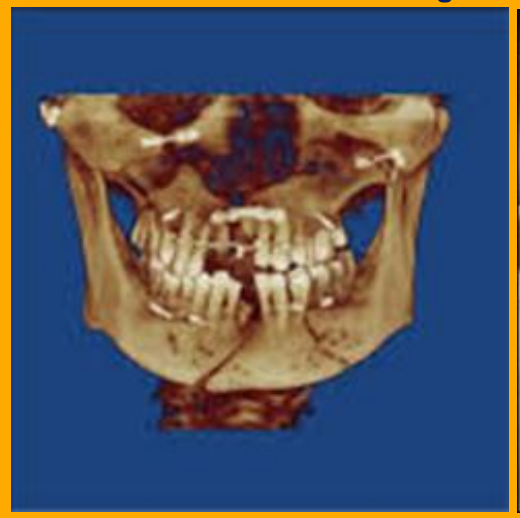
In The Name of God

Evaluating of maxillofacial trauma in sport



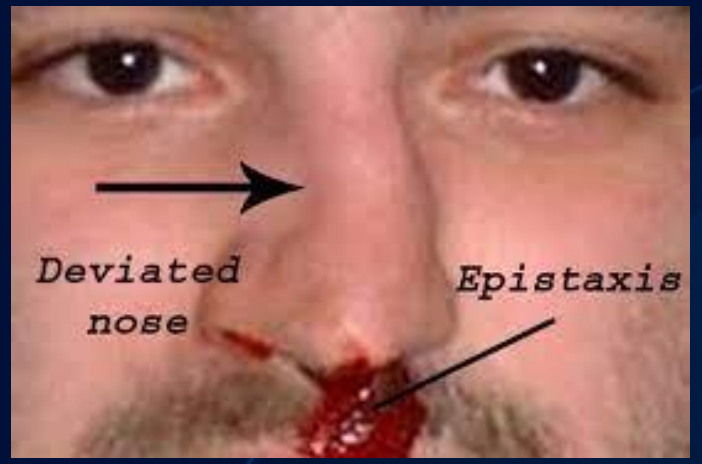
Presented by :Dr N. Abbaszadeh

Epidemiology maxillofacial injuries

- Because the face has a vast arterial system, lacerations bleed freely and rapid swelling often occurs
- 50% of oral &maxillofacial injuries are related to the facial
- Nasal fracture was the most frequent trauma (45.5%),

  followed by mandibular (29%) and

  zygomatic (24.9) fracture



Ethology

- Motor vehicle accident was the major cause of trauma (up to 70%) followed by
- assault
- Sport
- fall
- Domestic violence (women)

maxillofacial injuries in sport

- Facial Injuries to the cheek, nose, lips and jaw are very common in sports - especially those with moving objects, and or contact sports
- 18% of all athletic injuries are included
- Most frequently associated sport:
    - Before 1964, Football
    - Now Baseball

Types of facial injuries

-**Soft tissue** When the impact intensity is low

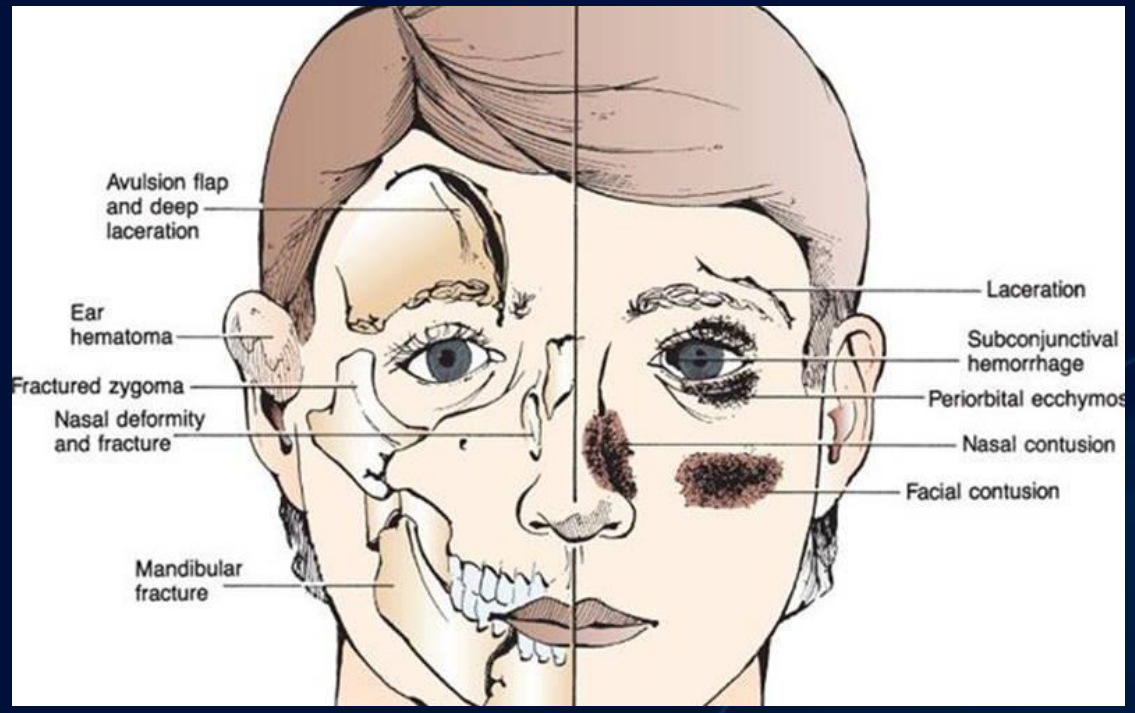
Closed Hematoma Contusion

Open Laceration Abrasion Punctures

-**Hard tissue** When the impact intensity is high

Fractures

dislocation



Superficial facial injuries provide important visual clues to underlying soft tissue and bony injuries.

Soft tissue injuries

Hematoma

- Causes mass of blood to collect in the injured area (Blood lump)
- Larger blood vessel damaged
- Fist-sized hematoma = 10% volume loss

Hematoma formation 2 hours after a blow to the forehead in a football game

Soft tissue injuries

Contusion Or bruise

- Produced when blunt force damages dermal structures and the small veins and capillaries under the skin break
- Blood, fluid leak into damage area causing swelling, pain
- Presence of blood causes skin discoloration called ecchymosis (bruise)

A bruise, also known as a contusion

Black eyes are the result of blunt force or trauma around the eye socket, including to the nose

Soft tissue injuries

Abrasion

- Loss of portions of epidermis, upper dermis by **rubbing or scraping force.**
- Usually associated with capillary oozing, leaking of fluid
- Road rash is a type of abrasion caused during an accident

fall from a bicycle is common

Abrasion

Soft tissue injuries

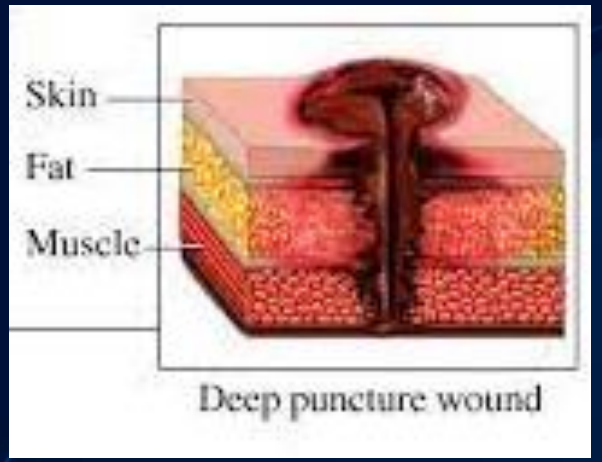
Laceration

- **Cut** by sharp object
- **Typically longer** than it is deep
- May be associated with severe blood loss, damage to underlying tissues
- Types –Linear(regular) or
  –stellate (irregular)

Soft tissue injuries

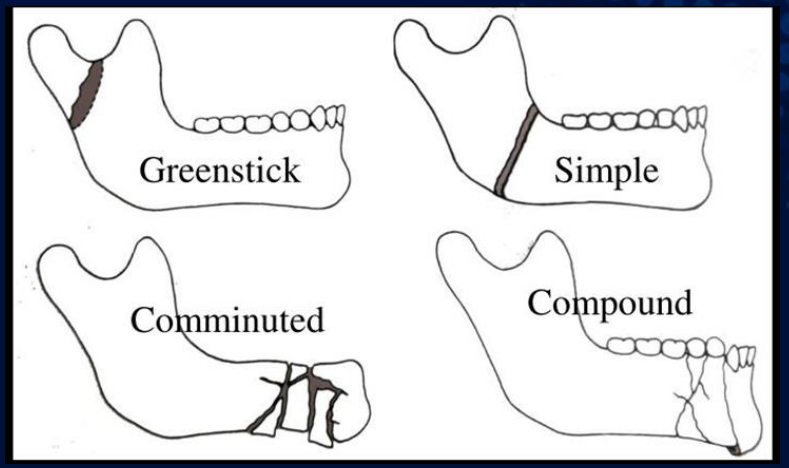
Punctures

- The Result of using pointed weapon such as stabbing force or other
- The Wound is deeper than it is long
- Difficult to assess injury extent
- Object producing puncture may remain impaled in wound
- **Gunshot** is Special type of puncture wound



Hard tissue injuries

Fractures



- Basic classification bone fracture
- **Simple fractures** consist of single fracture planes that do not communicate with the external environment.

  -Greenstick fractures are incomplete fractures that involve only one cortical plate

- **compound fractures** communicate with the exterior ,via PDL ,Mucosa

  - Comminuted fractures involve multiple bone fragments at one fracture site and are often the consequence of a higher-impact force

  - complex fracture or complicated fracture is used to describe fractures with damage to adjacent

