

Radiographic Evaluation of Facial Trauma

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9/18/19

Diagnostic Radiology 4001

Reviewed By: Manickam Kumaravel MD



History

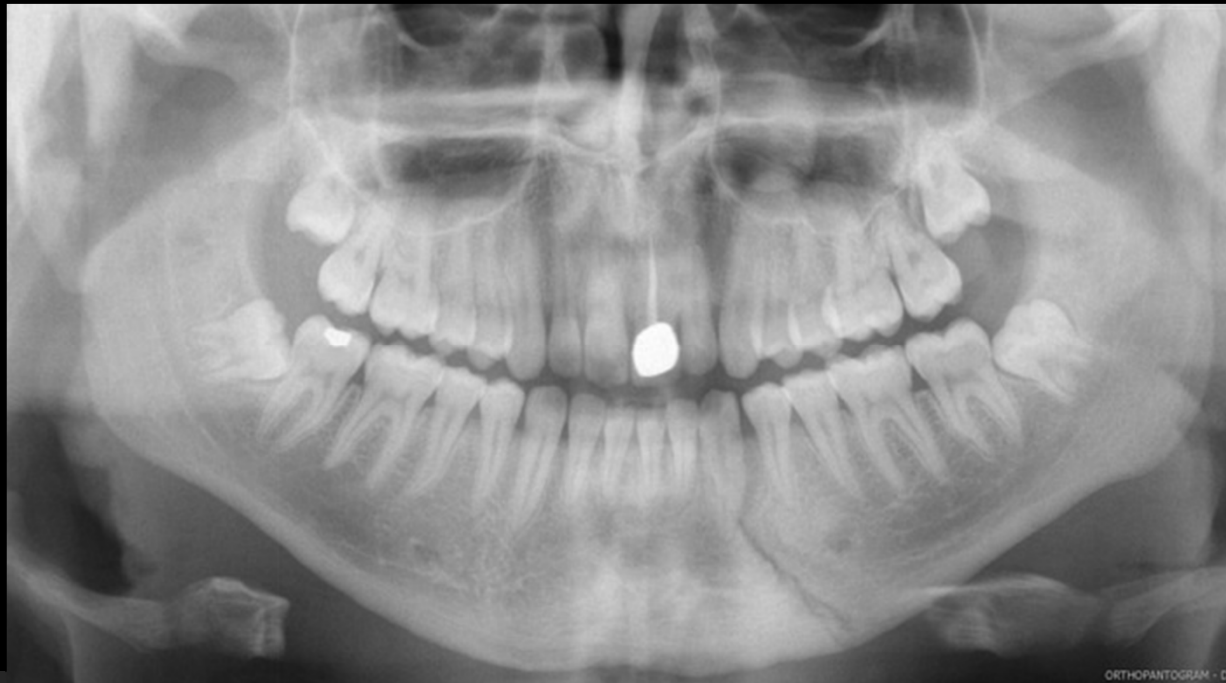
- 36M
- Level 1 trauma, assault w/ fists and feet, thrown from moving bus
- GCS 3, intubated w/ sedation PTA
- Primary survey intact

History: secondary survey

- HR 69, BP 120/75, RR 18, SpO2 100% ETT
- GCS 7T
- bilateral periorbital edema & ecchymosis, right eye chemosis, telecanthus, bowstring test positive right
- blood in oropharynx and nares, rightward nasal deviation, mobile nasal bone w/ crepitus
- mobile right ZMC, maxilla, and left mandibular body

Imaging of Facial Skeletal Trauma

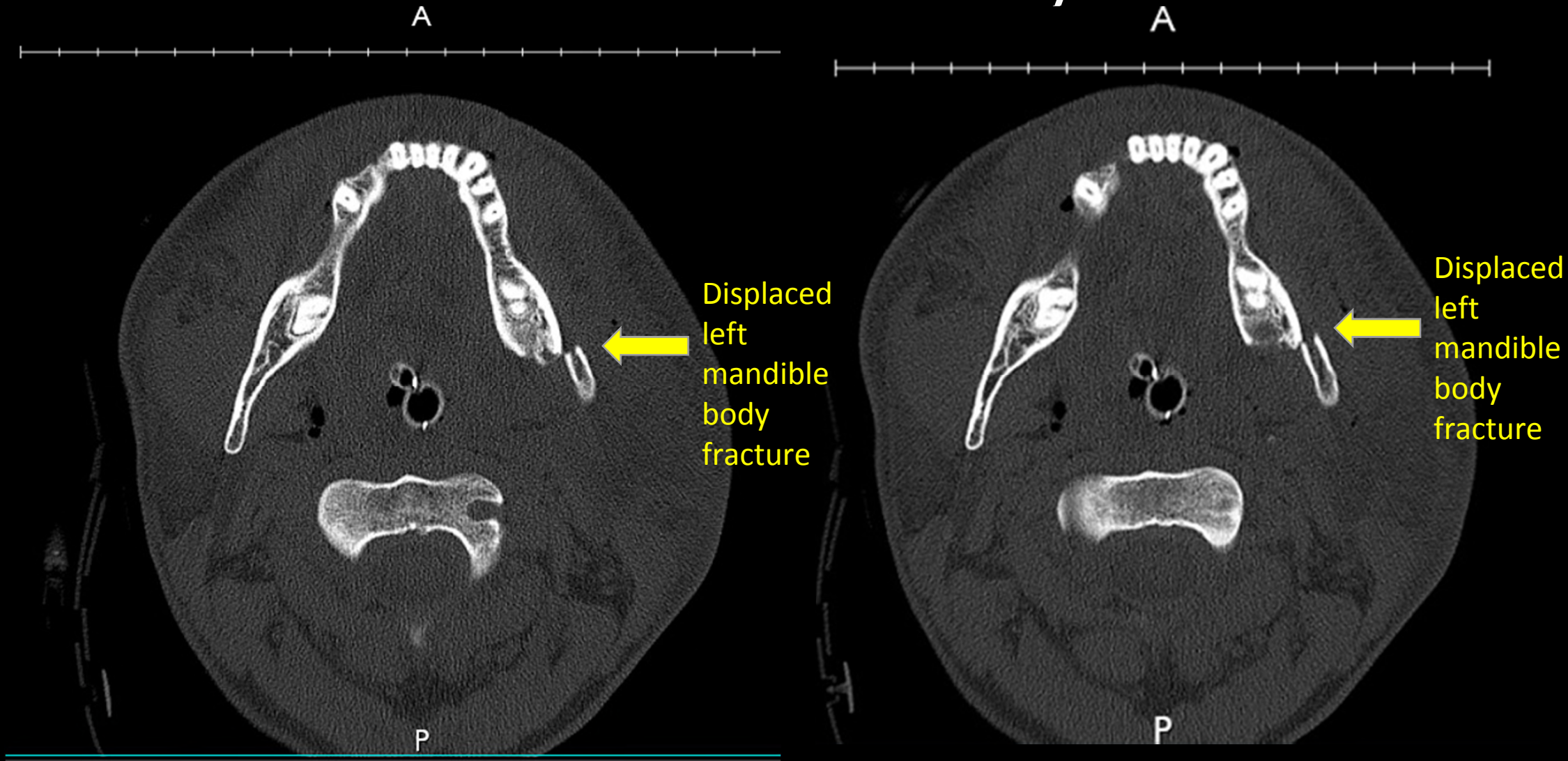
- Best option for panfacial trauma: CT maxillofacial, 3 views
- If mandible only: mandibular series xray (3 views) or panorex
- Don't forget images for concomitant injuries! (CT brain, CT c-spine)



