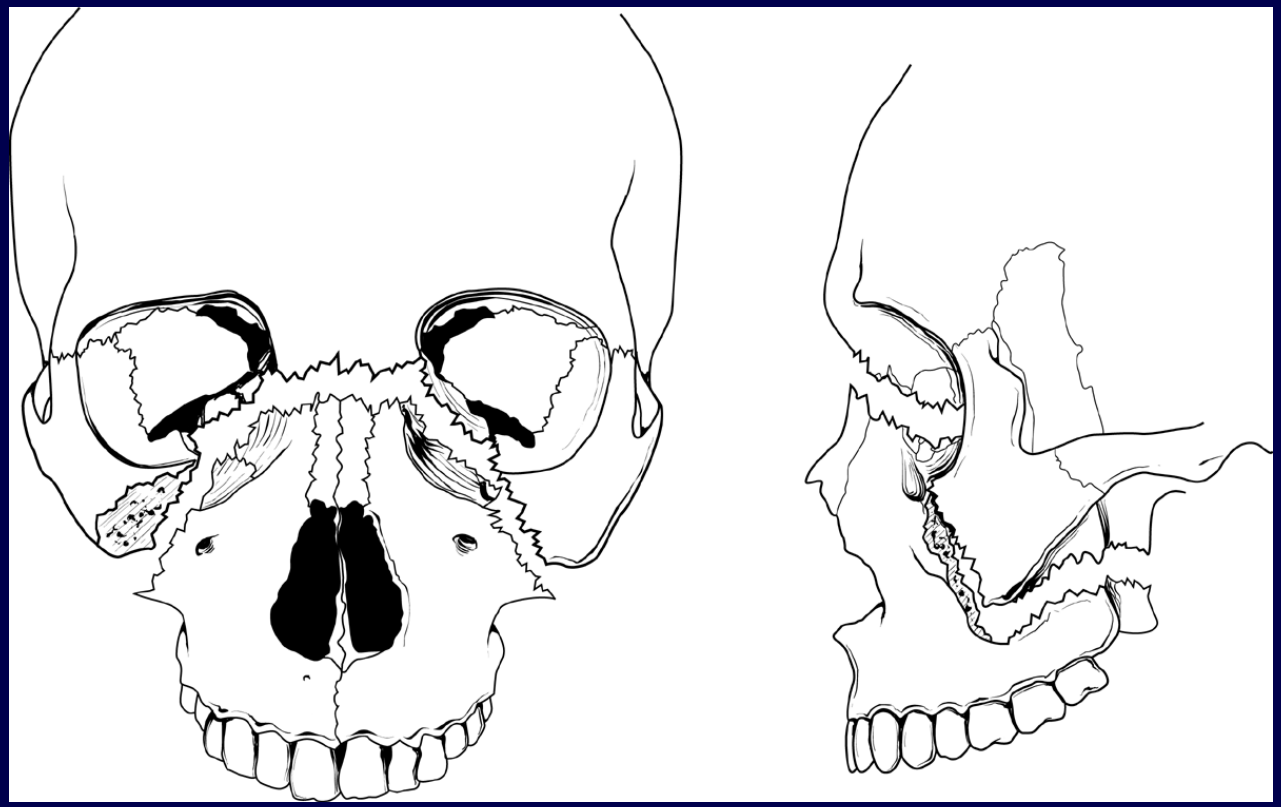






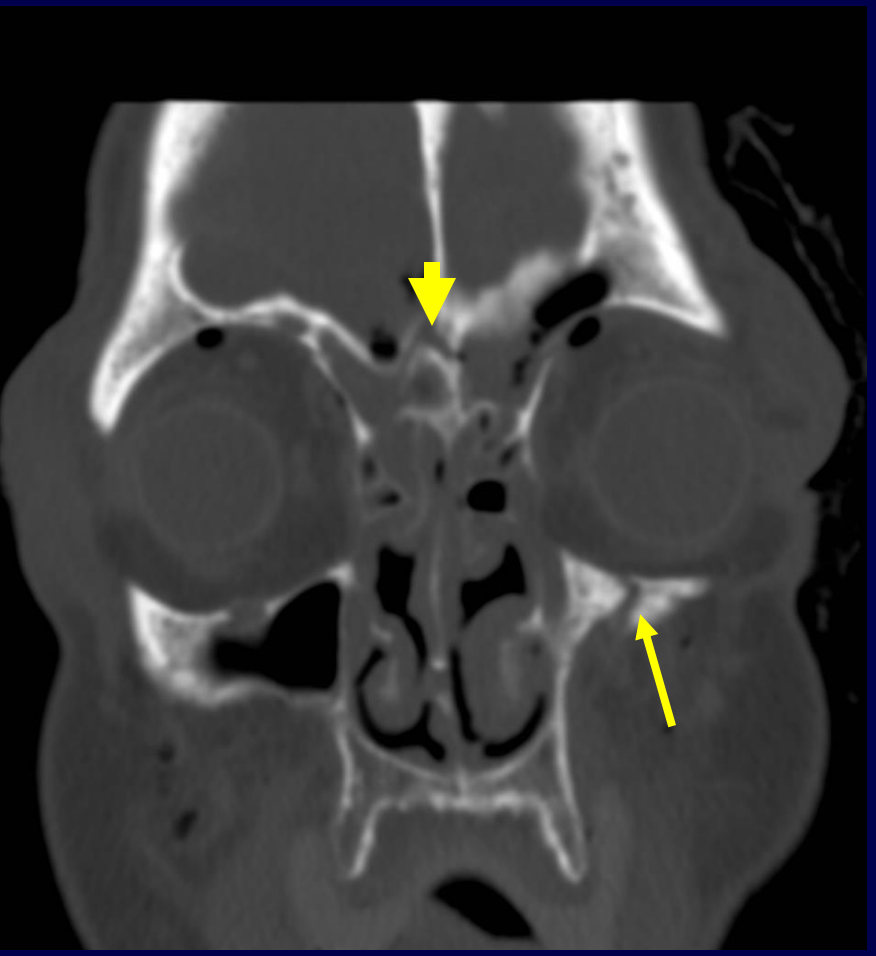


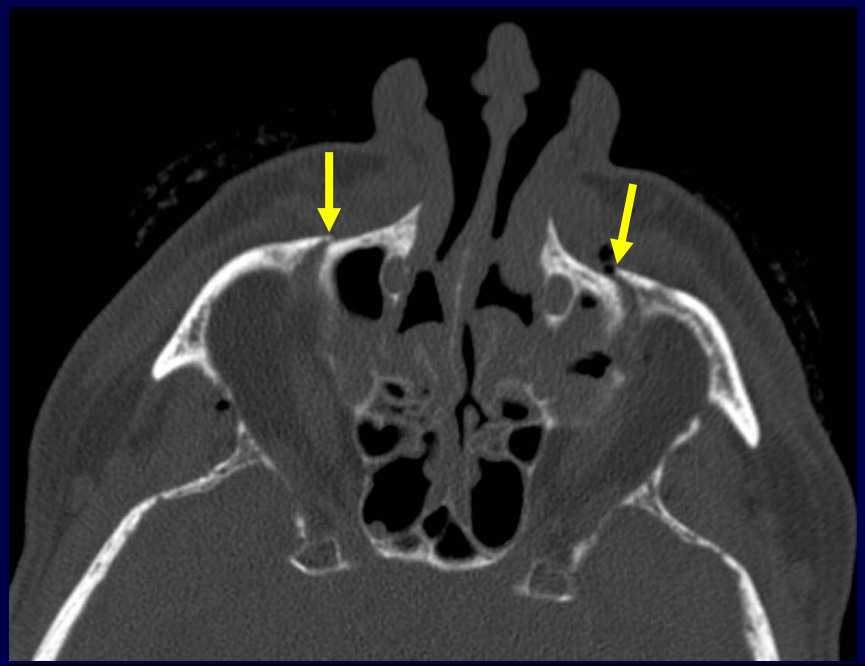
LeFort II Fracture

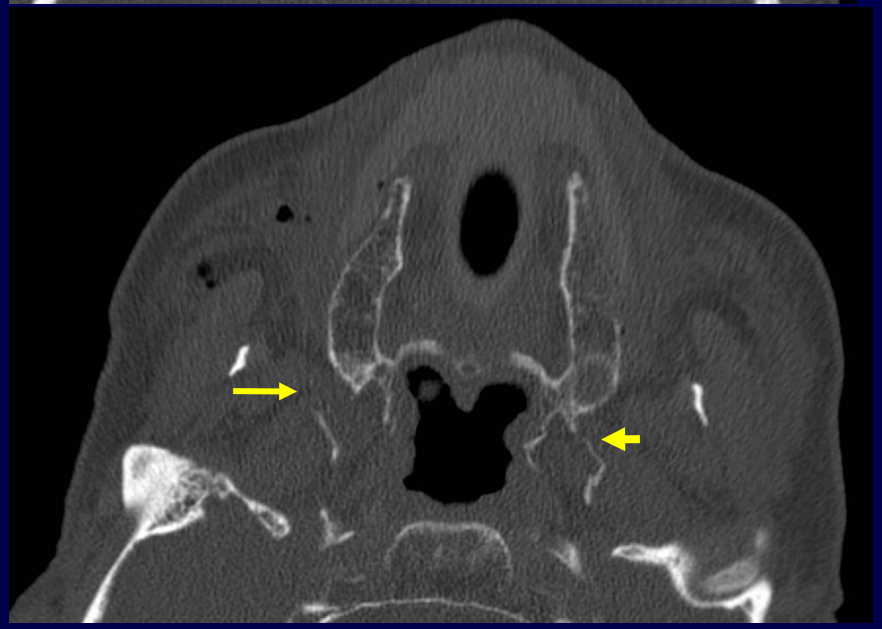


- Pyramid-shaped fracture (O2 mask)
- Naso-maxillary unit displaced from zygoma and frontal bones
- Best shown on axial CT through maxillary sinuses
- Fractures of anterior/posterolateral walls maxillary sinuses
- Fractures through the inferior orbital rims and nasal bridge