In encounter of oral &maxillofacial injuries caused by severe trauma

Emergent Management (ABCs approach) is the first action

Airway

Manually move the tongue forward

At risk of aspiration – missing teeth

Breathing

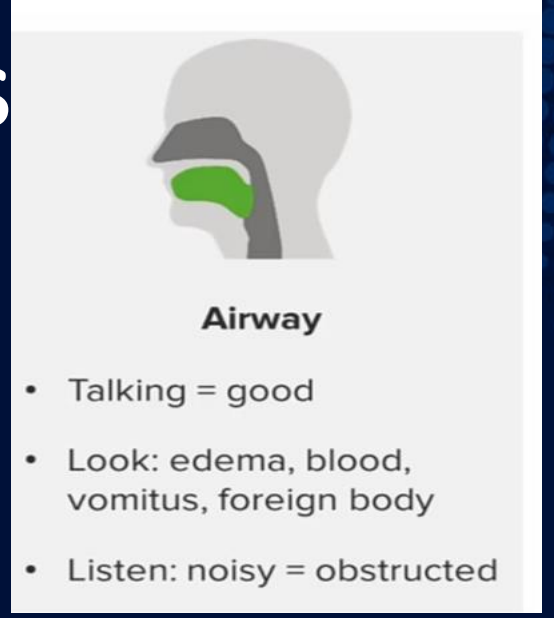
crico-thyroidotomy

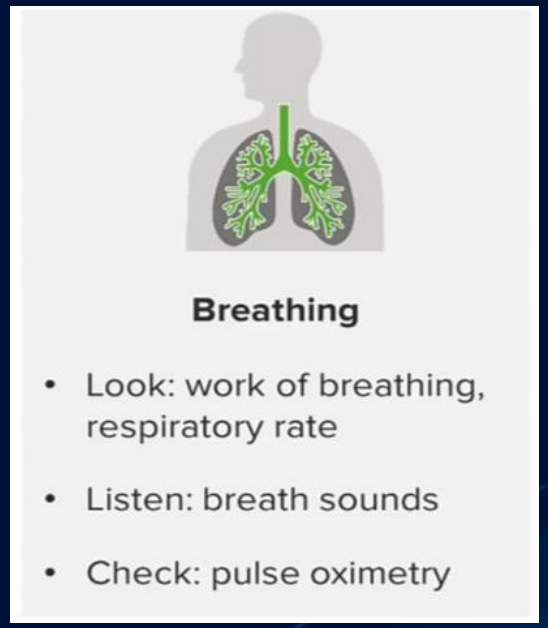
Circulation

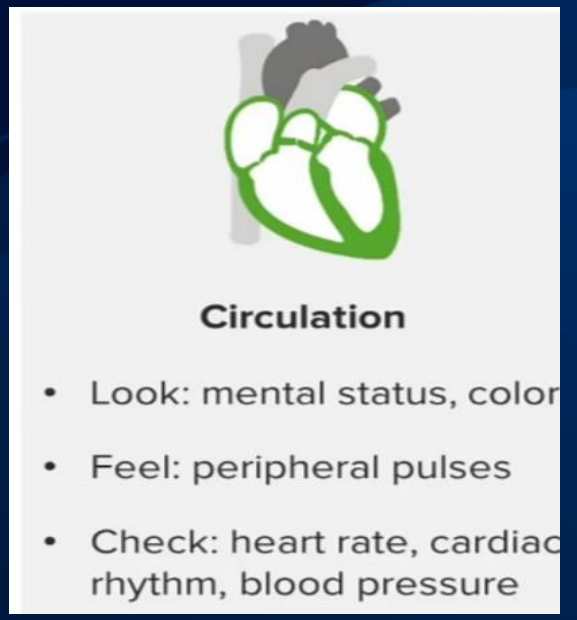
heart rate , blood pressure

bleeding → Anterior and posterior nasal packing

Maintain cervical immobilization

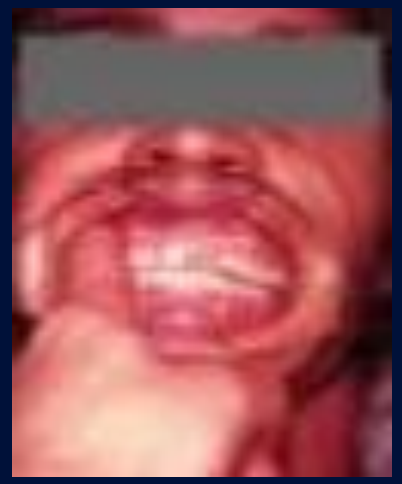






clinical Examination (physical)

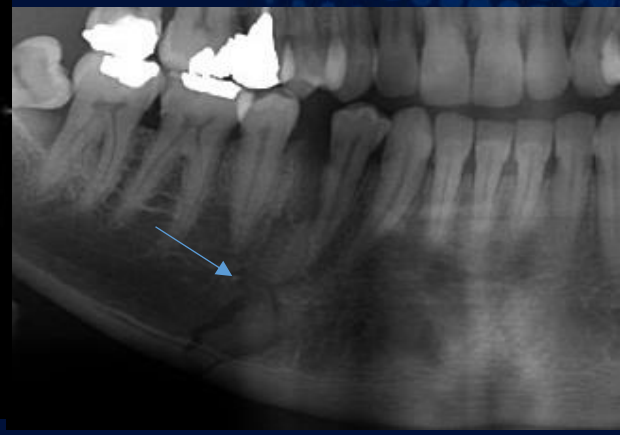
- Any bleeding, swelling/bruising/ecchymosis/ deformity ,etc should be checked
- pain
- Palpate all bony margins for tenderness and steps
- Eye examination
- Intra-oral examination
- Facial stability
- Facial sensation




Clinical examination

- **History of trauma is very importan**
- **When** did it happen? Time plays an important role in the healing process of injuries
- **where** did it happen? Place and type of exercise
- **How** did it happen? Mechanism of injury

Radiologic examination



- Provides essential information about

  1 - the presence, location, and orientation of fracture planes and fragments

  2 - the involvement of adjacent vital anatomic structures;

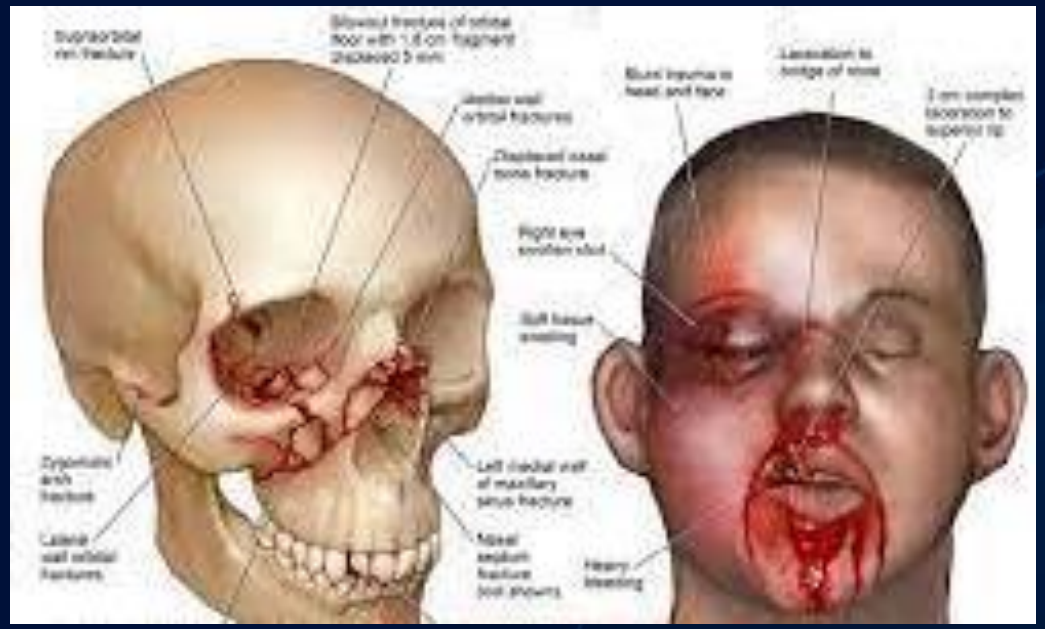
  -the presence of foreign objects that have may have become embedded within the soft tissues.

  3- Post therapeutic images allow for the monitoring of healing and detection of long-term changes resulting from the trauma → important in Athletes

- Any Radiographic Evaluation are based on findings in clinical exam

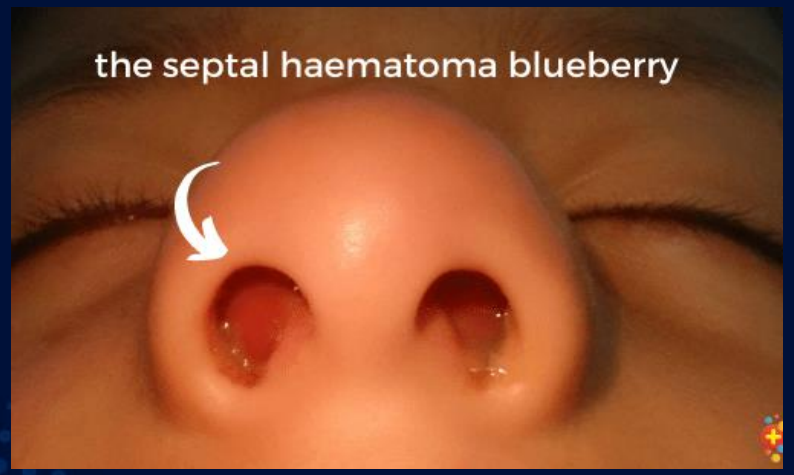
Facial injuries

- A direct blow to the mouth , nose or surrounding areas can result in a facial fracture.
- Severe bleeding in the mouth& nose, loose teeth, or movable bone fragments, deformities indicate a fracture.
- Severe swelling may obstruct the airway
- Radiologic examination is an integral component of the diagnostic evaluation of the patient with trauma to the teeth and jaws.



Nasal Injuries

- Soft tissue should be inspected for any scratches, abrasions or lacerations
- Epistaxis
- hematoma
- Swelling



Nasal injuries

- Nasal fracture

  . most common facial fracture in sport

  . Nosebleeds are almost always seen.

  . it is particularly susceptible to lateral displacement.

  . Nose may appear flattened and lose its symmetry.

  . Deformity is usually present- especially with a lateral blow

. There may be crepitus over the nasal bridge and ecchymosis under the eyes

Nasal injuries

Radiographic examination

- Plain film radiography is choice
- CT ,CBCT in Sevier injuries

Axial And coronal view nasal bone fracture

Eye Injuries

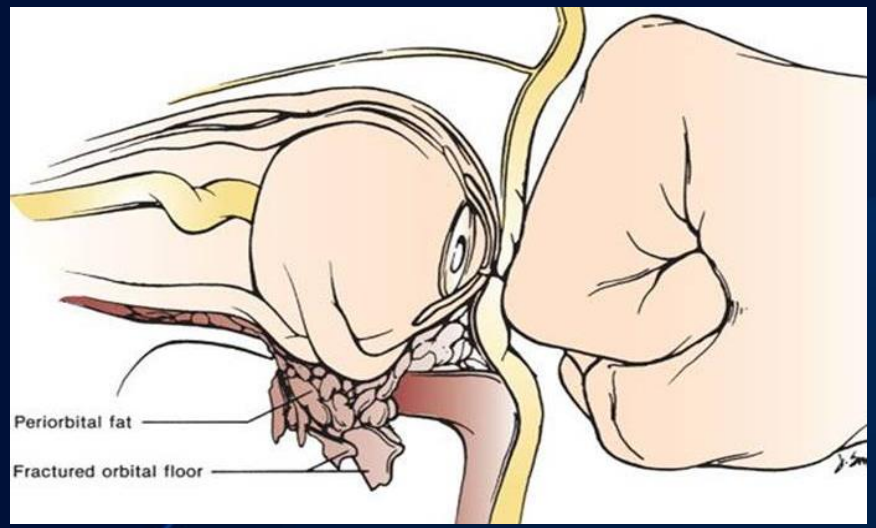
Soft tissue

- Periorbital Ecchymosis &Hematoma (Black Eye)
- swelling and hemorrhage into the surrounding eyelids and area
- Inspect the anterior chamber of the eye for bleeding Check the ability of individual to focus
- Inspect any Foreign bodies- dust or dirt can lead to intense pain and tearing
- - Inspect eye for obvious abnormalities and palpate for possible orbital fractures

Eye Injuries

hard tissue

- The most common fractures involve the orbit is Orbital Wall Blowout Fractures
- It is very thin wall of the orbit
- result from a direct blow to the orbit by an object that is too large to enter the orbital cavity such as a fist or a baseball
- Periorbital edema is a common feature of the orbital blowout fracture,
- enophthalmos.
- Eye movements may be restricted
- Epistaxis If the ethmoid air cells are involved

