“MID FACE FRACTURES”

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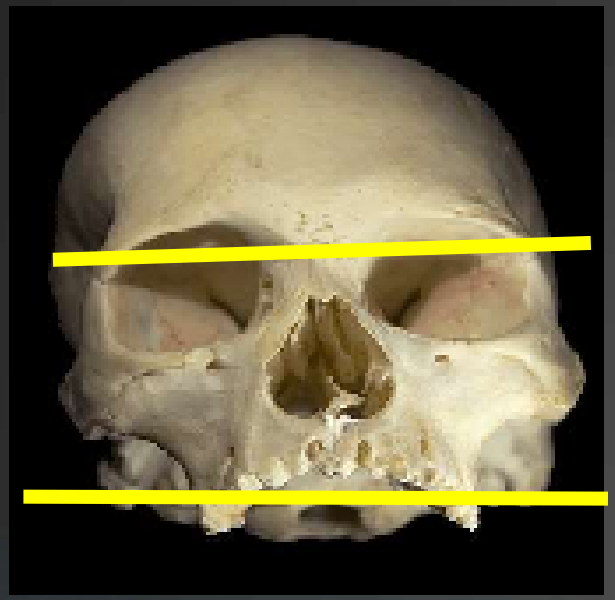
INTRODUCTION

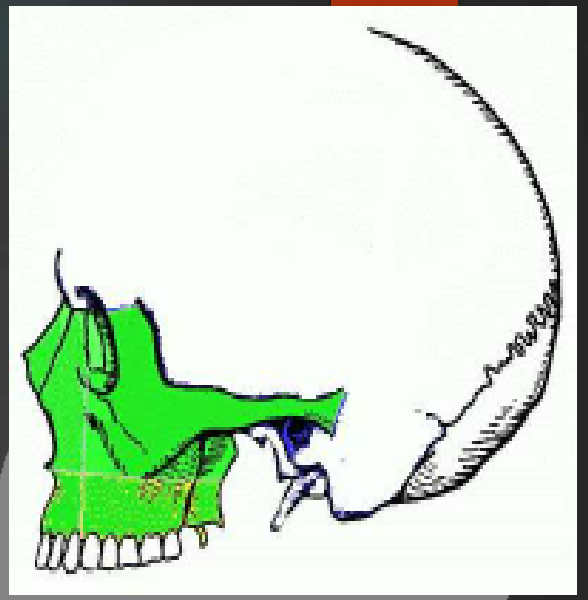
- Face is intimately related to self image.
- Facial features depend upon underlying bony frame work.
- The maxillofacial region has special importance because of its proximity to the all important brain-case as well as respiratory passages.
- The maxilla represents the bridge between the cranial base superiorly and the dentition inferiorly.
- Its intimate association with the oral cavity, nasal cavity, and orbits and the important structures adjacent to it make the maxilla a functionally and cosmetically important structure.
- It is a region responsible for senses like vision, smell, hearing and taste and resonance of voice.

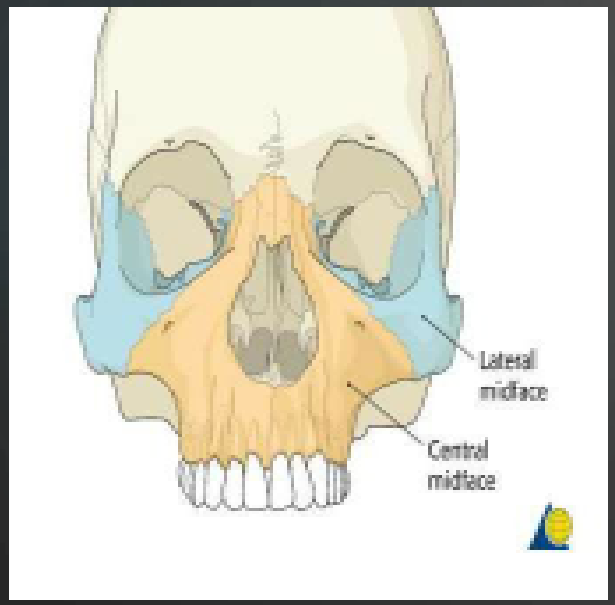
- Fracture of these bones is potentially life-threatening as well as disfiguring.
- Hence we being maxillofacial surgeons need to do systematic and timely repair of these fractures to correct deformity and prevent unfavorable sequalae.
- To reconstruct the facefollowing trauma is highly demanding and requires uncompromising care.

WHAT IS MID FACE??



- Area between a superior plane drawn through the zygomaticofrontal sutures tangential to the base of the skull and an inferior plane at the level of the maxillary dental occlusal surfaces.
- These planes do not parallel each other but converge posteriorly at a level approximating that of the foramen magnum
- Triangular region with its widest dimension facing anteriorly.

