THE UNIVERSITY OF WESTERN AUSTRALIA

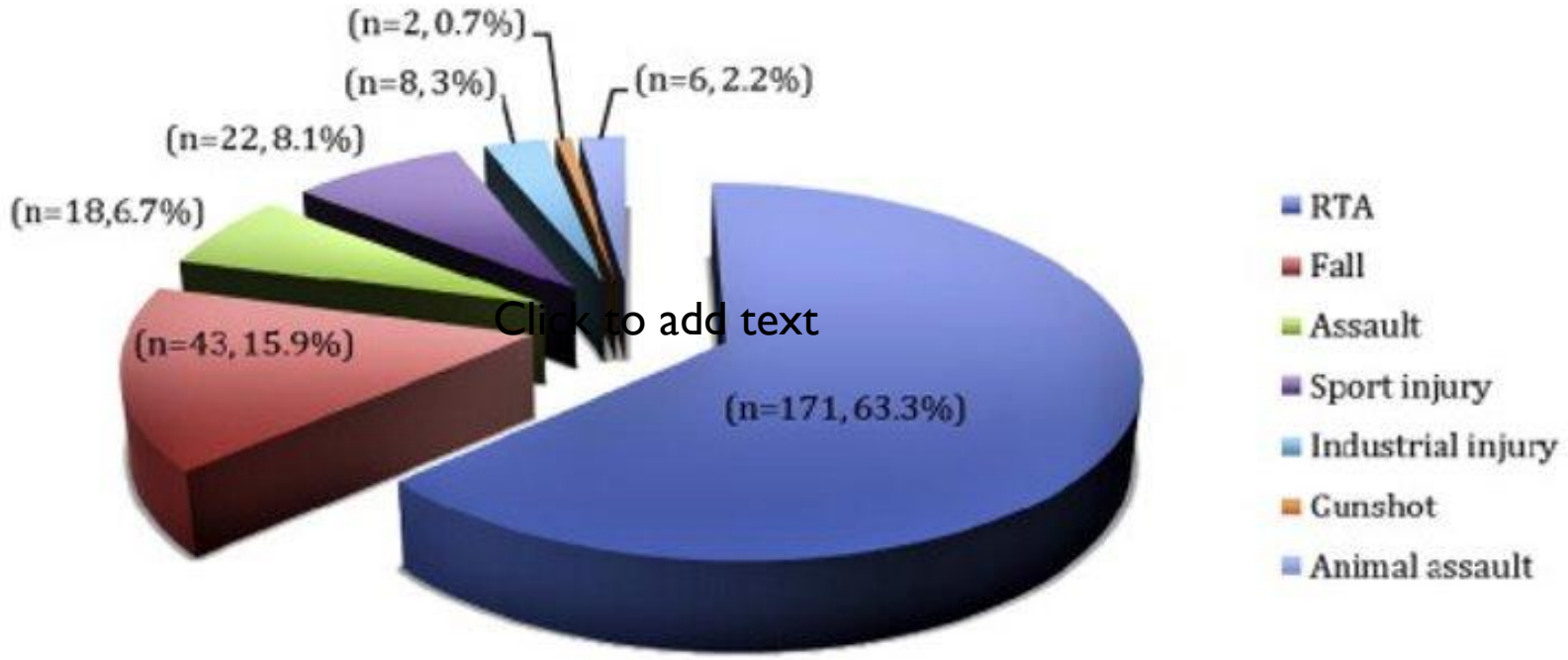
Oral Health Centre of Western Australia

MAXILLOFACIAL TRAUMA

MAGDALEN FOO

DISCIPLINE LEAD ORAL MAXILLOFACIAL SURGERY

Etiology of maxillofacial fractures



Click to add text

EPIDEMIOLOGY

- Nasal bones is the most common isolated facial bone fracture (largely due to the prominence and central location of the nose on the face and weakness of the nasal cartilage) followed by mandibular fracture which is the second most common
- Most common causes of facial fractures are interpersonal violence and motor vehicle accidents
- Other causes are falls, sporting injuries, and industrial injuries

EPIDEMIOLOGY

- Alcohol is an aggravating factor
- 80% are males, majority aged 20 - 35



BIOMECHANICS OF TRAUMA

Injury identification	Injury classification	Injury prevention
Nature of injury - degree of force, resistance to force	Severity of injury - direction of force, point of application of force	Pattern of injury –

TRAUMA

- Trauma can be defined as the application of excessive energy to the human body above its tolerance, resulting in damage

$$KE = \frac{1}{2} m v^2$$

- Kinetic Energy is directly related to injury severity, and is predicted by ½ mass and **(velocity)2**