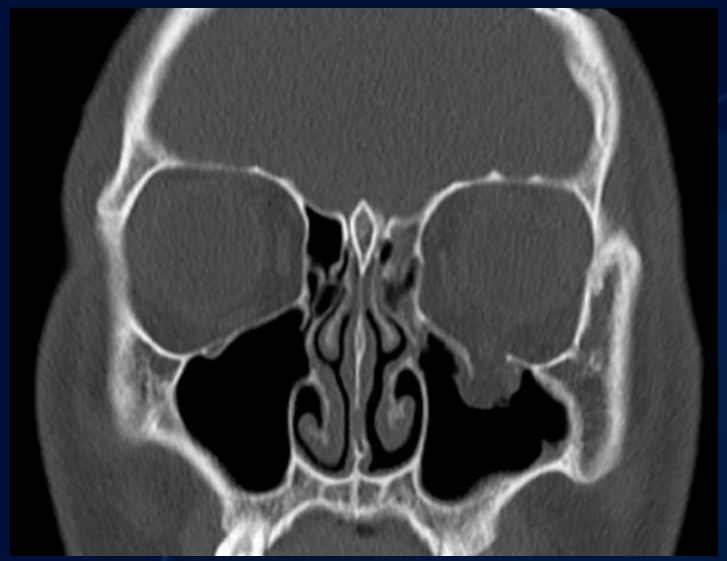


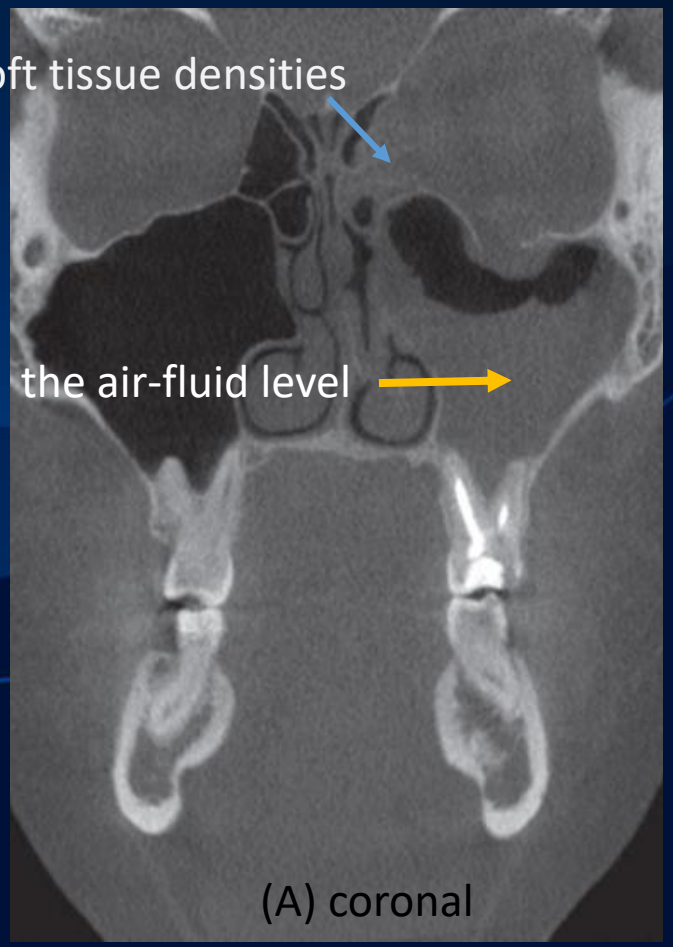
Blow-out fracture

Eye Injuries

Imaging examination

- The imaging modality of choice to evaluate orbital blowout fractures is CBCT or thin-section MDCT with multiplanar reformats in bone and soft tissue kernels.
- Coronal reconstructions best demonstrate discontinuities of the lamina papyracea in a medial wall or the orbital floor.
- MDCT imaging may also show soft tissue densities or air-fluid levels in the adjacent ethmoid air cells or maxillary sinus or herniation of periorbital fat and entrapment of periorbital muscle through the bony defect in the orbital floor





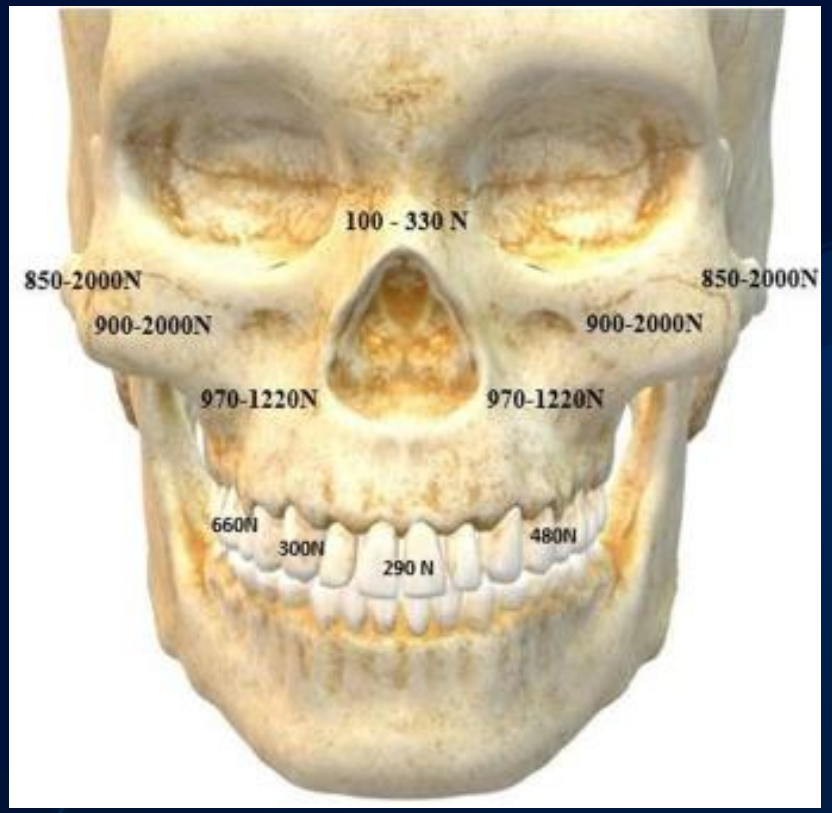
CBCT images show orbital blowout fractures involving the lamina papyracea of the left ethmoid bone and the orbital floor in the coronal (A) and sagittal (B) planes. Note the fluid/soft tissue densities in the adjacent ethmoid air cells and the air-fluid level in the left maxillary sinus.

(C) Computed tomography reconstructions made perpendicular to the track of the optic nerve show the "trapdoor" appearance of the orbital floor blowout fracture with herniation of soft tissue into the maxillarysinus (arrow).

Midfacial injuries

Lefort's classification

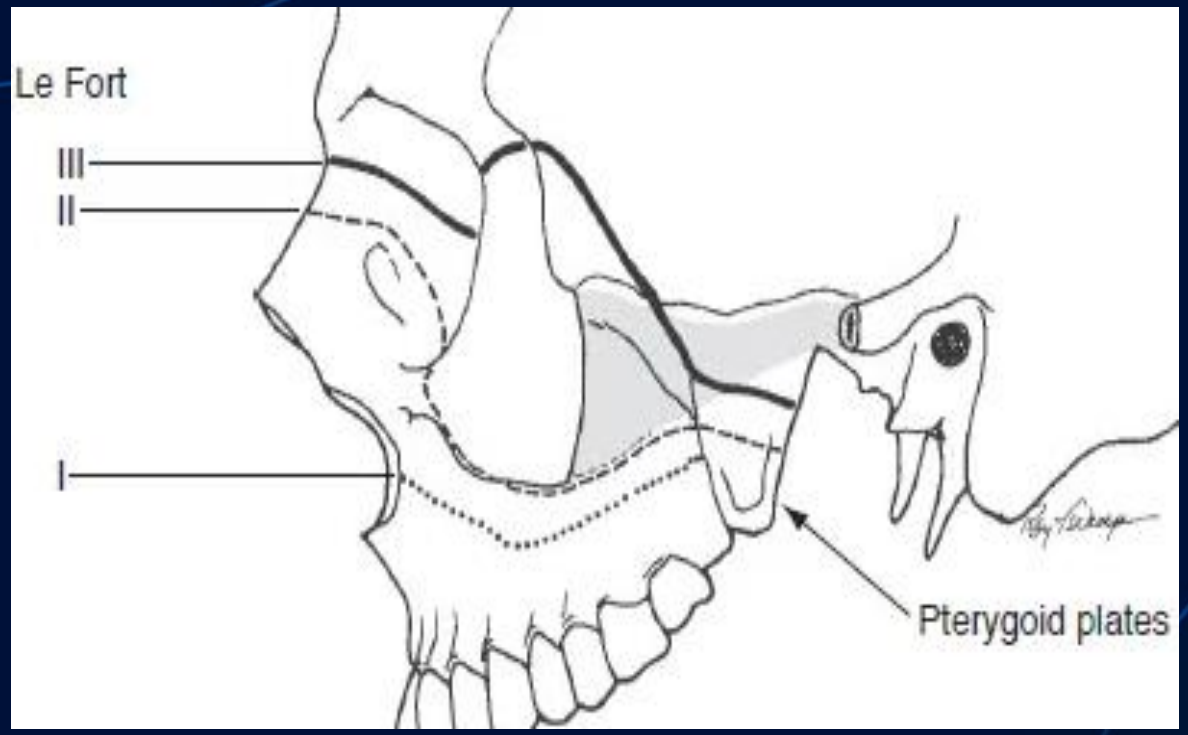
- An impact 100 times the force of gravity is required to break the midface
- Complex fractures involving multiple facial bones may be quite variable
- Midface fracture often follow general patterns classified by the French surgeon René Le Fort.
- Checking for abnormal midface mobility

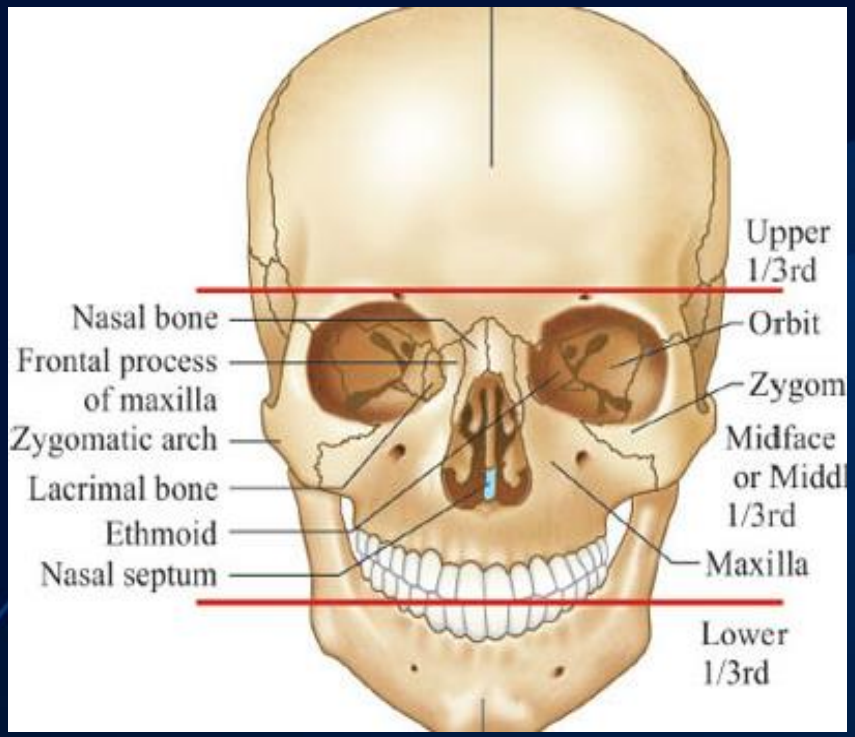


Midface fracture

Le Fort Fractures

- all Le Fort fractures include fractures of one or more of the pterygoid plates of the sphenoid bone.
- Although Le Fort fractures may be bilateral, they are most often unilateral.