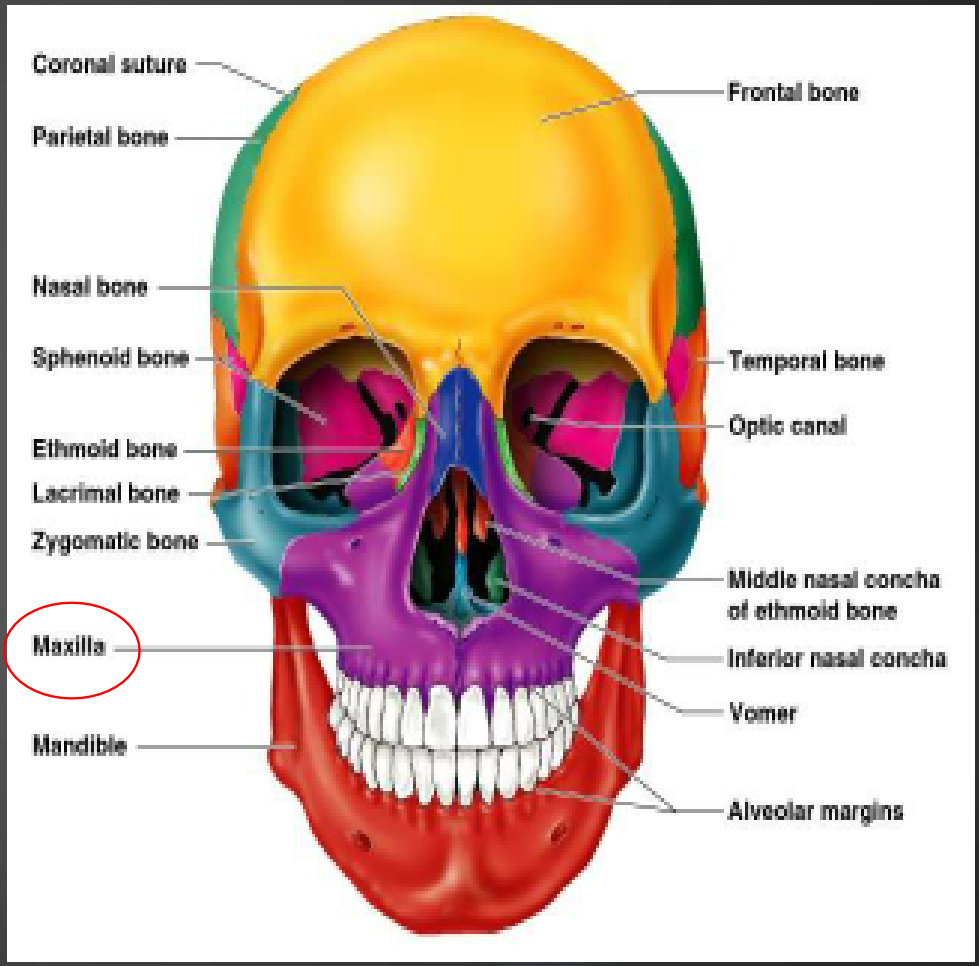


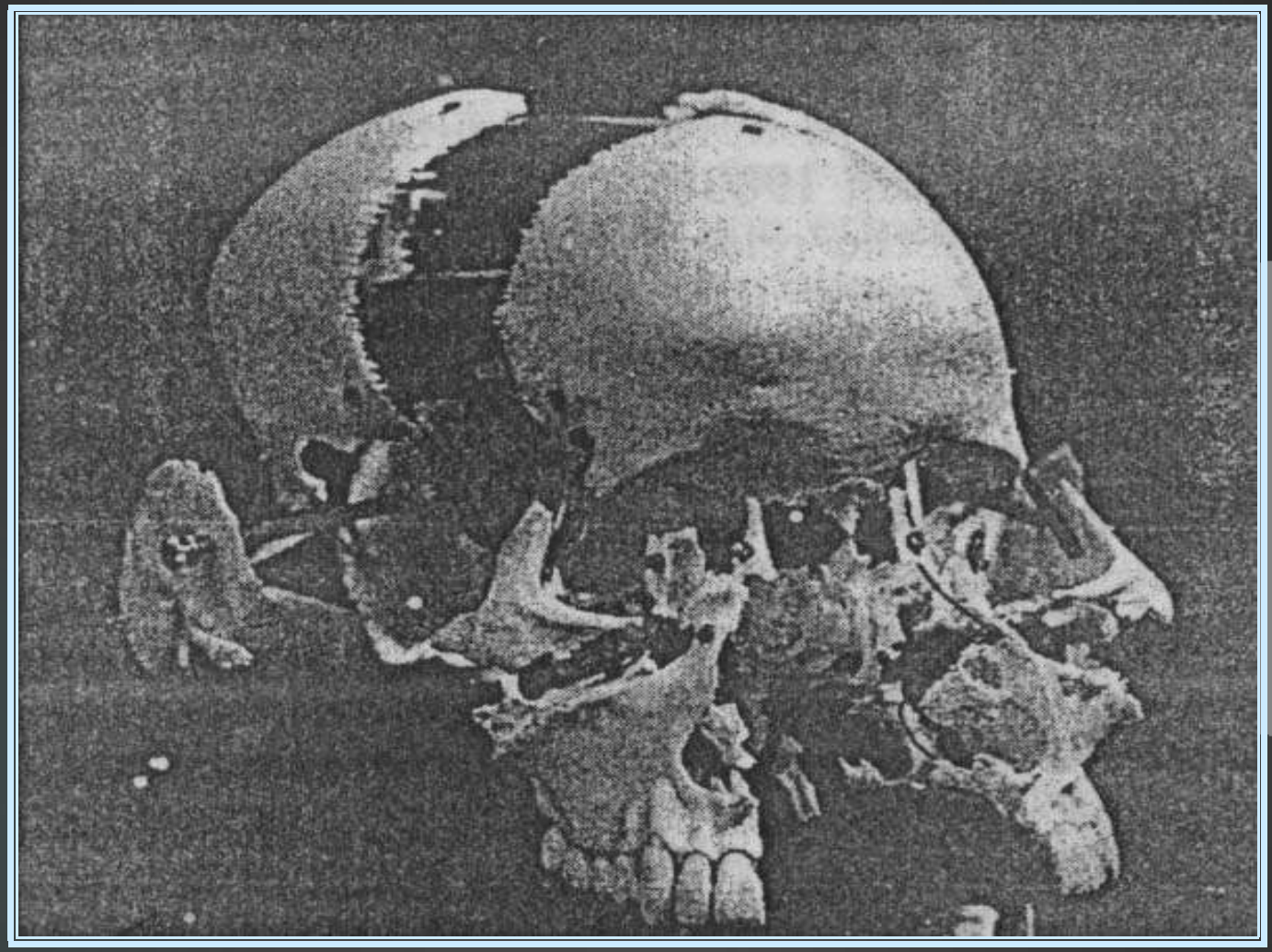


BONES OF MIDFACE :

(17 BONES)

Paired Bones	Unpaired Bones
Maxilla	Vomer
Zygomatic bone	Ethmoid
Zygomatic process of temporal bone	Sphenoid (Pterygoid plates)
Palatine bone	
Nasal bone	
Lacrimal bone	
Inferior conchae	





Anatomical specimen showing the disarticulated bones of the skull exploded and mounted to demonstrate their complex interrelationship.

MECHANISM OF MIDFACE FRACTURE :

- These facial bones in isolation are comparatively fragile but gain strength and support as they articulate with each other.
- It is this strength gained from each other that has been described as the facial buttress by Manson.

- **Area of strength**
  - Vertical and horizontal pillars
  - Muscular attachment
- **Area of weakness**
  - Sutures
  - Lining tissues and air-filled cavities

Vertical buttress:

- nasomaxillary
- zygomaticomaxillary
- pterygomaxillary

Horizontal buttress:

- frontal bar(supra orbital rims)
- infra orbital rims
- maxillary palate

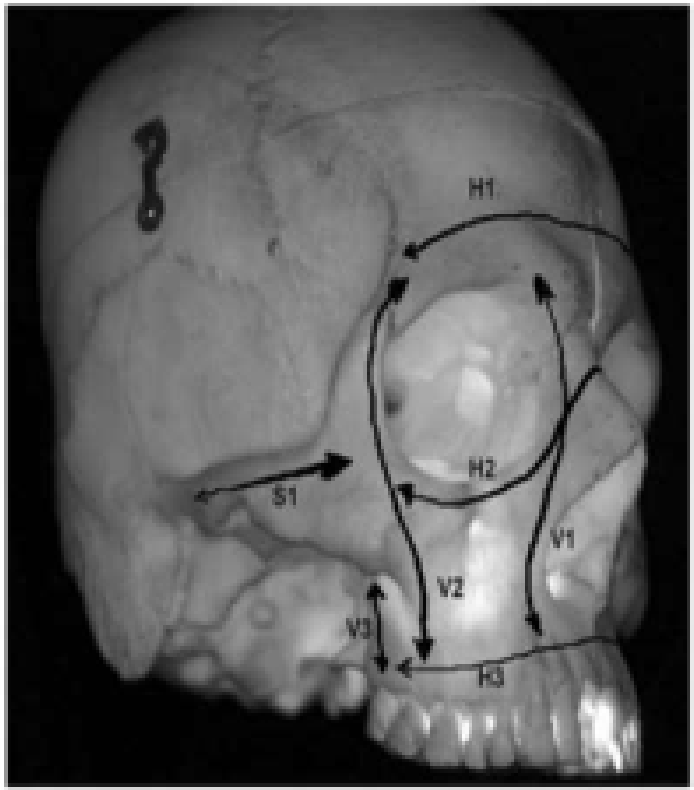


Figure 1 Transilluminated skull demonstrating air-filled sinuses within the midface, reinforced by dense skeletal buttresses. The vertical pillars, i.e., the medial or nasomaxillary buttress (V_1), lateral or zygomaticomaxillary buttress (V_2), and posterior or pterygomaxillary buttresses (V_3), dissipate forces directed toward the cranial base. The horizontal buttresses are oriented along the supraorbital rims (H_1), infraorbital rims (H_2), and dentoalveolar process and palate (H_3), providing further structural support to the functional spaces of the eyes, nose, and mouth. The zygomatic arches provide the only sagittal buttresses (S_1).