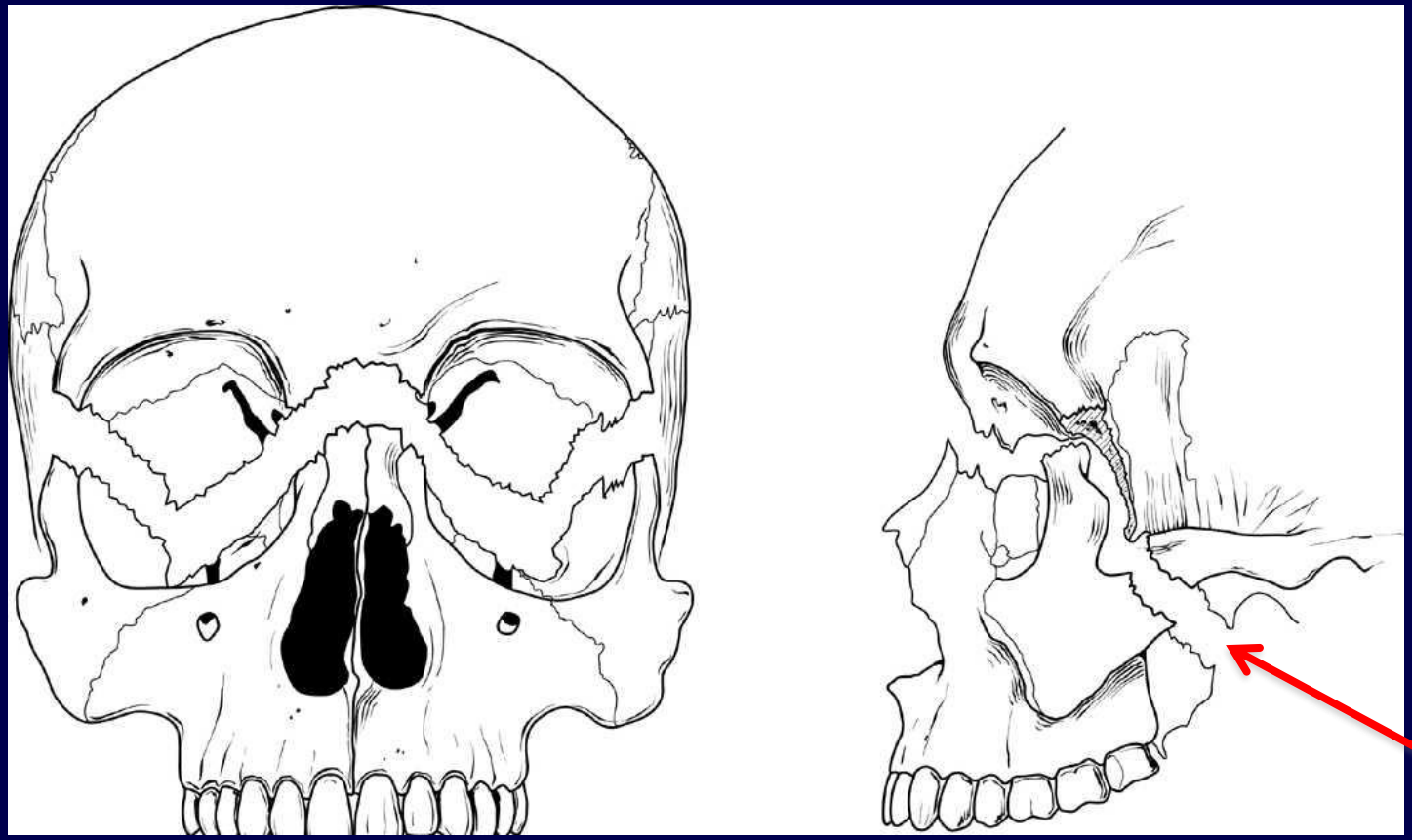
LeFort II Fracture





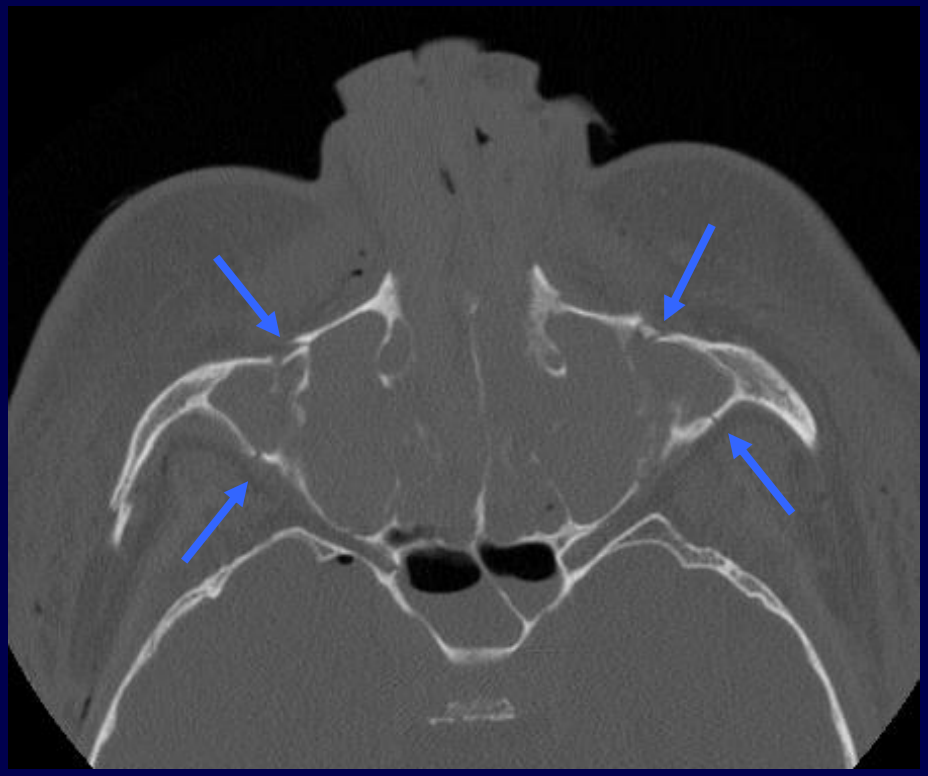


LeFort III Fracture

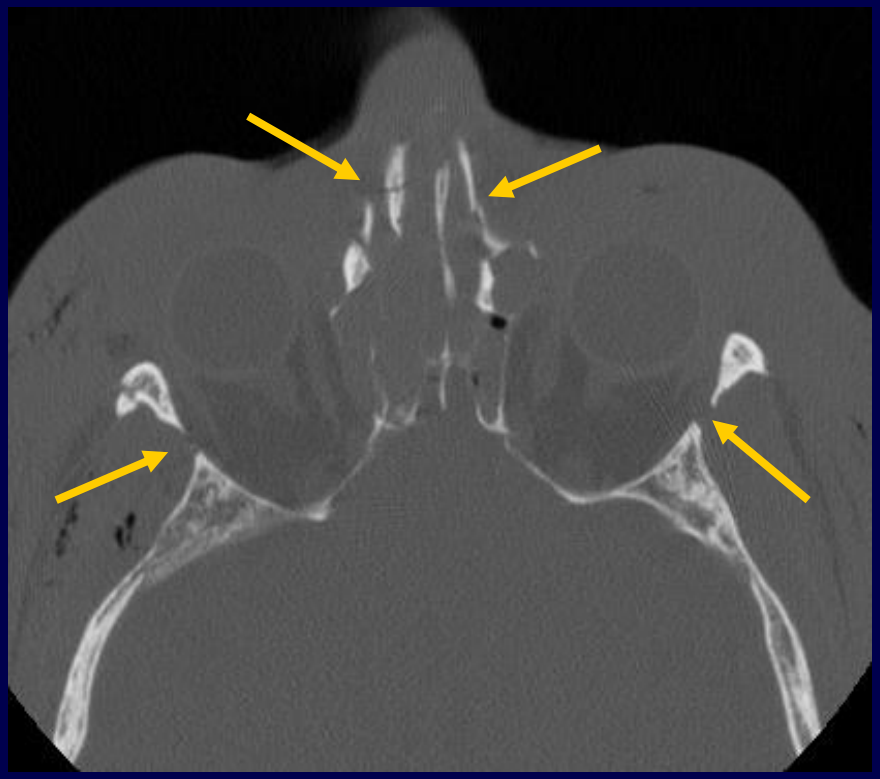


- Complete craniofacial disassociation
- Fracture separates entire facial skeleton from calvaria
- May be associated with LeFort I and LeFort II fractures
- Best shown on axial CT through orbits

Axial CT of LeFort III Fracture
(With Associated LeFort II Fracture)