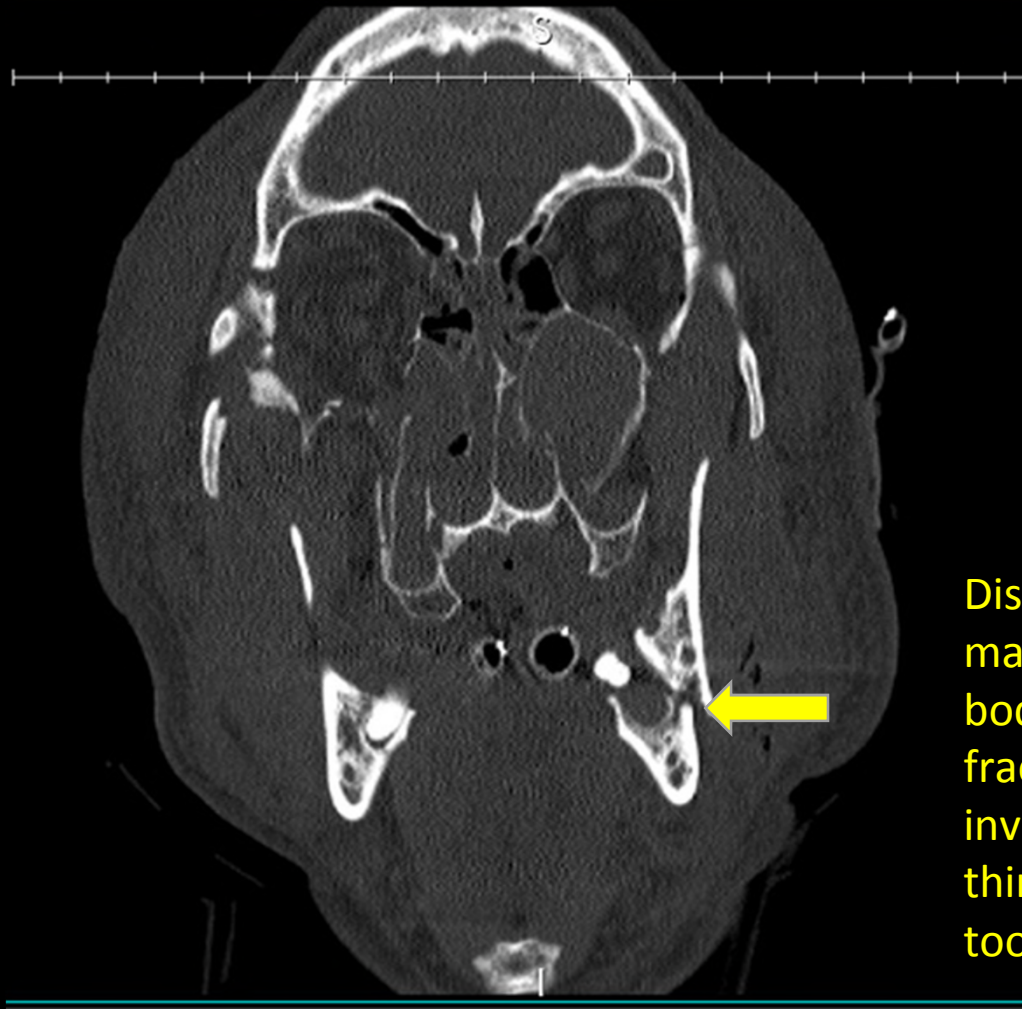
Example
panorex

<https://radiopaedia.org/articles/mandibular-fracture?lang=us>

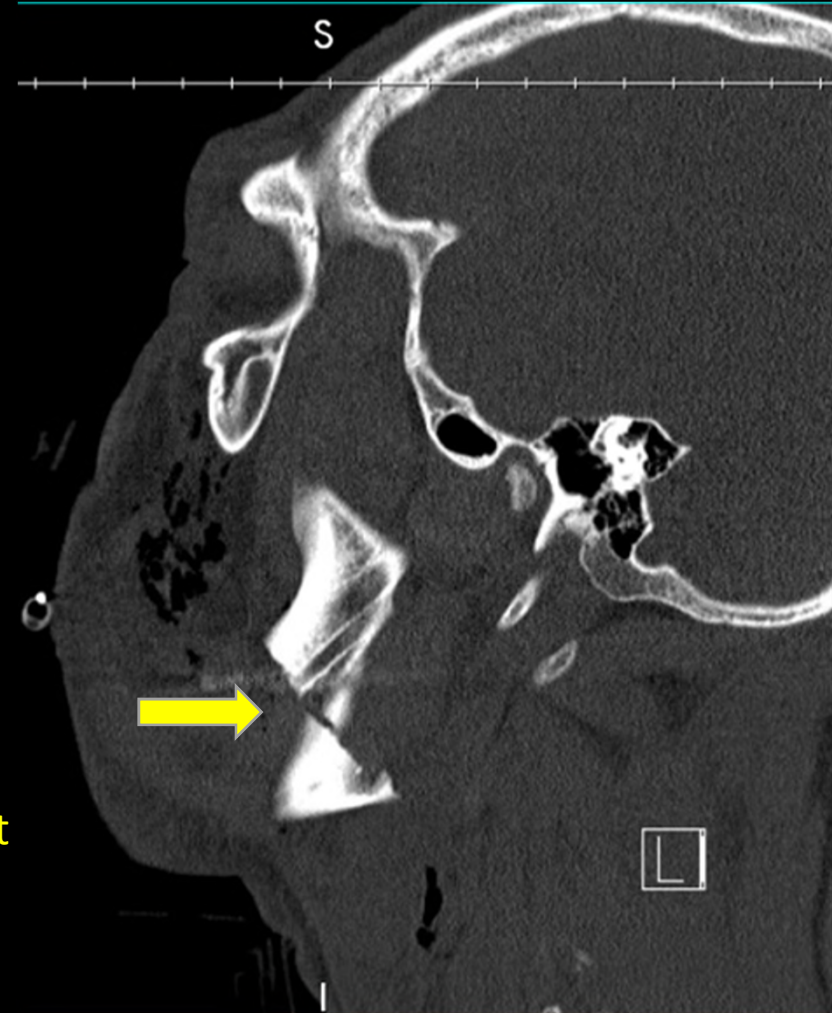
CT maxillofacial w/o



CT maxillofacial w/o

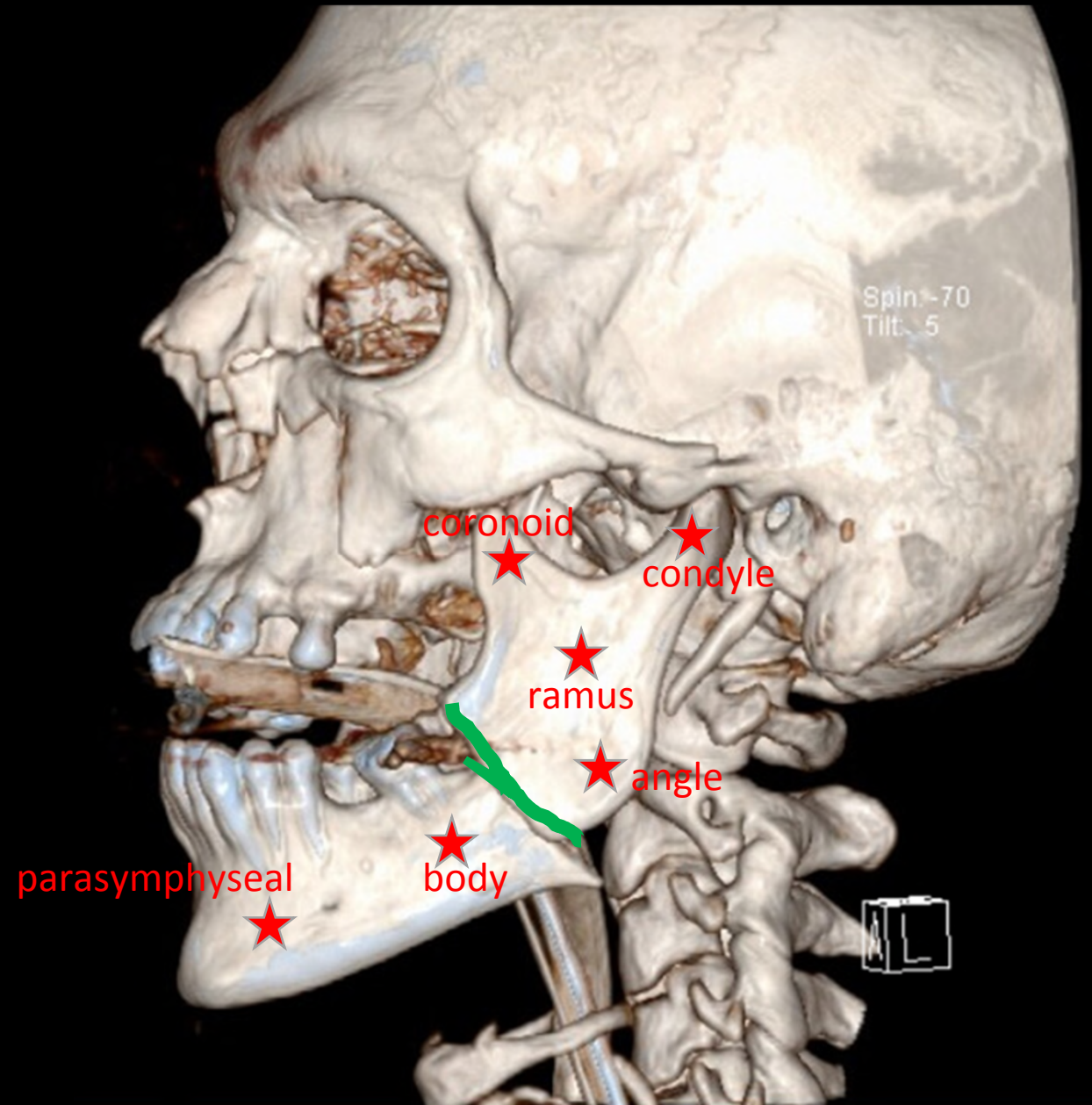


Displaced
mandible
body
fracture,
involving left
third molar
tooth



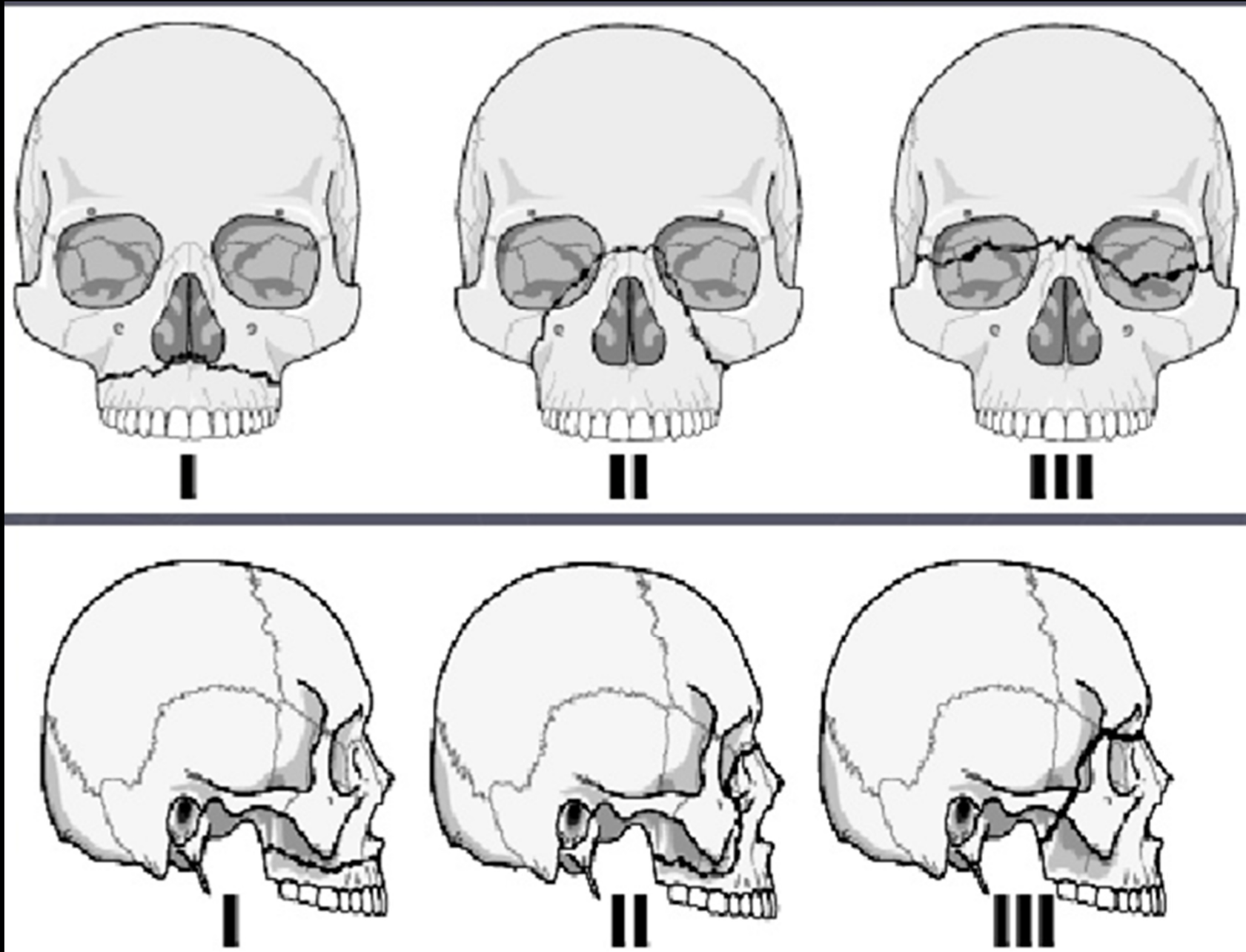
Mandible: 3D recon

- Condyle 30%
- Angle 25%
- Body 25%
- Parasymphyseal 15%
- Ramus 3%
- Coronoid 2%



LeFort fractures

- I: separates maxillary teeth/hard palate from upper maxilla
- II: pyramidal fx, separates nasal complex and maxilla from skull base and zygoma
- III: separates midface from skull base