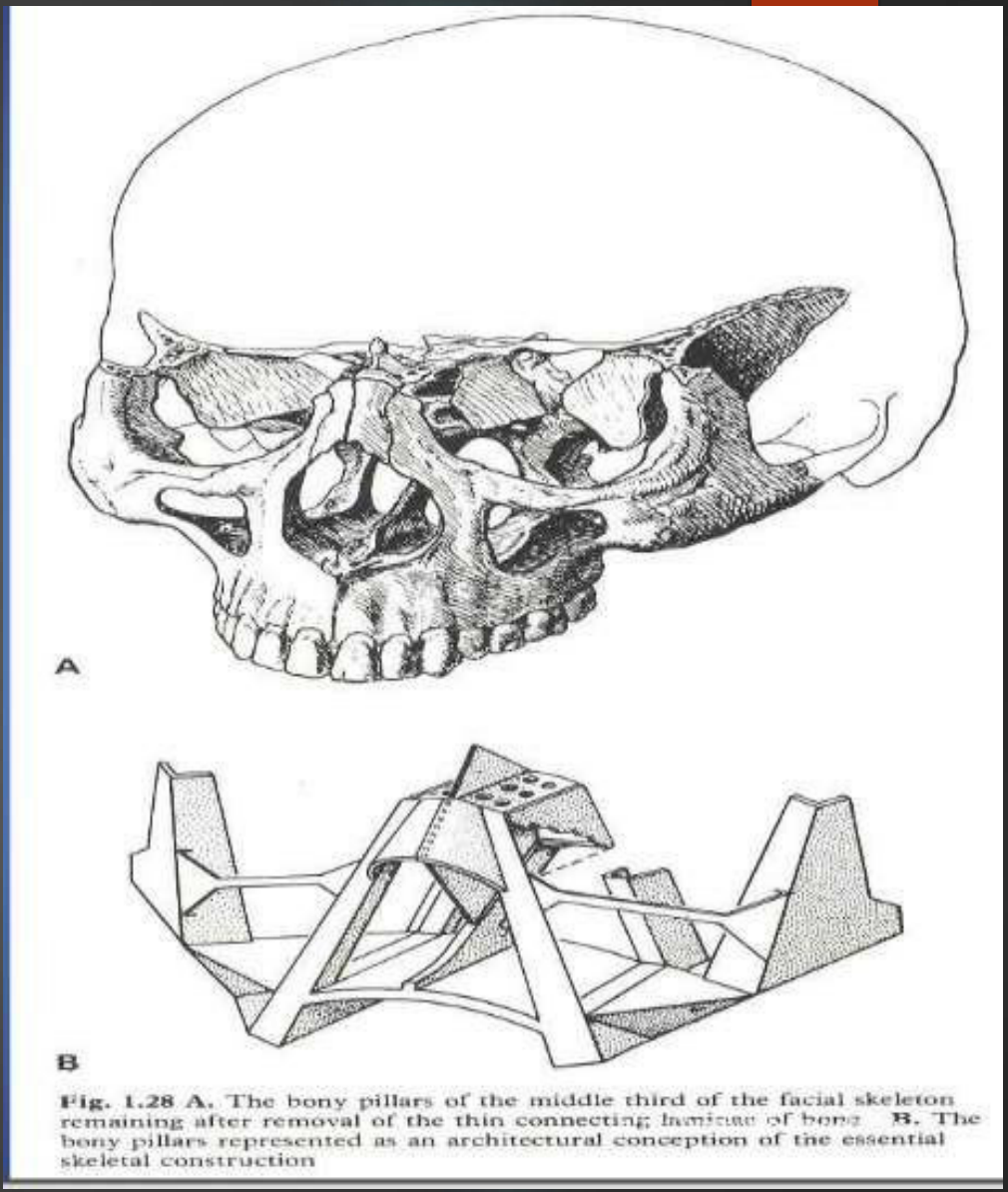
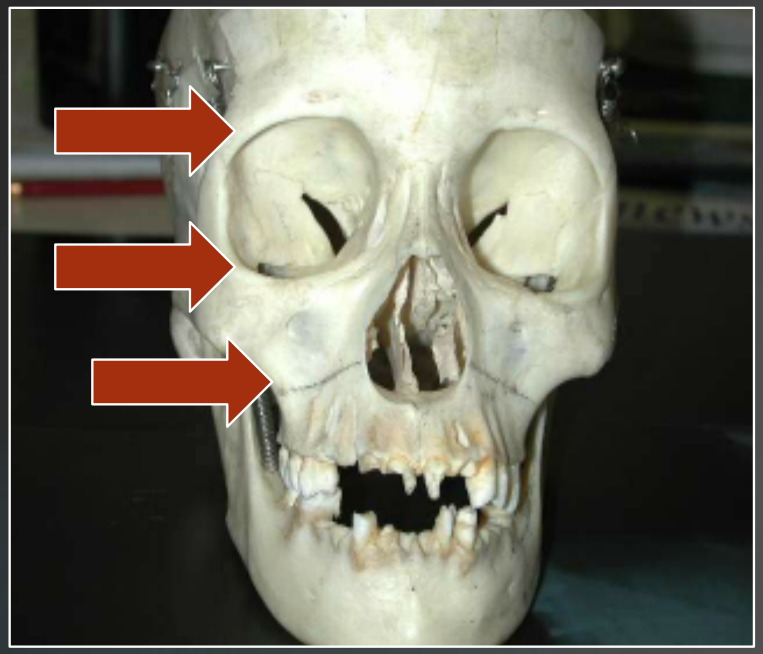


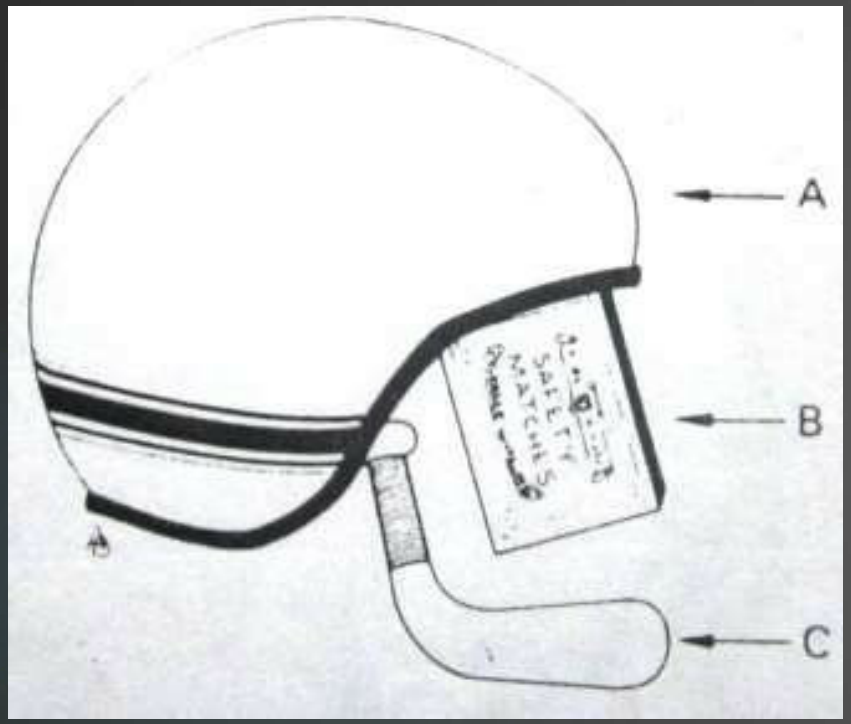
Fig. 1.28 A. The bony pillars of the middle third of the facial skeleton remaining after removal of the thin connecting laminae of bone. **B.** The bony pillars represented as an architectural conception of the essential skeletal construction