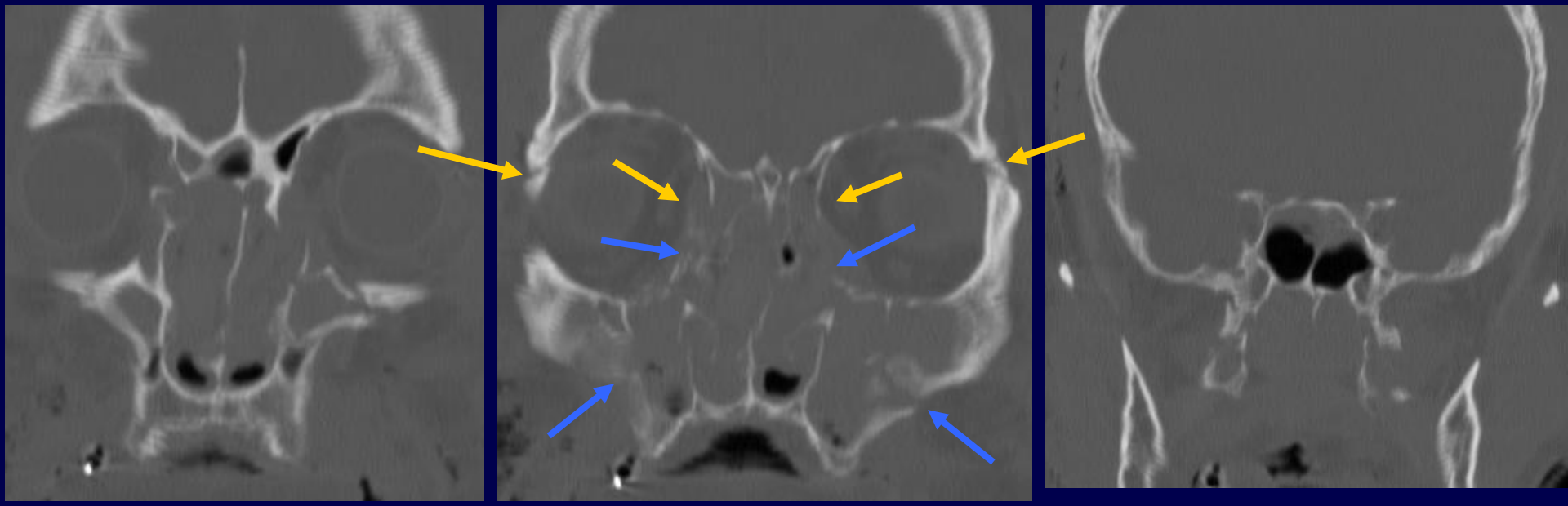


LeFort II Fracture Lines



LeFort III Fracture Lines

Coronal CT of LeFort III Fracture (With Associated LeFort II Fracture)



LeFort II Fracture Lines

LeFort III Fracture Lines

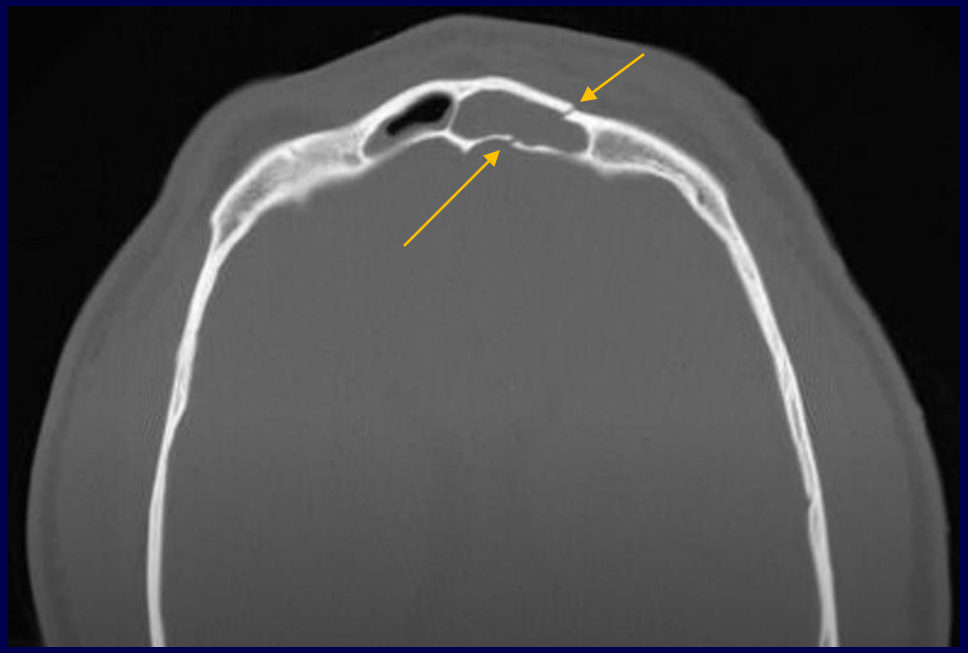
Critical Fractures of the Face

- Frontal Sinus
- Zygomatic arch
- Orbit
- NOE
- Maxillary buttress
- Hard palate
- Mandible

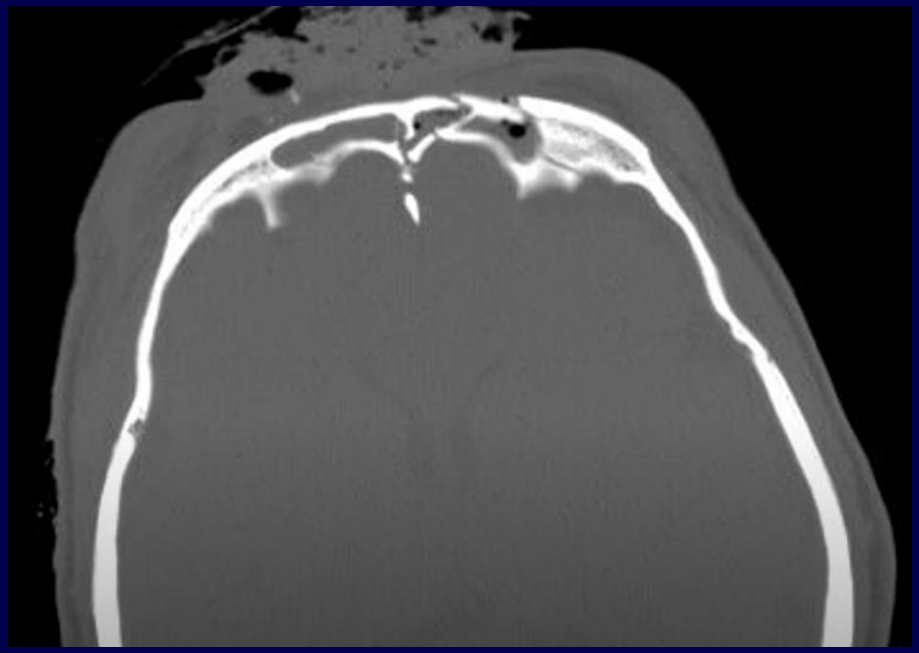
Frontal Sinus

- Importance:
  - Risk of infection
  - Risk of CSF leak
  - Mucosal disruption
- Issues:
  - Anterior vs. posterior table
  - Intersinus septum
  - Displacement of fragments

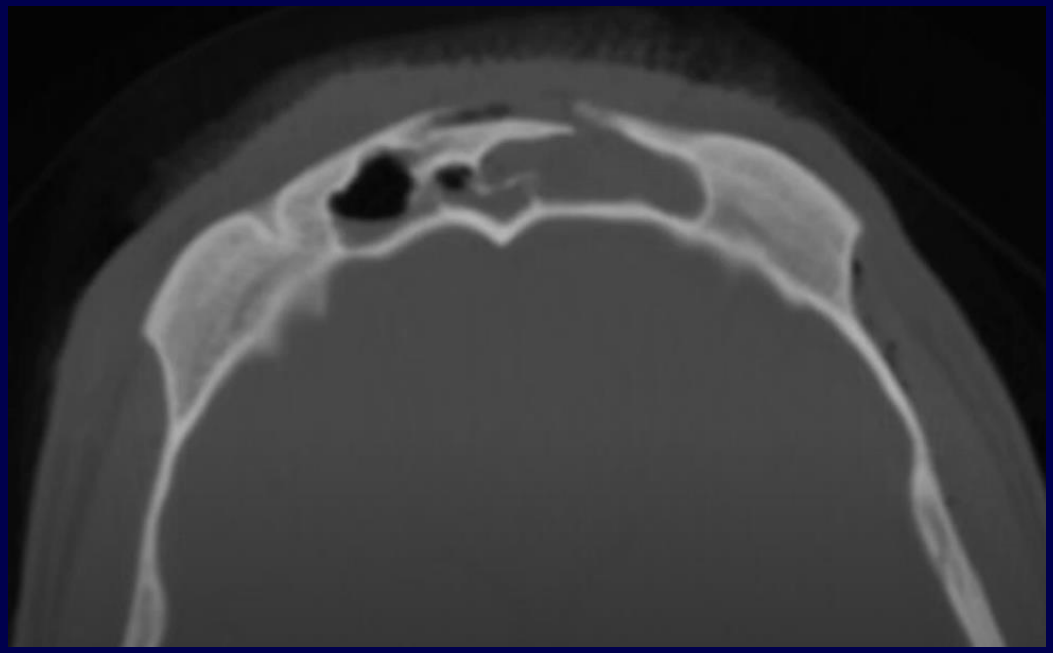
Nondisplaced fracture through frontal sinus