TYPES OF INJURIES

BLUNT

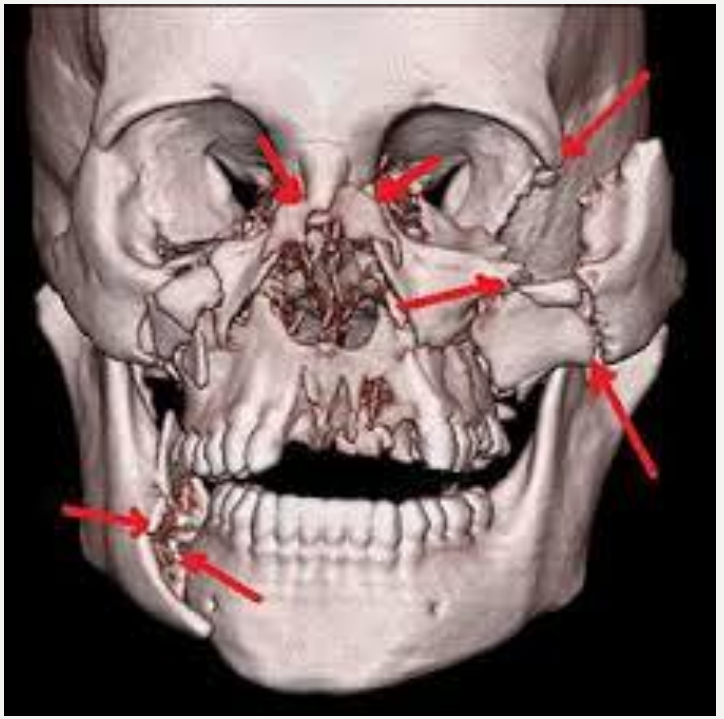
- Motor vehicle accidents
- Falls

PENETRATING

- Stab wounds
- Firearm injuries

MOTOR VEHICLE ACCIDENTS





FALLS











INTERPERSONAL VIOLENCE

- Using instruments or fists

ASSAULT

FRACTURE MANDIBLE



NASAL FRACTURE



SPORTS INJURY







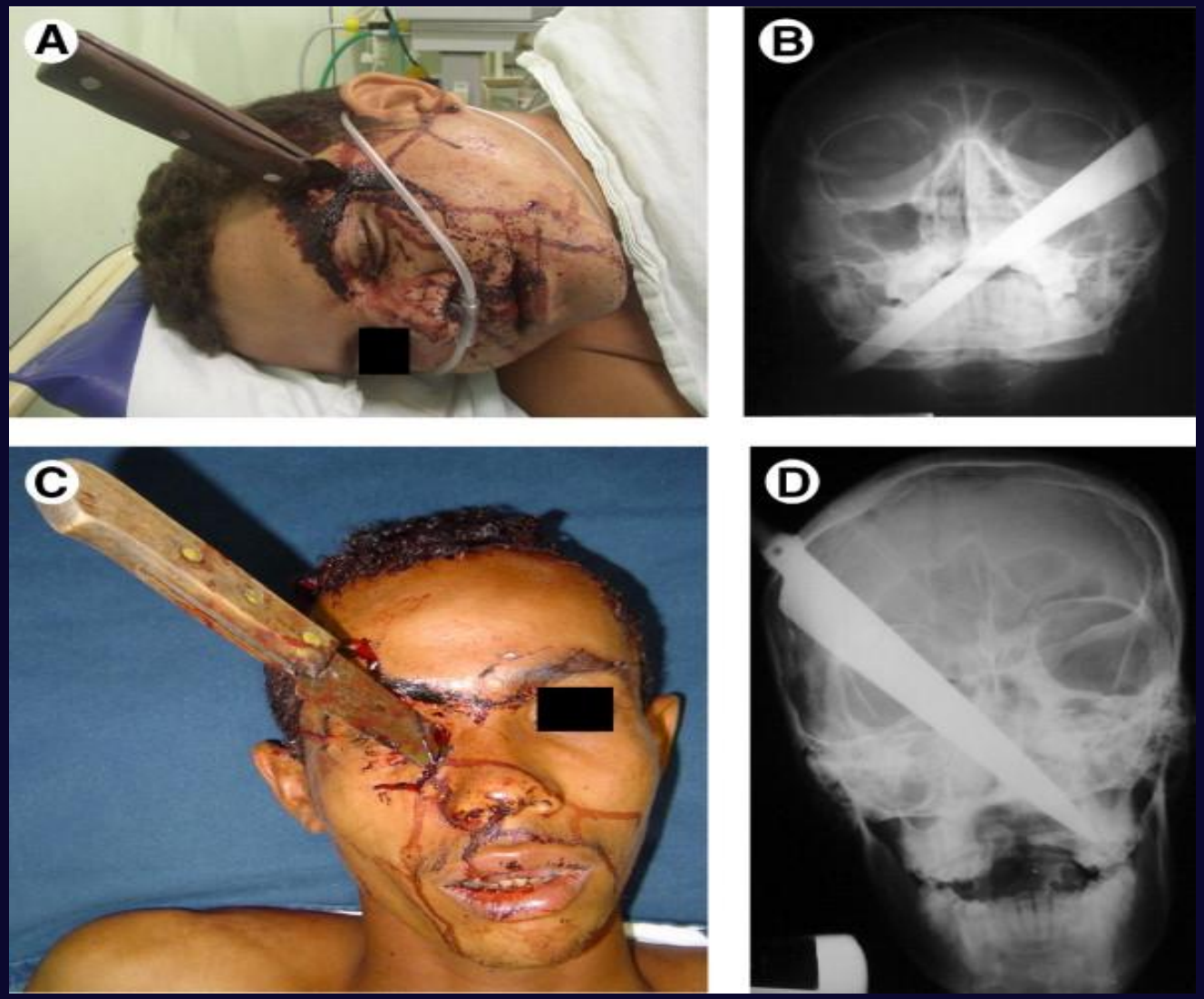




WORK RELATED INJURY







KNIFE WOUND

BALLISTICS





OTHER TYPES OF INJURY

DOG BITE



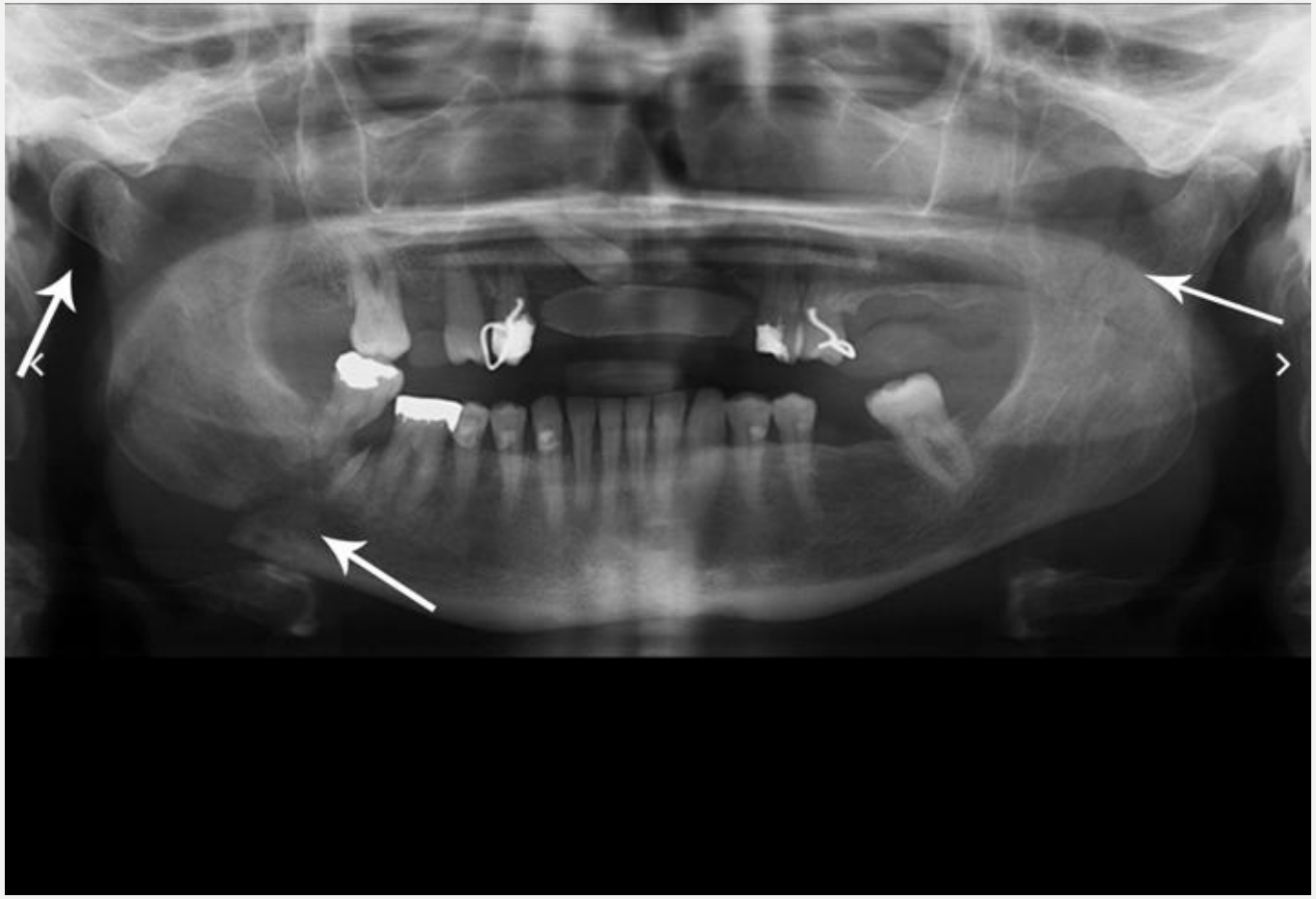
KICKED BY HORSE



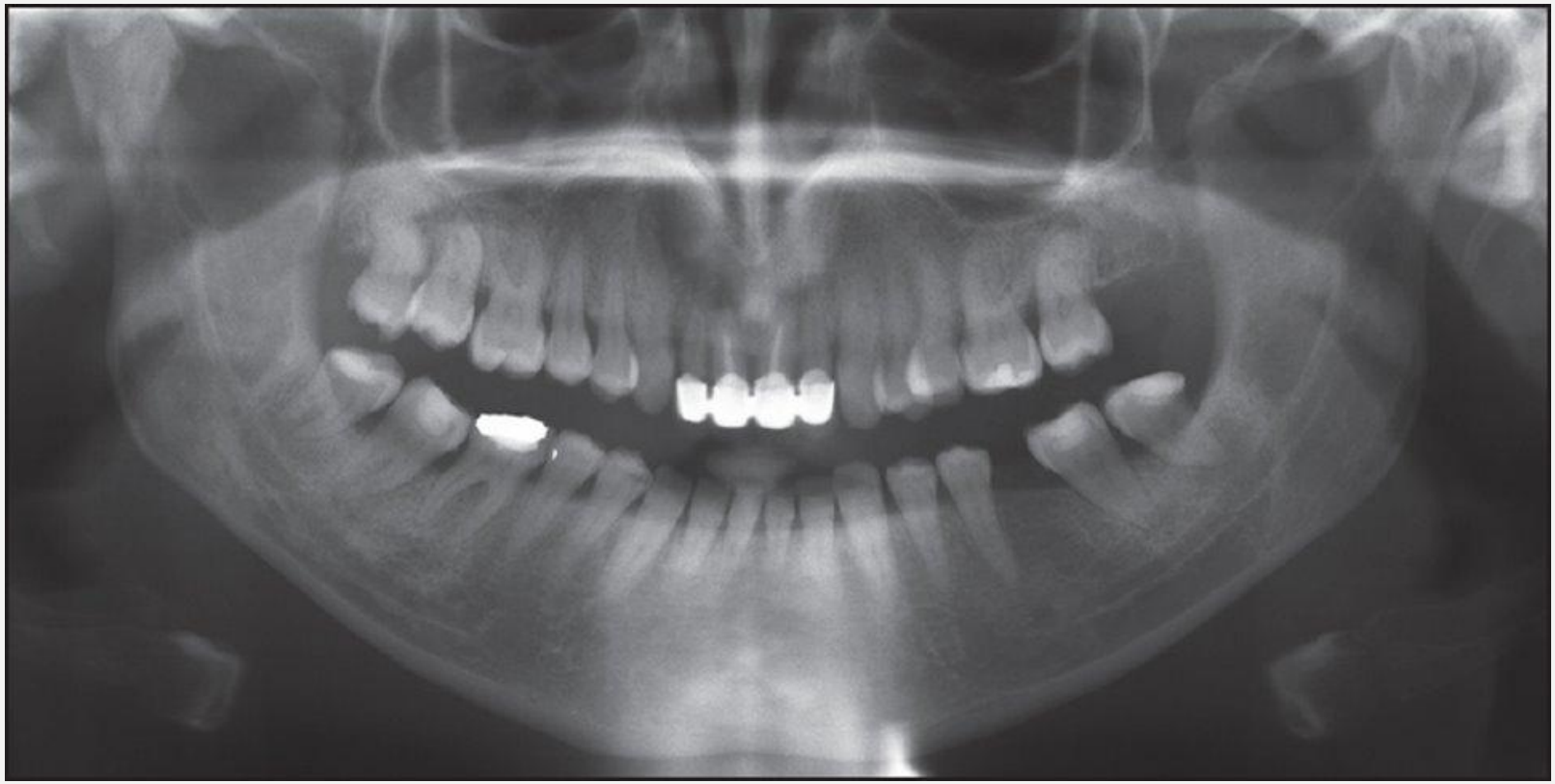
TYPES OF FRACTURE

Simple/closed - break does not penetrate skin	Compound/ open- broken bone penetrates skin	Comminuted – breaks into many fragments
Compression – bone is crushed e.g. in osteoporosis	Depressed – broken bone pressed inward e.g. skull fracture	Impacted – bone ends forced into each other
Spiral – ragged break when excessive twisting forces applied to bone e.g. sports fracture	Greenstick – bone breaks incompletely – common in children	Pathological – fracture in abnormal bone, spontaneous or following minor trauma