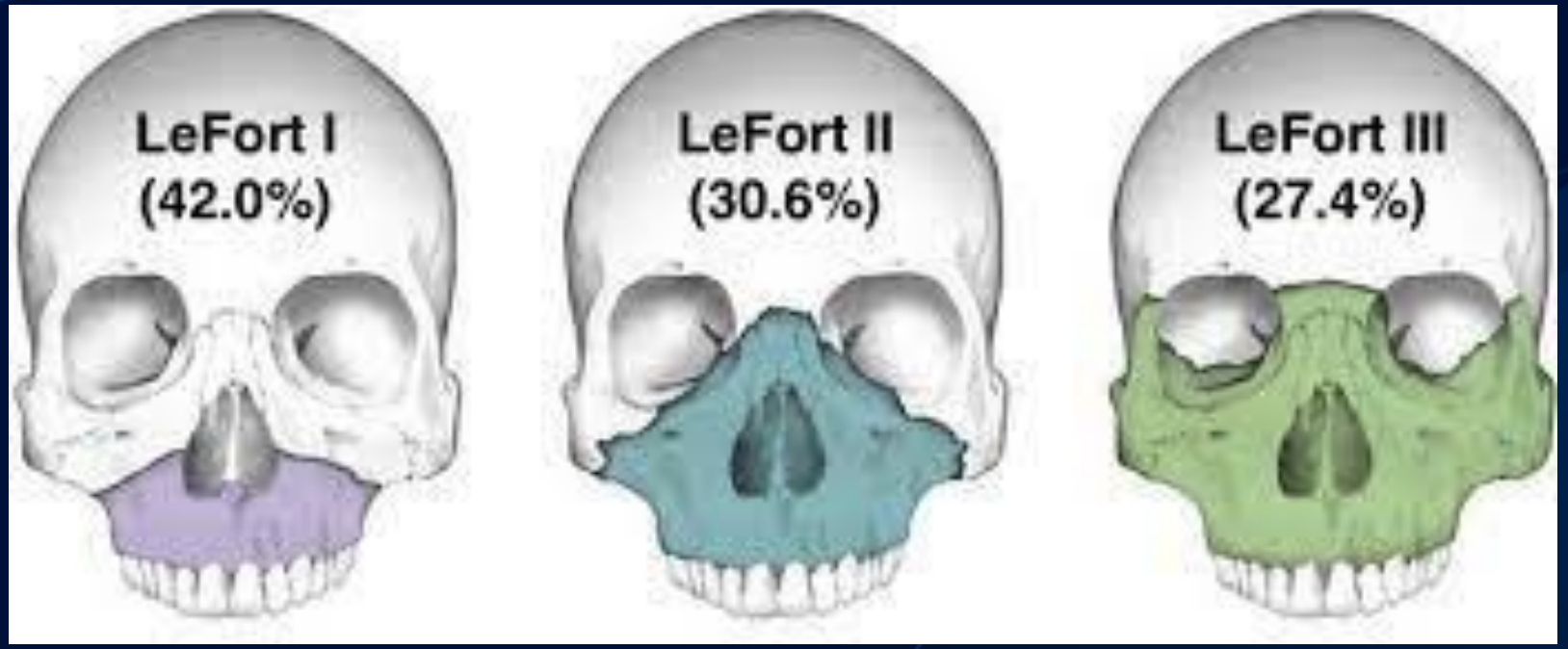




Midface fracture

Based on Lefort's classification

- Basic patterns were found based on the direction of the blow to the face
- Lefort I – separates hard palate from bone
- Lefort II – separates central maxilla and hard palate from rest of face
- Lefort III – craniofacial disassociation – entire facial skeleton is removed



Midface fracture

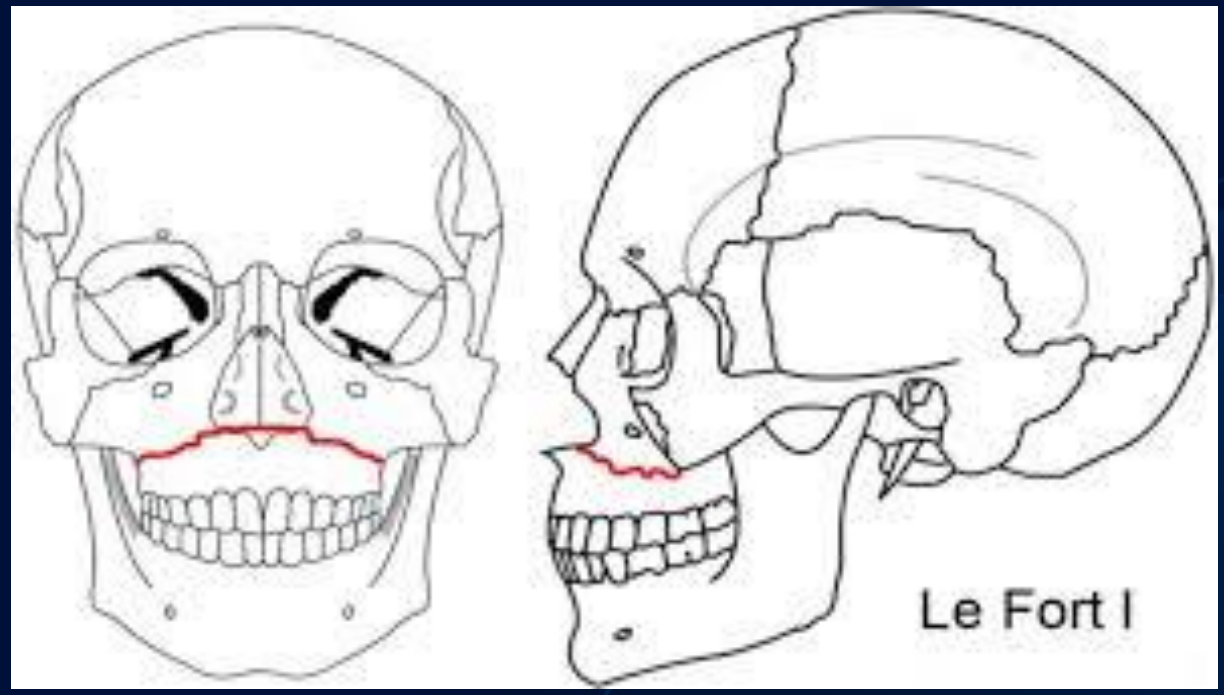
Imaging examination

- MDCT or large FOV CBCT is the diagnostic imaging modality of choice for complex facial fractures because
- provides suitable image detail to detect secondary changes associated with trauma, including herniation of fat and extraocular muscle, soft tissue swelling or emphysema, and blood or fluid accumulation
- Contrast resolution MBCT is better but CBCT is very low dose
- CT images may be rendered to produce three-dimensional surface renderings.

Midface fracture

LeFort I

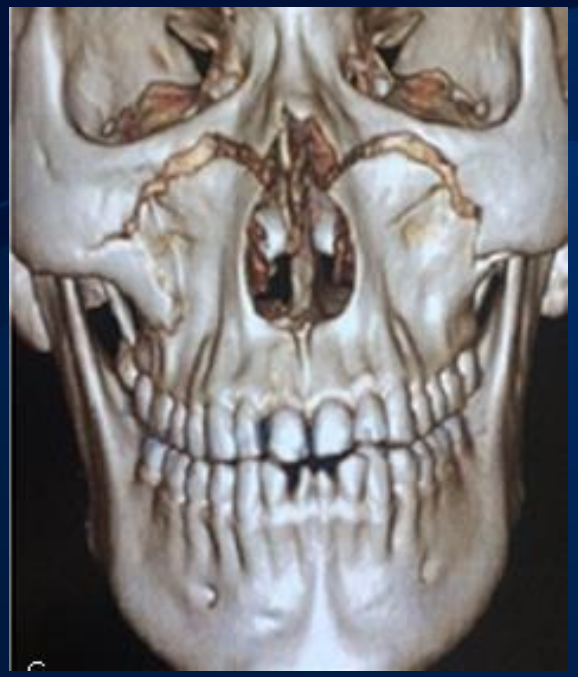
- is the result of a horizontally directed traumatic force directed posteriorly at the base of the nose.
- Separates the maxilla and pterygoid plates from the skull, in a transverse direction, at the level of the inferior aspect of the maxillary sinuses, including the alveolar process and teeth if present.
- Concomitant fractures of the mandible (54%) and zygomatic bone (23%) are frequent in these patients



Midface fracture

Clinical examination Lefort I

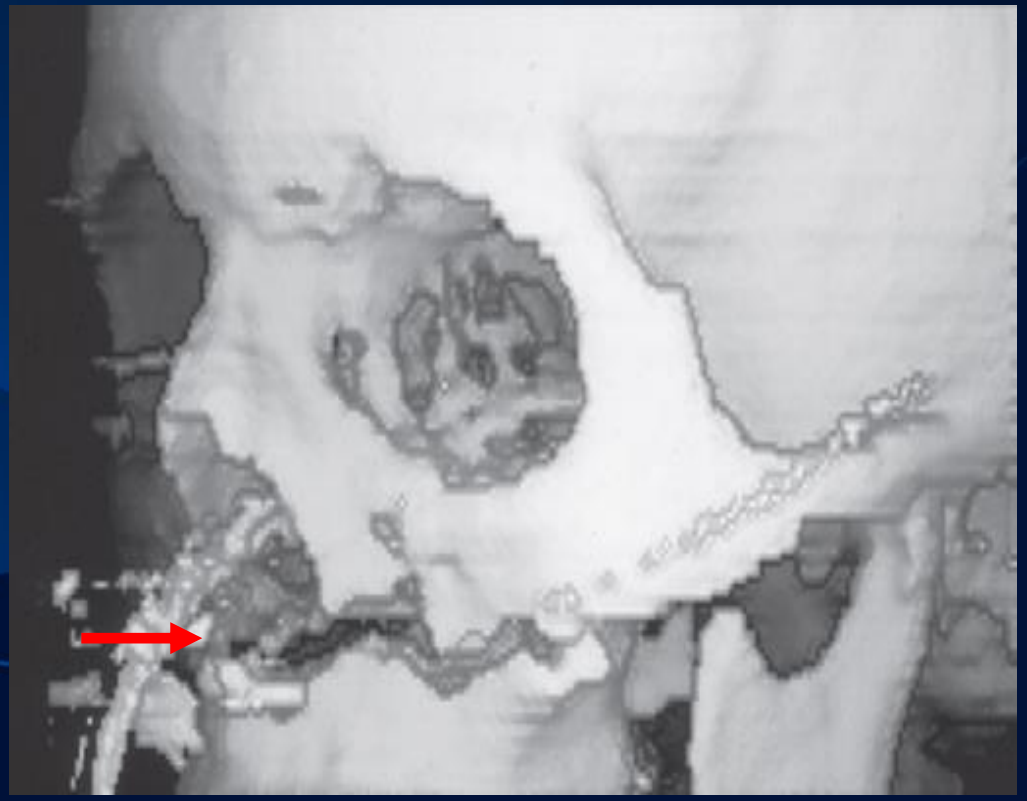
- As a result, the posterior maxillary teeth contact the mandibular teeth first
- resulting in an anterior open bite, retruded chin, and long face.
- pain over the nose and face
- swelling and bruising about the eyes
- Manipulation may reveal a mobile maxilla and crepitation.
- varying degrees of paraesthesia