Displaced fracture through frontal sinus



Displaced anterior table fragment

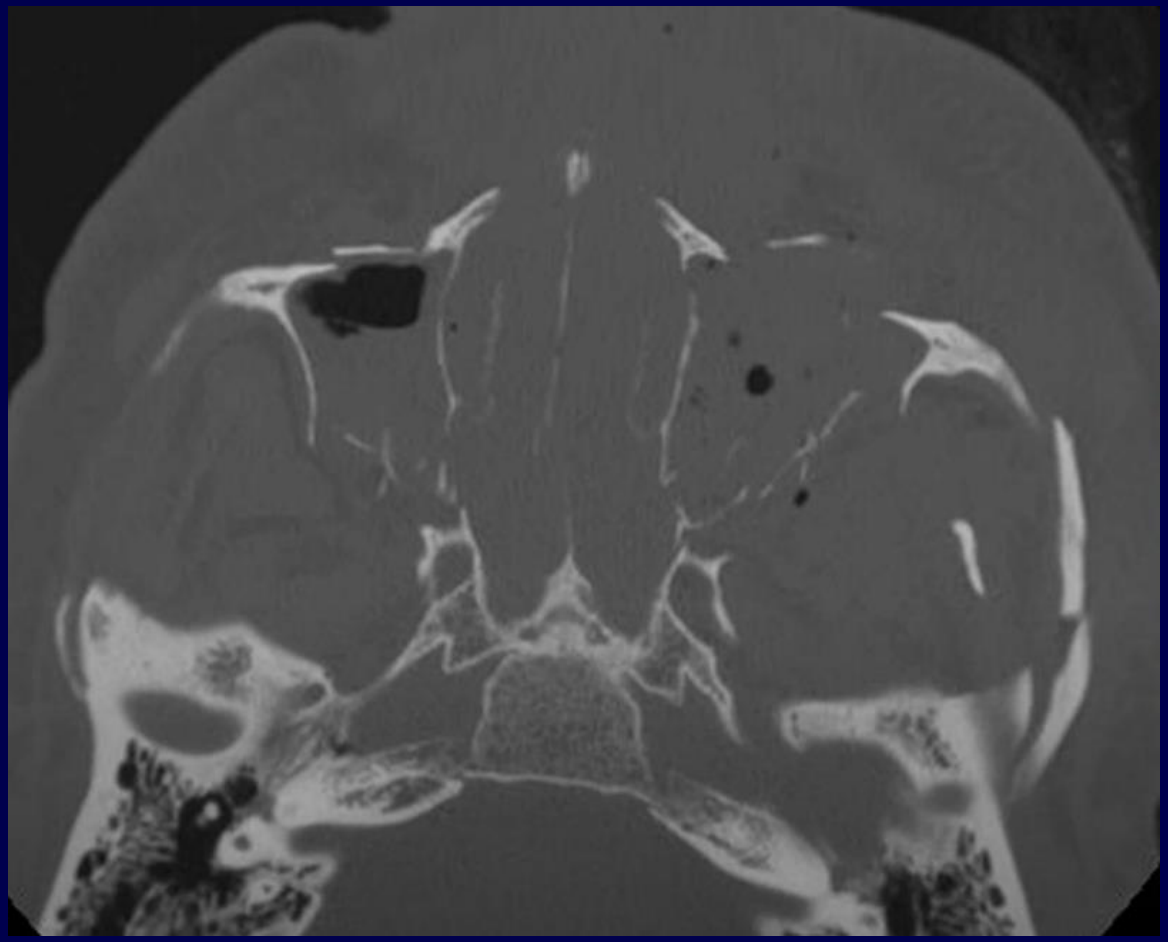


Fracture through frontal sinus into orbital roof

Zygomatic Arch

- Importance:
  - Cosmetic—Facial symmetry
  - Support of Midface
- Dictation Issues:
  - Segmental fractures
  - Interzygomatic distance
  - Deformity fractures: no lucent line
    - (“facial greenstick”)

Increased interzygomatic distance

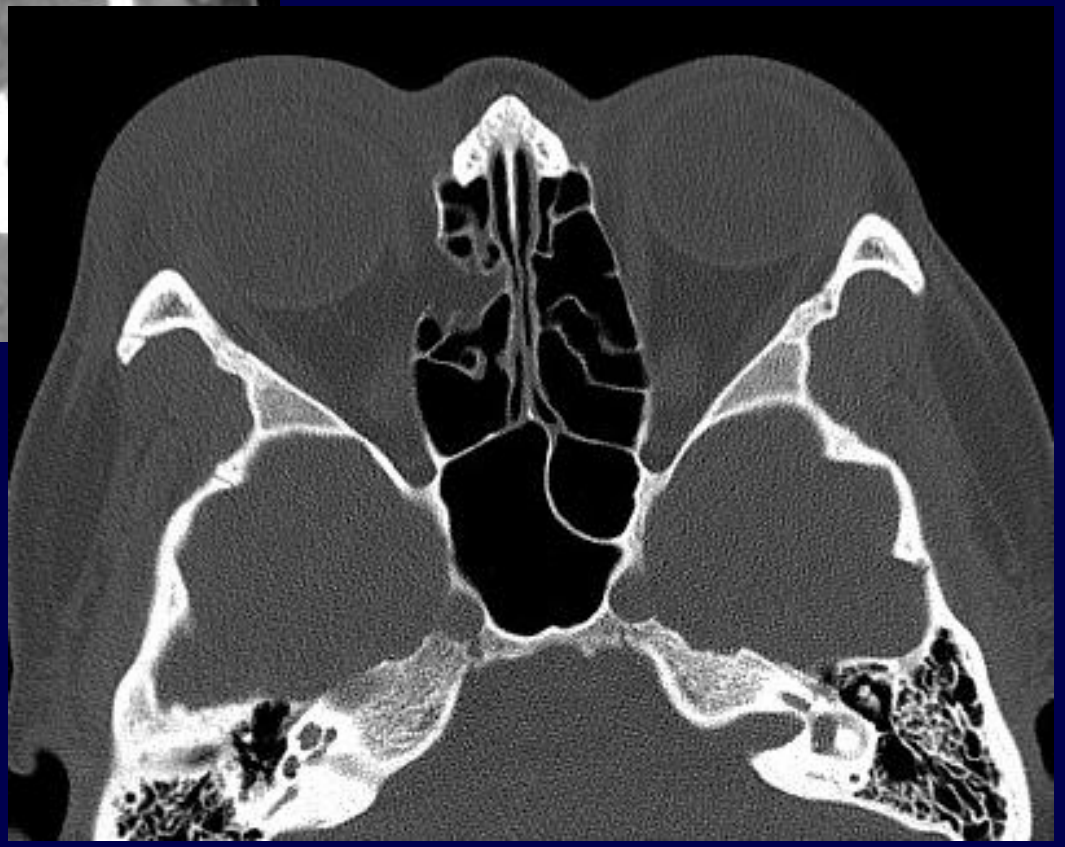


Acute Deformity Fracture

Orbital Fractures

- Importance:
  - Orbital volume
    - Delayed enopthalmos
  - Anchoring ligaments
- Dictation Issues:
  - Rim vs. wall
  - Blowouts
  - Trapdoors
  - Herniation (imaging finding) vs. entrapment (clinical dx)
  - Size of defect
    - Percentage of orbital floor vs. dimensions of the defect vs. area of the defect

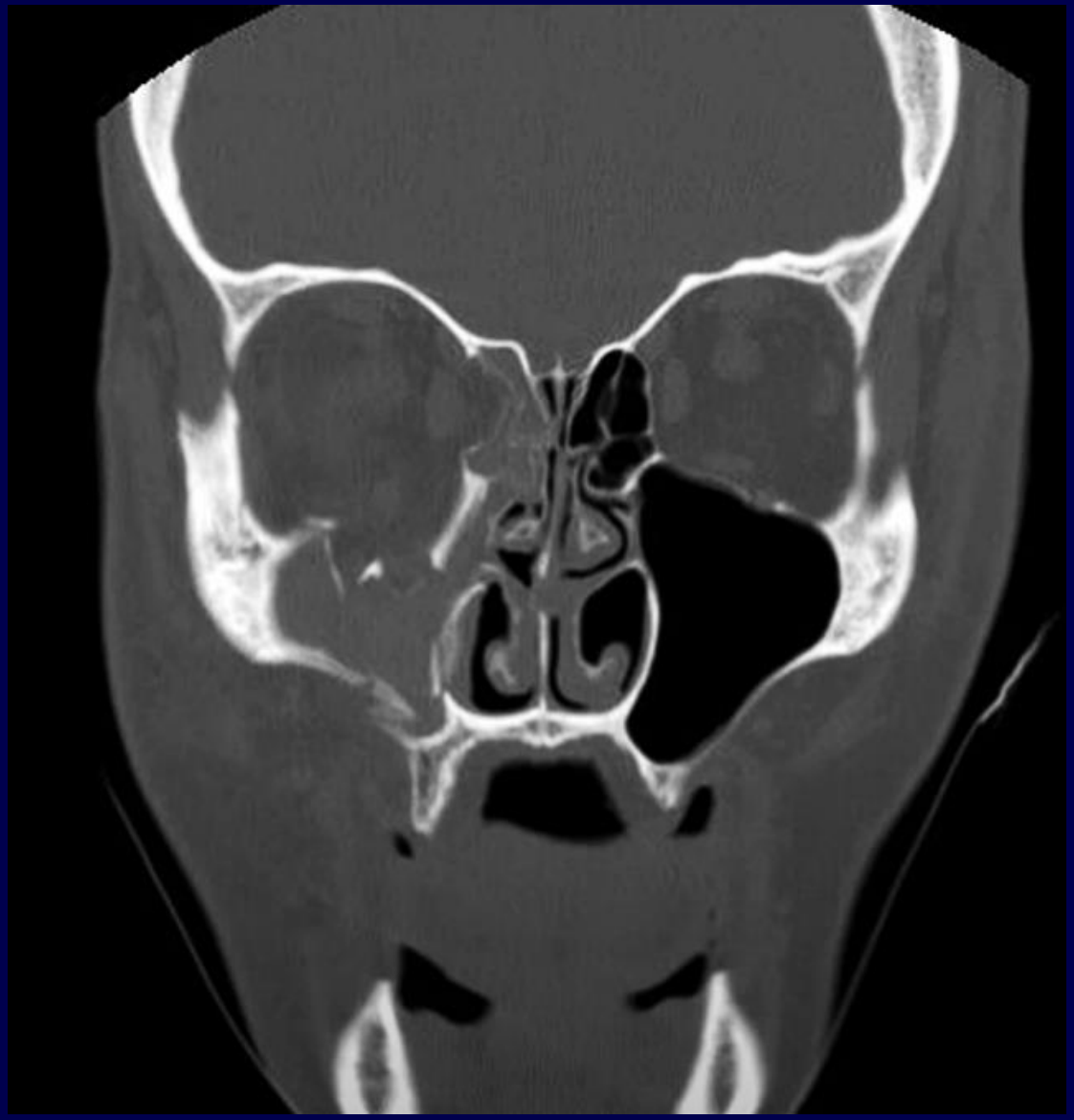
24 year old female
status post assault, LOC



