CT of Maxillofacial Fracture Patterns

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Technology changes the diagnosis

Viking 1
1976

MGS 2001
Orbital sutures and thin orbital bony plates allow suture diastasis and fractures of thin bone to absorb impacting energy. This mechanism plus orbital fat and muscles cushions the globe and preserves vision in high-energy impacts to the orbit.
Orbital blow-in fracture

Orbital Blow-out Fractures:
Significant Imaging Features

- Evidence of muscle or fat entrapment - rare
- Pure or impure fracture (? intact inferior orbit rim)
- Orbital hematoma (up to 24% orbital injuries)
- Complications: enopthalmous, diplopia, hypoesthesia
- Size (area) of floor defect or associated fractures
- Calculations of blow-out fractures of the orbital floor by 3D-CT and 2D-CT method are accurate for assessing the area of fracture and the volume of herniated tissue

Medial orbital wall fracture

- Isolated or associated 20-40% with floor fracture
- More common to cause orbital emphysema
- Rarely surgically repaired
- Complications: Horizontal gaze palsy, enophthalmous, epistaxis

Medial Orbital Blow-out Fractures
Medial blow-out with herniation

Orbital Blow-in fracture
Orbital Blow-in fracture:
MRI with brain herniation

Orbital Blow-up fracture

- Rare
- Orbital roof fragments explode into frontal lobe
- Typical – dural tears and CSF leak
- Frontal sinus involvement common
Orbital "blow-up" fracture

Orbital Blow-up fracture
Naso-orbital-ethmoid Complex

- Nasal bridge, lower frontal sinus, medial orbits
- Comminution, depression, and lateral spread of bones
- Soft tissue injury; medial canthal ligament, lacrimal drainage, nasofrontal sinus
- Usually associated

Naso-orbital Ethmoid Fractures

- N= 21
- Clinical findings:
  - Widened intercanthal distance (71%)
  - Increased nasofrontal angle (28%)
  - Epistaxis (100%)
  - Visual disorder (62%)
  - Cerebrospinal rhinorrhea (33%)
  - Enophthalmos (23%)
  - Facial paralysis (14%)
Naso-orbital-ethmoid Complex
NOE and repair

Nasomaxillary Fracture

Kicked by horse
Sagittal mid-face pattern

Zygomatic-maxillary Complex (ZMC)

- Impact on malar eminence
- 4-point fracture
- Displaces posterior and medially
- Simple type vs. hi-grade variant
Zygomatic-maxillary Complex (ZMC)

- Always involves orbital floor
- May involve medial orbit wall
- Lateral canthal ligament and inferior orbital nerve
- Coronoid process impact

Zygomatic-maxillary Complex (ZMC) – hi-grade
Zygomatic-maxillary Complex (ZMC) Hi-grade

Complex ZMC
**Orbital Apex Syndrome**

- Optic neuropathy and ophthalmoplegia
- Loss of cranial nerves II, III, IV, ophthalmic division of V, and VI
- Blindness, fixed dilated pupils, proptosis, ptosis
- Causes: inflammatory, infectious neoplastic, iatrogenic/traumatic, and vascular conditions

**LeFort Fracture Patterns**

- Described as symmetric mid-face lines of weakness - experimental
- Often asymmetric clinically and combined with ZMC, NOE
- **Always** involves pterygoid plate fractures
- Higher energy usually leads to higher grade
LeFort Fracture Patterns

LeFort Fracture 1

- Fracture all 6 walls of maxillary sinuses
- Floating palate
- Typically: nasal septum & maxillary nasal spine
- Airway compromise - rare
LeFort Fracture I +

Mobile nose and maxilla

Fx. Lateral maxillary sinus, medial orbital floor, nasal bridge, pterygoids (pyramidal)

Soft tissues: medial orbit, infraorbital nerve

LeFort II Fracture Patterns
Lefort II/III: highly comminuted
Combined LeFort Fracture Pattern - Smash
Mandibular Fractures

<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>30 - 40 %</td>
</tr>
<tr>
<td>Angle</td>
<td>25 - 31 %</td>
</tr>
<tr>
<td>Condyle</td>
<td>15 - 17 %</td>
</tr>
<tr>
<td>Symphysis</td>
<td>7 - 15 %</td>
</tr>
<tr>
<td>Ramus</td>
<td>3 - 9 %</td>
</tr>
<tr>
<td>Alveolar</td>
<td>2 - 4 %</td>
</tr>
<tr>
<td>Coronoid process</td>
<td>1 - 2 %</td>
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Mandibular Angle Fracture
ORIF angle/body fx – oops!

Minimally displaced bilateral fractures
Mandibular Fracture – Dislocation

Mandibular Fracture - Dislocation
Mandible fracture-dislocation (sagittal split)

LeFort I/II/III: Comminuted mandible fractures
Attempted suicide: Bit blasting cap

GSW: Facial explosion