SPOT THE FRACTURE



SPOT THE FRACTURE



SPOT THE FRACTURE



SPOT THE FRACTURE



SPOT THE FRACTURE



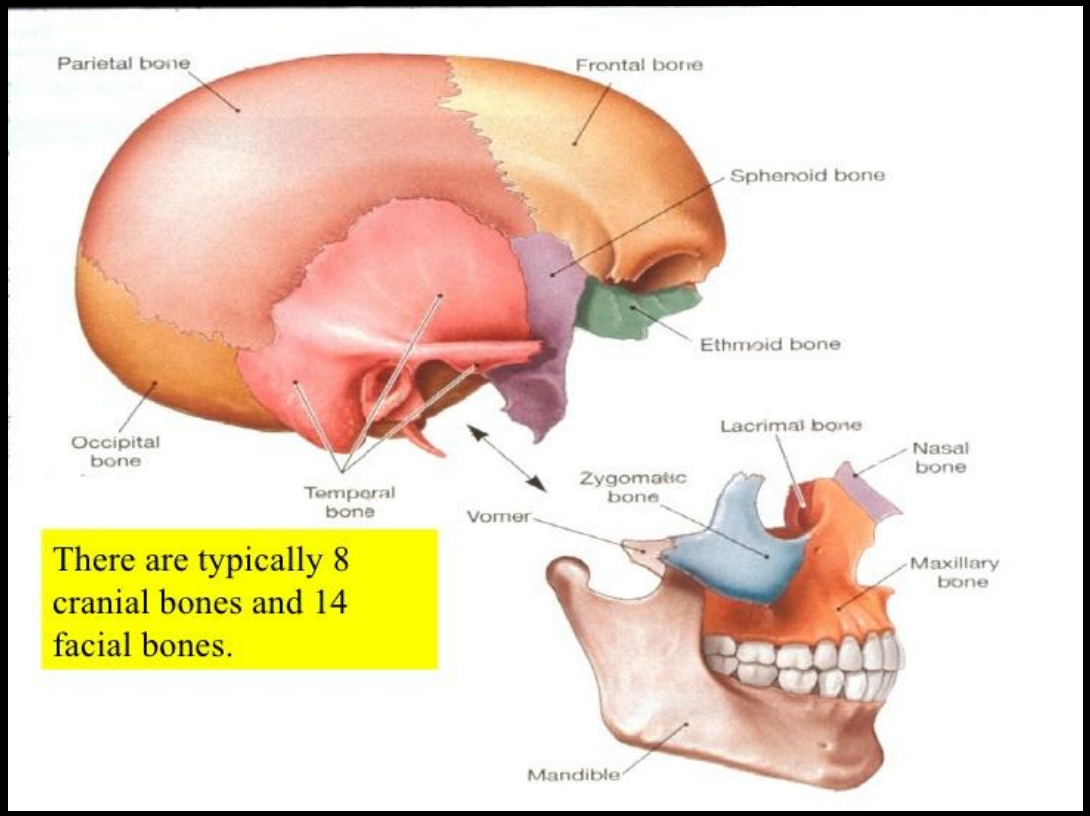


Zygomatic complex



Isolated zygomatic arch

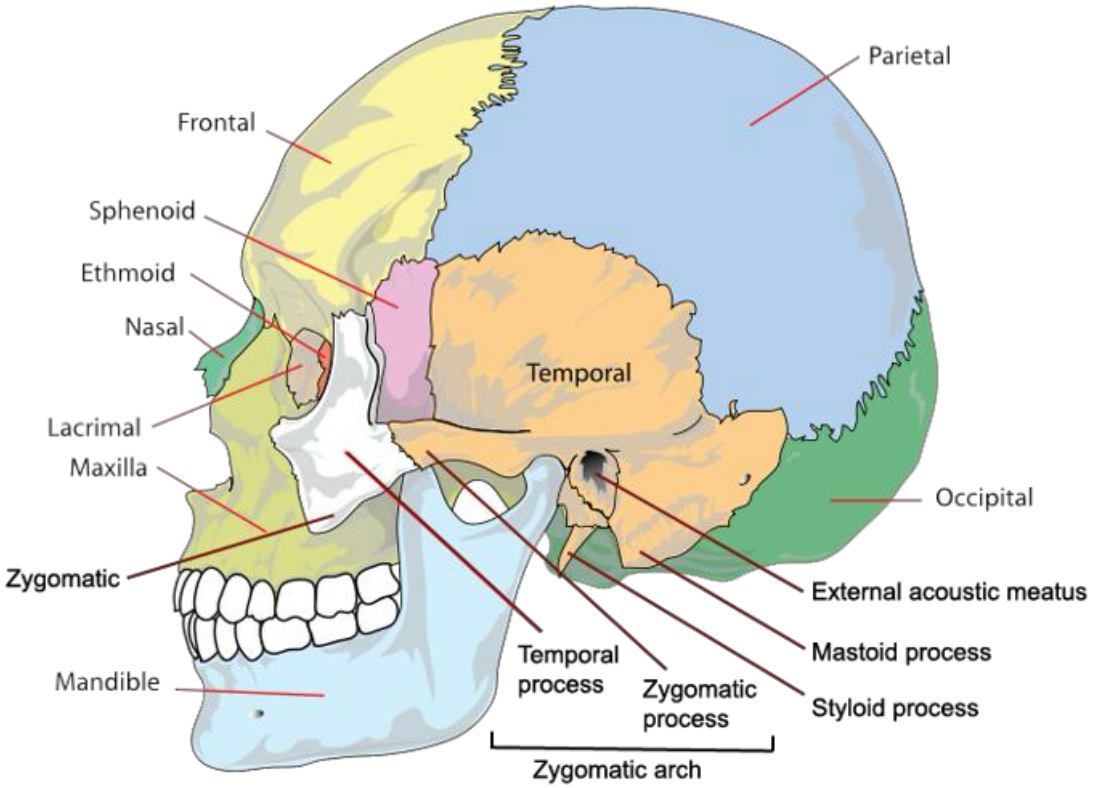
RELEVANT ANATOMY



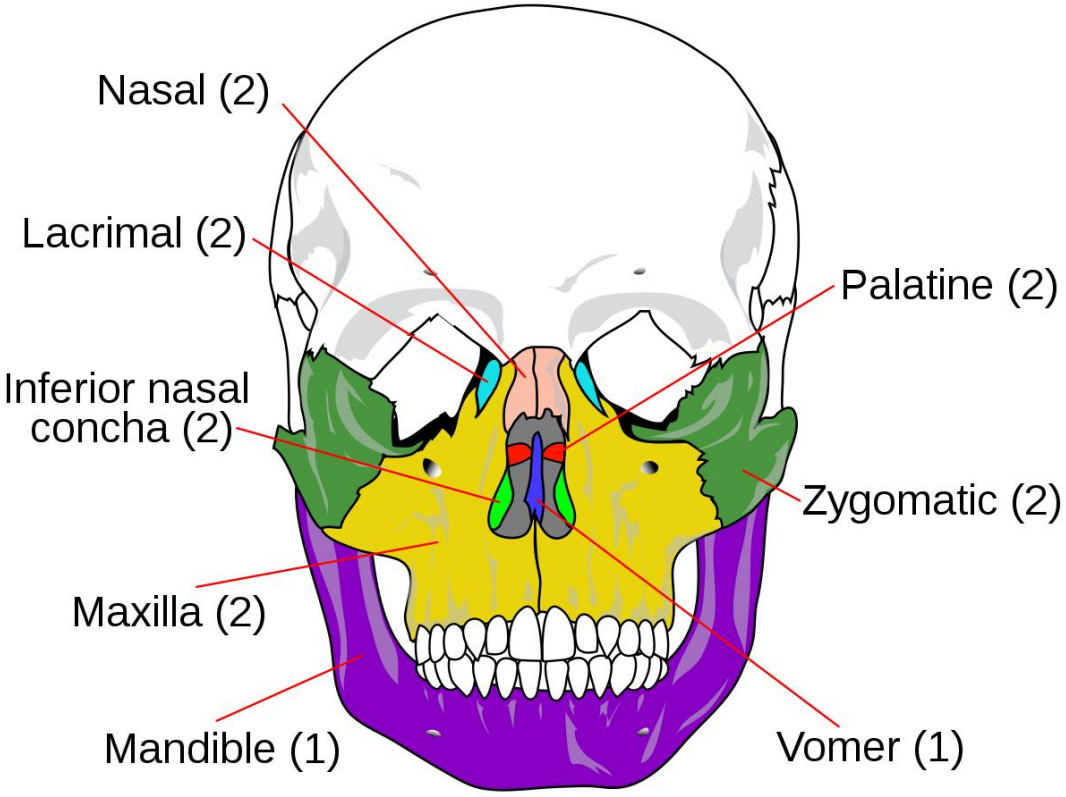
SKULL - VAULT AND BASE,

FACIAL SKELETON

CRANIAL BONES AND FACIAL BONES

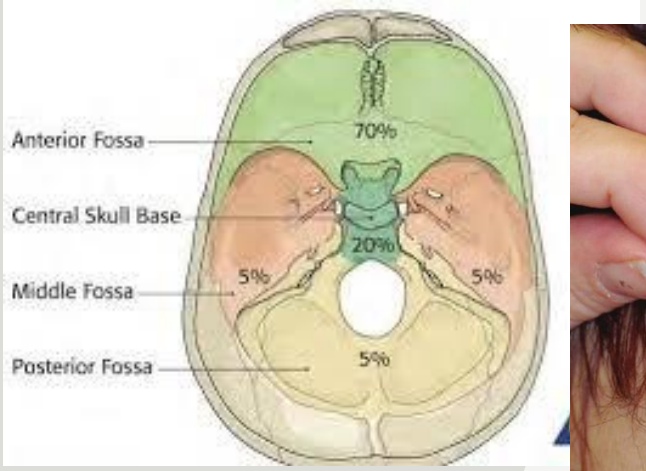


FACIAL BONES



14 facial bones

RELEVANT ANATOMY





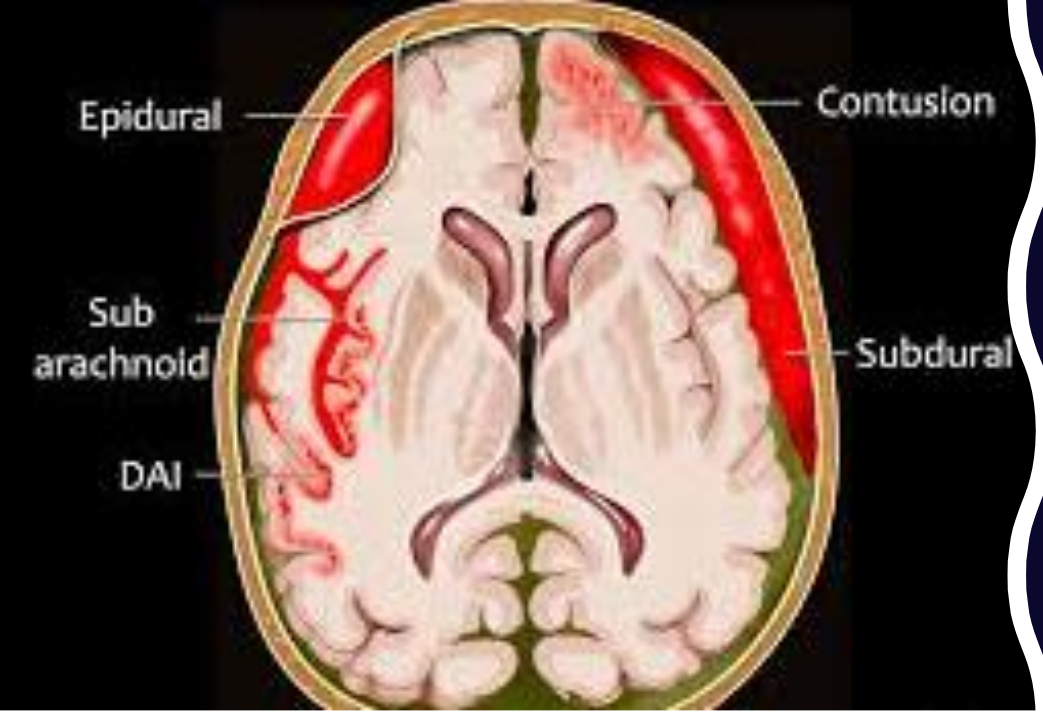
- Base of skull fracture - break of a bone in the base of the skull
- Symptoms include bruising behind the ears, bruising around the eyes, or blood behind the ear drum
- A cerebrospinal fluid (CSF) leak occurs in about 20% of cases
- Result in fluid leaking from the nose or ear

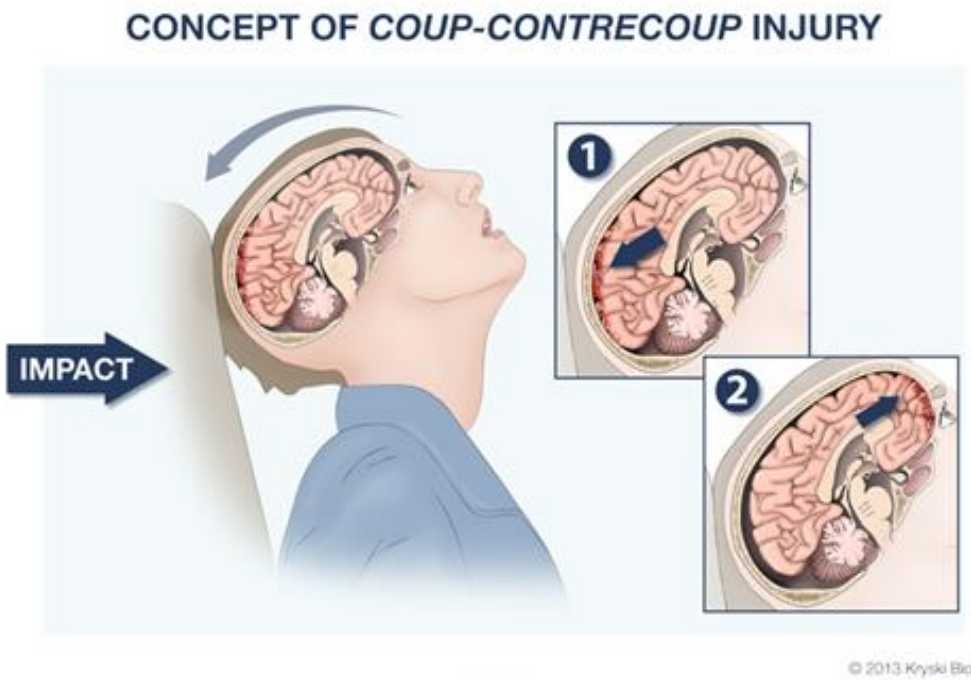


RELEVANT ANATOMY

- Stabilize Neck/C-spine







HEAD INJURY

Contact (head strike)