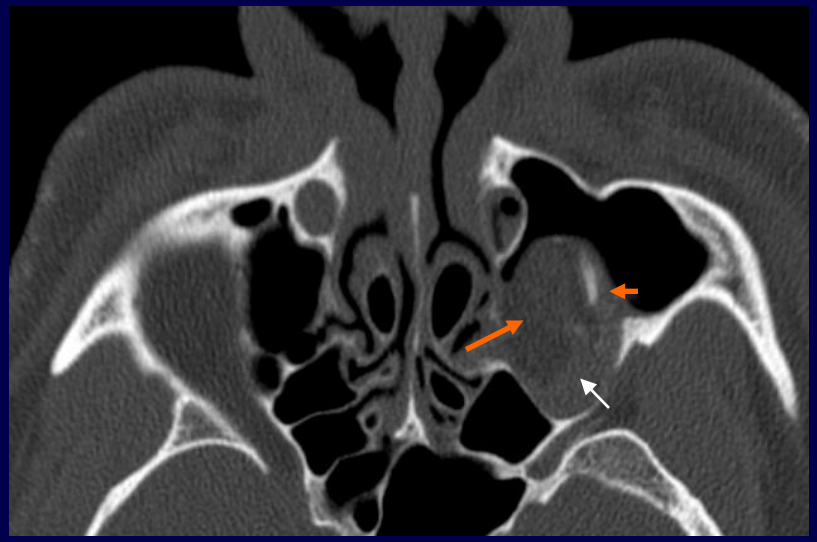
Look for fat where it doesn't belong

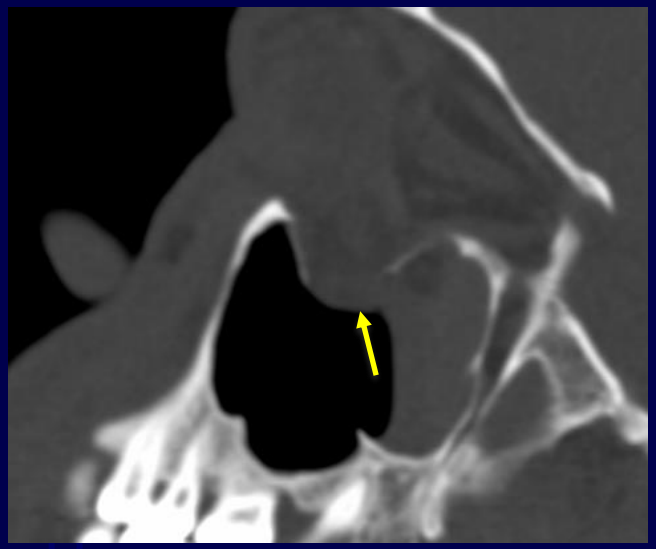
Case courtesy of Crystal Farrell

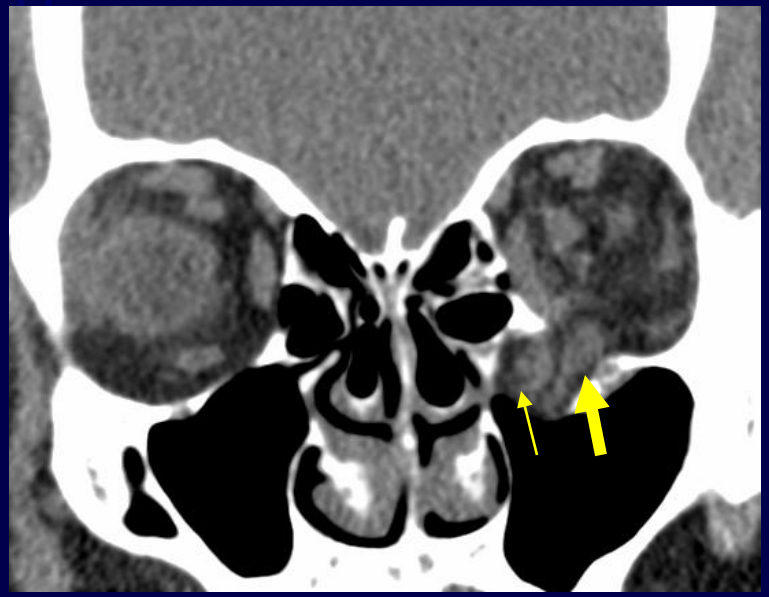
Blowout Fracture



Axial CT, Coronal and Sagittal Reformats of Orbital Floor Blowout Fracture

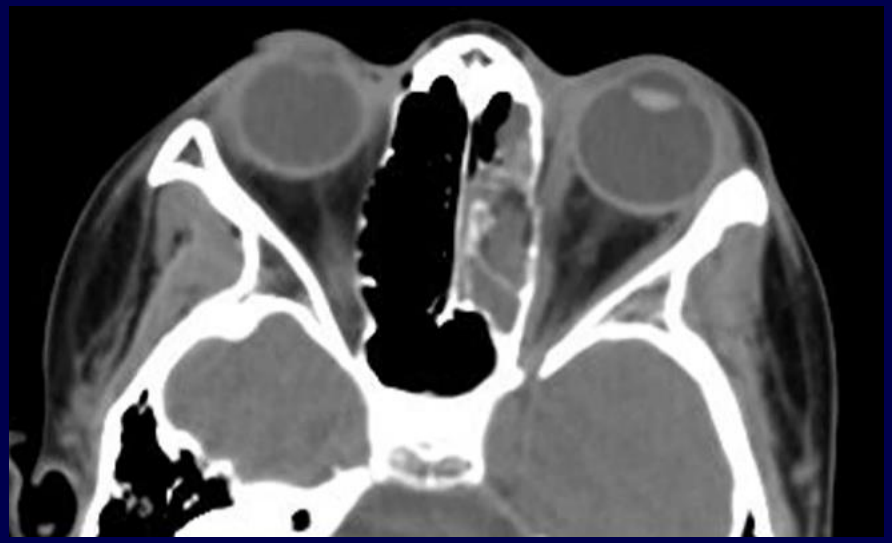


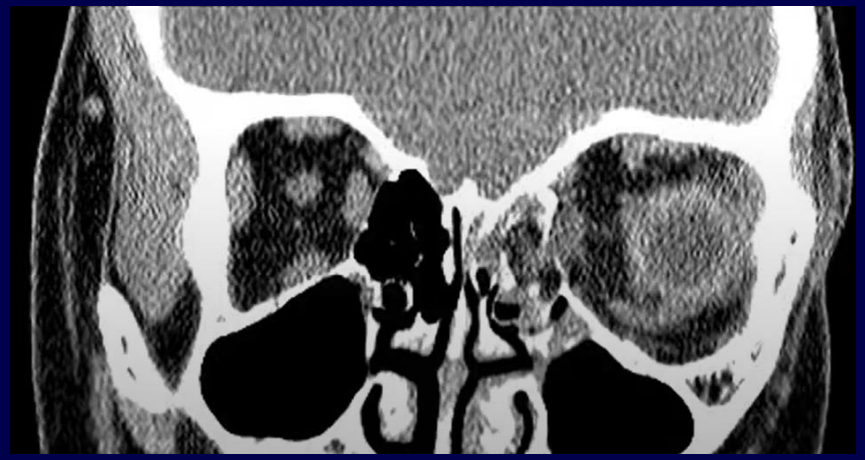




Herniation vs. Entrapment

Look for fat where it doesn't belong



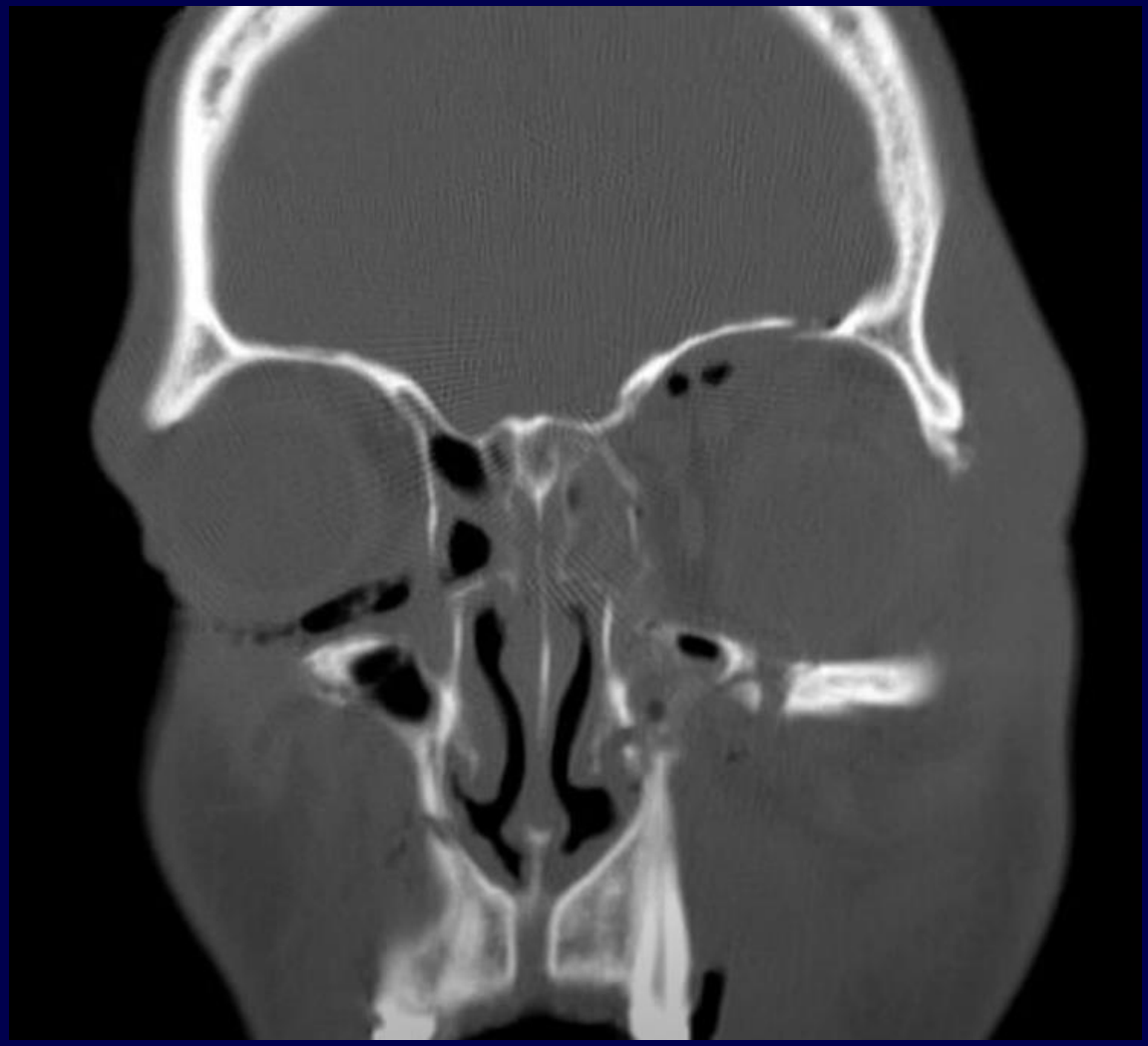


Medial rectus was clinically entrapped

Trapdoor Fracture vs. Hinged Fragment

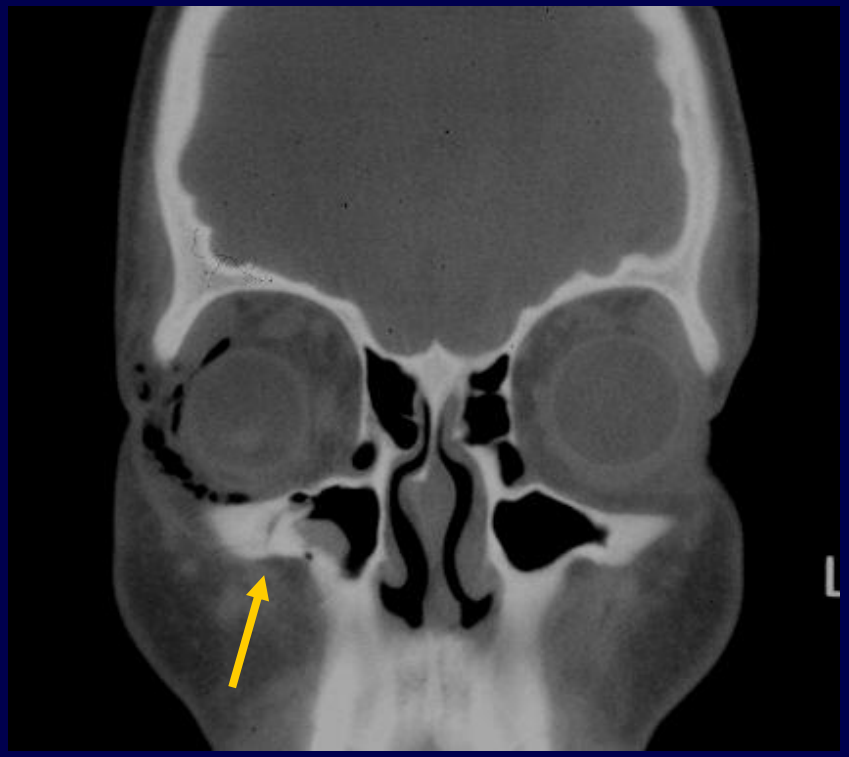