Vertical and horizontal pillars:

Midface is
forces in **inferior superior directions.** Poorly constructed to withstand **lateral and frontal forces.**

ANATOMICAL CONSIDERATIONS:

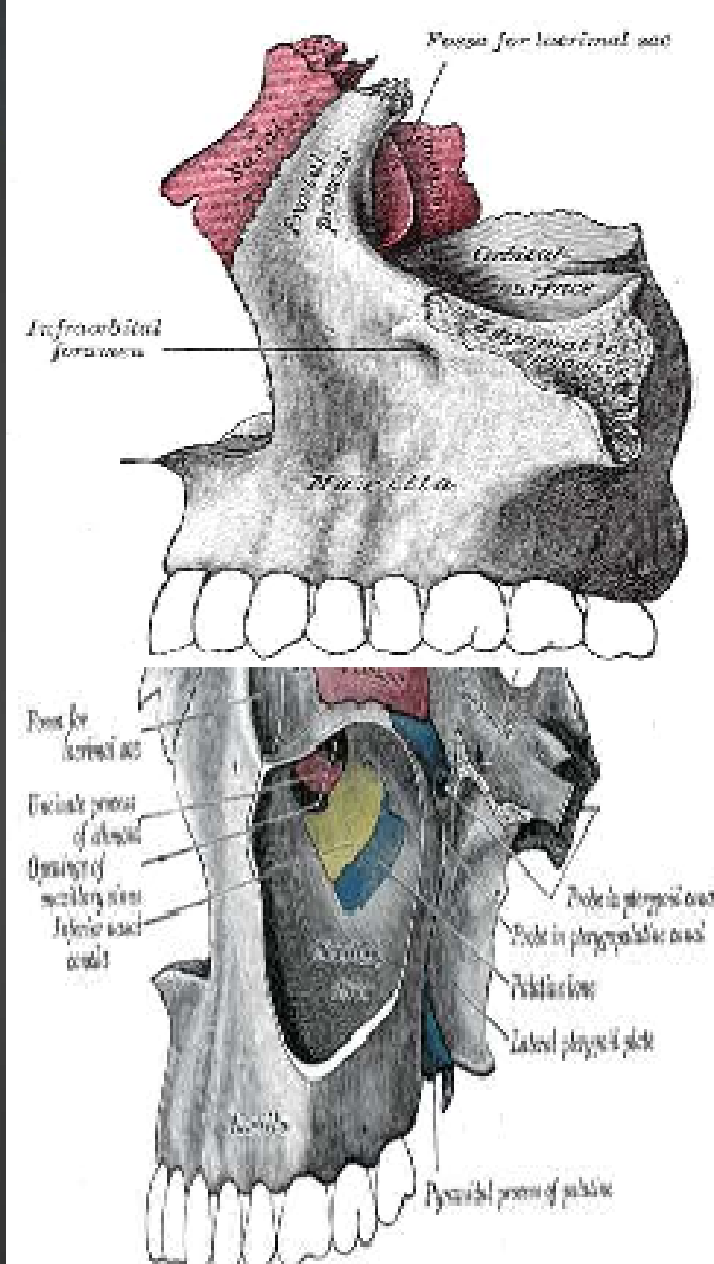


- This structure is analogous to a matchbox sitting below and anterior to hard shell containing brain
- Act as cushion for trauma directed towards cranium from anterior or antero- lateral direction

MAXILLA

- The maxilla consists of a central body and four processes namely the frontal, zygomatic, alveolar and palatine process. The body is hollowed out and contains the maxillary sinus.
- It is pyramidal shaped with the base being the medial surface facing the nasal cavity and the apex being elongated into the zygomatic process. It has an orbital or superior surface which forms the floor and rim of the orbit, a malar or anterolateral surface which forms part of the cheek and a posterolateral or infratemporal surface which contributes to the infratemporal fossa. The base is rimmed inferiorly by the alveolar process.

- The **alveolar process** houses the dental arch with the sockets varying in size according to the teeth. The palatine process is a horizontal process and medially articulates with the palatine process of the opposite maxilla which posteriorly it articulates with the horizontal plate of the palatine bone.
- The **zygomatic process** is an extension of the anterolateral surface of the body which contributes to the zygomaticomaxillary suture.
- The **frontal process** projects upward to articulate with the maxillary process of the frontal bone as well as the nasal bone anteriorly and the lacrimal bone posteriorly.
- It encloses a cavity **maxillary sinus**.

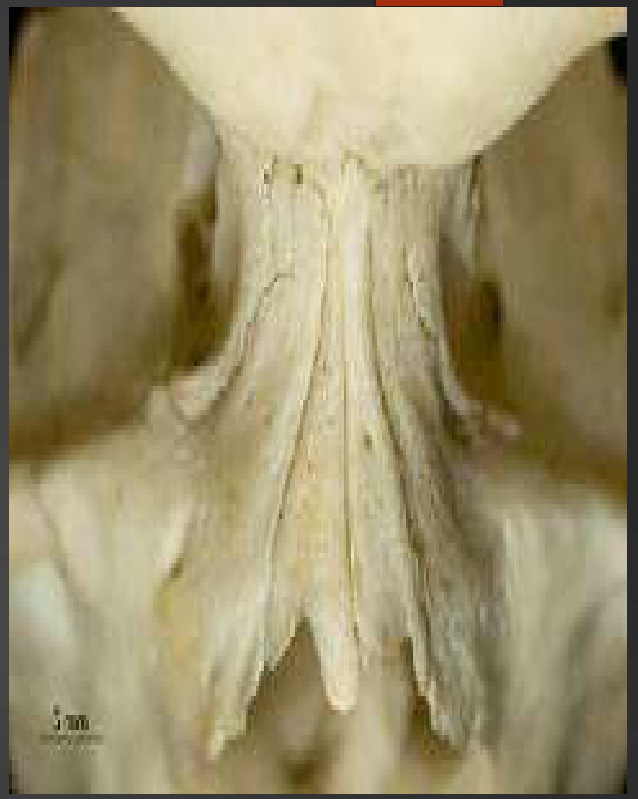


ZYGOMA

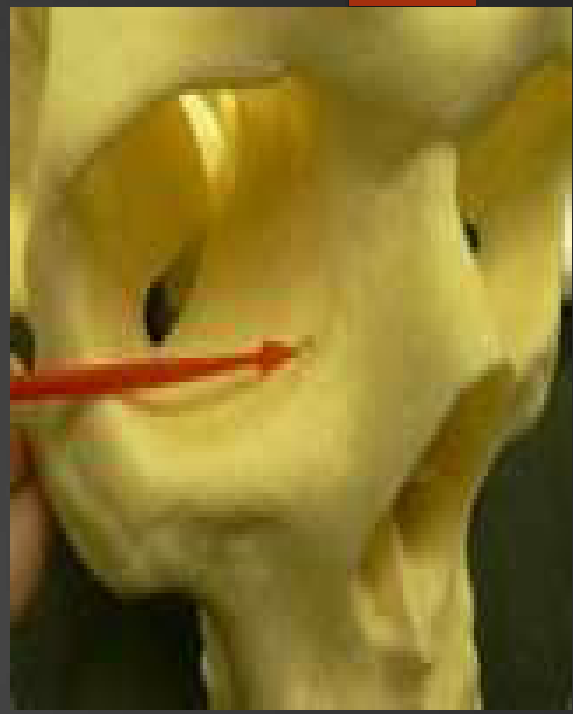
- The name zygoma is derived from the word meaning a yoke (i. e. a structure that connects various parts together).
- It is often described as a diamond or pyramidal shaped bone
- The posterior surface contributes to the temporal fossa.
- Projecting superiorly is the frontal process which articulates with the zygomatic process of the frontal bone in front and greater wing of sphenoid behind to form the lateral wall and rim of the orbit.
- Posterolaterally the temporal process articulates with the zygomatic process of the temporal bone to form the zygomatic arch.
- Inferiorly and it broadly articulates with the maxilla to form the inferior orbital rim and contributes to the orbital floor as well as the zygomaticomaxillary buttress

NASAL BONES

The paired quadrilateral bones form the upper part of the bridge of the nose and articulate with the frontal process of the maxilla laterally and with each other in the midline. Superiorly they articulate with the frontal bone.