- Scalp laceration
- Skull fracture
- Coup
- Epidural haematoma
- SDH (Subdural haematoma)

Acceleration (violent head motion)

- Concussion
- Contrecoup
- SDH (Subdural haematoma)
- DAI (Diffuse axonal injury

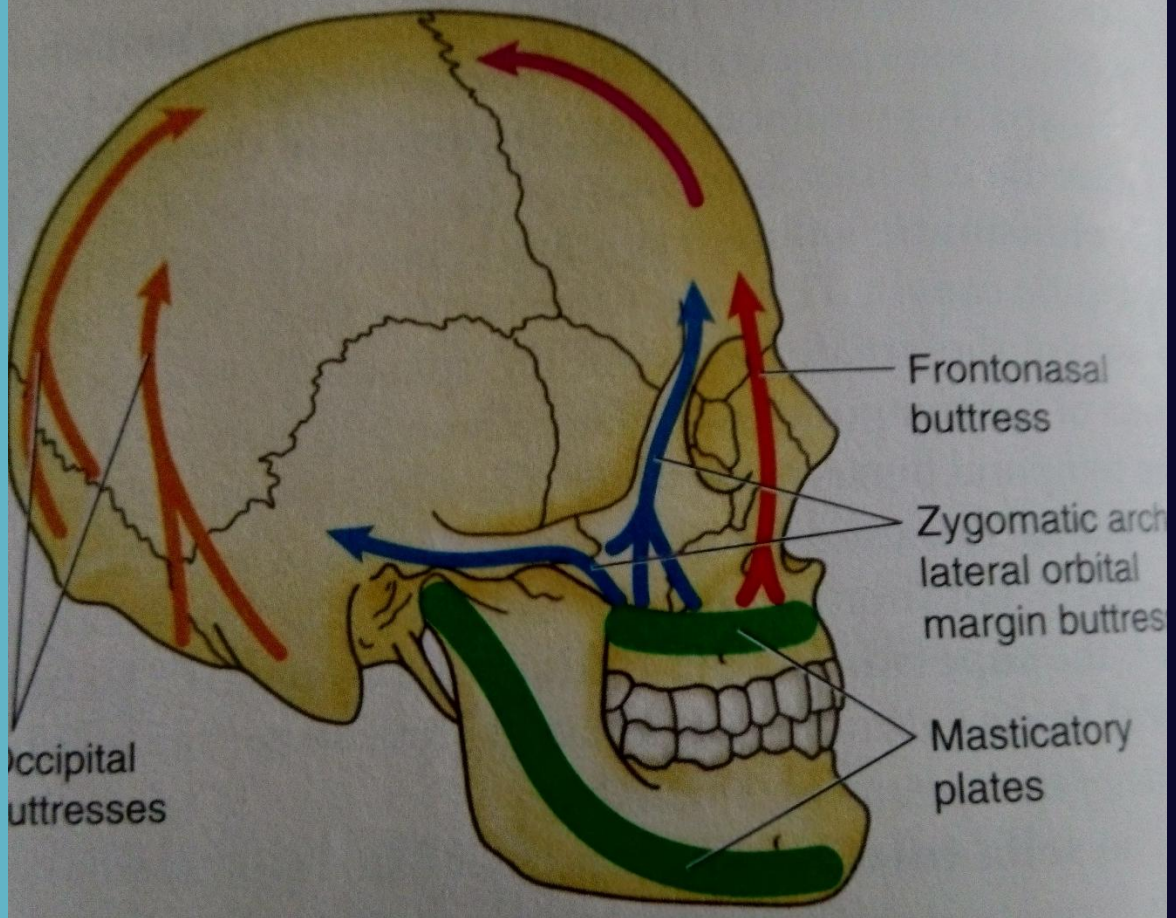
RELEVANT ANATOMY

SOFT TISSUES



ORAL CAVITY AND TEETH BEARING AREAS





ateral aspect

GURE 7.13. **Buttresses of cranium.** The buttresses are thicker port
cranial bone that transmit forces around weaker regions of the cran

BUTTRESSES AND 'CRUMPLE ZONES'

One hypothesis theorizes that the sinuses function as a crumple zone to distribute and absorb energy to protect the brain and other critical structures in the event of facial trauma

ANATOMICAL STRUCTURES



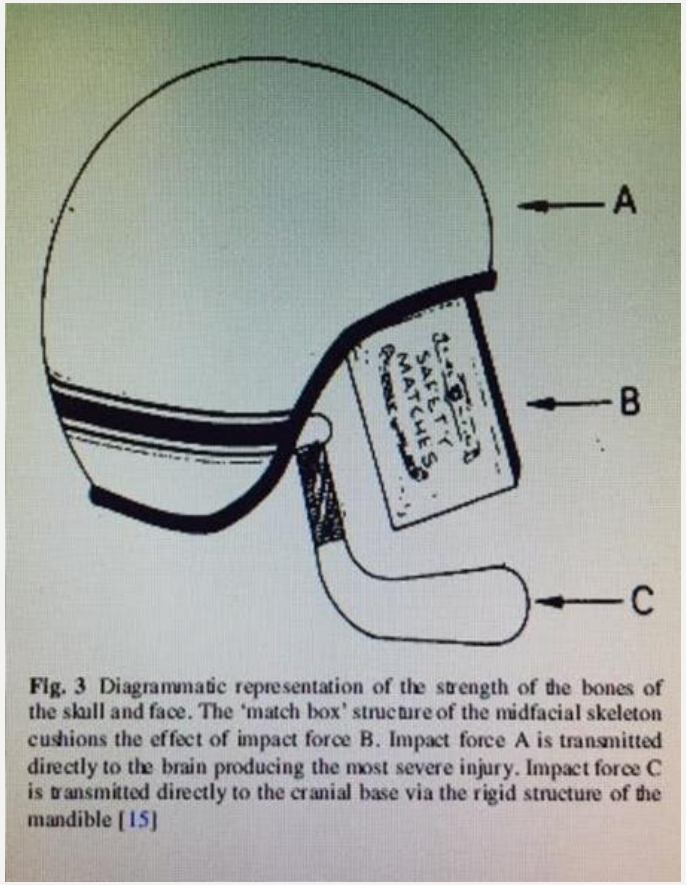
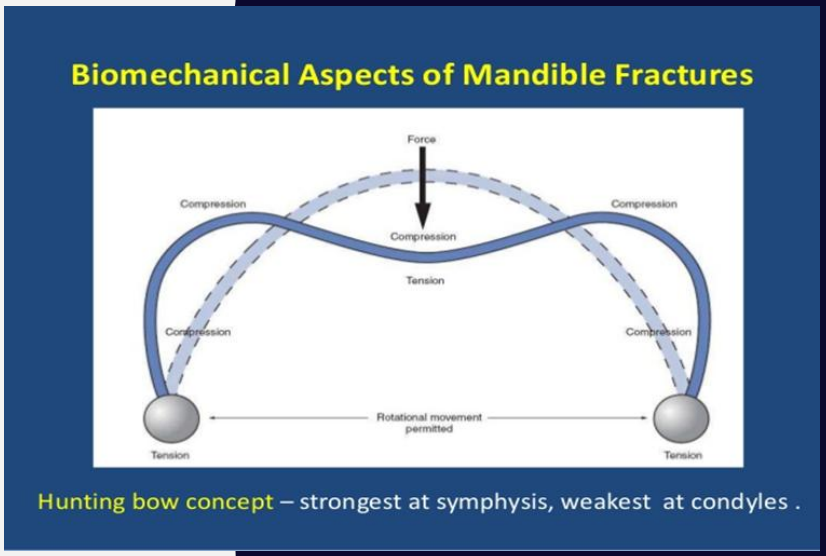
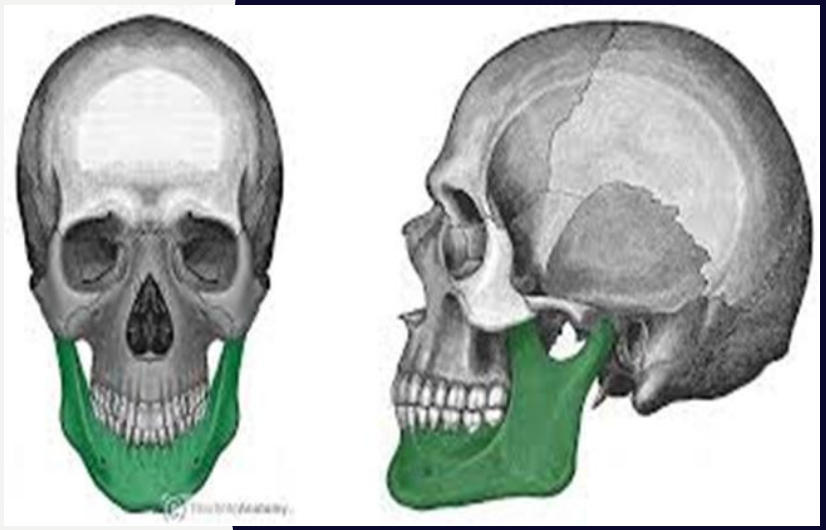


Fig. 3 Diagrammatic representation of the strength of the bones of the skull and face. The 'match box' structure of the midfacial skeleton cushions the effect of impact force B. Impact force A is transmitted directly to the brain producing the most severe injury. Impact force C is transmitted directly to the cranial base via the rigid structure of the mandible [15]

