Facial Trauma: Implications For Diagnosis and Treatment.

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Learning objectives

- To review facial anatomy and describe multi-detector-CT (MDCT) protocols that are appropriate for facial trauma. To describe the main types of trauma, highlighting relevant findings for surgeons.
Background

- Facial trauma is a common occurrence in Emergency Rooms. About 54% of patients that suffered facial trauma present a major lesion. Structure complexity requires the radiologist to have a wide knowledge of anatomy and trauma mechanisms to correctly interpret the CT images. MDCT is an essential tool not only because it allows multiplanar reconstruction, but also for its rapid execution.
- We evaluated 500 facial trauma exams performed between April 2009 and March 2010 in our institution, a major trauma center in Rio de Janeiro, Brazil. Study protocols, techniques and image findings were described and illustrated.
Imaging findings OR Procedure details

• We underscore the anatomy of the facial buttresses, anatomic variants, the patterns of facial fractures, and which ones are important to point out to the surgeon. We illustrated naso-orbitoethmoid fractures, fractures of the zygomaticomaxillary complex, including Le Fort fracture types I, II and III, and orbital and mandibular ones.

Protocol

• MDCT allows the acquisition of very thin slices, resulting in high resolution not only in the axial plane but also in the patient's longitudinal axis.
• Images can be acquired with 2 mm collimation and 0.5 mm increment, with multiplanar and three-dimensional reconstruction.
• Fracture detection is significantly higher with thin multiplanar reformations.

Anatomy of the Facial Buttresses

• The face should be evaluated as a functional unit and not just as a set of isolated structures.
• Facial buttresses represent areas of increased bone thickness that support the functional units (muscles, eyes, teeth and airways). They have sufficient bone thickness to accommodate metal screw fixation. This concept is important to classify the types of fractures and to determining osteotomy plans.
• The most common buttress fracture patterns are: the naso-orbitoethmoid complex fractures, the zygomaticomaxillary complex fractures and orbital fractures.
• Buttress reduction is important to establish functional support for the teeth and globes.
• The buttresses are divided into vertical and horizontal, as follows Fig 1):
  • a) Vertical: Lateral maxillary (+ lateral orbital wall), medial maxillary (+ medial orbital wall), posterior maxillary (pterigomaxillar) and posterior vertical.
  • b) Horizontal: Upper transverse maxillary (+ orbital floor), lower transverse maxillary (+ palate), upper transverse mandibular and lower transverse mandibular.

Naso-orbitoethmoid (NOE) fractures

• By definition, these fractures are distinguished from simple nasal fractures (Fig 2) by posterior disruption of the medial canthal region, the ethmoids (Fig 3), and the medial orbital walls.
• NOE fractures are one of the most difficult fracture patterns to repair, because they involve the central upper midface, disrupting the confluence of the medial maxillary buttress with the upper transverse maxillary.
• The surgeon needs to know the degree of comminution of the medial vertical maxillary buttress, specifically in the region of the lacrimal fossa, where the medial canthus attach.
• When the nasofrontal ducts are disrupted (Fig 4), the frontal sinus (Fig 5) surgery is needed to prevent a mucocele in the future.

Zygomaticomaxillary Complex Fractures

• Each pair of zygomas have two attachments to the cranium and two to the maxilla.
• The Zygomaticomaxillary Complex is surgically important in establishing orbital volume and serving as a reference for reduction of maxillary fractures, because it creates a large portion of the orbital floors and lateral orbital walls.
• The zygomatic arch is important to establishes both facial width and profile.
• Tripod fracture: zygomaticofrontal suture, zygomaticotemporal suture, and infraorbital foramen (Fig 7). Present with flatness of the cheek, anesthesia in the distribution of the infraorbital nerve, diplopia, or palpable step defect.
• The lateral impact forces, generally force the zygomatic arch, which can cause a simple fracture near the midpoint or a double fracture with central fragment (Fig 6).
• Le Fort (Fig 9) fractures are classified as follows: The Le Fort I is a horizontal segmented fracture of the alveolar process of the maxilla, in which the teeth are usually contained in the detached portion of the bone. The Le Fort I pattern involves fractures through the inferior portions of the medial and lateral maxillary buttresses. The Le Fort II pattern involves fractures through the zygomaticomaxillary and frontomaxillary sutures (Fig 8). The Le Fort III involves complete craniofacial dissociation.

Orbital Fractures

• Orbital fractures can occur in isolation or with other fracture patterns, most commonly occurring in the orbital floor or less frequently in the medial wall (Fig 13).
• Fractures in the orbital apex or roof are less common. The lateral wall of the orbit is very tough as it protects the globe and is only involved in very severe maxillofacial trauma (Fig 12).
• Blowout fractures (Fig 10 and 11) are caused by direct trauma to the globe which causes an increase in intraorbital pressure and decompression via fracture of the orbital floor. In this case, is important to pay attention to the shape and position of the inferior rectus muscle on coronal CT scans,
because it can provide information regarding the damage to the fascial sling of the globe.

**Mandibular Fractures**

- Mandible fractures (Fig 14,15 and 16) are a frequent injury because of the mandible's prominence and relative lack of support. As with any facial fracture, consideration must be given for the need of emergency treatment to secure the airway or to obtain hemostasis if necessary before initiating definitive treatment of the fracture.
- The most frequent cause of mandibular fractures is related to car crashes. In automobile accidents, the condylar region was the most common fractured site.
- The fractures occur in the body (29%), condyle (26%), and angle (25%) of the mandible. The symphyses account for 17% of mandibular fractures, whereas fractures of the ramus (4%) and coronoid process (1%) have lower occurrence rates.
- 43% of the patients had an associated injury. Of these patients, head injuries occurred in 39% of patients, head and neck lacerations in 30%, midface fractures in 28%, ocular injuries in 16%, nasal fractures in 12%, and cervical spine fractures in 11%.
Images for this section:

Fig. 0: Anatomy of the Facial Buttresses

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Fig. 0

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Fig. 3: Axial nonenhanced CT image shows comminution of the left ethmoid region.
Fig. 4: Coronal nonenhanced CT image of a patient with NOE fractures shows comminuted fracture of the left ethmoid region and disruption of the left nasofrontal ducts.
Fig. 0

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Fig. 6: 3D volumetric reformatted CT image shows comminuted fractures of the right zygomatic arch.
Fig 7: 3D volumetric reformatted CT image shows fracture of lateral wall and floor of left maxillary sinus and fracture of the right zygomatic arch.

Fig. 0

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Fig 8: 3D volumetric reformat ted CT shows a Le Fort II fracture. Note the fractures through the zygomaticomaxillary and frontomaxillary sutures.

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Axial CT Scans shows a mandibular body fracture and left parasympyphysis fracture.

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3D volumetric reformatted CT shows a left mandibular body and parasymphysis fracture, with associate dentoalveolar fracture.

Note Le Fort 2 fracture.

Fig. 0

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Conclusion

- MDCT is the best imaging method to evaluate facial trauma as it allows to safely localize and characterize lesions helping surgeons in the preoperative evaluation so as to prevent future sequelae such as cosmetic deformity and functional debilities.
Personal Information

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References