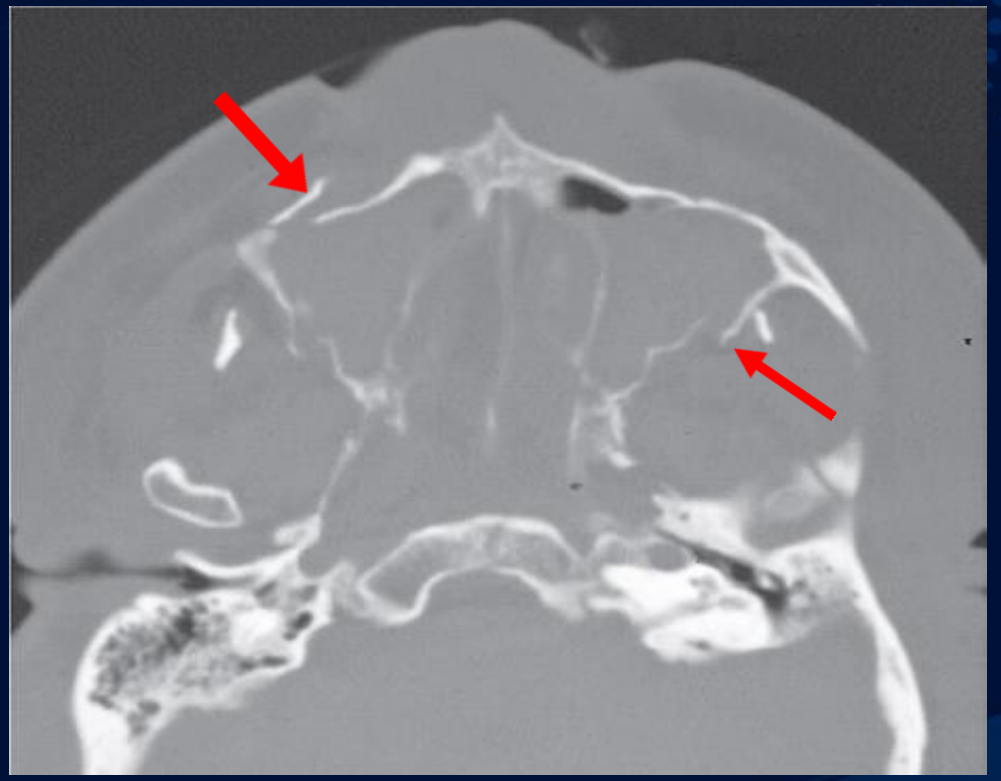
Midface fracture

imaging Examination Lefort I

- CT,CBCT imaging
- coronal or axial images together may reveal involvement of the pterygoid plates posteriorly
- reveals an air-fluid level or radiopacification in the maxillary sinus
- Three-dimensional reconstructions of the MDCT,CBCT data set may show the plane of the fracture to greatest advantage



Three-dimensional reconstruction of the image data shows extension of the fracture plane from above the
base of the nose posteriorly through the maxillary tuberosity.

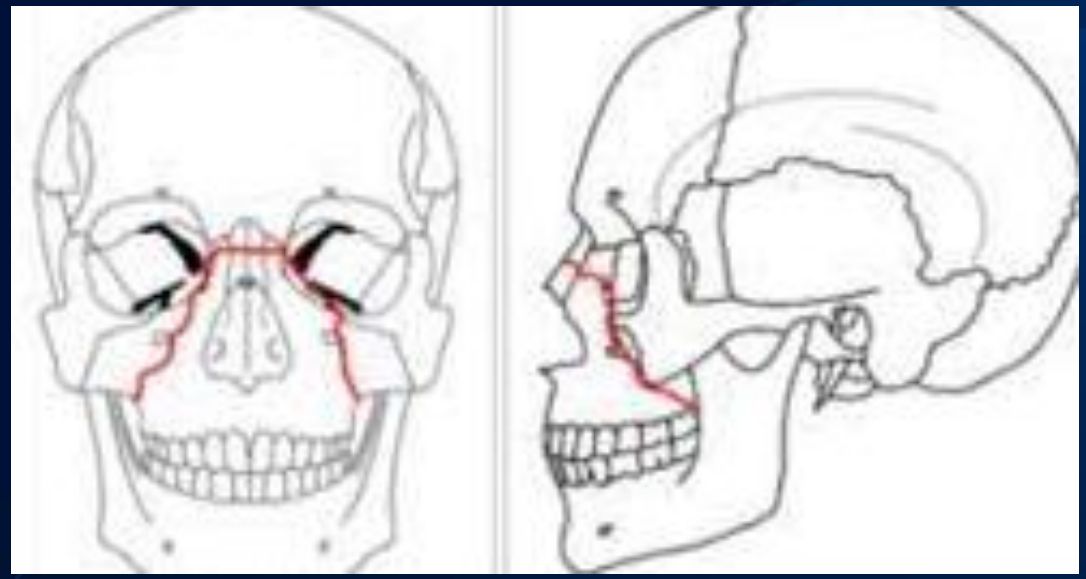


Axial image of Le Fort I fractures
1-involving the anterior and posterolateral walls of the right and left maxilla and the pterygoid plates.
2-Opacification of the maxillary sinuses is also seen, with a small retained collection of air in the left maxillary sinus

Midface fracture

Lefort II

- It results from a violent force applied posteriorly and superiorly through the base of the nose
- This force separates the maxilla pterygoid plates, medial wall of the orbit, and nasal bones as a unit from the base of the skull.
- has a pyramidal shape on posteroanterior skull images
- The frontal and ethmoid sinuses are involved in about 10% of cases, especially in severe comminuted fractures.



Midface fracture

Lefort II clinical examination

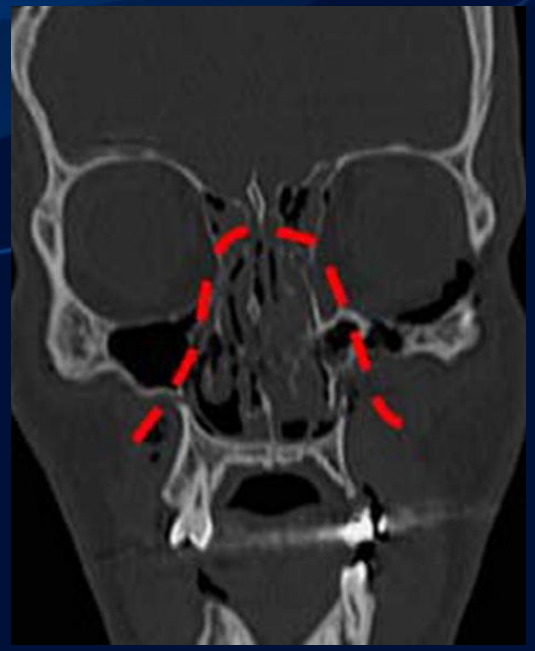
- results in massive edema and marked swelling of the middle third of the face. The edema is likely to be so severe that it is impossible to see the globes
- ecchymosis develops around the eyes
- The broken nose is displaced because the face has fallen,
- anterior open bite ,Epistaxis is inevitable, and cerebrospinal fluid rhinorrhea may occur
- By applying pressure between the bridge of the nose and the palate, the “pyramid” of bone can be moved
- double vision and variable degrees of paresthesia over the distribution of the infraorbital nerve.

Midface fracture

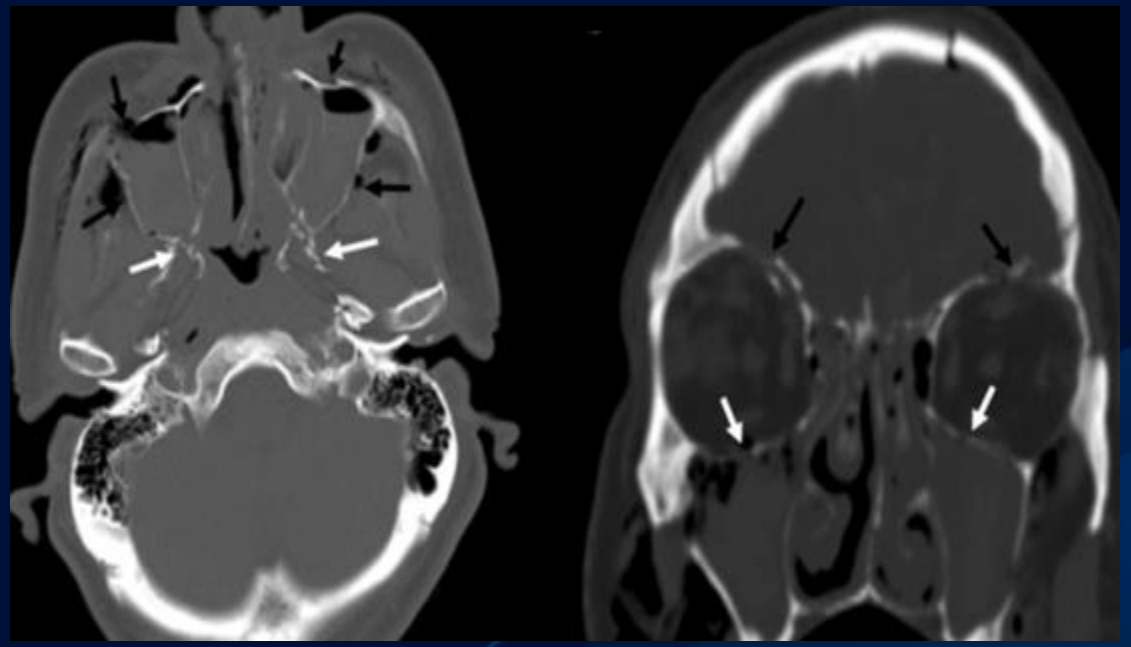
imaging Examination Lefort II

- CT imaging is the modality of choice for imaging such complex fractures.
- reveals fractures of the nasal bone, frontal process of the maxilla, infraorbital rim, and orbital floor
- Involvement of the zygomatic bone or zygomatic process of the maxilla, separation of the zygomaticomaxillary suture, and fracture of the lateral wall of the maxillary sinus and the pterygoid plates
- Involvement of the ethmoid air cells and frontal sinus