LACRIMAL BONES



- Each lacrimal bone is irregularly rectangular forming part of the medial wall of the orbit.
- They articulate posteriorly with the paper thin (lamina papyracea) part of the ethmoid, superiorly with the frontal bone and inferiorly with the body of the maxilla.
- The sharp orbital vertical lacrimal crest continues inferiorly to form the lacrimal hamulus, with its concave portion housing the lacrimal sac.

HISTORY :

- The first clinical examination of a maxillary fracture was recorded in 2500 BC.
- In 1822 Charles Fredrick William Reiche provided the first detailed description of maxillary fractures.
- In 1823 Carl Ferdinand van Graefe described the use of a head frame for treating a maxillary fracture.

HISTORY:

- In 1901 , Rene Le Fort published his landmark work, a three-part experiment using

  32 cadavers.

- The heads of the cadavers were subjected to low velocity forces; the soft

  tissue were then removed and the bones were examined.

HISTORY

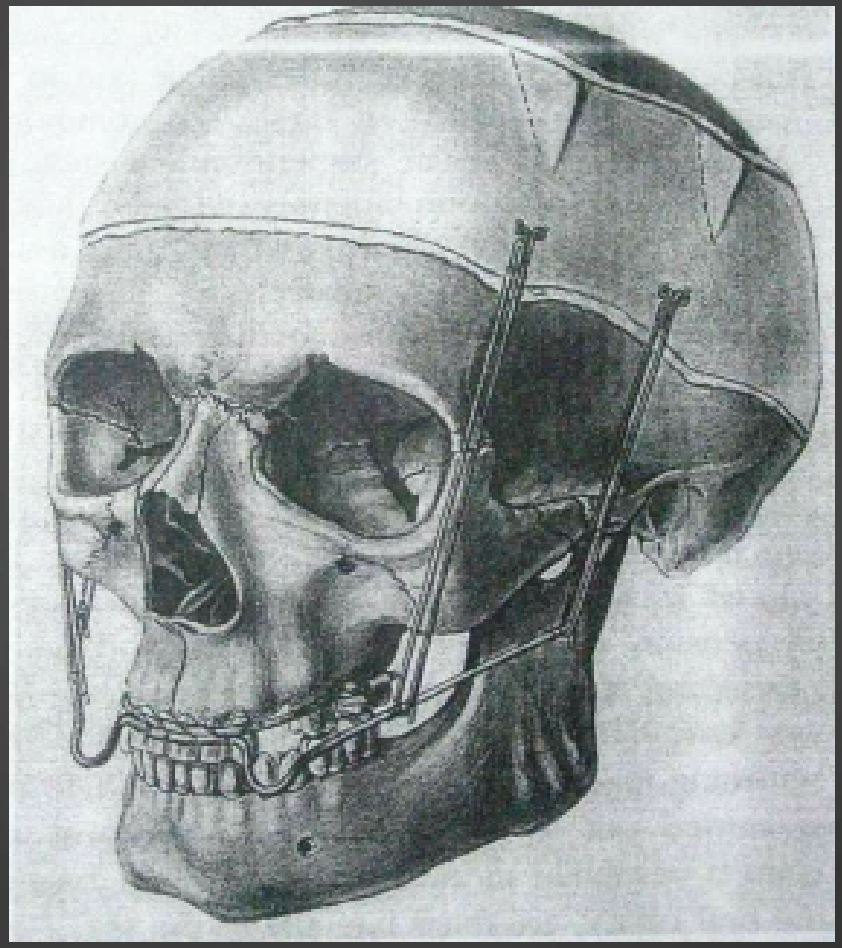
- Le Fort noted that generally face was fractured and the skull was not. He then stated

  that fractures occurred through three weak lines in the facial bony structure. From

  these three lines the Le Fort classification system was developed.

External Fixation

Craniomaxillary fixation- Wassmund's(1927) maxillary splint with side bars attached to a head cap



ETIOLOGY:

- Assault
- RTA
- Alcohol and Drug abuse
- Gunshot wounds
- Sports
- Falls
- Industrial accidents

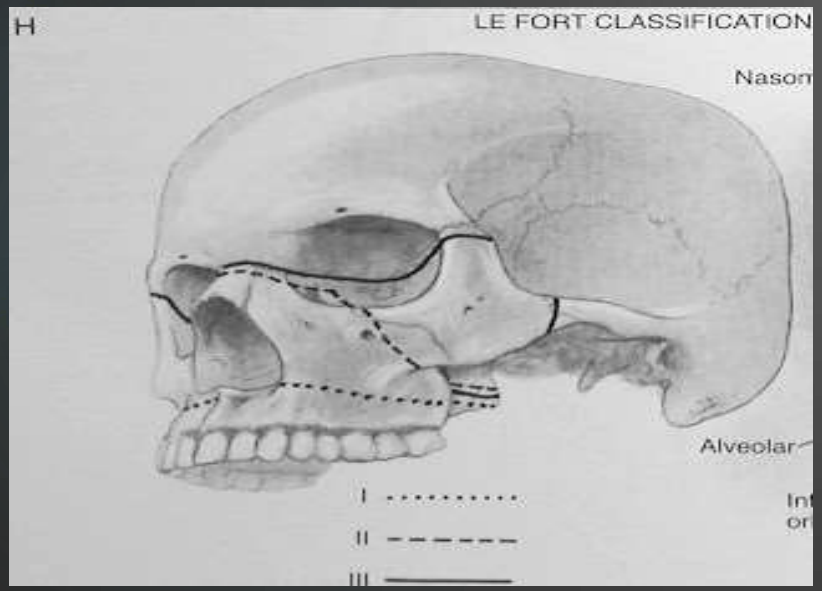
Classification

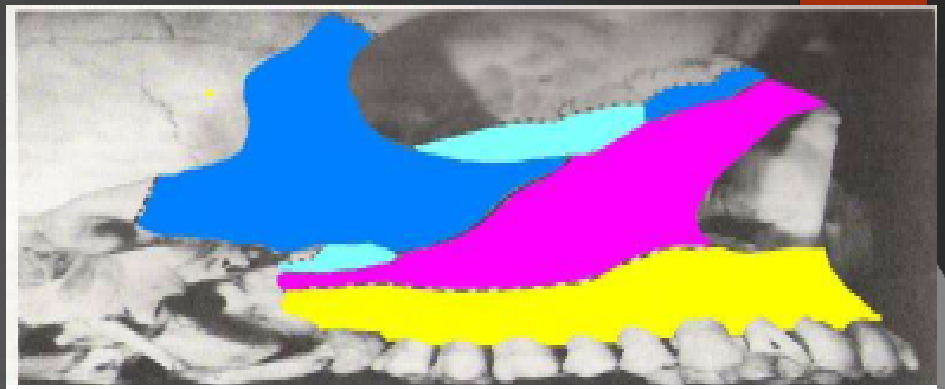
1. ALPHONSO GUERIN(1886)
2. RENE LE FORT FRACTURE CLASSIFICATION (1901)
3. ROWE AND WILLIAM CLASSIFICATION (1985)
4. MODIFIED LE FORT CLASSIFICATION (MARCIANI,1993)
5. ERICH'S CLASSIFICATION (1942)