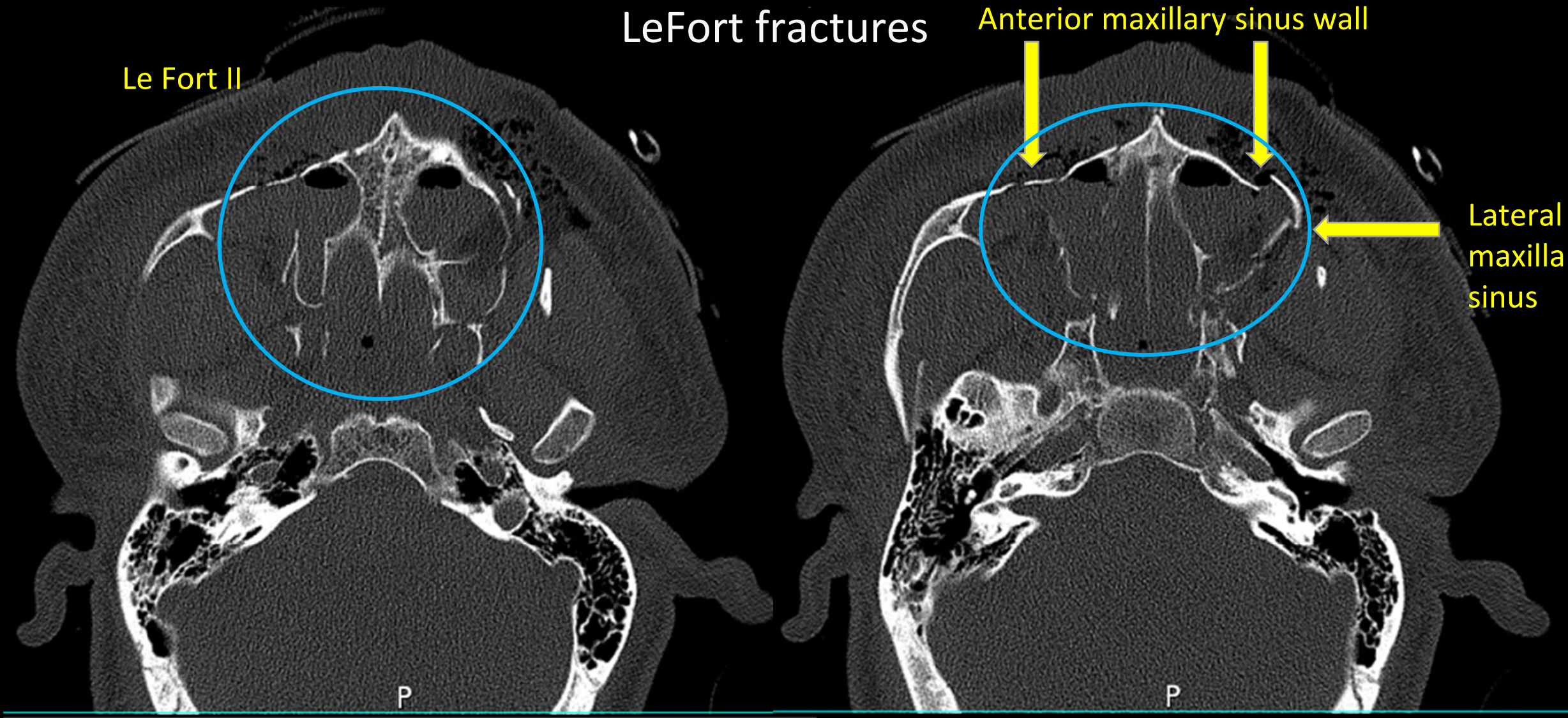
https://www.researchgate.net/figure/Classical-Le-Fort-Fracture-pattern-line-diagrams_fig1_315959597

