Orbital Trauma

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Orbital Trauma

- Causes: high acceleration, MVA, violent crimes, industrial accidents
- Orbital fractures
- Soft tissue injuries
Imaging Modalities for Orbital Trauma

- Plain radiograph
- CT
  - Conventional
  - Helical
    - IV contrast
    - no IV contrast
- MRI
- US
Primary Imaging Modality: Helical CT

• Rapid and high resolution
• Reformatted coronal and 3-D images
• Accurate for diagnosing fractures and soft tissue injuries
• Helpful for planning corrective surgeries
• CTA assesses traumatic vascular anomalies
• Radiation exposure: 0.02 – 0.03 Gy, similar to orbital plain films
Other Imaging Modalities

- Plain radiograph: difficult to interpret due to superimposition of bony structures.
- MRI: can evaluate vascular injuries and the optic nerve.
  contraindication: metal foreign body.
- US: limited use, can assess intraocular foreign body and other structures (retina).
Bones of the Orbit (Left)

- **orbital roof**
  - frontal b.
  - lesser wing of sphenoid b.

- **medial wall**
  - maxilla
  - lacrimal b.
  - ethmoid b. (lamina papyracea)

- **orbital floor**
  - body of sphenoid b. (posterior to ethmoid b.)

- **lateral wall**
  - frontal b.
  - zygomatic b.
  - greater wing of sphenoid b.

Bones of the Orbit on Coronal CT

Bones of the Orbit on Axial CT

zygomatic bone
lacrimal b.
ethmoid b.
body of sphenoid b.
sphenoid sinus

Frontal Sinus on Axial CT

Anatomy of Extraocular Muscles (Left Eye)

- levator palp sup
- sup oblique
- med rectus
- annulus of Zinn
- sup rectus
- lat rectus
- inf oblique
- inf rectus

Extraocular Muscles on CT Coronal View (Left Eye)

- levator palp sup
- sup oblique
- med rectus
- sup rectus
- sup ophth vein
- lat rectus
- optic nerve
- inf rectus

Soft Tissues of the Orbit: CT Axial View

Patient 1: Orbital Floor Fracture

Hx: 74 yo F, fell on left face, hitting left eye

- air pockets in the orbit
- soft tissue swelling and air
- fx of orbital floor
- blood in left max sinus

courtesy of Dr. N. Nelson, BIDMC
Blow-Out Fractures

- Patient 1 suffered a blow-out fracture.
- Definition: blunt trauma to the orbit displacing the fragmented bones outward. The globe can be pushed inward.
- Fracture often involves the medial wall or the orbital floor or both. Muscle entrapment may occur.
- The following slide illustrates a blow-out fracture.
Blow-Out Fractures

Pt 2: Blow-Out Fx with Muscle Herniation

Hx: 79 yo M, fell on right face at home

fx of medial wall

courtesy of Dr. N. Nelson, BIDMC
Pt 2: Blow-Out Fx with Muscle Herniation

- blood in max sinus
- orbital fat in max sinus

courtesy of Dr. N. Nelson, BIDMC
Pt 2: Blow-Out Fx with Muscle Herniation

- Blood in ethmoid sinus
- Lat displaced globe
- Orbital floor fracture

*courtesy of Dr. N. Nelson, BIDMC*
Pt 2: Blow-Out Fx with Muscle Herniation

- herniated inf rectus
- orbital fat in max sinus
- blood in max sinus

*courtesy of Dr. N. Nelson, BIDMC*
Diagnosing Muscle Entrapment Associated with Blow-Out Fx

- Ophthalmoplegia and diplopia in upward and downward gaze
- Secondary over-reaction of the unaffected eye
- Muscle entrapment is a clinical diagnosis. On radiology, only muscle herniation can be seen.

Surgical Treatment for Blow-Out Fx

1. subciliary incision
2. free entrapped tissues
3. repair bony defect with alloplastic implant

Interim Summary of Orbital Fractures

- Orbital floor and medial wall fx’s
- Orbital roof fx
- Lateral wall fx
- Tripod fx (displaced zygoma)
- Naso-ethmoidal orbital fx
- Le Fort III fx
- Le Fort II fx

Soft Tissue Injuries

- Ruptured globe
- Foreign body

Patient 3: Pan-Facial Trauma

Hx: 22 yo M, working with a cement truck, when the boom of the truck swung around and hit him on the right side of the face.
Patient 3: Axial CT

medial wall fx

orbital fat
ant. to fx’d nasal b.

extruded & lat.
displaced globe
(not ruptured)

lateral wall fx,
zygomatic b.

edema, hemorrhage, subcutaneous air

courtesy of Dr. N. Nelson, BIDMC
Patient 3: Coronal CT

- Orbital floor fx
- Fx’d and displaced zygomatic b.
- Fx’d and displaced mandible
- OG tube
- ETT

Courtesy of Dr. N. Nelson, BIDMC
Patient 3: 3D CT
Patient 3: Findings on 3D CT

- Fractures of all 4 orbital walls
- Orbital rim was shattered to > 8 pieces
- Le Fort I fracture of the maxilla
- Fractured and displaced mandible
Patient 3: Hospital Course

- Patient was hospitalized in the trauma ICU.
- He underwent tracheostomy and extensive facio-reconstructive surgeries.
- The next 2 slides are from a CT taken after his first major facial surgery.
Patient 3: 10 Days Later, Coronal CT

- lat. displaced globe
- extensive fx’s of right facial bones
- right maxilla and mandible in near alignment
- soft tissue edema and hematoma

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Patient 3: 10 Days Later, 3D CT

reconstructed
inf orbital rim
Patient 3: Hospital Course cont’d

• Patient was discharged on hospital day 14.
• Many of the facial fractures have been repaired, although he will have additional surgeries as an outpatient.
• His trach was removed.
• His vision in right eye was 20/400 five days after the injury. He was able to read.
Orbital Trauma: in Summary

• Helical CT is the primary imaging test
• Reconstructed coronal and 3D images help with diagnosis and surgery planning
• Medial wall is the most commonly fx site
• Blindness occurs in 3% of facial fx’s
• Don’t forget ABC: mandibular fx can obstruct the airway
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