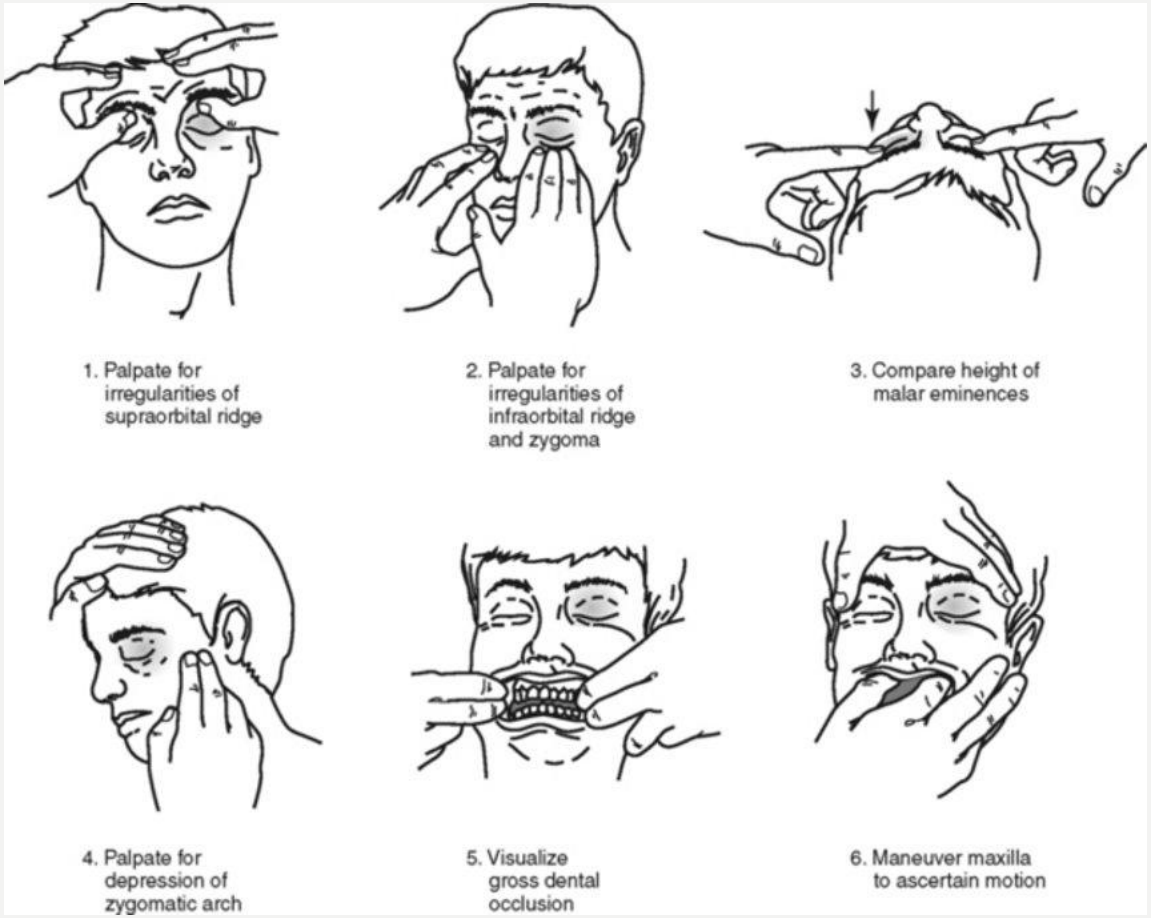
ANATOMICAL STRUCTURES

- Lower third of facial skeleton prominent - more commonly fractured c.t. middle third
- Fracture alone or in combination with other facial fracture
- U shaped bone (> sensitive to lateral impact c.t. frontal impact) look for contralateral fracture
- Articulates with temporal bone at TMJ (condyle safety mechanism/ 'crumple zone')
- Craniomandibular articulation - beware may have head /C-spine injury
- Muscle attachment (e.g bilat #, tongue may drop back obstructing airway)





EXAMINATION



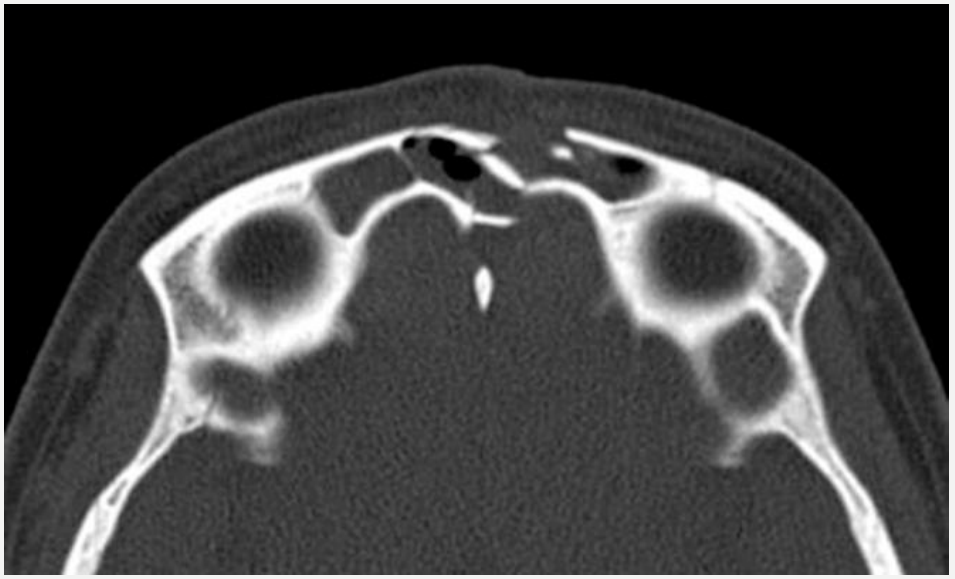
FRONTAL BONE FRACTURES

- Frontal fractures – high energy
- Usually involves the anterior table
- Produces a cosmetic defect



FRONTAL BONE FRACTURES

- Posterior table fractures are less common but more significant as involve the cranial cavity
- Requires joint management by maxillofacial and neurosurgical teams



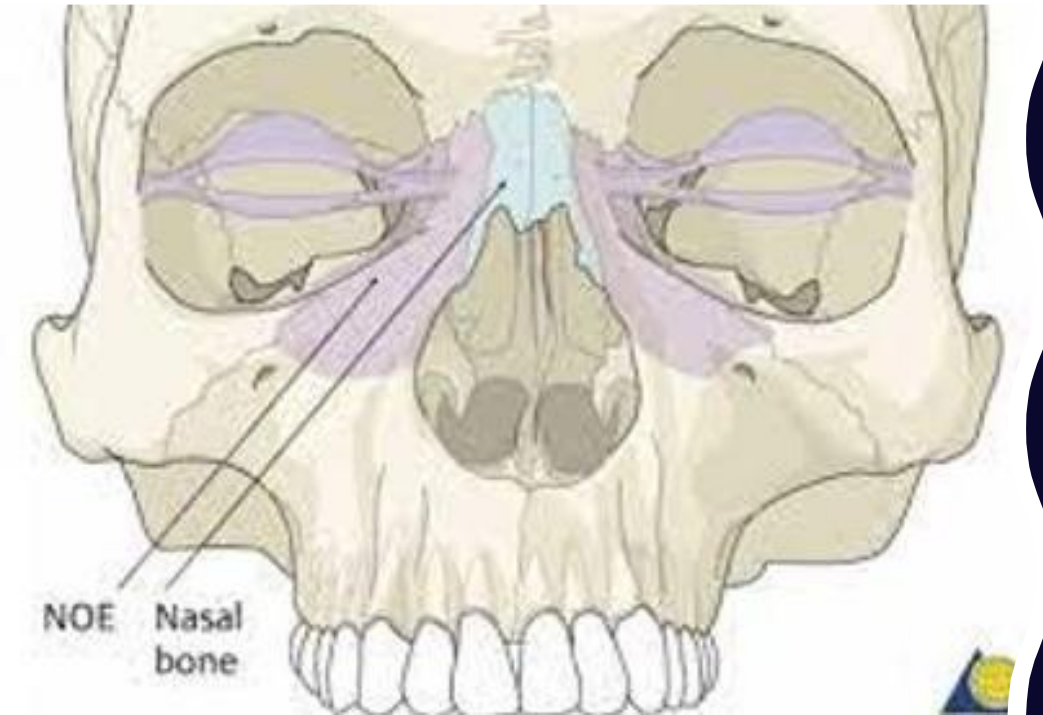


NASAL BONE FRACTURES

- Most common facial fracture (> 50%)
- Main cause is interpersonal violence
- Assess for asymmetry and mobility *clinically*
- Manage epistaxis
- Allow 5-7 days for the oedema to resolve, facilitating precise operative intervention