imaging Examination Lefort II



Le Fort II fracture in a football match

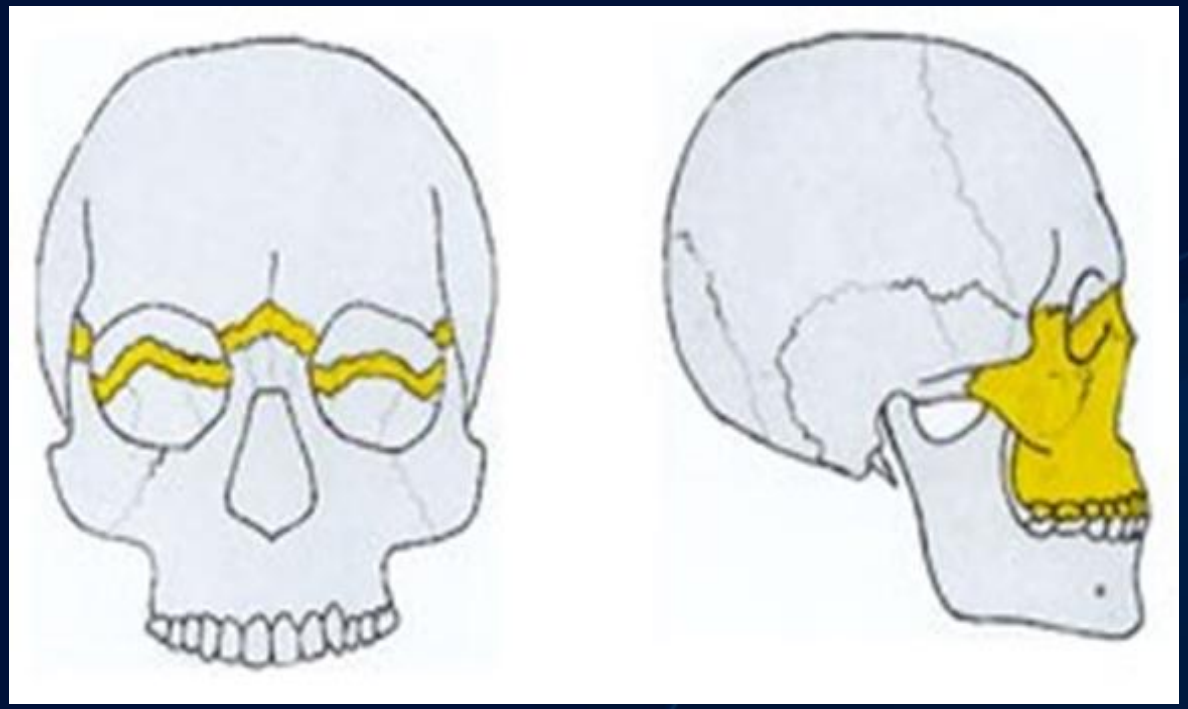


Axial and coronal Le Fort II. Note the fractures through the orbital rims
And pterygoid plate

Midface fracture

Lefort III

- results when the traumatic force is of sufficient magnitude to separate the middle third of the facial skeleton completely from the cranium.
- The fracture plane usually extends from the nasal bone and frontal process of the maxilla and across the orbital floor and passes across the pterygomaxillary fissure and separates the bases of the pterygoid plates from the sphenoid bone.



Midface fracture

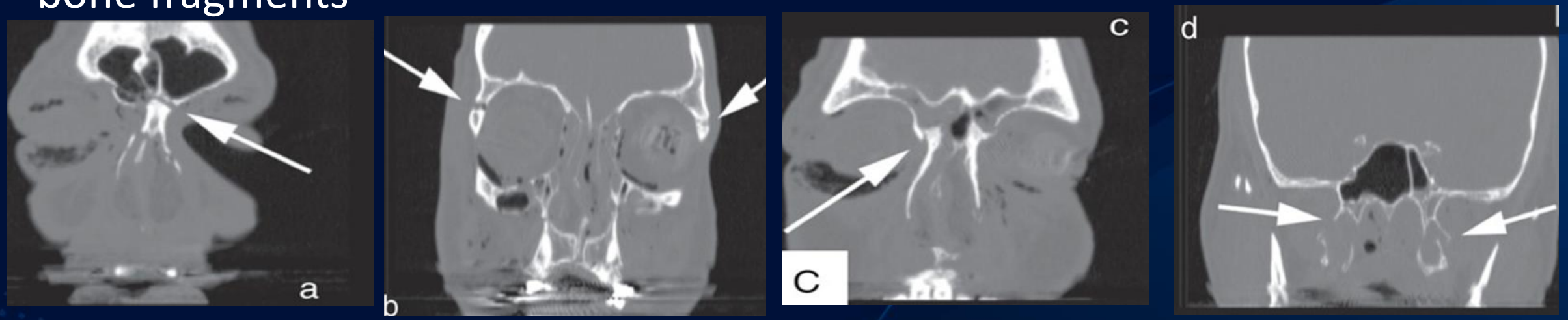
Lefort III clinical examination

- this injury is considerably more extensive lefortII.
- The soft tissue injuries are severe, with massive edema.
- Bleeding may occur into the periorbital tissues and the conjunctiva,
- A “dished-in” or concave deformity of the face is characteristic of this fracture pattern
- intraoral and extra oral palpation reveals irregular contours and step deformities,

Midface fracture

Lefort III Radiographic examination

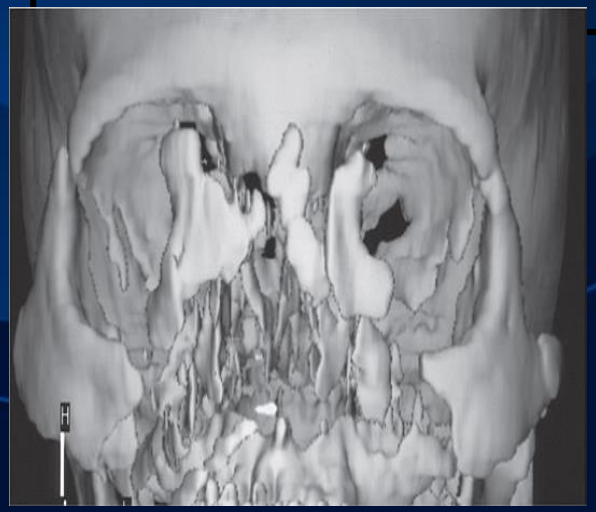
- CT imaging
- The main radiologic findings are distractions of the frontonasal, frontomaxillary, zygomaticofrontal, and zygomaticotemporal sutures
- Multiple facial bone fractures with greater severity,
- Three-dimensional reconstructions show the fracture planes and large bone fragments



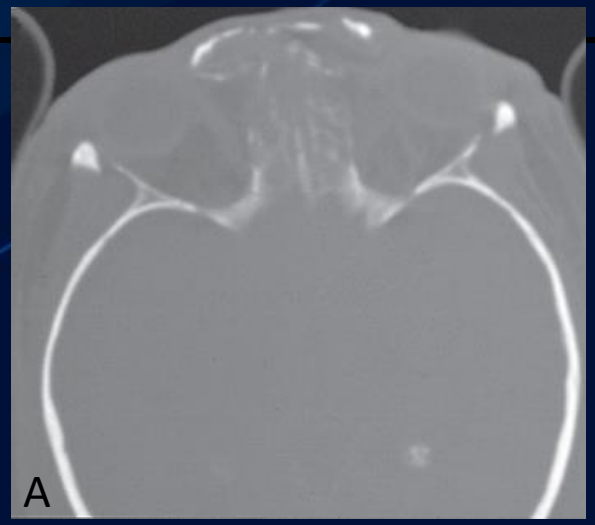
CT imaings Le Fort III fracture

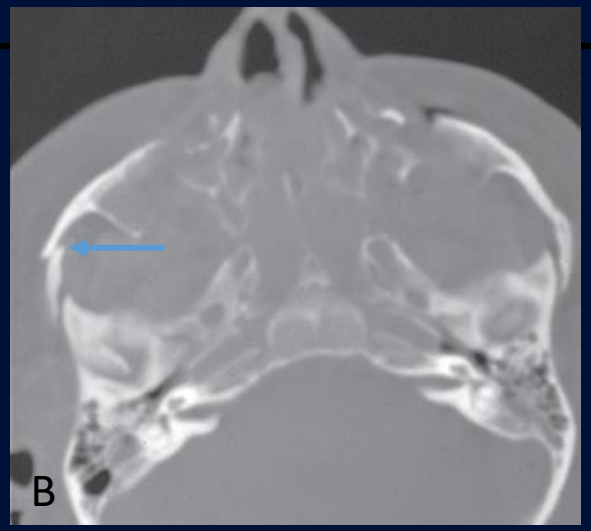
Midface fracture

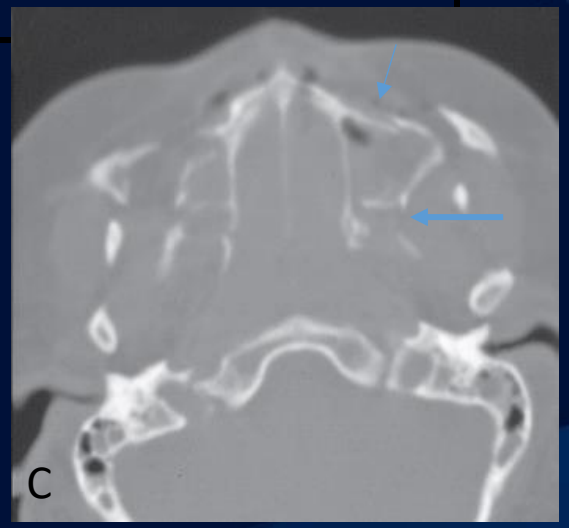
Lefort III Radiographic examination



3D reconstructions, frontal view







Axial (CT) images show a bilateral Le Fort III fracture with distractions of the frontonasal (A), frontomaxillary, zygomaticofrontal, and zygomaticotemporal sutures

(B) and fractures of the nasal bone, frontal process of the maxilla, orbital floor, and pterygoid plates

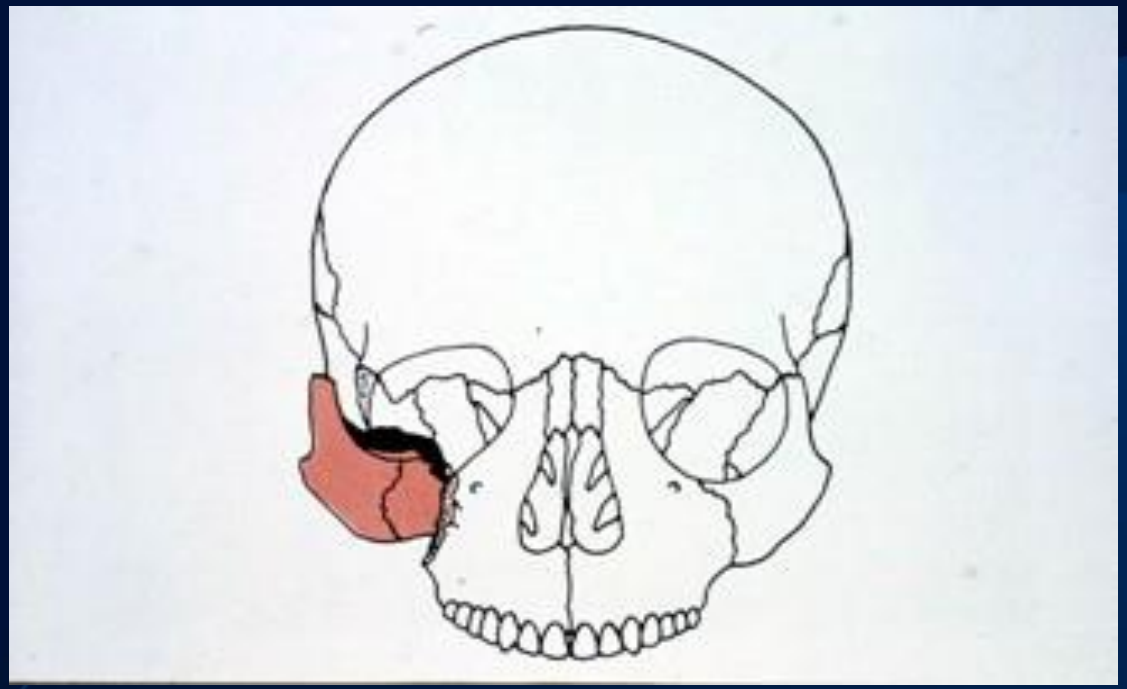
(C). Note the near-total radiopacification of the maxillary sinuses

