Radiographic Evaluation of Facial Trauma

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9/18/19
Diagnostic Radiology 4001
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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

Displaced left mandible body fracture

Displaced left mandible body fracture
CT maxillofacial w/o

Displaced mandible body fracture, involving left third molar tooth
Mandible: 3D recon

- Condyle 30%
- Angle 25%
- Body 25%
- Parasympyseal 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
LeFort fractures

Anterior maxillary sinus wall

Lateral maxillary sinus

Le Fort II
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
Zygomaticomaxillary Complex

- Zygomaticomaxillary
- Zygomaticotemporal
- Zygomaticofrontal
- Zygomaticosphenoid

https://quizlet.com/memorang/skull-lateral-view-netters-anatomy-s4fio8w
Right ZMC

Lateral orbital wall

zygoma

Lateral orbital wall

zygoma
CT maxillofacial w/o

Minimally displaced left zygomatic arch fracture
Naso-orbito-ethmoid complex

Ethmoid sinus wall fractures, sinuses filled with blood

Ethmoid fracture
Ethmoid sinus wall fractures, sinuses filled with blood
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
<table>
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<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
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**Rating Scale:** 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level*
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](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


• Swearington JJ. Tolerances of the human face to crash impact.

• https://radiologykey.com/imaging-maxillofacial-trauma/

• https://radiopaedia.org/articles/le-fort-fracture-classification?lang=us

• https://medicine.uiowa.edu/iowaprotocols/facial-fracture-management-handbook-lefort-fractures
Questions?