Facial Trauma
ASHNR
Edward P. Quigley, III, MD PhD
University of Utah

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Overview

- Anatomy and physiology
- Orbits and Globes
- Maxillofacial fractures
- Mandible fracture dislocation
- Oral cavity and dental
- Complications
- Skull base, Temporal Bone, Craniocervical

Anatomy and Physiology

- Osseous and cartilaginous anatomy
  - Orbits
  - Sinuses and nasal cavity
  - Maxilla, Mandible
  - Zygoma, Sphenoid and Skull base
  - Hyoid, Thyroid, Cricoid
- Mechanical models
  - Buttress, struts, and arches
  - Conical orbits and Tetrahedral prisms
- Force
  - Weak breaks first
  - Sequential failures
- Patterns
  - Limited Strut
  - Transfacial LeFort
  - Smash

Hopper, Salemy, and Sze 2006

Vascular injuries

- Hematoma
- Dissection
- Pseudoaneurysm
- AV fistulae
- Cavernous carotid fistula

Winegar et al. 2013

Courtesy S. McNally
Outline

- Anatomy and physiology
- Vascular injuries
  - Orbits and Globes
- Maxillofacial fractures
- Mandible fracture dislocation
- Oral cavity and dental
- Skull base, Temporal Bone, Cranio cervical
- Supraglottic neck, larynx, infraglottic neck

Orbits and Globes

- Penetrating globe injury
- Retinal detachment/ Lens Dislocation
- Post septal and orbital apex hematoma
- Orbit floor fracture
- Lateral orbital wall
- Lamina papyrecea
- Orbital roof, frontal sinus fracture

Orbits and Globes

- Anterior chamber
  - Small anterior compartment
  - Large anterior compartment posterior globe
- Lens
  - Dislocation
  - Subluxation
- Vitreous
  - Hemorrhage
- Retina
  - detachment
- Optic Nerve
  - Avulsion

Terson syndrome
• Post septal hematoma
  – “Compartment” syndrome
  – Optic nerve injury
  – Orbital apex hematoma

• Orbital Floor
  – Muscular/Fat entrapment
  – Infraorbital foramen
  – Enophthalmos

• Medial wall
  – Lamina papyrecea
    – May be component of medial compartment fx
  – Can involve nasolacrimal canal
  – Musculotendinous entrapment

• Orbital Roof
  – Apex hematoma
  – Fracture into frontal sinus or anterior fossa
  – High energy
  – Delayed complication, meningitis

• Orbital Roof
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Orbits and Globes

- Lateral wall of orbit
  - High energy
  - May be component of sphenotemporal buttress complex

Facial smash plus orbit

How does minimal orbital floor fracture result in vergence limitation?

- Fat adhesive syndrome
- Extraconal fat fascicle adhesion
- Tenon’s capsule becomes scarred and trapped

Maxillofacial Fractures

- Transfacial
  - LeFort (I, II, III), LeFort + ZMC
- Complex strut
  - Central midface
  - Nasoethmoidal
  - Nasomaxillary buttress
  - Maxillofacial buttress
  - ZMC
  - Sphenotemporal buttress
- Simple strut
  - Nasal arch
  - Isolated maxillary wall
  - Isolated orbital rim
  - Nasal septal
- Mandibular fracture and TMJ dislocation

Transfacial:

- Common features of LeFort Fx of pterygoid plates or root of pterygoids

Fat adhesive syndrome:

Wright and Speigel Pediatric Ophthalmology
Transfacial: Le Fort I
- Guerin
- Floating palate
- Maxilla, medial and lateral, nasal septum
- Direct force on maxilla

Transfacial: Le Fort II
- Pyramidal fracture
- Inferomedial orbit, frontonasal
- Most common
- Midface separation

Transfacial: Le Fort III
- Craniofacial disassociation
- Floating face
- Frontonasal, medial lateral orbit, malar zygoma, pterygoids

Complex: LeFort III + ZMC
Complex strut fractures

- Central midface
  - Nasofrontoethmoidal
  - Nasomaxillary buttress
  - Maxilloalveolar buttress
- Lateral midface
  - ZMC
  - Sphenotemporal buttress

Nasoorbitoethmoidal fractures

- Medial Maxillary Buttress Fracture
- Nasal bones, ethmoid sinuses, medial orbital walls
- Complications:
  - Exoophthalmos from mass effect
  - Telecanthus from splaying the medial canthal tendon
  - CSF leak from cribriform plate

NOE Markowitz and Manson

Complex strut fractures

- Central midface
  - Nasofrontoethmoidal
  - Nasomaxillary buttress
  - Maxilloalveolar buttress
- Lateral midface
  - ZMC
  - Sphenotemporal buttress

Maxilloalveolar buttress

- Alveolar process is the most common maxillary fracture
- Teeth are the stress riser or fulcrum
- Complications:
  - Considered an open fracture
  - Fractured dentition
Complex strut: Lateral Midface
Zygomaticomaxillary complex fracture

- Arch/ring rules
- Depressed fragment with fx at zygomaticomaxillary suture and zygomaticotemporal
- Tripod = maxillary sinus and lateral orbital wall

Complex strut fractures

- Central midface
  - Nasofrontoethmoidal
  - Nasomaxillary buttress
  - Maxilloalveolar buttress
- Lateral midface
  - ZMC
  - Sphenotemporal buttress

Isolated simple strut fractures

- Nasal arch
- Isolated frontal bone
  - Complication: Obstruction and mucocele
- Isolated maxillary wall
  - Complication: dacrocystitis
- Isolated orbital rim
- Nasal septal
  - Complications: Hematoma, perforation

Mandible Trauma

- Arch and ring mechanics
- TMJ dislocation
- Body > angle > condyle > symphysis > ramus > coronoid process
- Inferior alveolar nerve

Oral cavity and dental

- Tongue laceration
- Dental fractures
- Foreign objects
- Usually clinically obvious
- On obtunded patients always evaluate for dental foreign objects, bridges, partials in the hypopharynx or supraglottis (iatrogenic)
Skull base, Temporal Bone, and Craniocervical injuries

- Often visible on Maxillofacial CT or C-spine CT.
- Corners of the film

Temporal Bone Trauma

- Fractures
  - Longitudinal
    - Along long axis of petrous portion
    - ~80% of TB fractures
    - More likely to involve ossicles
    - CHL
    - ~20% facial nerve injury
  - Transverse
    - Perpendicular to long axis of petrous portion
    - More likely to involve bony labyrinth – SNHL
    - ~50% facial nerve injury
  - Mixed

Post traumatic complications

- Infection
- Meningitis Cerebritis
- Ocular muscular entrapment, Enophthalmos, Diplopia
- Maxillary mandibular malocclusion
- TMJ disfunction
- Vascular injury, dissection, AV fistula, pseudoaneurysm, occlusion

Post Traumatic complications

Concluding questions:

- Do the mechanics of injury predict the facial trauma?
- Which buttresses are involved?
- What are the possible complications?
- Have you considered more than the osseous injury?

Summary

- Common mechanisms of force predict injury patterns
- Face is “crumple zone”
- Orbit and Maxillofacial patterns of injury
- Mandible and zygoma obey arch mechanics
- Do not ignore soft tissues, cartilage, vascular, airway injury
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Rene LeFort 1869-1951