LeFort fractures

Le Fort II

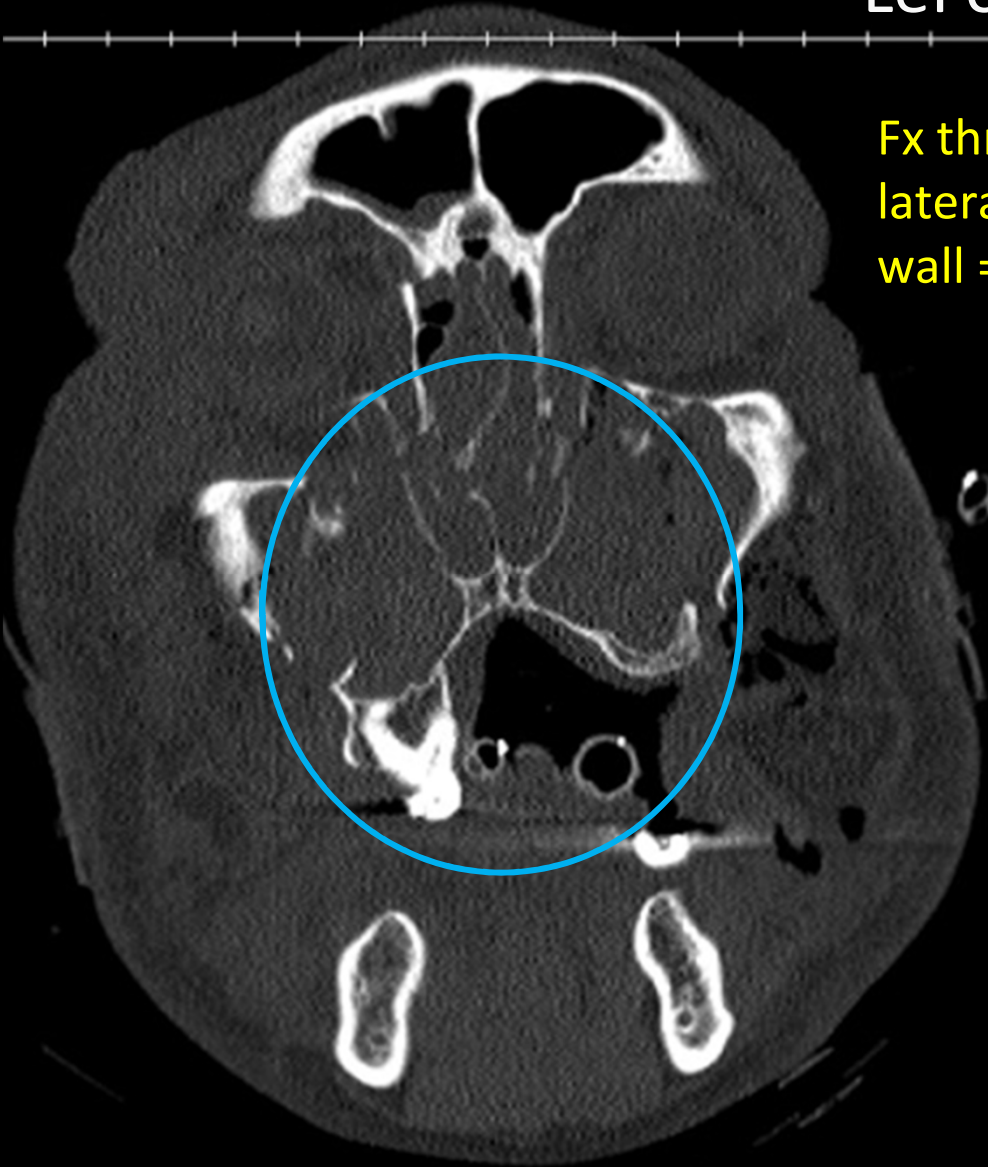
Anterior maxillary sinus wall

Lateral maxillary sinus

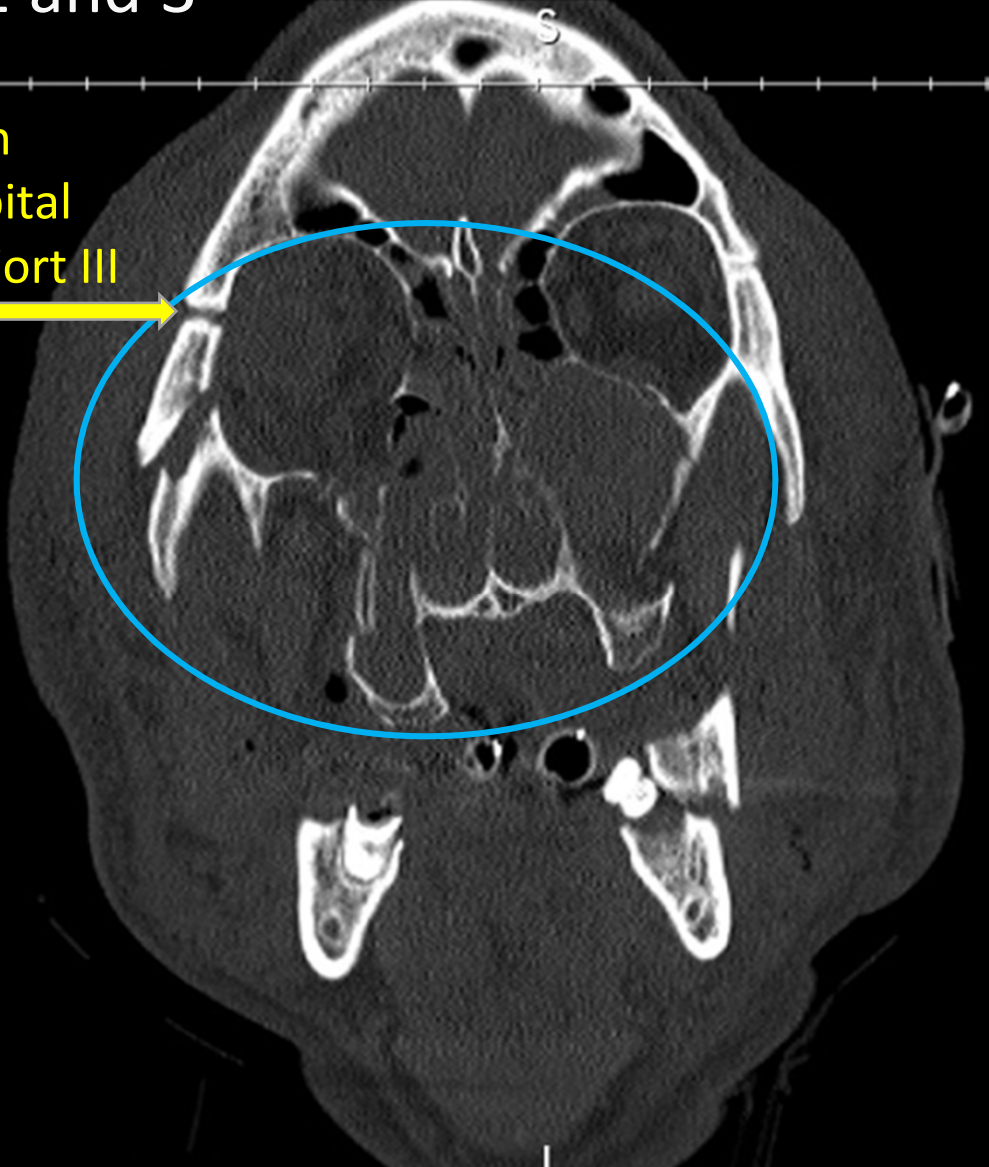


S

LeFort 2 and 3

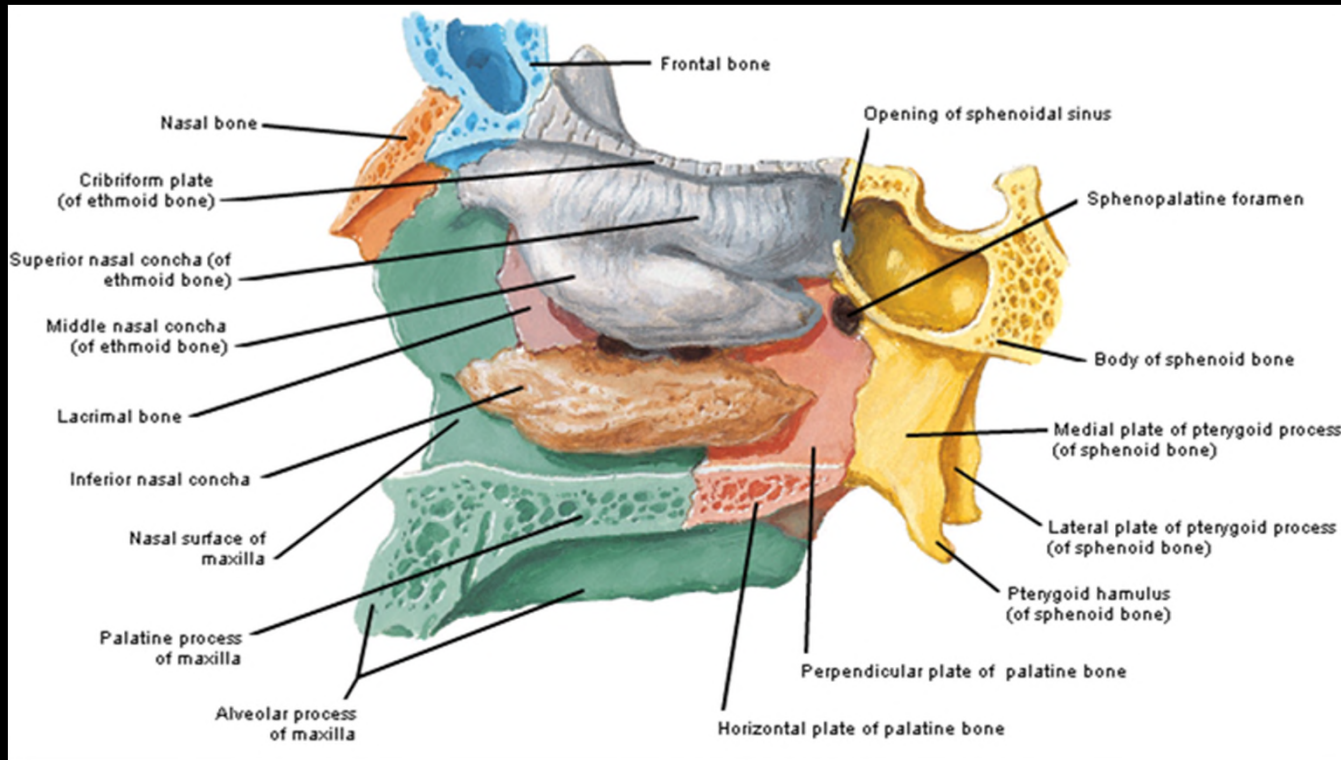


Fx through lateral orbital wall = Le Fort III

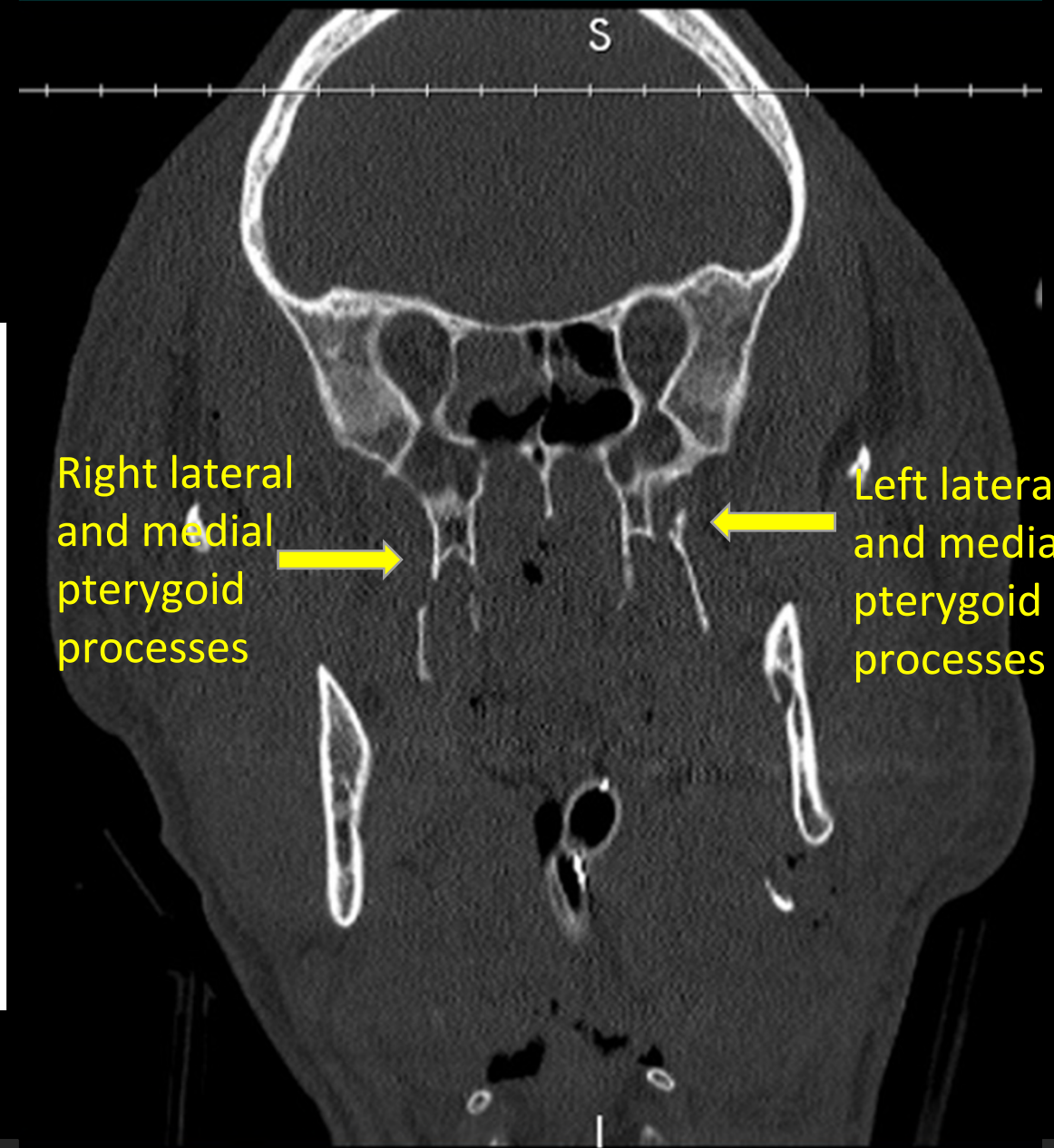


Pterygoid process fx

Mandatory to dx a LeFort fracture!