Extension to Orbital Rim

- Need to have a stable platform for the placement of the repair plate.
- Also need to note involvement of the orbital apex and optic canal.

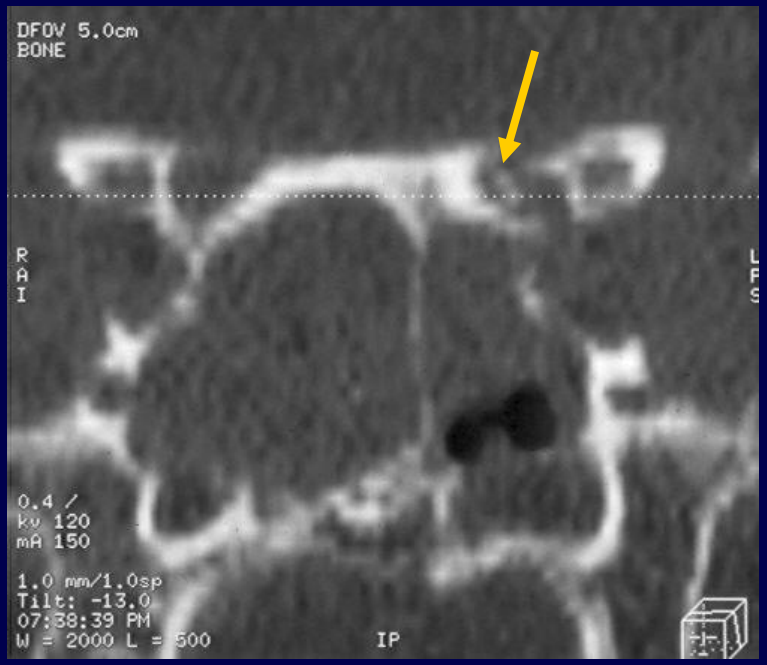


Extension to Orbital Apex

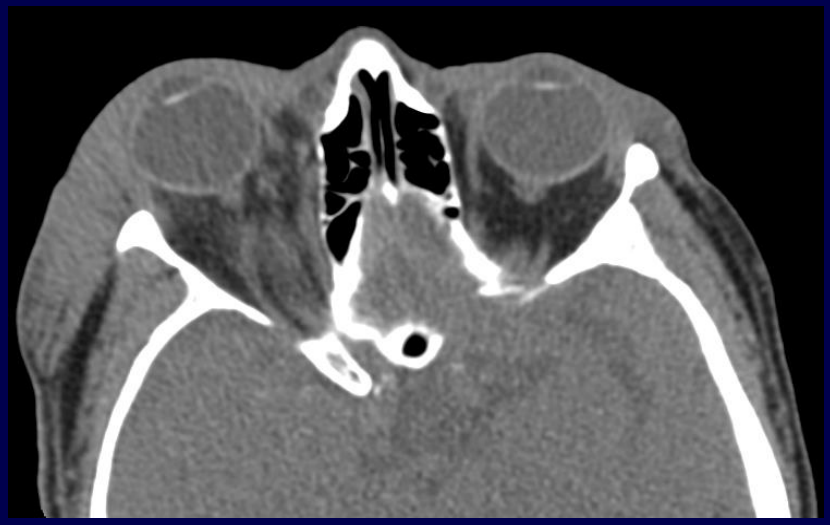
Orbital Rim Fracture
Right Inferior Orbital Rim



Orbital Apex Fracture with Optic Canal Fracture



Orbital Roof Fracture
Retrobulbar Hematoma



Orbital Roof Fracture
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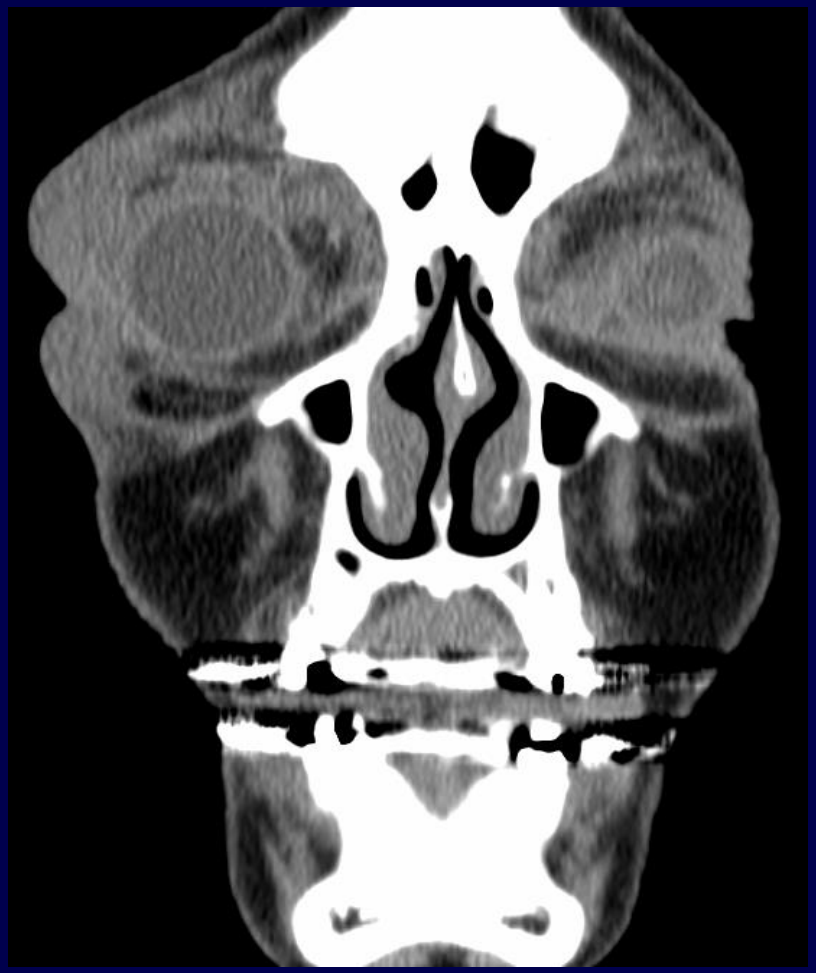
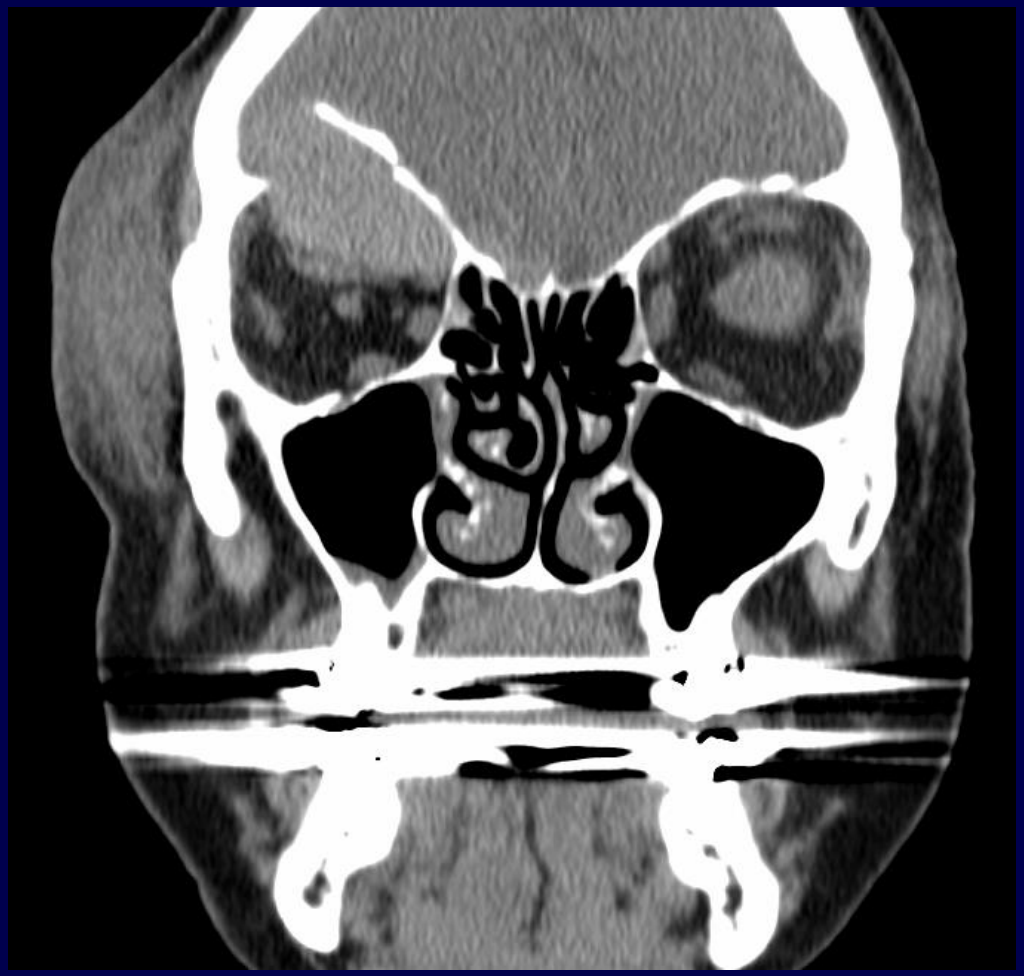