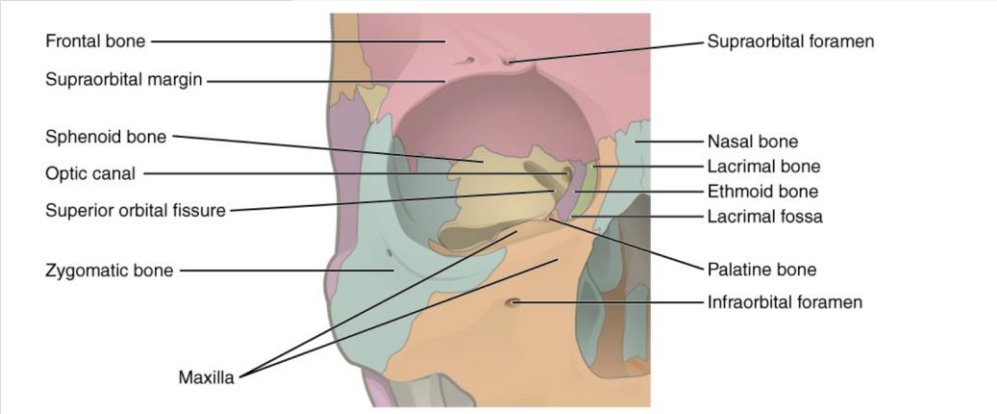






NASO-ORBITAL-ETHMOIDAL FRACTURE

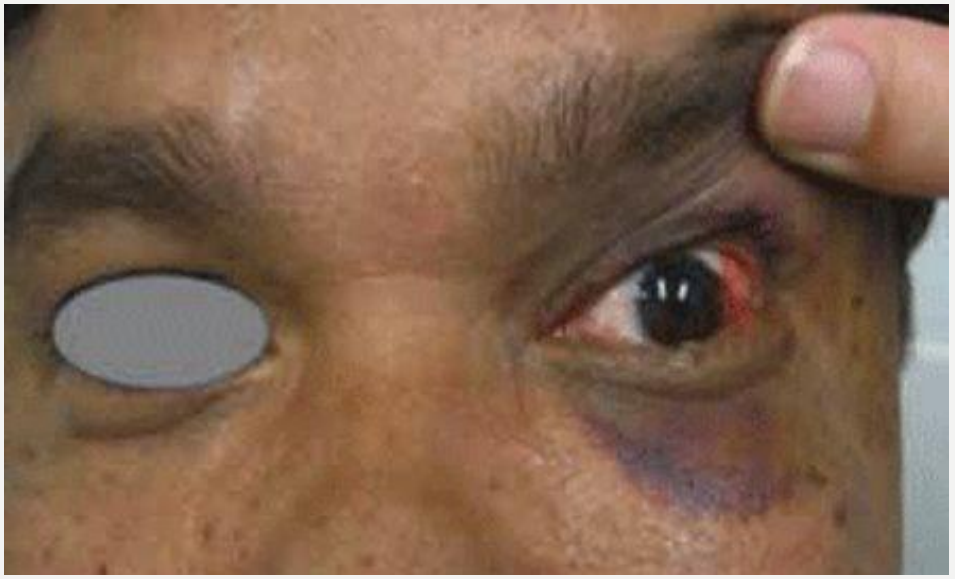
ORBITAL FRACTURE



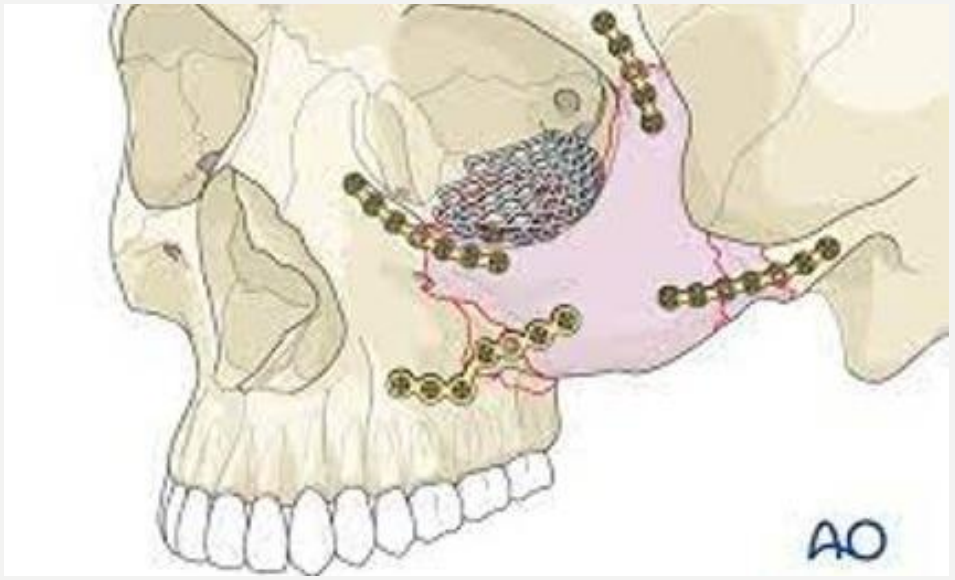
- Medial and inferior walls of the orbital skeleton are exquisitely thin
- Floor and lateral wall commonly involved in zygomatic complex fractures
- Also occur as an isolated injury due to a direct blow to the orbit or orbital rim
- **Assessment of the eye is paramount** when these injuries occur
- Subconjunctival and periorbital haematoma are common
- Diplopia occurs when the orbital muscles and soft tissues are trapped



ZYGOMATIC COMPLEX FRACTURE



OPEN REDUCTION AND INTERNAL FIXATION



ZYGOMATIC FRACTURES

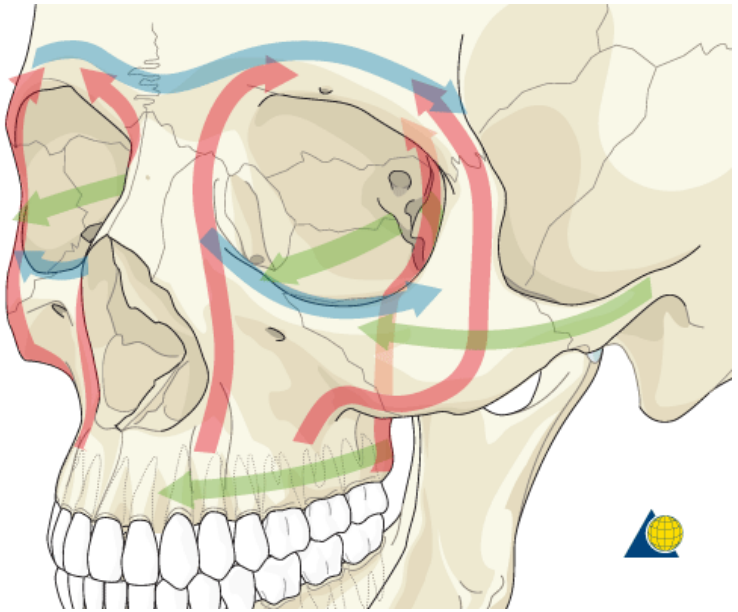
- Periorbital swelling and ecchymoses
- Subconjunctival haemorrhage
- Palpable step at the infraorbital margin or the lateral brow area
- Infraorbital nerve paraesthesia
- Depression of the malar eminence
- Diplopia is common due to orbital involvement – entrapment of extraocular muscles





MIDFACE

- Bony pillars
- Fragility (and prominence)
  - Nasal
  - Maxilla (anterior wall)
  - Zygomatic arch
  - Zygomatic complex
  - Orbit
- Compressible air-filled energy-absorbing crumple zone vs frontal bone



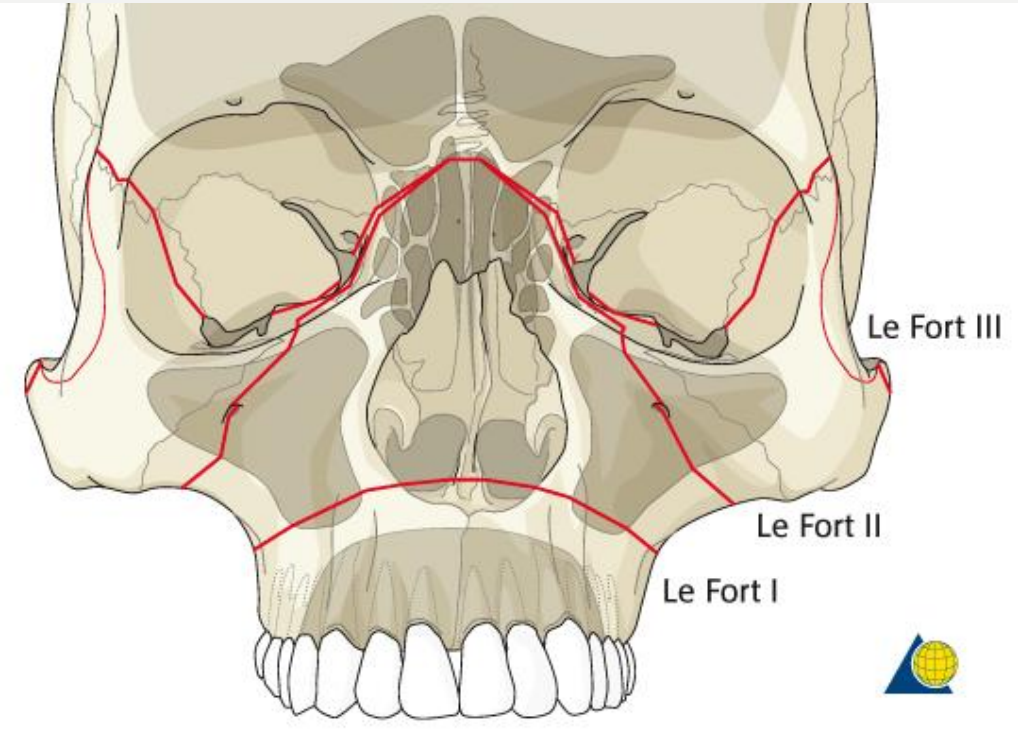




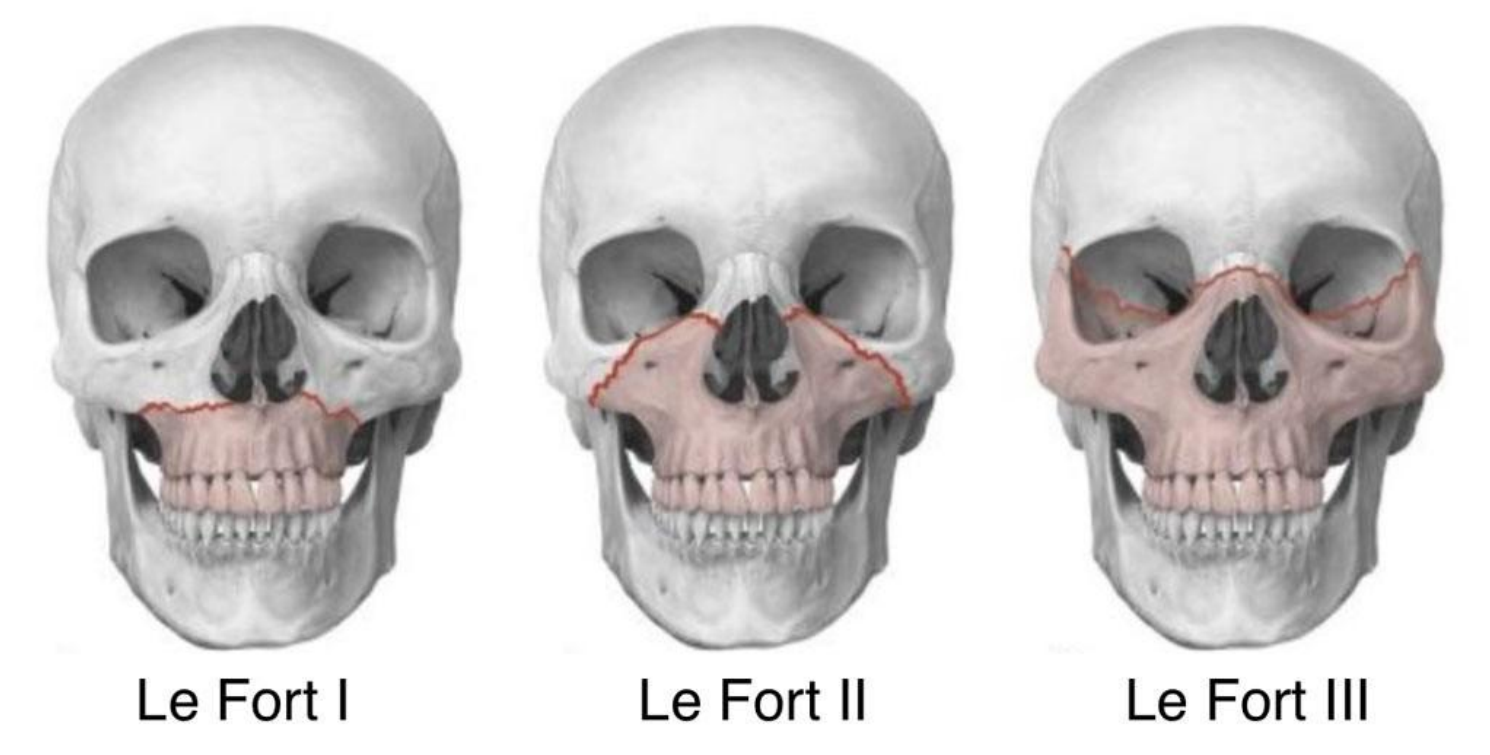
MIDFACE FRACTURES

- Facial swelling with bilateral periorbital haemorrhages (raccoon signs)
- Flattening and elongation of the midface
- Dish face deformity
- Test mobility of the maxilla
- Patients often complain of malocclusion
- Beware airway obstruction