https://web.duke.edu/anatomy/Lab23/Lab23_table.html



Zygomaxillary Complex

- Zygomaxillary
- Zygomaticotemporal
- Zygomaticofrontal
- Zygomaticosphenoid

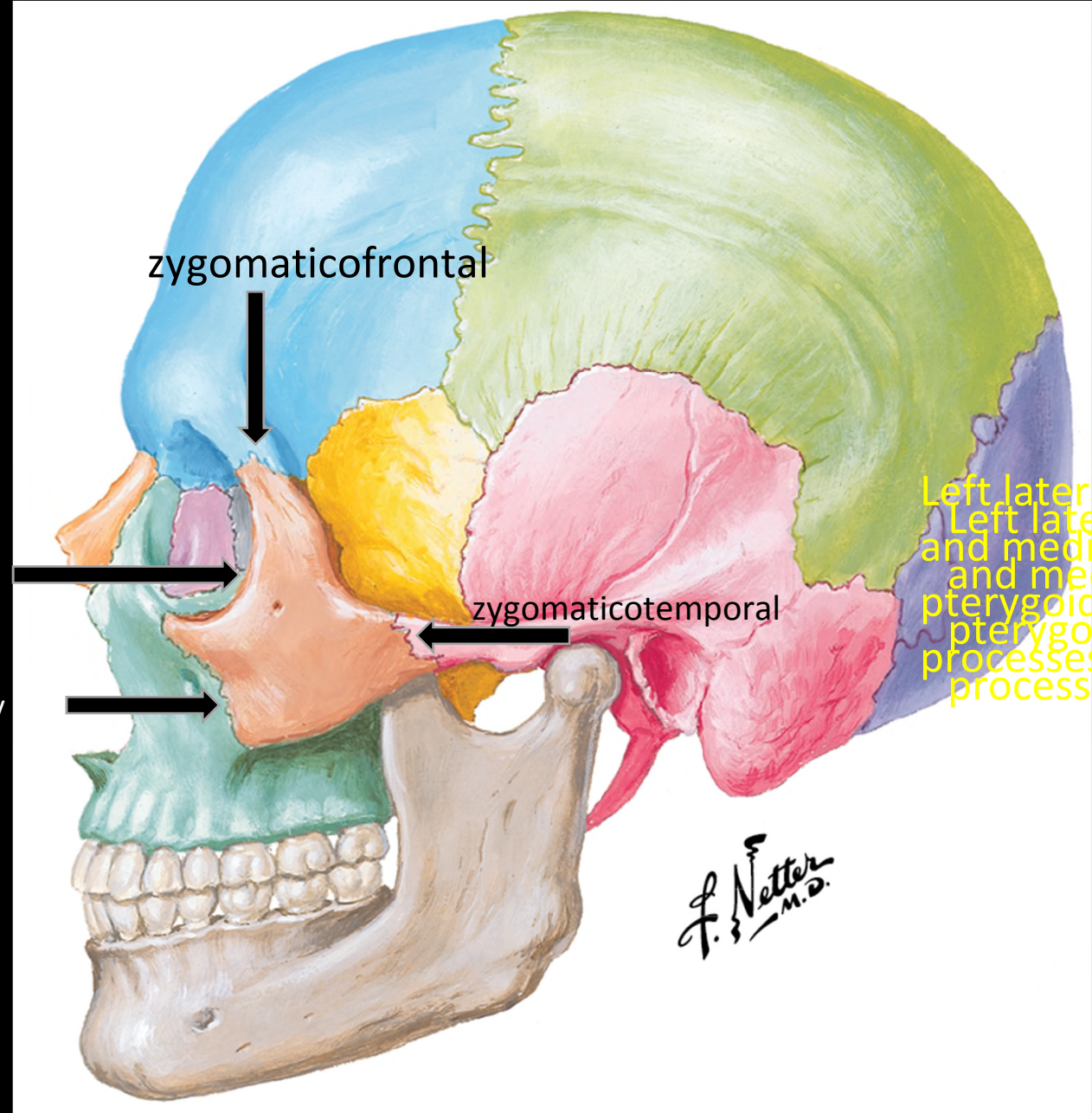
zygomaticosphenoid

zygomaxillary

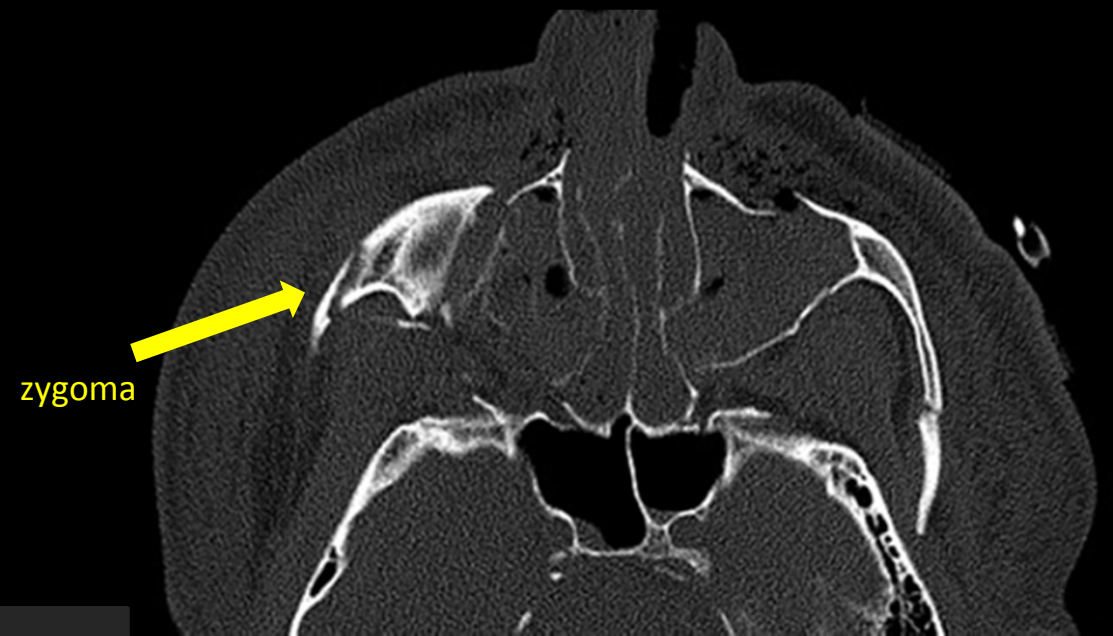
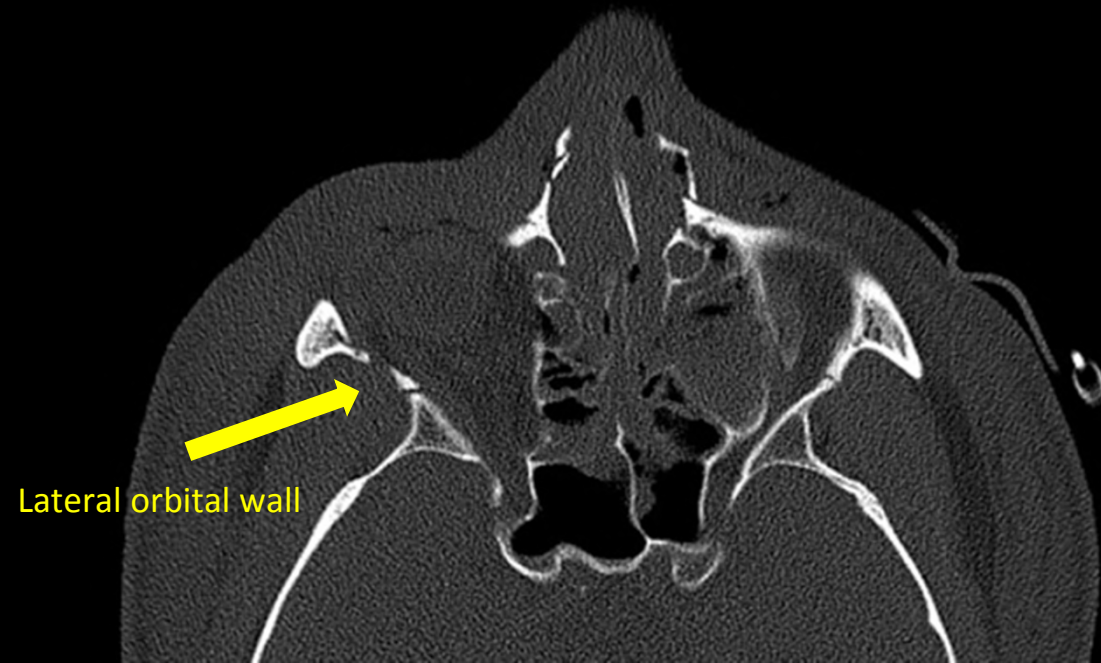
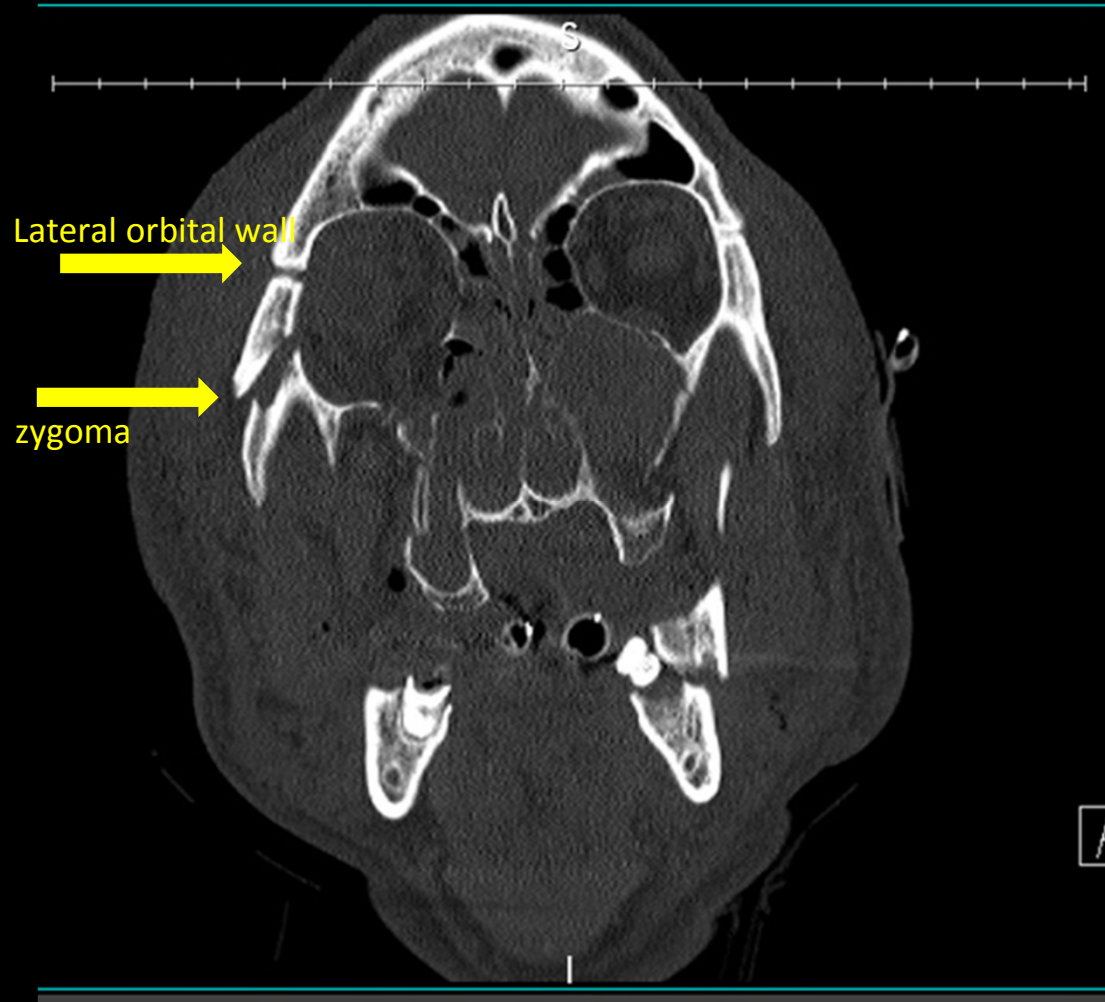
zygomaticofrontal

zygomaticotemporal

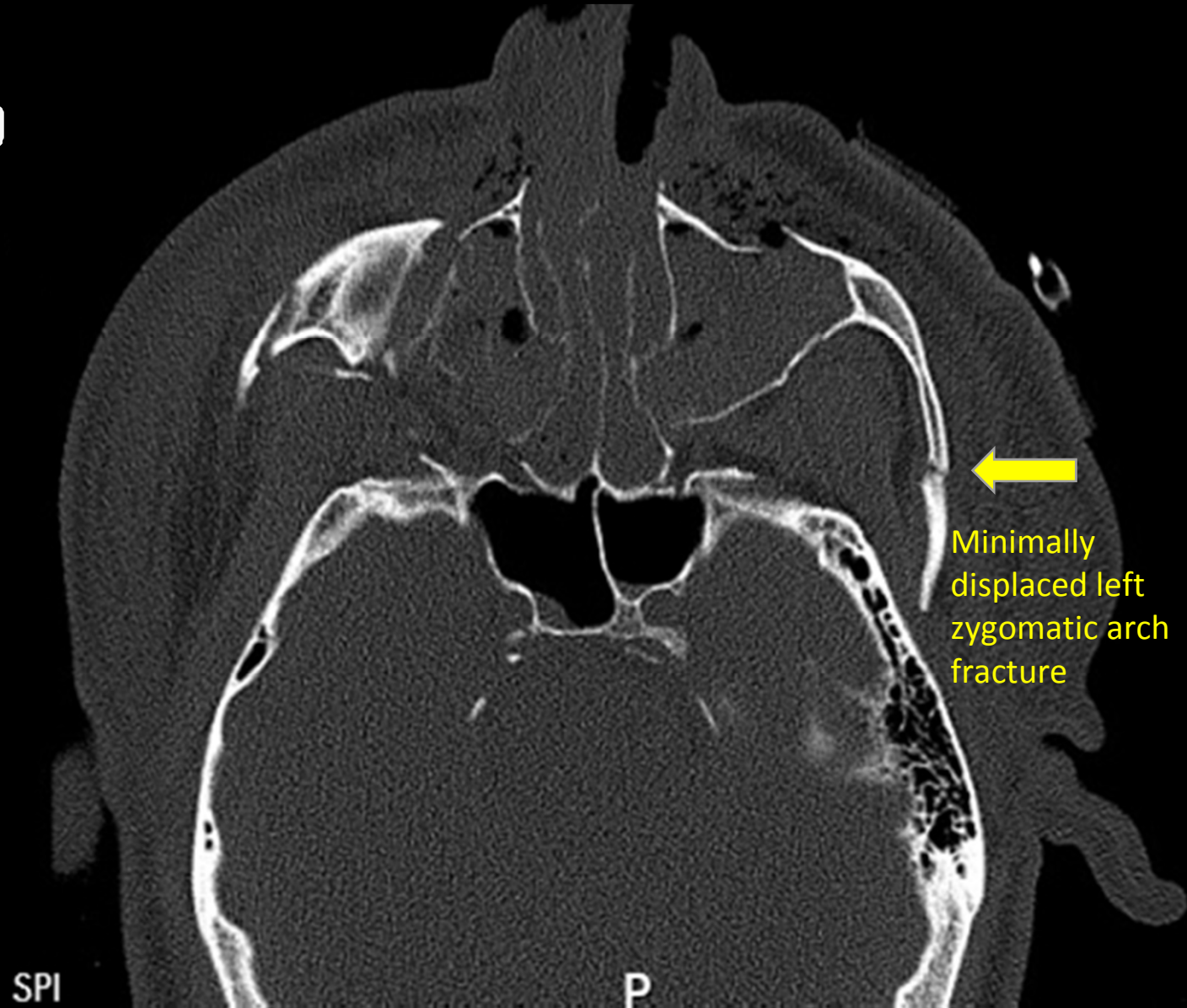
Left lateral
and media
and medi
pterygoid
pterygoid
processes
processes