substantial fragmentation of the periorbital bones , zygomatic bone

Midface fracture

Zygomatic fracture

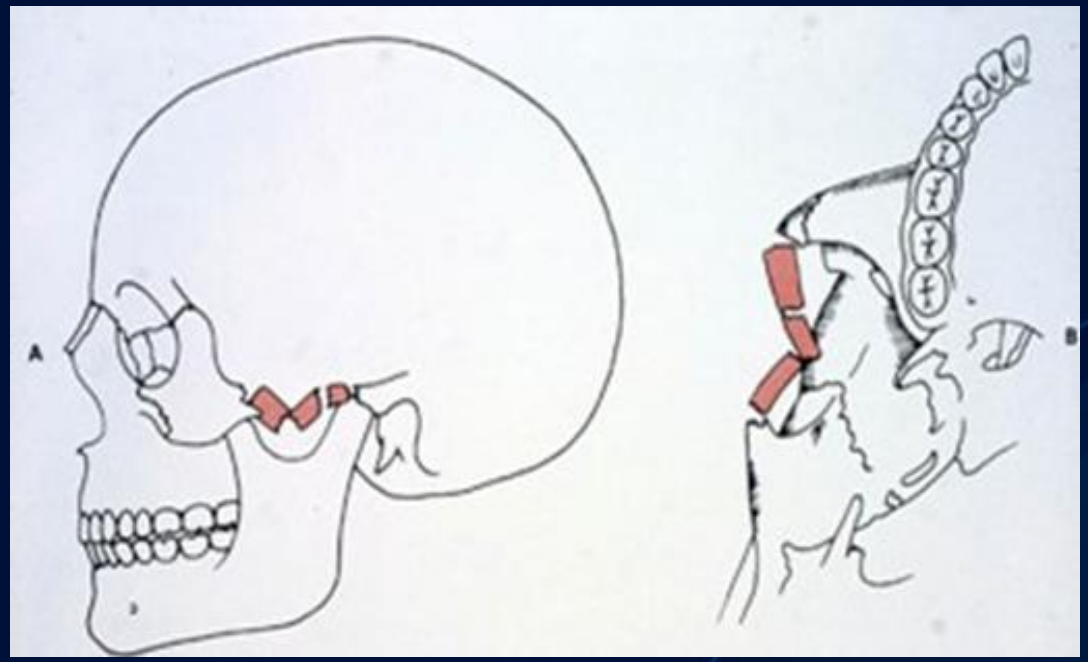
- With direct impact to the zygomatic bone the cheek will appear flat or depressed
- Most commonly fractured bone in the midface
- "Trimalar" fracture
  - –Frontal-zygomatic suture
  - –Maxillary-zygomatic suture
  - –Temporal zygomatic suture



Midface fracture

Zygomatic arch fracture

- In zygomatic arch fractures, the zygomatic process of the temporal bone is fractured
- usually result from a forceful blow to the cheek or side of the face

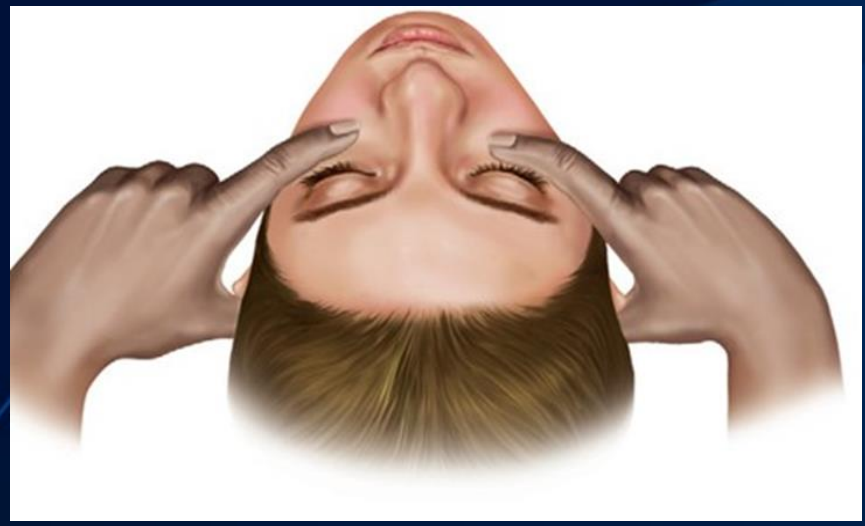


Isolated zygomatic arch fracture lateral view

Midface fracture

Zygomatic fracture clinical Examination

- **Flattening** of the upper cheek , **tenderness and dimpling** of the skin
- periorbital **ecchymosis** and **hemorrhage** into the sclera (near the outer canthus)
- unilateral **epistaxis** , **anesthesia or paresthesia** of the cheek,
- **Mandibular movement** may be limited if the displaced zygomatic bone impinges on the coronoid process

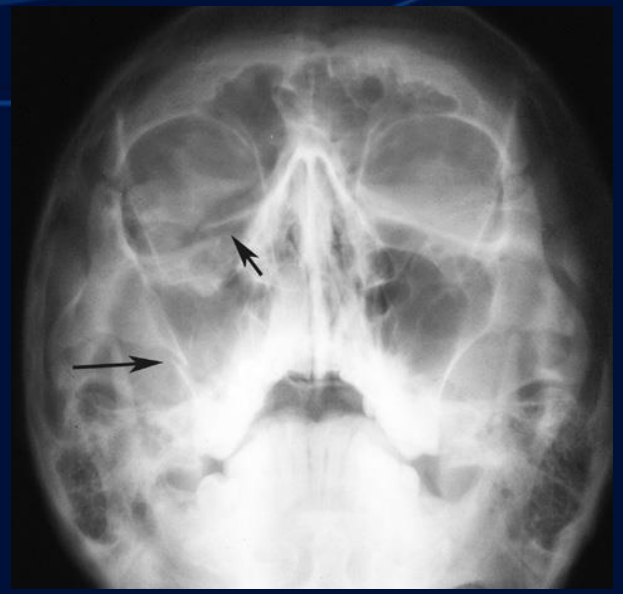


Flattening of the Malar Prominence

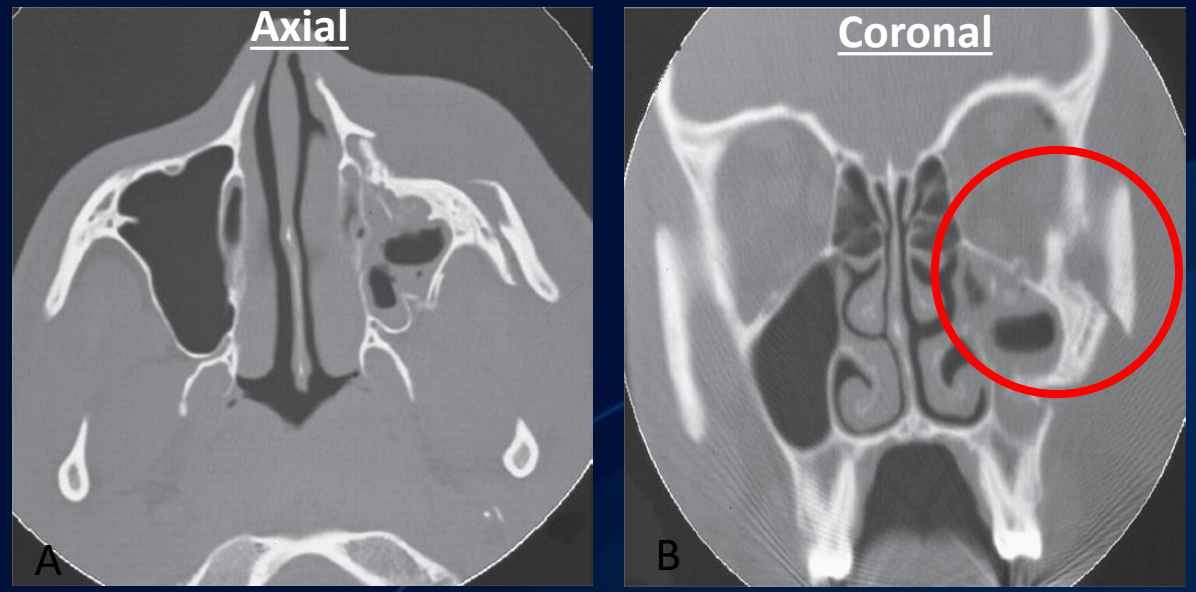
Midface fracture

Zygomatic fracture Imaging Examination

- It is important to consider that on panoramic images, the zygomaticotemporal suture appears as a radiolucent line
- Waters view → tripod fracture
- MDCT,CBCT is the modality of choice for imaging these fractures



Waters view shows a tripod fracture involving the right zygomatic bone .Note the fracture through the right orbital rim (short arrow) and lateral wall of the maxillary sinus (long arrow). Also, there is radiopacification of the right maxillary sinus.



Axial (A) and coronal (B) computed tomography images show depression and rotation of a left tripod fracture. An air-fluid level is also visible in the left maxillary sinus.