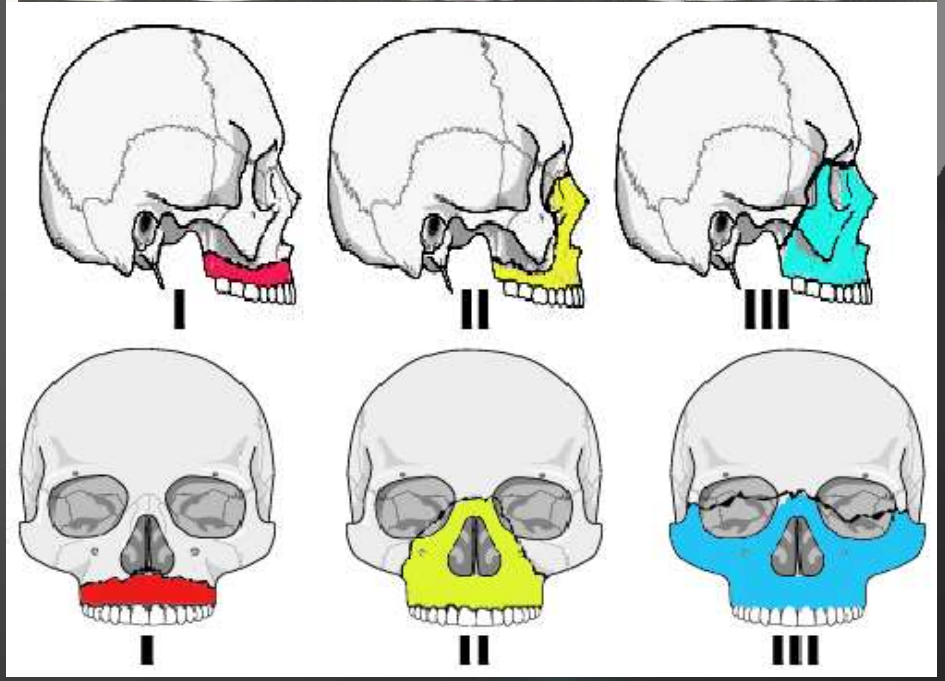
1) Rene Le Fort classification (1901):

Le Fort classification:

- •Le Fort I
- •Le Fort II
- •Le Fort III







3. Rowe & william's classification :

- A – FRACTURES NOT INVOLVING DENTOALVEOLAR COMPONENTS

1. Central region

a- fracture of nasal bone &/or nasal septum

- lateral nasal injuries
- anterior nasal injuries

b. fractures of frontal process of maxilla

c. fractures of type a & b which extend into ethmoid bone

d. fractures of type a ,b ,c which extends into frontal bone

2. Lateral region-

Fractures involving zygomatic bone,arch & maxilla excluding dentoalveolar component

- B –FRACTURES INVOLVING DENTOALVEOLAR COMPONENT

1. Central region
   - a-dentoalveolar fractures
   - b-lefort I (subzygomatic fractures)

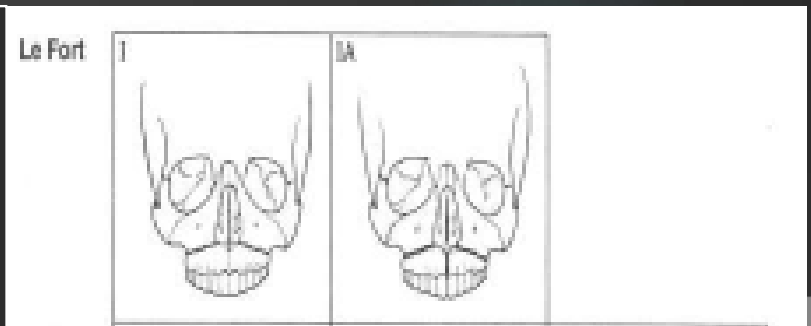
2. Combined central & lateral region
   - a-high level
   - b-LeFort III with midline split
   - c-LeFort III with midline split + fracture of roof of orbit or frontal bone

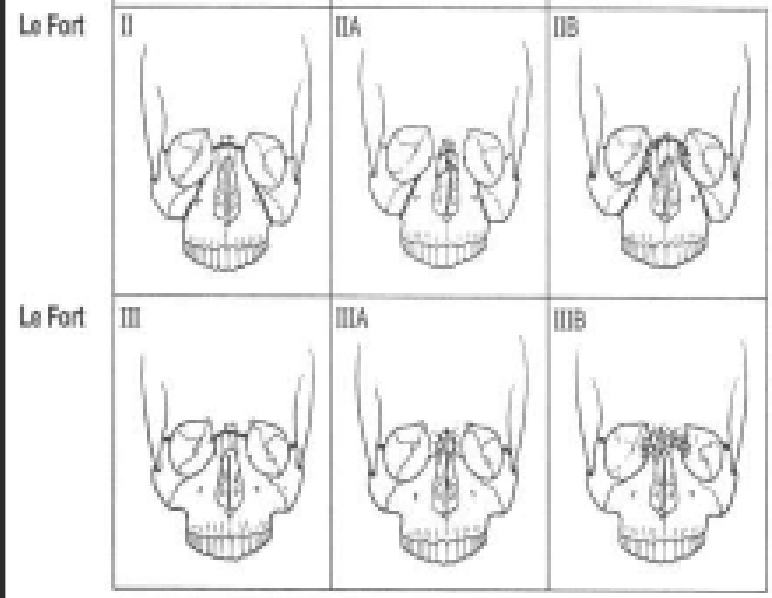
Limitations of the lefort classification

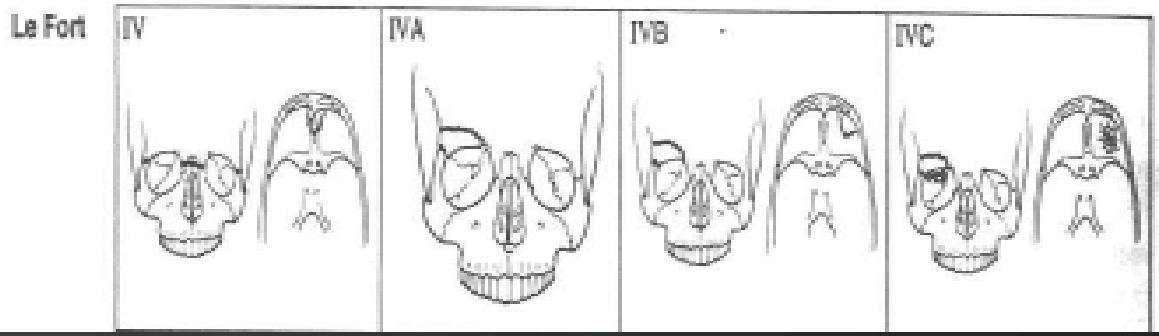
- The LeFort classification has proven to be less satisfactory to describe more complex fracture patterns, comminuted, incomplete, combination maxillary fractures or to describe fractures of the part bearing the occlusal segment.