Right ZMC



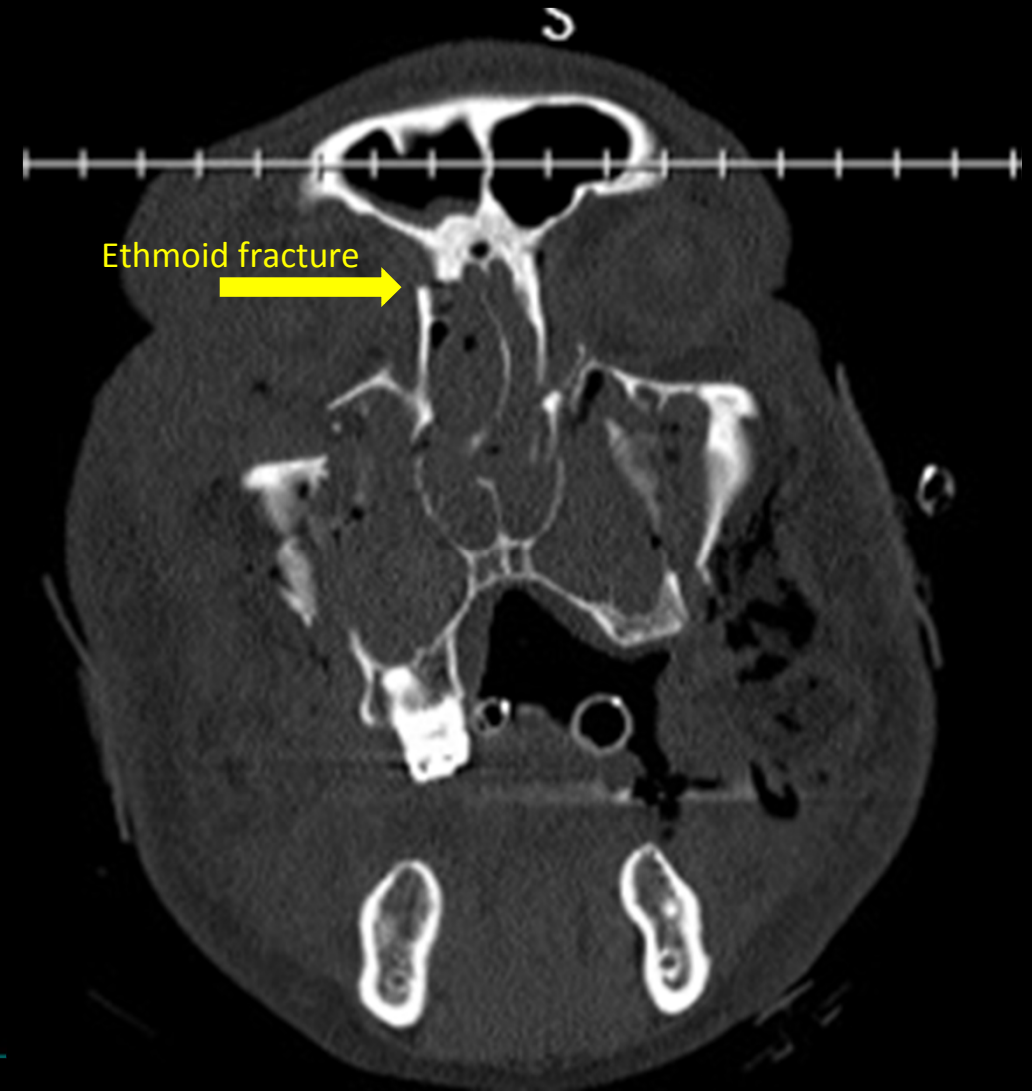
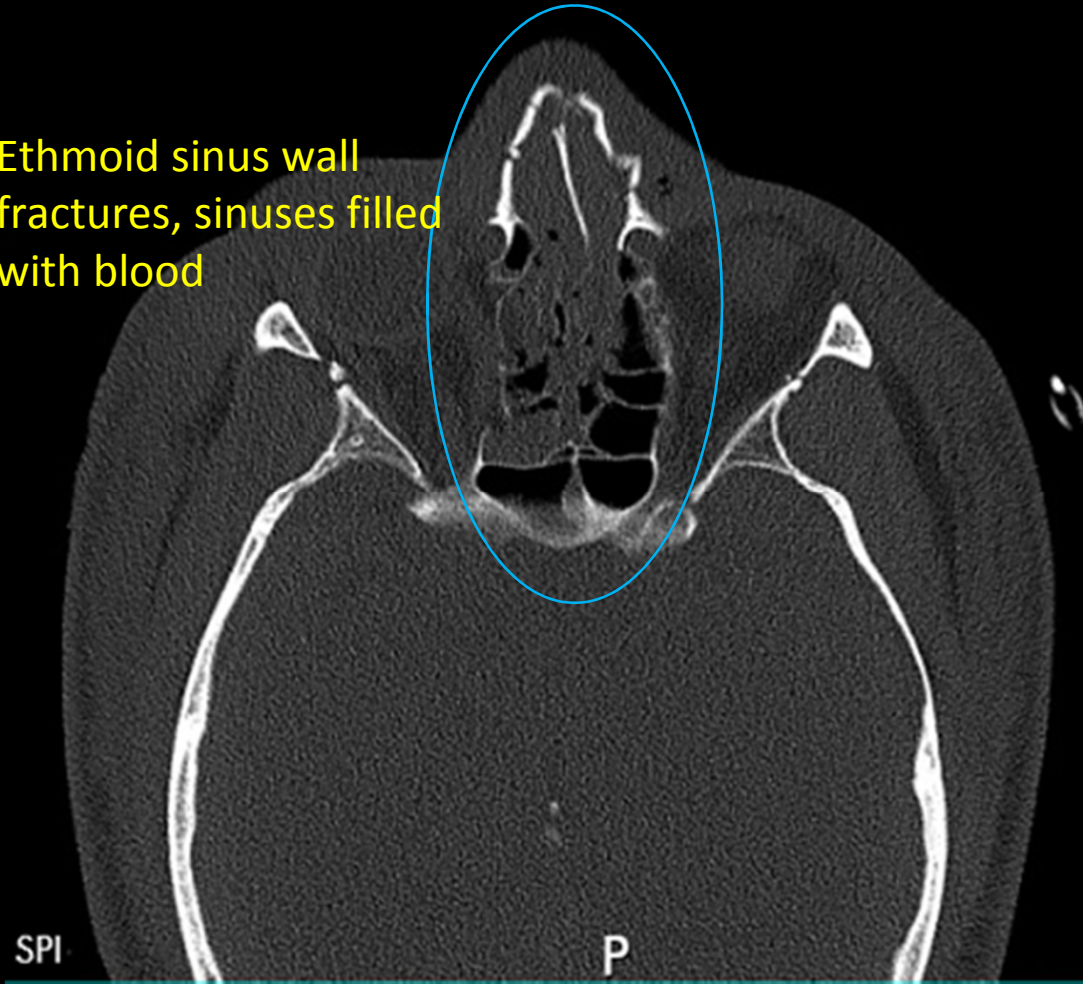
CT maxillofacial w/o