LE FORT FRACTURES



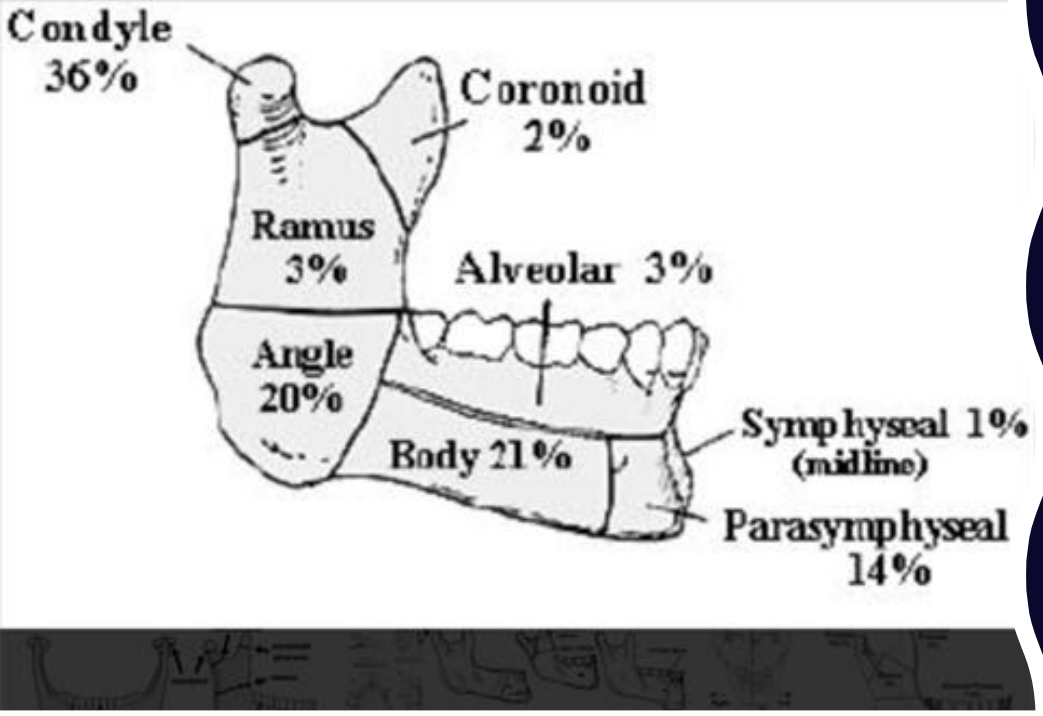
LE FORT FRACTURES



FRACTURE MANDIBLE

AO Classification

F	NO. OF FRACTURE OR FRAGMENTS
L	LOCATION OF THE FRACTURE
O	STATUS OF OCCLUSION
S	SOFT TISSUE INVOLVEMENT
A	ASSOCIATED FRACTURES





SITES OF FRACTURE MANDIBLE

- Condyle (intra/ extracap, high neck/ low condyle)
- Angle
- Body
- Parasymphysis
- Symphysis
- Ramus
- Coronoid
- Alveolus

FRACTURE MANDIBLE

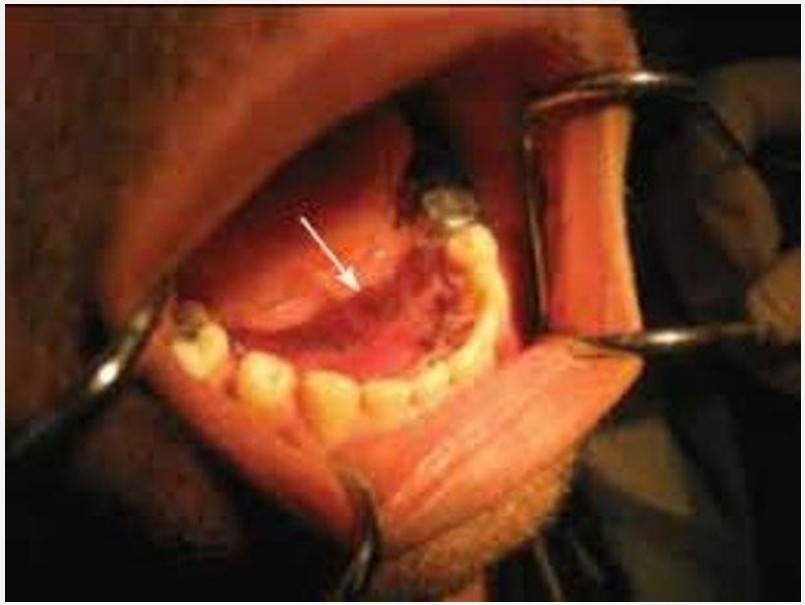
- Pain
- Swelling
- Limited mouth opening
- Mental paraesthesia
- Deviation of mandible (condyle #)
- Malocclusion
- Step deformity
- Mobility at site (+/- missing or mobile teeth)
- Haematoma (lingual haematoma pathognamonic)





FRACTURE MANDIBLE

LINGUAL HAEMATOMA

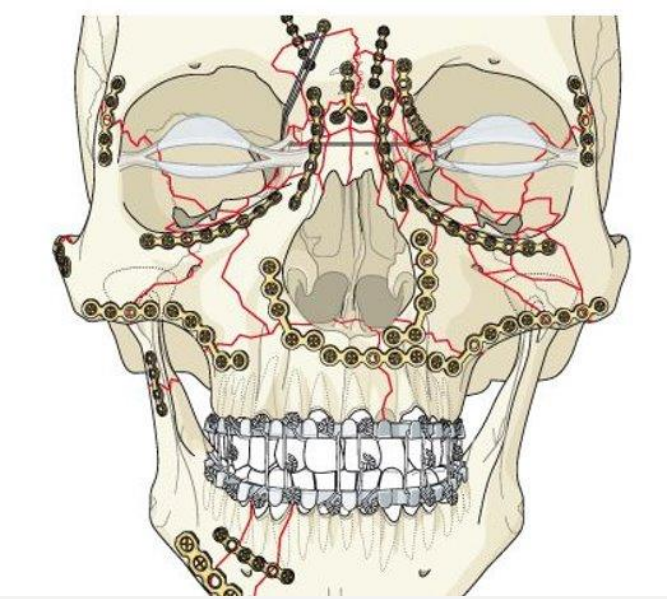


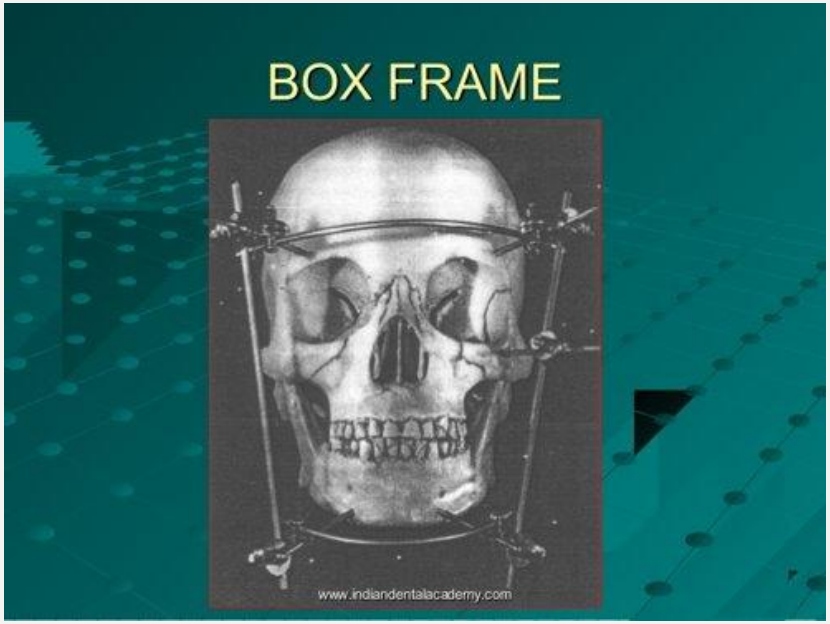
MALOCCLUSION



TREATMENT

- **Reduction** – realignment of bone ends
- Open versus closed reduction
- **Immobilization** – to allow the healing process
- Internal fixation versus external fixation







OPEN REDUCTION AND INTERNAL FIXATION

Mini-plate

More expensive

Intra or extraoral approach

Periosteal stripping disturbs vascular envelope

Direct visualisation and reduction of fracture

Earlier return to normal function

Better nutrition

Better oral hygiene



CLOSED REDUCTION

IMF screws, arch bars, Eyelet wires, bonded brackets

Less expensive

Does not traumatize vascular envelope

Period of immobilization (difficulty eating/weight loss)

Requires intact dentition

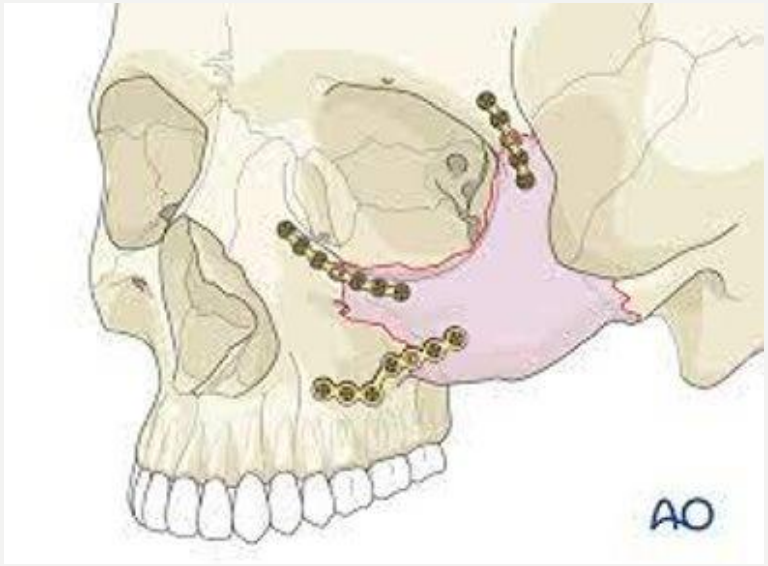
Requires patient compliance

Risk damage to roots

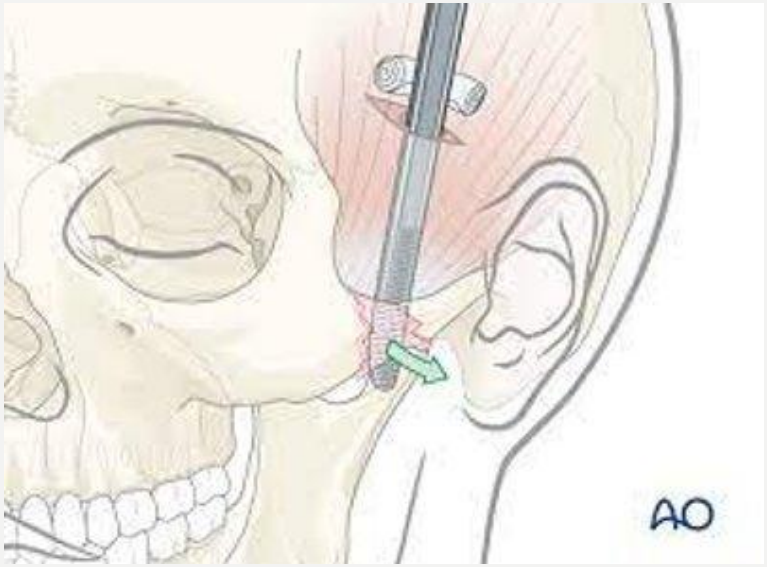
Gingivae inflammation/ poor oral hygiene