Orbital Roof Fracture
Retrobulbar Hematoma

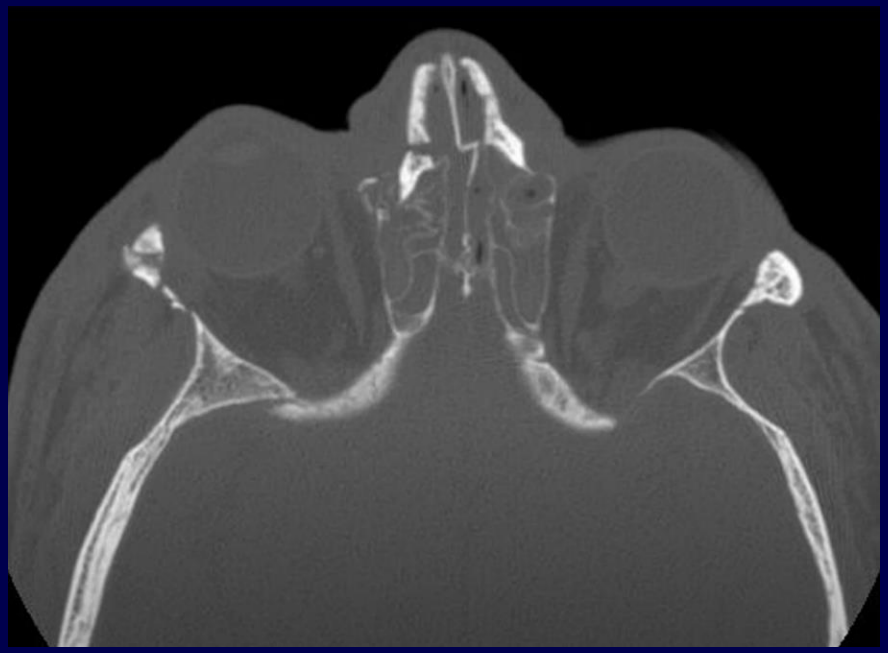
Acute Orbital Compartment Syndrome Retrobulbar Hematoma

- Intraorbital hemorrhage increases pressure within the confined orbital space
- When pressure within orbit exceeds central retinal artery pressure ischemia results
- Recognition/prompt treatment prevents blindness
- Retrobulbar hematoma needs emergency ophthalmologic consultation
- Proptosis

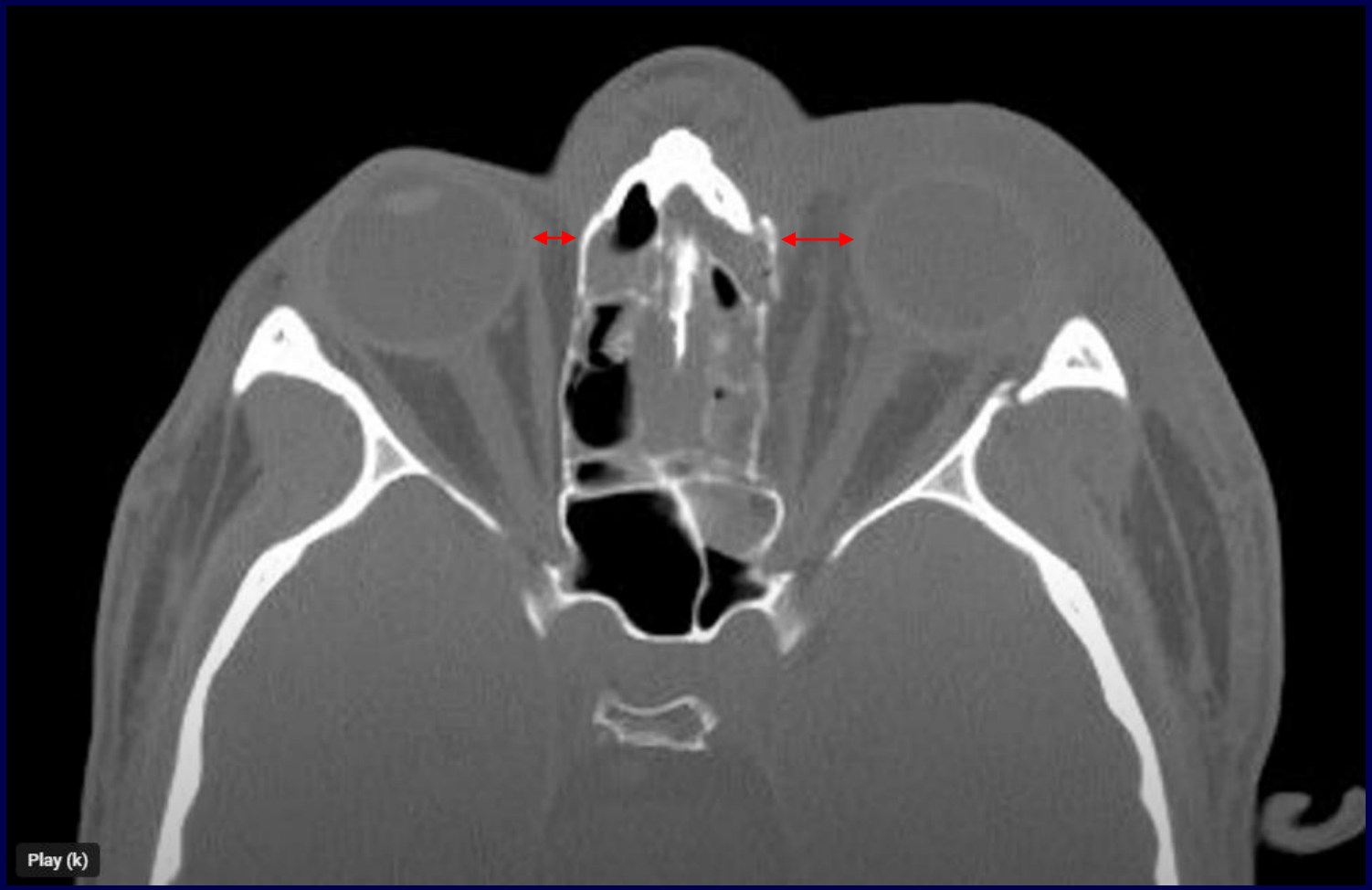
Naso-Orbito-Ethmoidal Region

- Importance:
  - Medial canthal ligament
- Issues:
  - 90% avulse bone fragment
  - Asymmetric distance to orbital rim
  - Transnasal repair
  - Associated nasolacrimal injury