Mandibular injuries

soft tissue

- Any soft tissue damage should be assessed in terms of swelling, bruising, deformity
- Check the overlying skin for laceration
- Intra Oral examinations → oral mucosa, gums and teeth
- Opening and closing the mouth → malocclusion
- Consider airway problems spatially bilateral FX is high risk
- bite stick test → tooth facture


bite stick test

Mandibular fractures

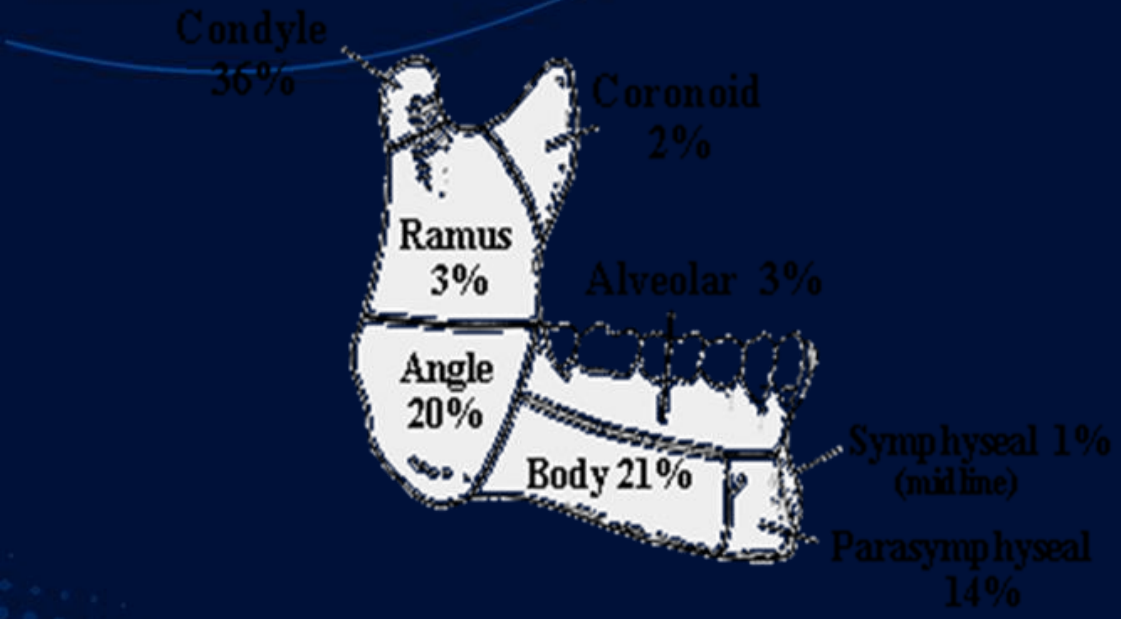
hard tissue

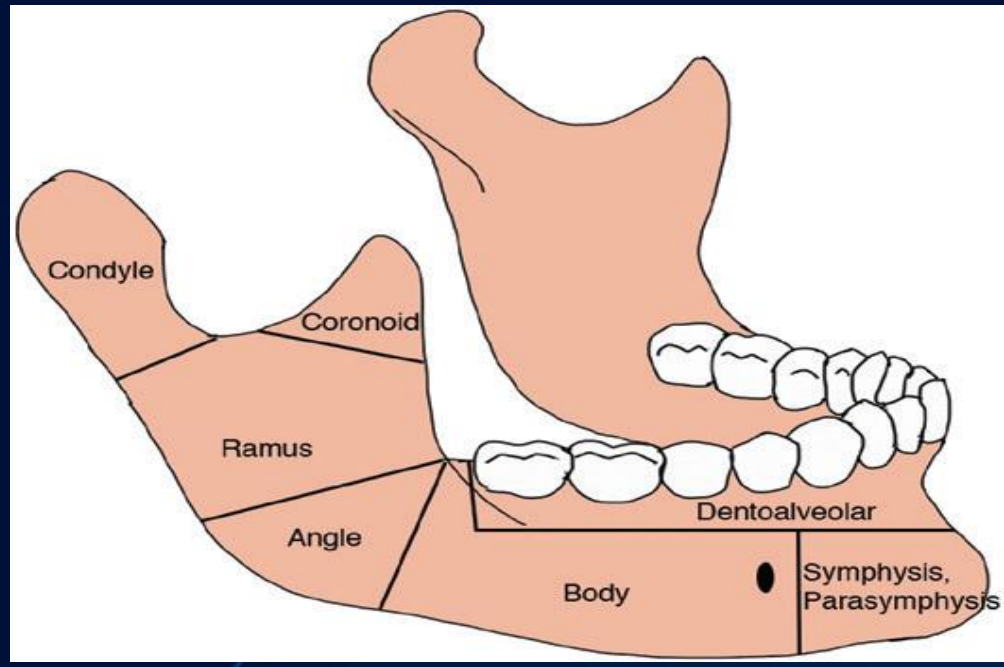
- Mandible Fractures After nasal bone, most common fracture of face
- In sport is third most common fracture behind the nasal and zygotic fractures.
- usually is double fractures .
- note malocclusion, numbness, dislocation
- Look in preauricular area → condylar fracture

Mandibular Fractures

can be classified by its anatomic location

- The locations and patterns of the fractures vary with the mechanism of injury and the direction the force of impact.
- Fractures that arise distant to the site of direct traumatic impact are called indirect fractures.





Classification of mandibular fractures based on anatomic location.

Mandibular Fractures

imaging examination

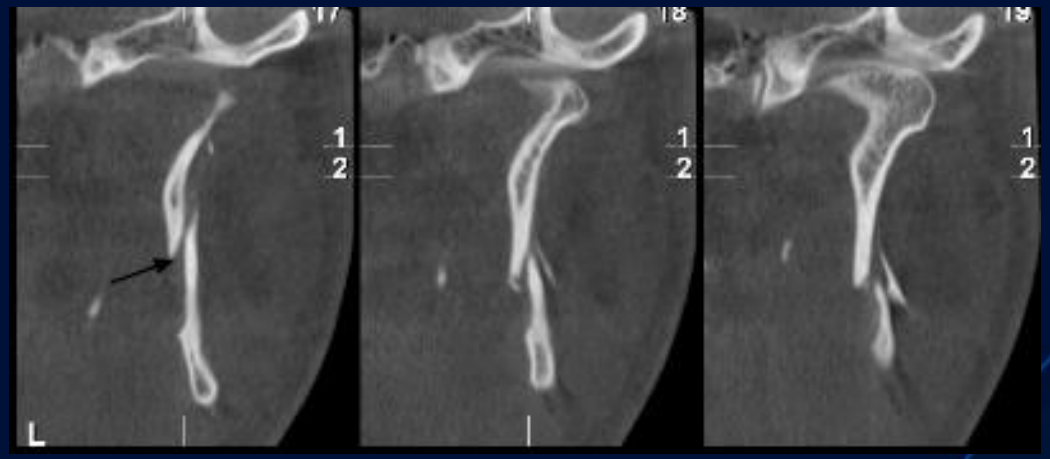
- Panoramic imaging is often the initial examination performed to evaluate Where involvement of the mandibular body or alveolar process is suspected
- it is Sometimes supplemented by an open-mouth Towne view to evaluate the mandibular condylar head and neck fracture laterally


Towne view

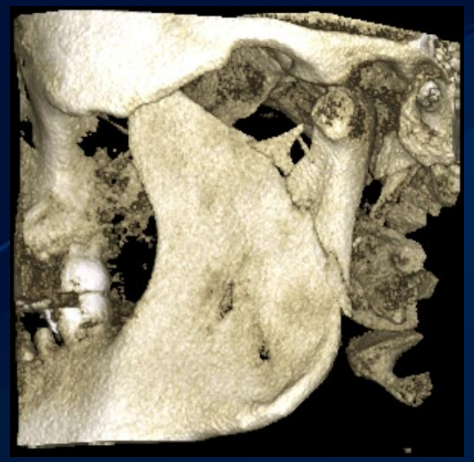
Mandibular Fractures

imaging examination

- complex fractures of the mandible are best imaged with CBCT or preferably MDCT
- soft tissue injuries such as the TMJ capsule and disk, MRI is the modality of choice.



CBCT condylar neck fracture



TMJ Injuries

Mandibular Dislocation

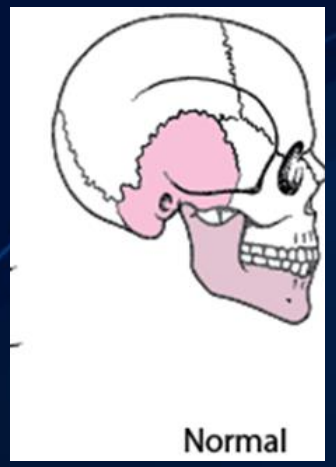
- Dislocation generally results from a direct blow to chin while the mouth is open or blunt trauma
- Anterior most common 70% , maybe unilateral or bilateral
- malalignment ,malocclusion ,open and locked jaw
- Risk factors:

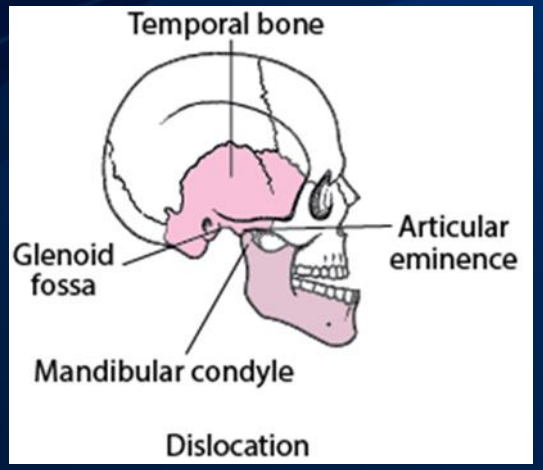
  Weakness of the temporal mandibular ligament

  Over stretched joint capsule

  Shallow articular eminence

  Neurologic diseases which result in increased muscular activity





TMJ Injuries

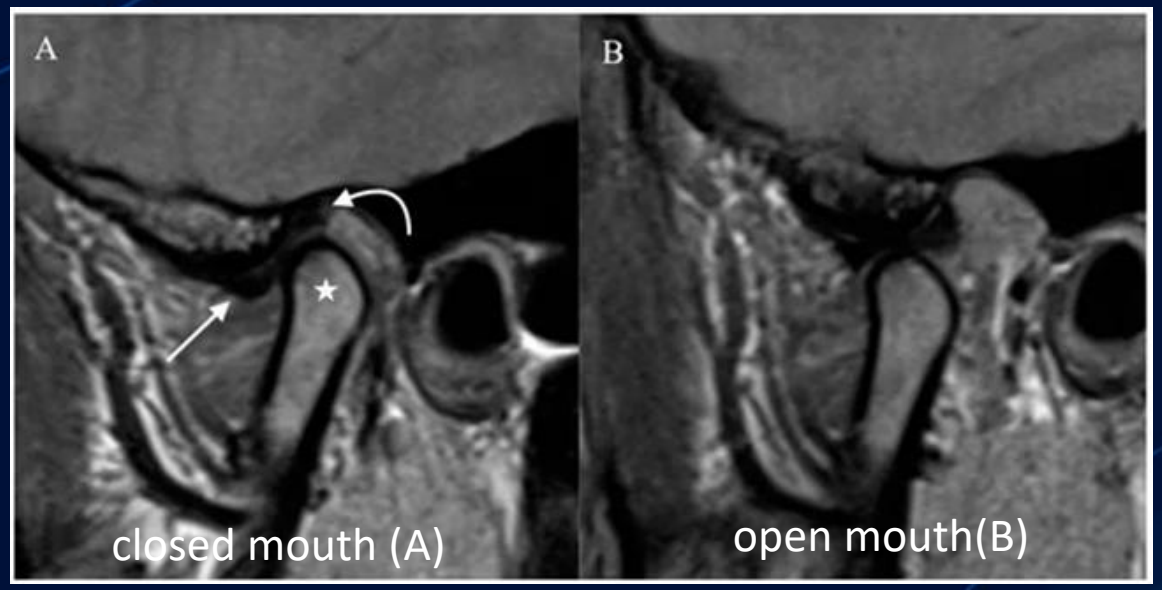
Mandibular Dislocation

- X-rays should be performed if there is trauma to exclude fracture.
- Panoramic view

Panoramic view of the patient showing bilateral anteriorly dislocated condyle

TMJ Injuries
Soft tissue injuries

- Soft tissue injuries to the temporomandibular joint capsule and disk are present or suspected, MRI is the modality of choice



Normal Temporomandibular joint MRI. Proton density sagittal image of the TMJ in closed mouth (A) position shows normal location and bow-tie appearance of the articular disc with anterior (straight arrow) and posterior bands (curved arrow). The mandibular condyle (star) is in an anatomic location within the mandibular fossa. On open mouth images (B), normal condylar rotation and anterior translation are noted

Thank you