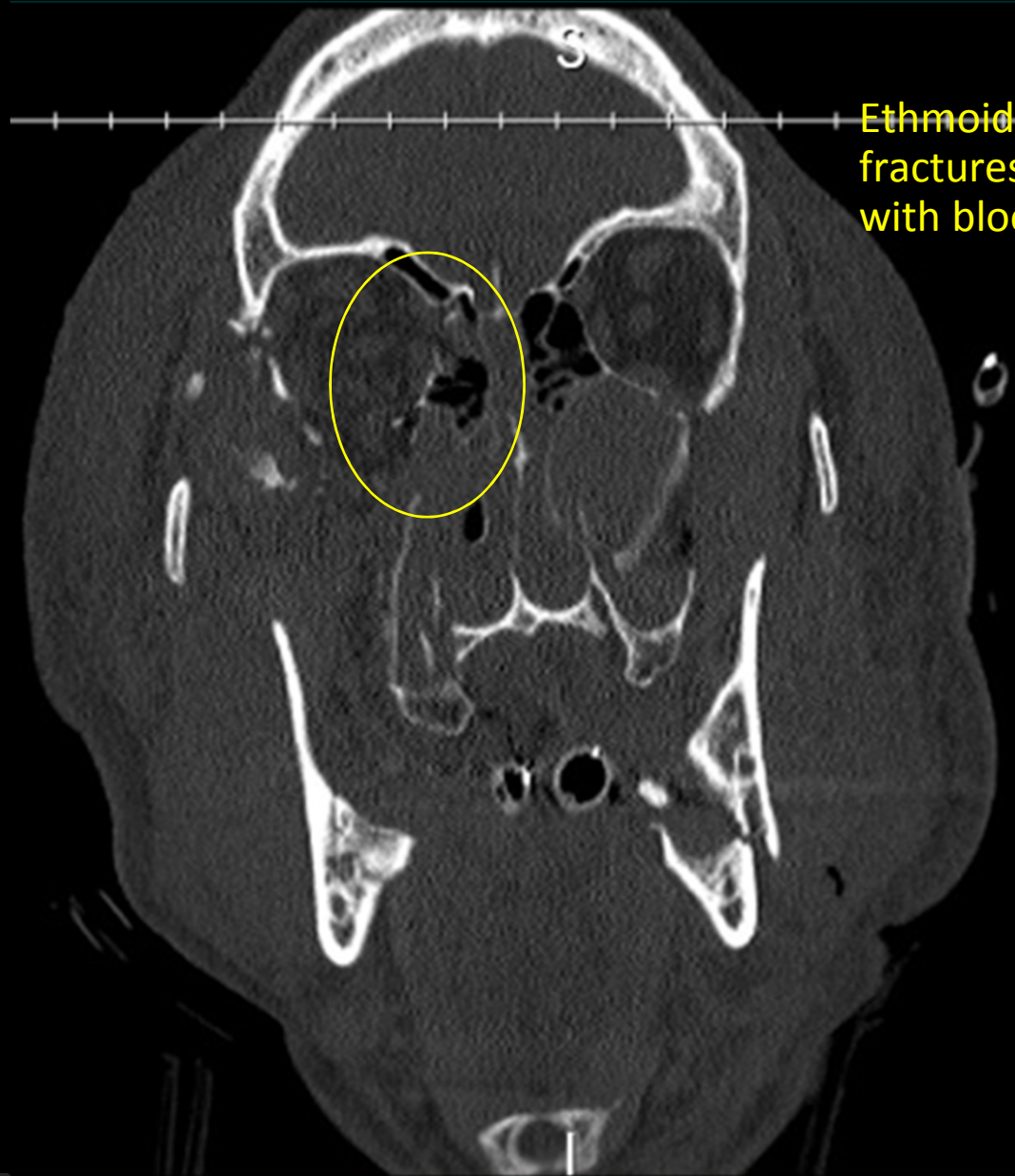


Minimally displaced left zygomatic arch fracture

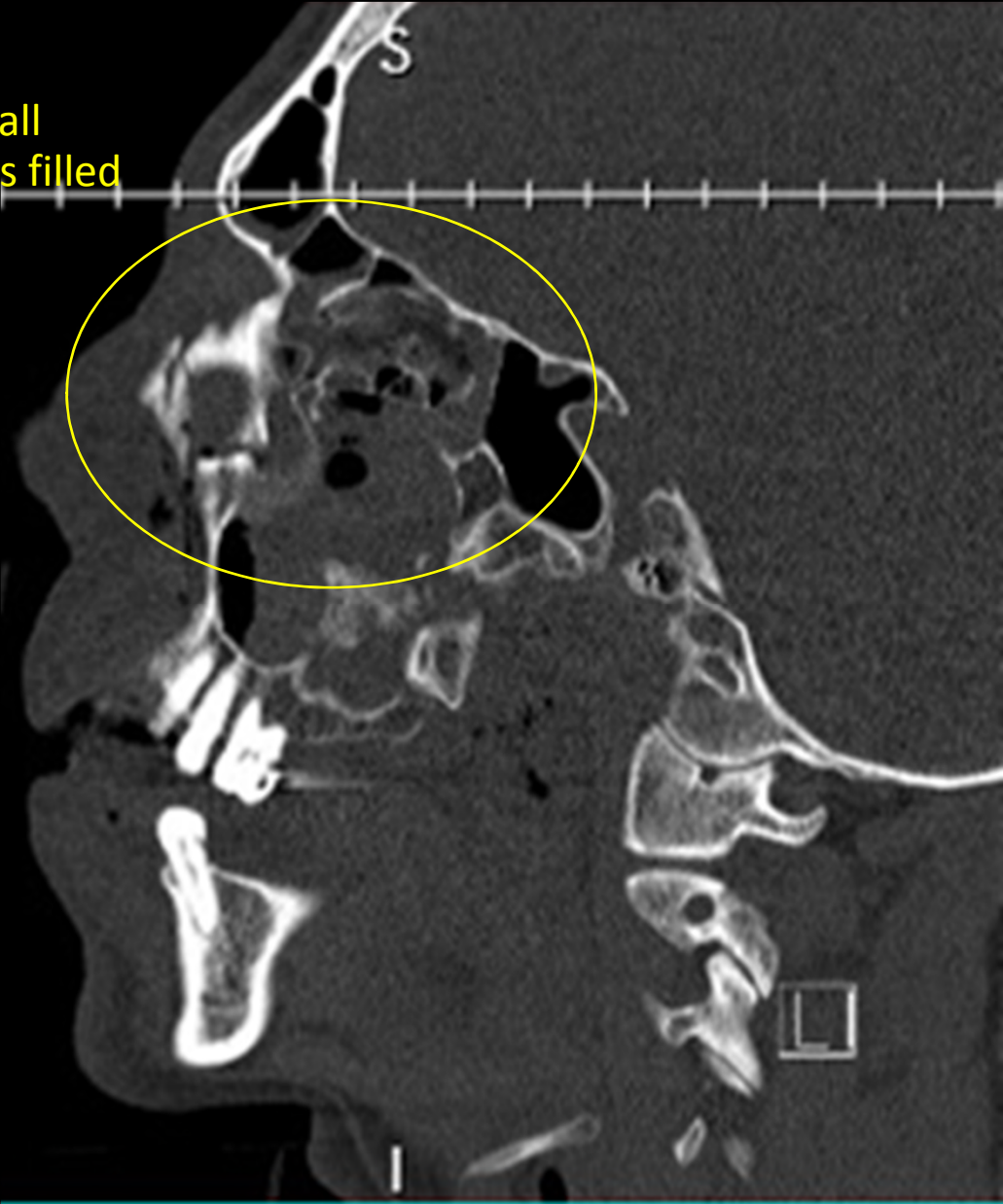
Naso-orbito-ethmoid complex

Ethmoid sinus wall fractures, sinuses filled with blood

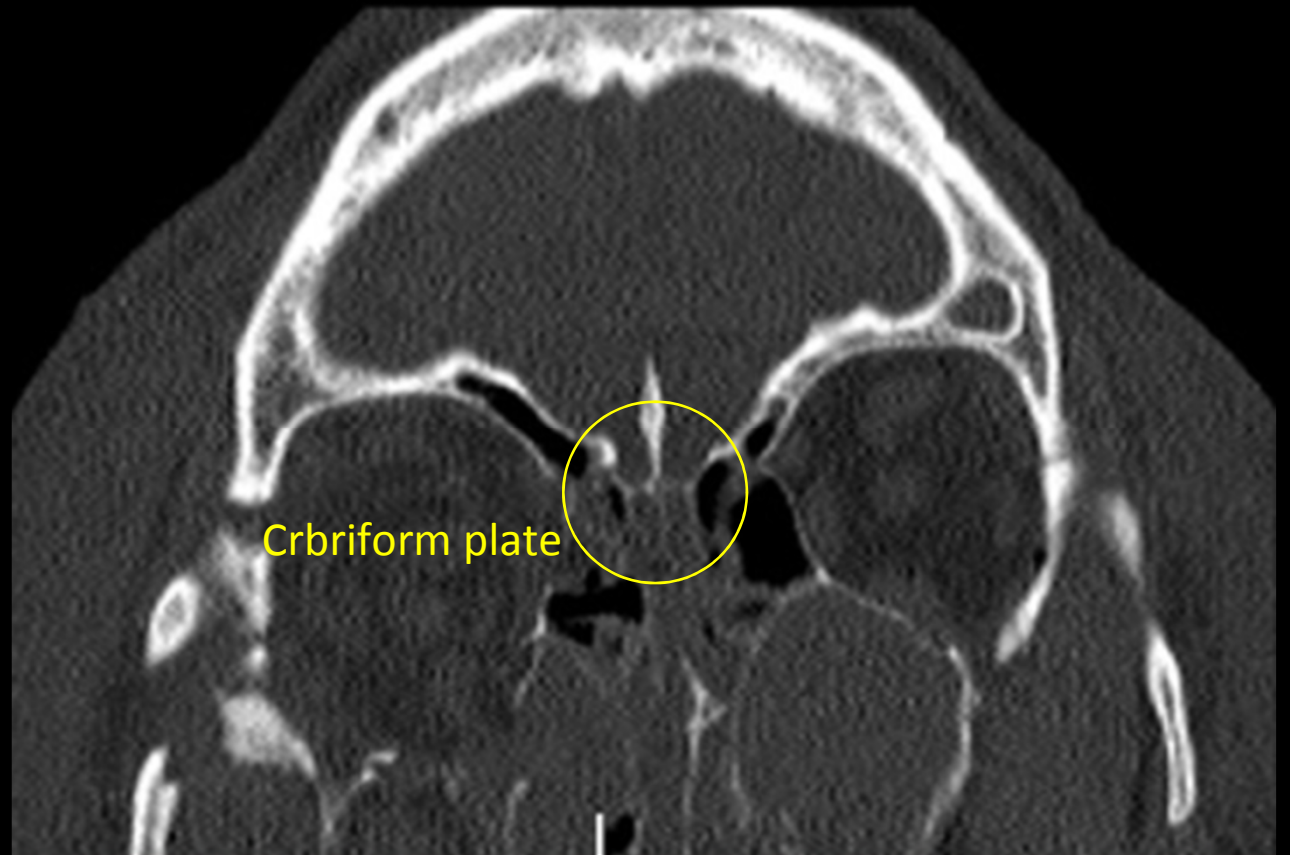
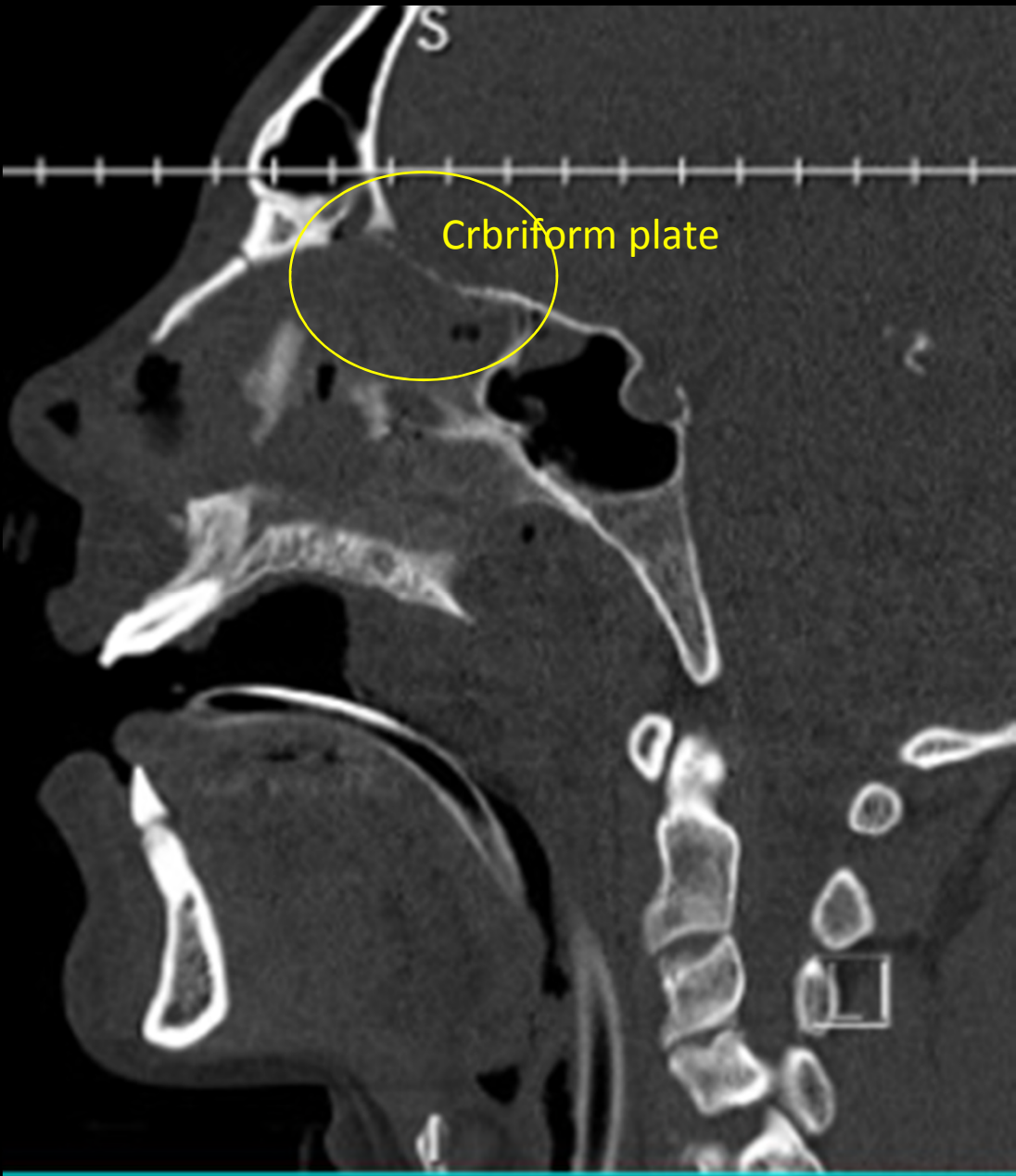