2) Marciani modification of Le Fort:

- LE FORT I: LOW MAXILLARY FRACTURE
  - Le Fort I (a)Le fort I -multiple segment
- LE FORT II:PYRAMIDAL FRACTURE
  - Le Fort II (a) : le fort II + nasal
  - Le Fort II (b) : le fort II (a) + ethmoid
- LE FORT III: CRANIOFACIAL DYSJUNSTION
  - Le Fort III (a) : Le Fort III + nasal fracture
  - Le Fort III (b) : Le Fort III (a) + ethmoid
- LE FORT IV: LE FORT II OR LE FORT III WITH CRANIAL BASE
  - *Le Fort IV (a) :* Le Fort IV with supraorbital rim
  - *Le Fort IV (b) :* Le Fort IV + anterior cranial base
  - *Le Fort IV (c) :* Le Fort IV (b) + le fort IV(a)







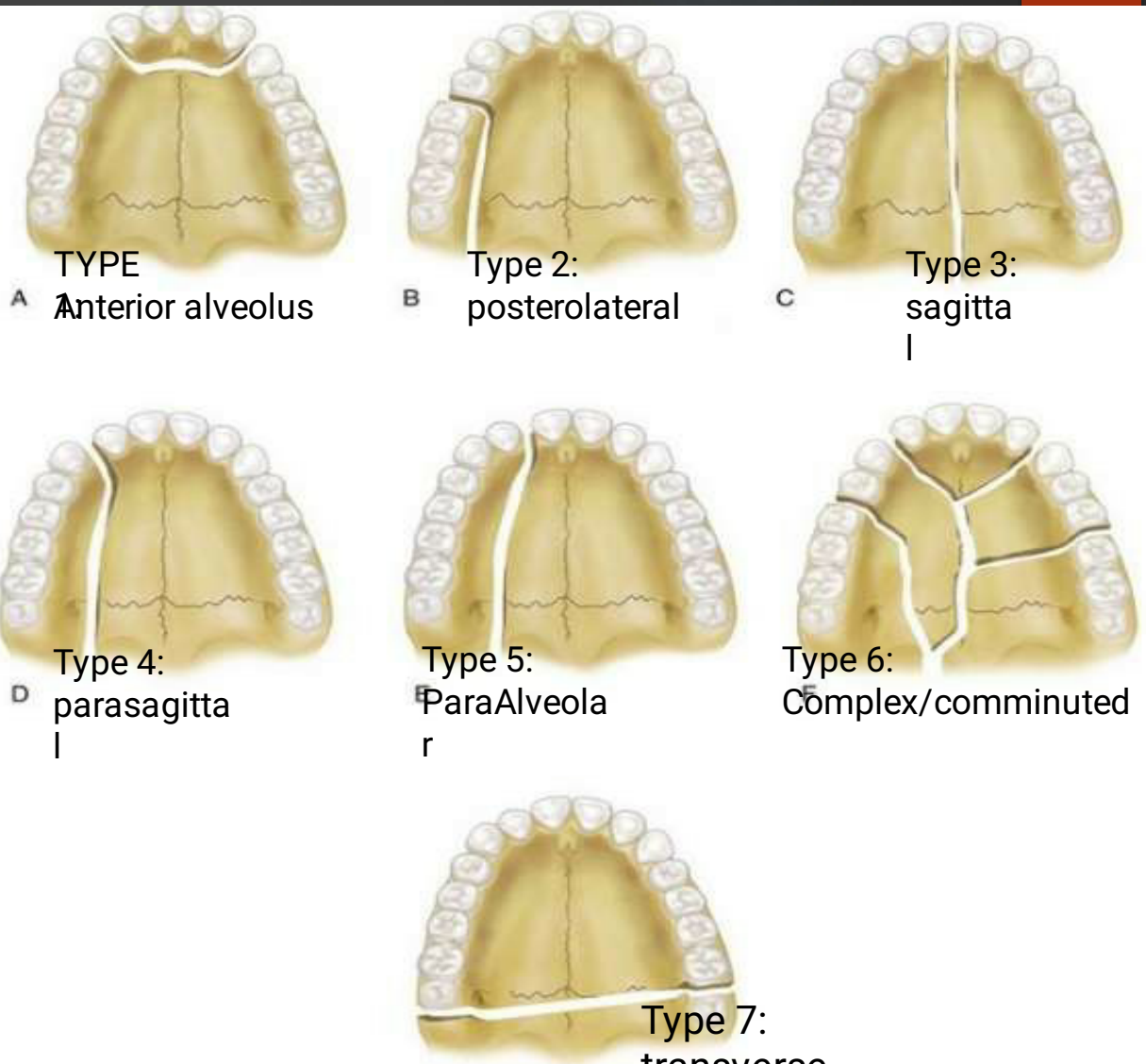
PREVALENCE OF MID-FACE FRACTURES

Fracture Type		Prevalence
Zygomaticomaxillary complex (tripod fracture)		40 %
LeFort	I	15 %
	II	10 %
	III	10 %
Zygomatic arch		10 %
Alveolar process of maxilla		5 %
Smash fractures		5 %
Other		5 %

- Erich’s classification (1942)
  - Horizontal, pyramidal, transverse
- Classification based on relationship of fracture line to zygomatic bone
  - Subzygomatic, suprazygomatic
- Classification based on level of fracture line
  - Low, mid, high level fractures

PALATAL FRACTURE:

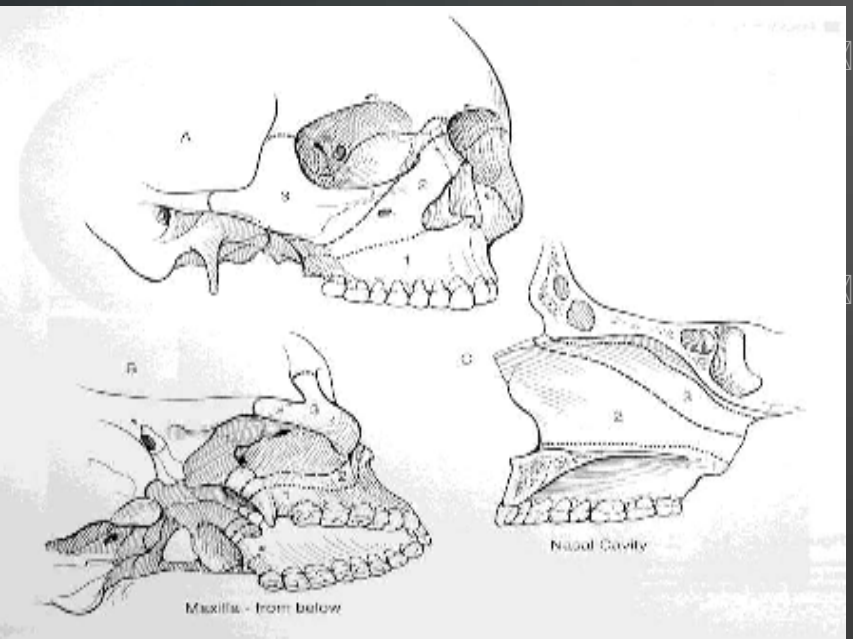
- Handrickson M, Clark n, Manson P,Palatal fracture classification, patterns and Treatment with rigid internal fixation:. Plast recostr surg 101(2):319-332,1998




LEFORT
I

- A violent force applied over a more extensive are, above the level of the teeth will result in a Le Fort I Fracture.
- Which is not confined to smaller section of the alveolar bone
- **Low-level fracture, a subzygomatic Fracture.**
  - Guerin's fracture
  - Horizontal fracture
  - Floating fracture