ZYGOMATIC FRACTURES

OPEN REDUCTION

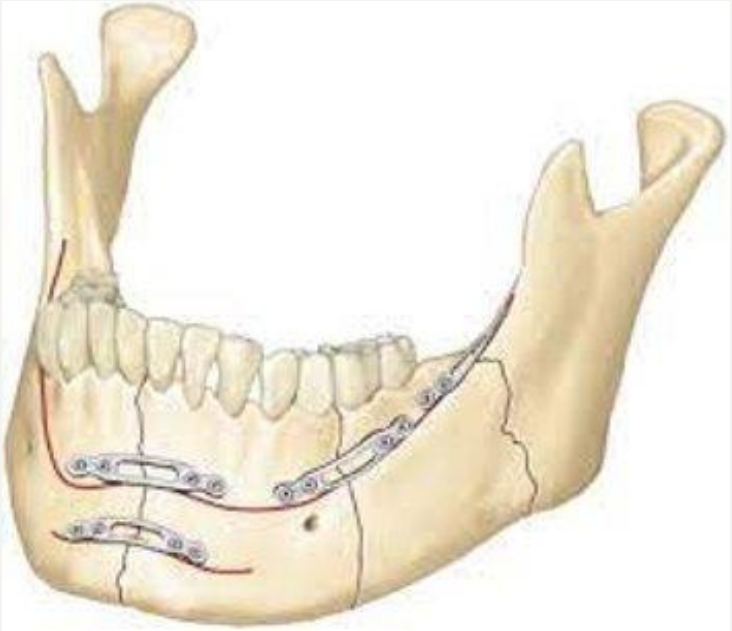


CLOSED REDUCTION

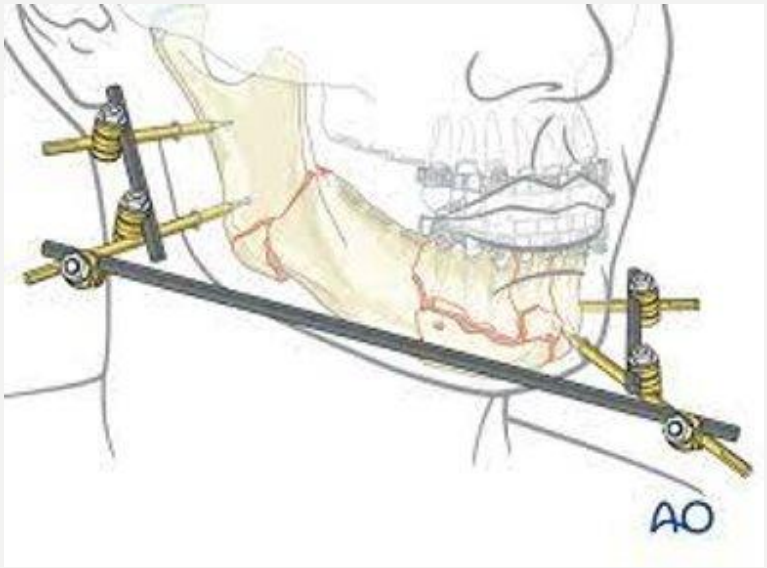


IMMOBILIZATION OF FRACTURE

INTERNAL FIXATION

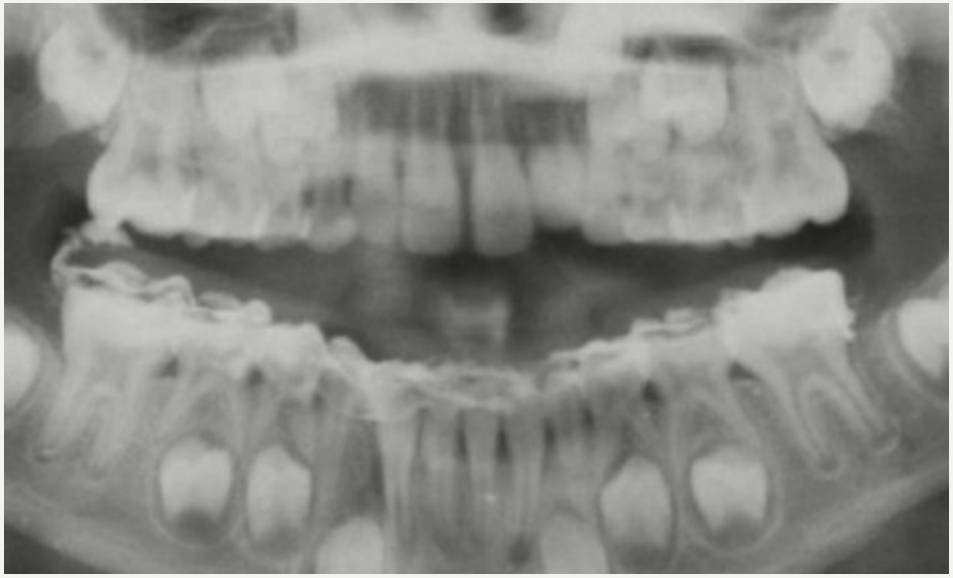


EXTERNAL FIXATION



PAEDIATRIC MANDIBULAR FRACTURES

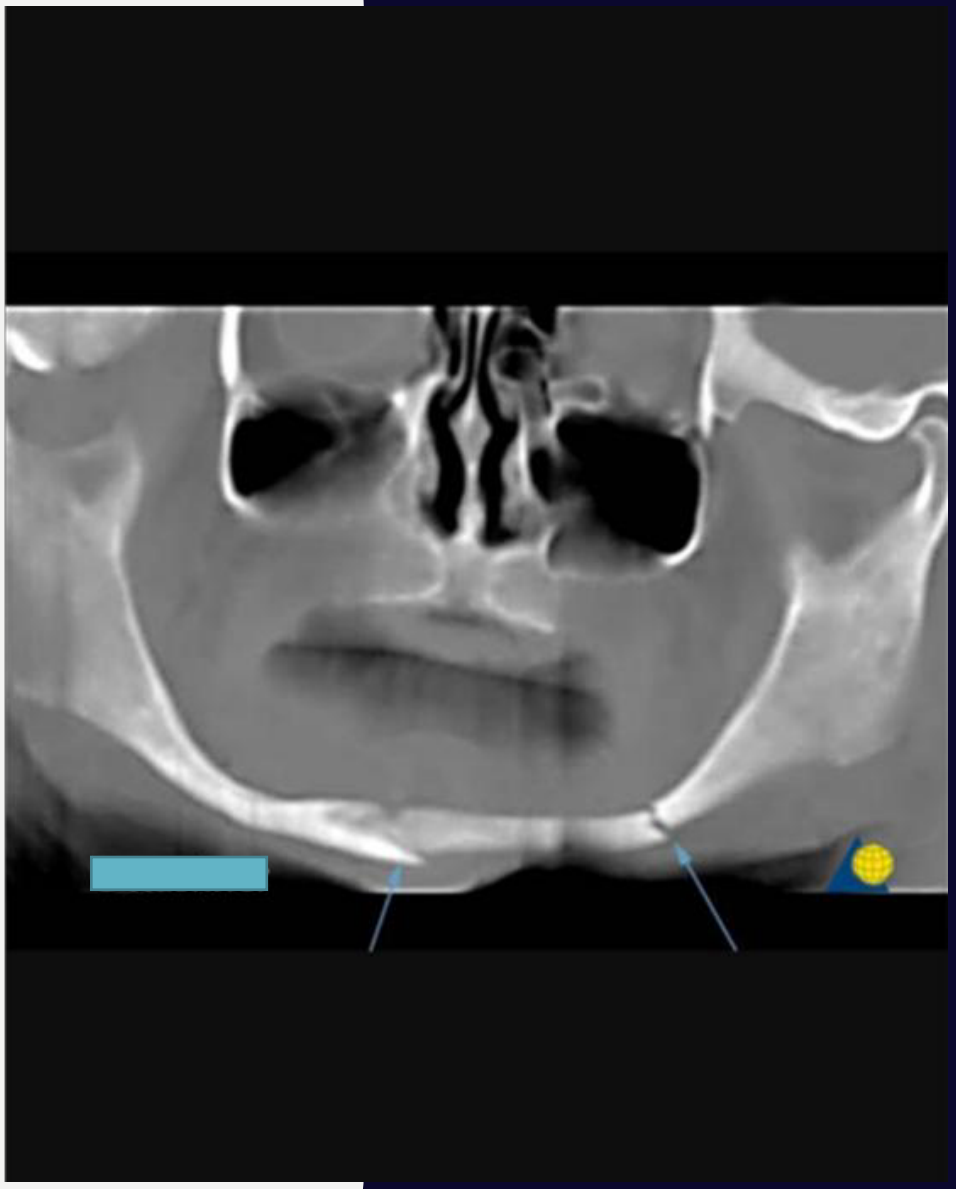
- Bony growth centres and developing tooth buds
- Restoration of mandibular continuity important for function and future craniofacial development
- Conservative management if minimally displaced
- TMJ - growth centre in children so beware of late sequelae (ankylosis)





EDENTULOUS MANDIBLE

- Atrophy of the mandible, which becomes less resistant to traumatic forces
- Individuals with systemic co-morbidities
- Poor healing (fibrous/non-union)
- Poor bone stock



BONE HEALING

HEALING TAKES 4-6 WEEKS OR LONGER FOR LARGE BONES AND ELDERLY PATIENTS

REPAIR OF FRACTURES

1. Formation of haematoma

2. Fibrocartilage callus (mass of connective repair tissue) - splinting the break

3. Bony callus replaces the fibrocartilage callus

4. Bone remodelling in response to mechanical stress – healed fracture

POSTOPERATIVE CARE

- Soft diet important in patients who have undergone open reduction internal fixation
- Patients placed in intermaxillary fixation need to be advised about nutritional issues and oral hygiene instructions
- Postoperative radiographs and clinical assessment to check for - fracture healing
  - fracture segment alignment and status of occlusion

MAXILLOFACIAL TRAUMA

- Mechanism of injury important in history taking
- Patterns of injury from type of mechanism deployed
- Injury prevention as part of continuum of care – mouthguard, helmets.

ACKNOWLEDGEMENT

All images are available online