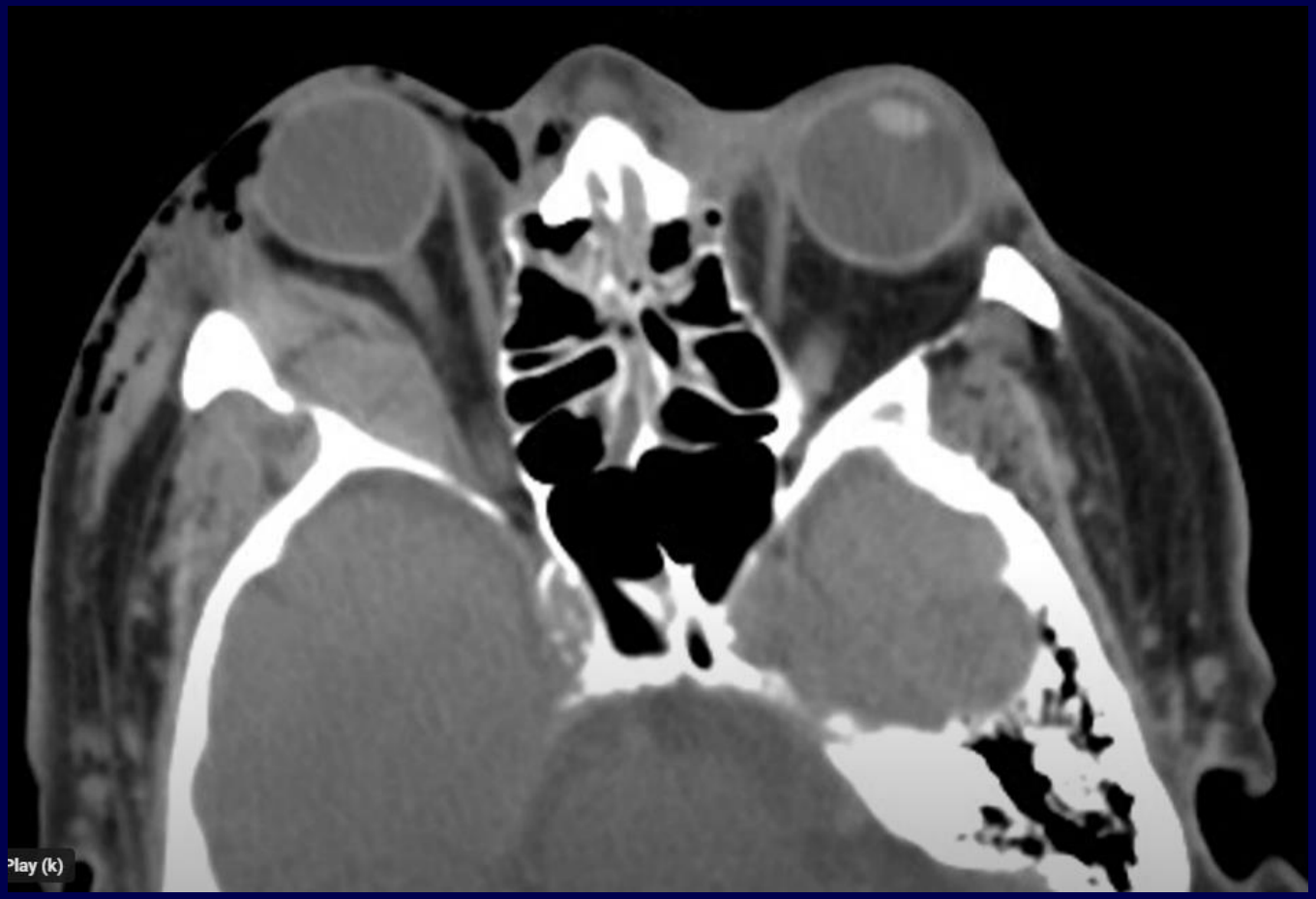
NOE Fracture Resulting in Bone Fragmentation



Stereotypical NOE Fracture

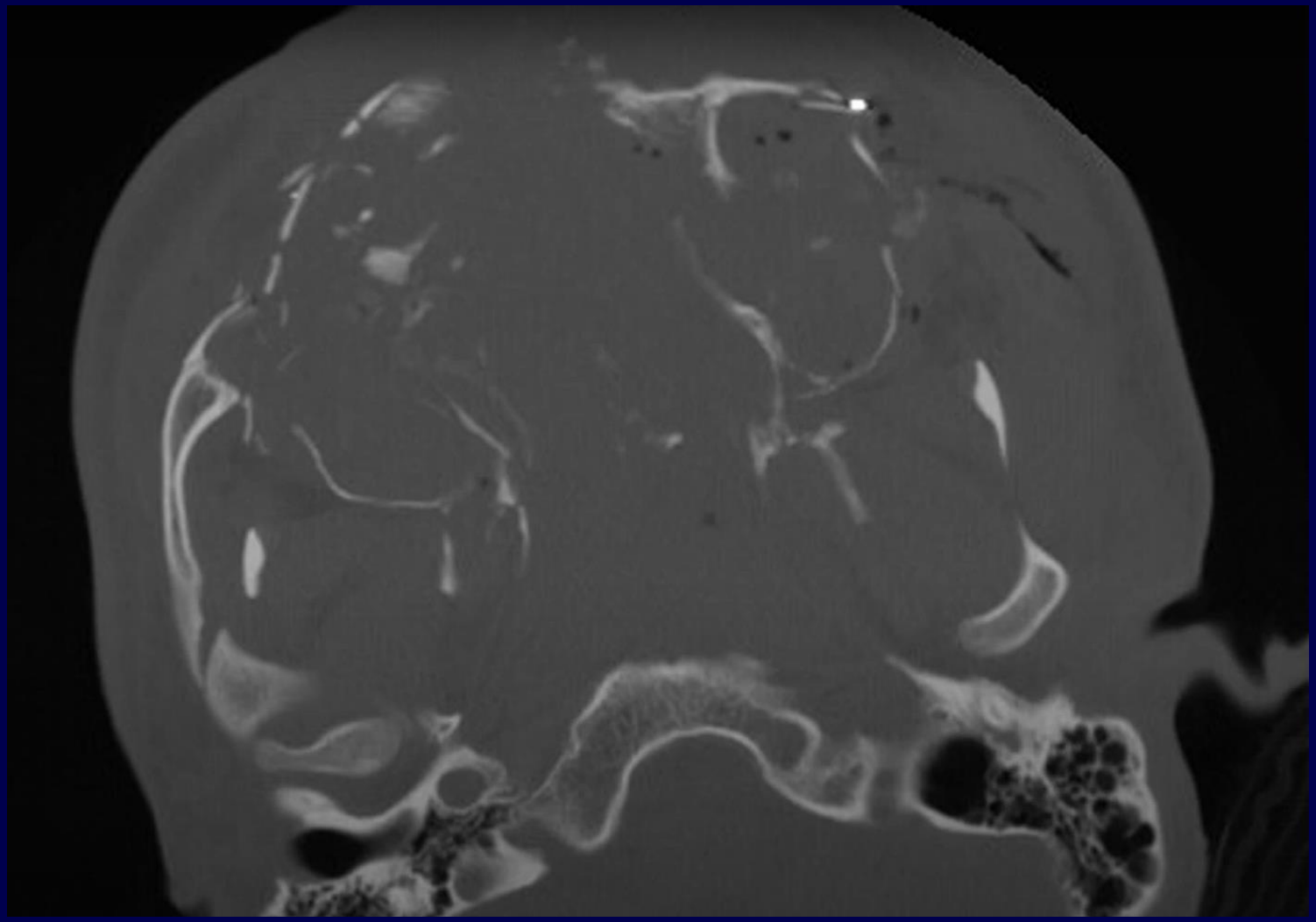


Orbital Hematomas
Can be associated with NOE fractures



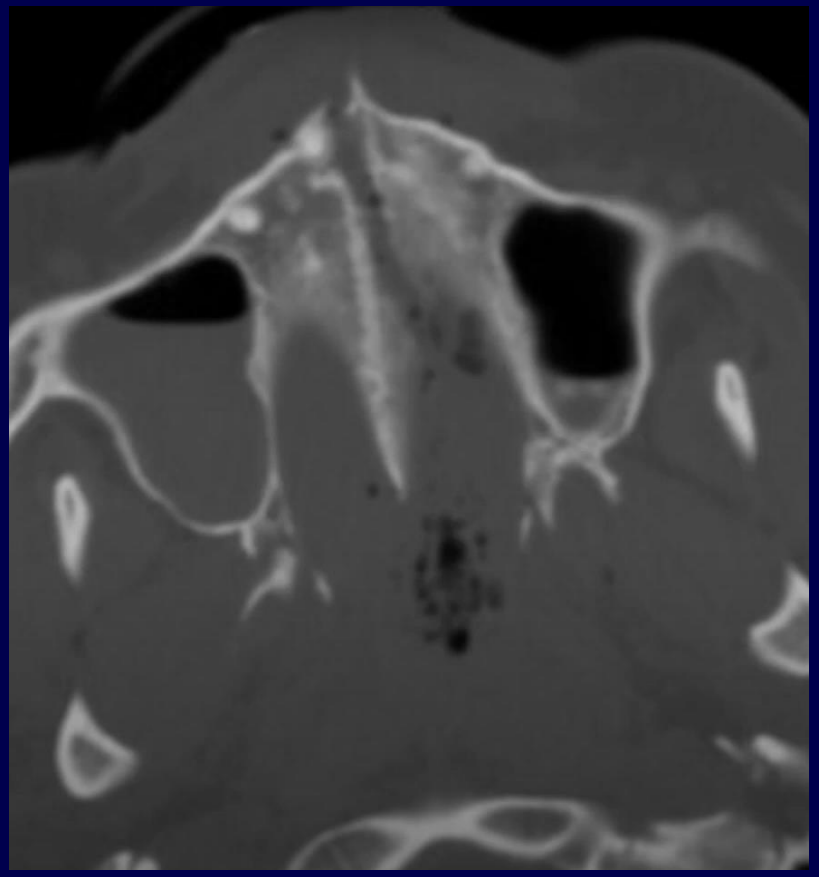
Maxillary Buttress

- What is it?
  - Practically, the anterior and posterior walls of the maxillary sinus
- Importance:
  - Opposes force of mastication
  - Poor native healing
- Issues:
  - Anterior/posterior buttress



Hard Palate

- Importance:
  - Oral-nasal fistula
  - Force of mastication prevents healing
  - Pain on chewing
- Issues:
  - Axial imaging plane
  - Most are sagittally oriented



Reference

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- Facial Fractures. Barton Branstetter. Accessed September 9, 2023.
  - https://www.youtube.com/watch?v=-mHcEobz1w8
  - https://www.youtube.com/watch?v=oVgriya_XLE&t=6s
  - https://www.youtube.com/watch?v=p_SQE3VhFpY&t=156s
  - https://www.youtube.com/watch?v=BwwLihpGXdg&t=32s

Thank you for your attention!

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