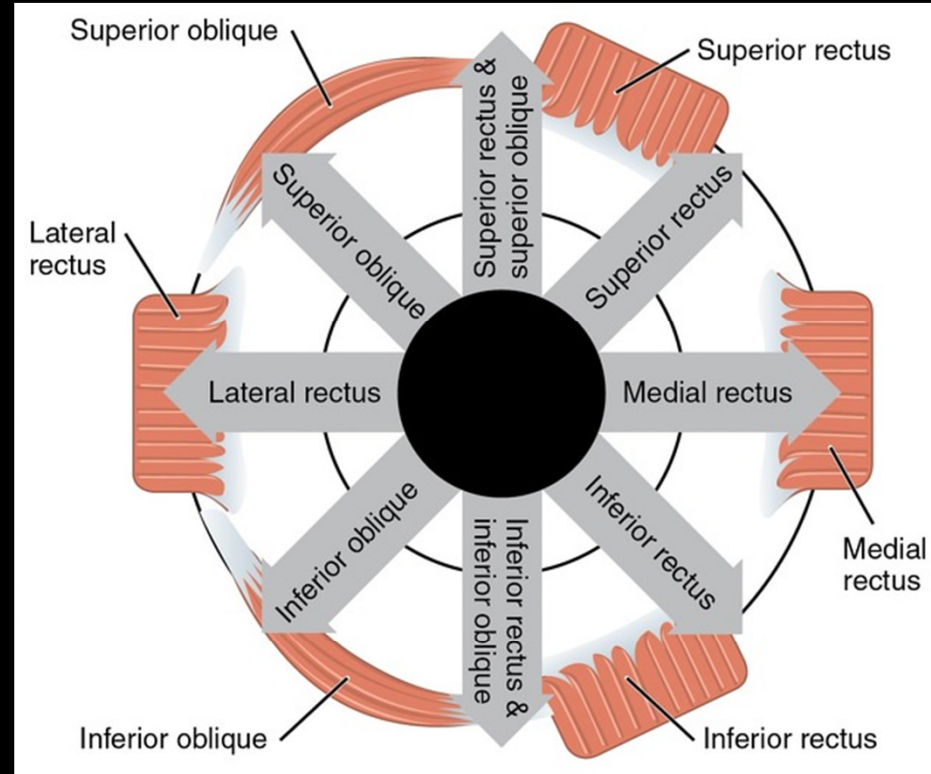
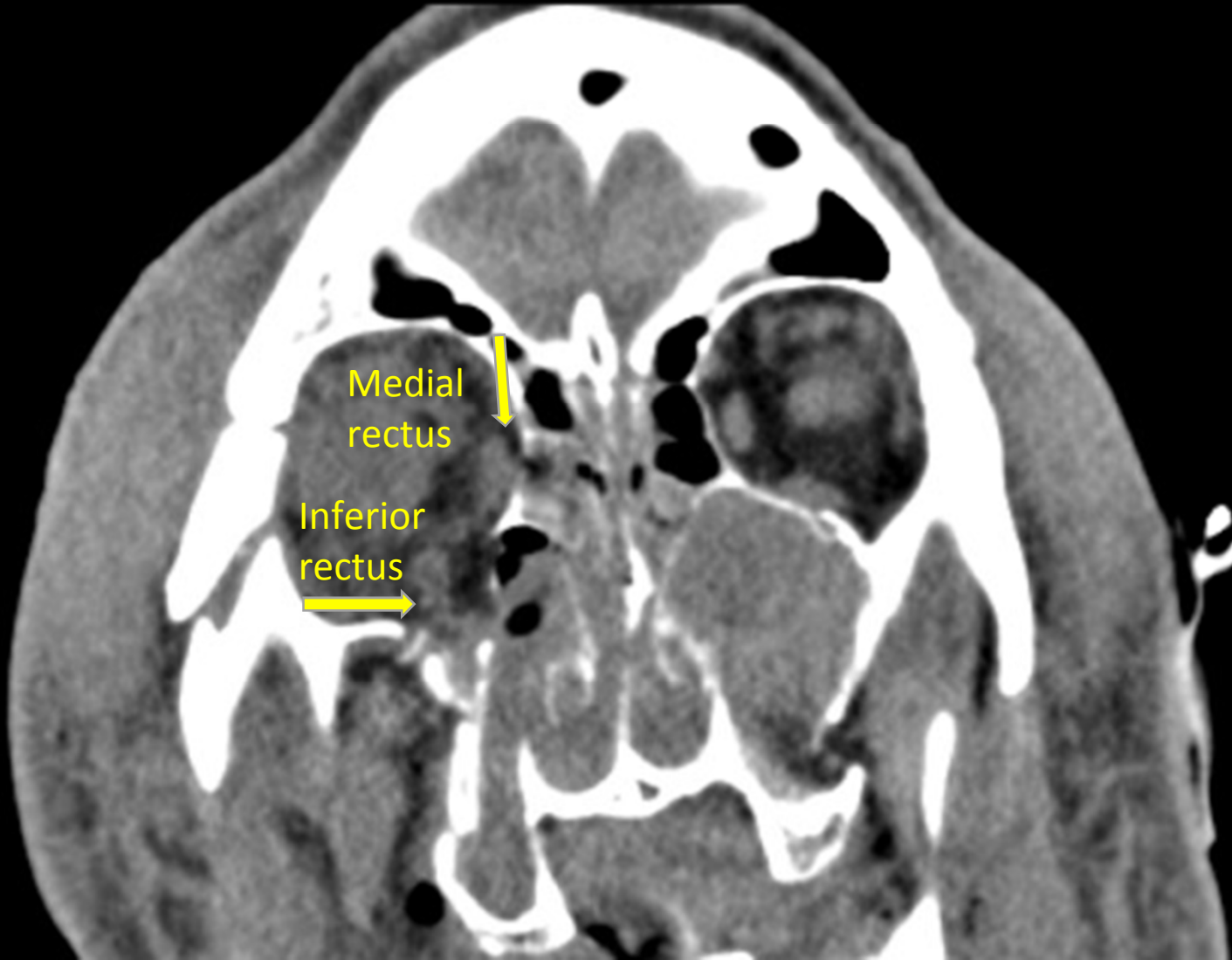
Ethmoid sinus wall fractures, sinuses filled with blood



Cribriform plate
intact!



Orbits



<https://radiopaedia.org/cases/extra-ocular-muscles-illustration-2?lang=us>

Differential Diagnosis

- Lots of fractures! Open vs closed, comminuted, displaced
- Cranial nerve injury: inferior alveolar nerve, infraorbital nerve, facial nerve
- Entrapment of rectus muscles, enophthalmos
- Nasolacrimal duct obstruction
- Epistaxis, septal hematoma
- Cervical spine injury
- Neurologic injury: TBI, intracranial hemorrhage

Final Diagnosis

- Bilateral LeFort 1, 2, and 3.
- Bilateral pterygoids, zygomatic arches, maxillary sinus walls, orbits sparing orbital roofs, nasal bones, and nasal septum. Fractures of maxillary sinus extending into the sinus cavities.
- Oblique displaced left mandibular body fracture extending into the angle.
- Inferior herniation of right inferior rectus muscle across orbital floor defect. Right medial rectus muscle herniation that abuts fracture fragments of medial orbital wall. **Ophtho evaluated the patient and he had full ocular motion on forced duction test in all directions, with no concern for entrapment of the muscle.**
- Small right retrobulbar/intraconal hematoma.
- Facial soft tissue swelling with foci of gas.
- **Inferior alveolar nerve injury.**



Treatment

- Open Reduction Internal Fixation (ORIF) mandible w/ MMF
- ORIF bilateral LeFort II fractures
- ORIF right ZMC
- ORIF NOE complex

Clinical Condition: Head Trauma

Variant 3: Moderate or severe acute closed head injury (GCS <13). Initial study.

Radiologic Procedure	Rating	Comments	RRL*
CT head without IV contrast	9		☼ ☼ ☼
MRI head without IV contrast	2		0
CTA head and neck with IV contrast	2		☼ ☼ ☼
MRA head and neck without IV contrast	1		0
MRA head and neck without and with IV contrast	1		0
CT head without and with IV contrast	1		☼ ☼ ☼
MRI head without and with IV contrast	1		0
MRI head without IV contrast with DTI	1		0
X-ray skull	1		☼
CT head with IV contrast	1		☼ ☼ ☼
FDG-PET/CT head	1		☼ ☼ ☼ ☼
Arteriography cervicocerebral	1		☼ ☼ ☼
Tc-99m HMPAO SPECT head	1		☼ ☼ ☼ ☼
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

<https://acsearch.acr.org/docs/69481/Narrative/>

Cost

- CT maxillofacial w/o: \$1250
- CT brain w/o: \$1462
- CT cervical spine w/o: \$1912
- CTA neck: \$1975
- MRI brain w/o: \$2400

Avg total to evaluate head/face trauma alone: \$8999

Current averages for self-pay in the Houston area as provided by: <https://www.newchoicehealth.com/directory>

Take Home Points

- Maxillofacial CT without contrast is the ideal imaging modality for suspected facial fractures
- Association between panfacial fractures and life-threatening injuries. Address airway, lungs, hemorrhage, c-spine, and neuro status before maxillofacial injury.
- Fractures occur at prominent places and points of bony weakness
- Important to accurately describe the location, pattern, and qualities of facial fractures because these factors can change management decisions.

References

- Potter JK, Hamawy AH. Facial Skeletal Trauma. In: Janis J. Essentials of Plastic Surgery. Pages 323-348.
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Questions?