00:01



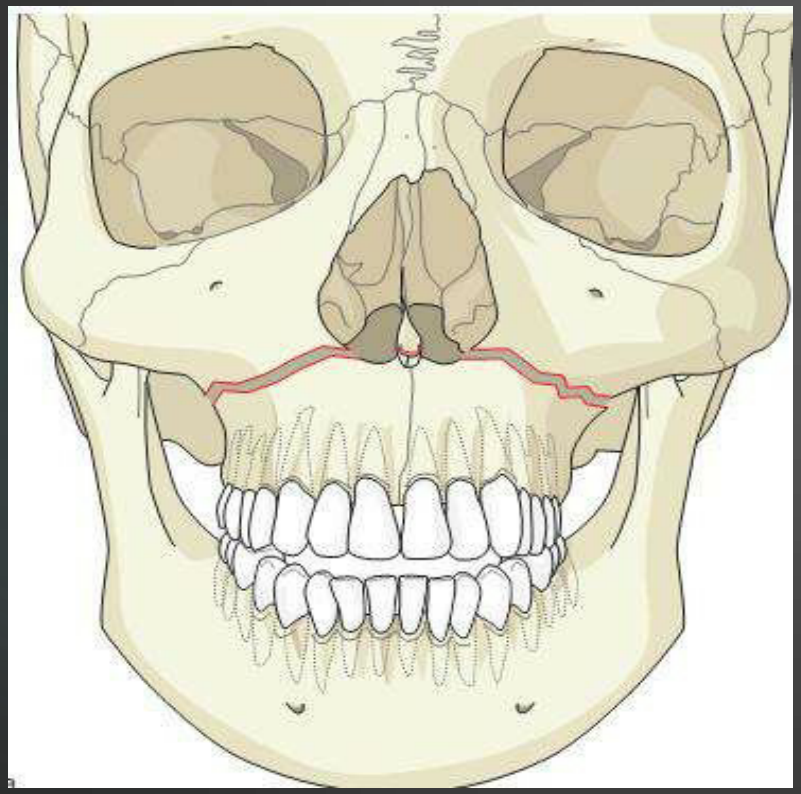
LEFORT 1 : Fracture line:

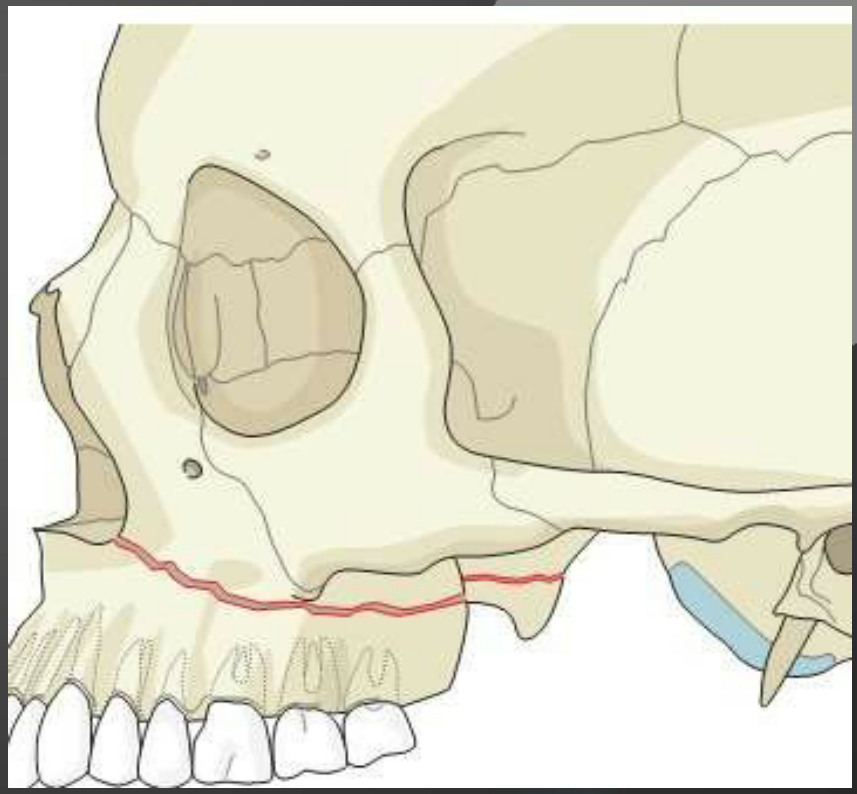
- I st line : starts from the lateral border of the pyriform aperture passes above the nasal floor, then it goes posteriorly above the canine fossa going backward below the zygomatic butress coming on the posterior wall of the maxilla, where it rises abruptly crossing the pterygo-maxillary fissure & breaks the pterygoid plates in lower1/3 & upper 2/3 parts.

- 2nd line : starts from same starting point and also passes along the lateral wall of nose and subsequently joins the lateral line of # behind the tuberosity.

- 3rd line : detaches the nasal septum from anterior nasal spine upto vomer bone.

- A typical Lefort-I fracture is always bilateral with the fracture of lower third of nasal septum.
- It can also occur as unilateral fracture.
- Lefort-I may occur as a single entity or in association with Lefort-II & III #.





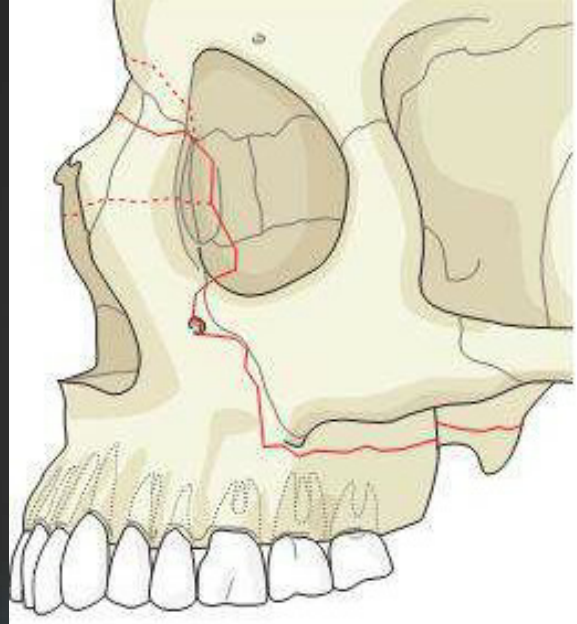

LEFORT
II

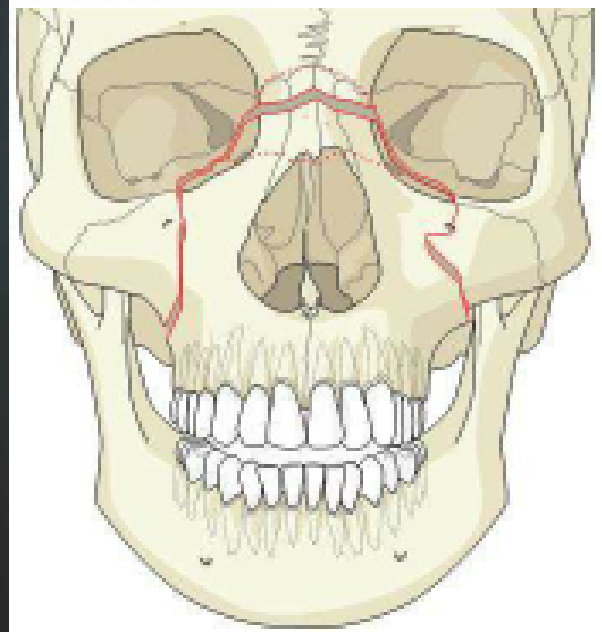
LEFORT II

- Pyramidal fracture or subzygomatic fracture
- Violent force, usually from anterior direction, sustained by the central region of the middle third of the facial skeleton over an area extending from the glabella to the alveolar margin results in a fracture of a pyramid shape.
- The force may be delivered at the level of the nasal bones.

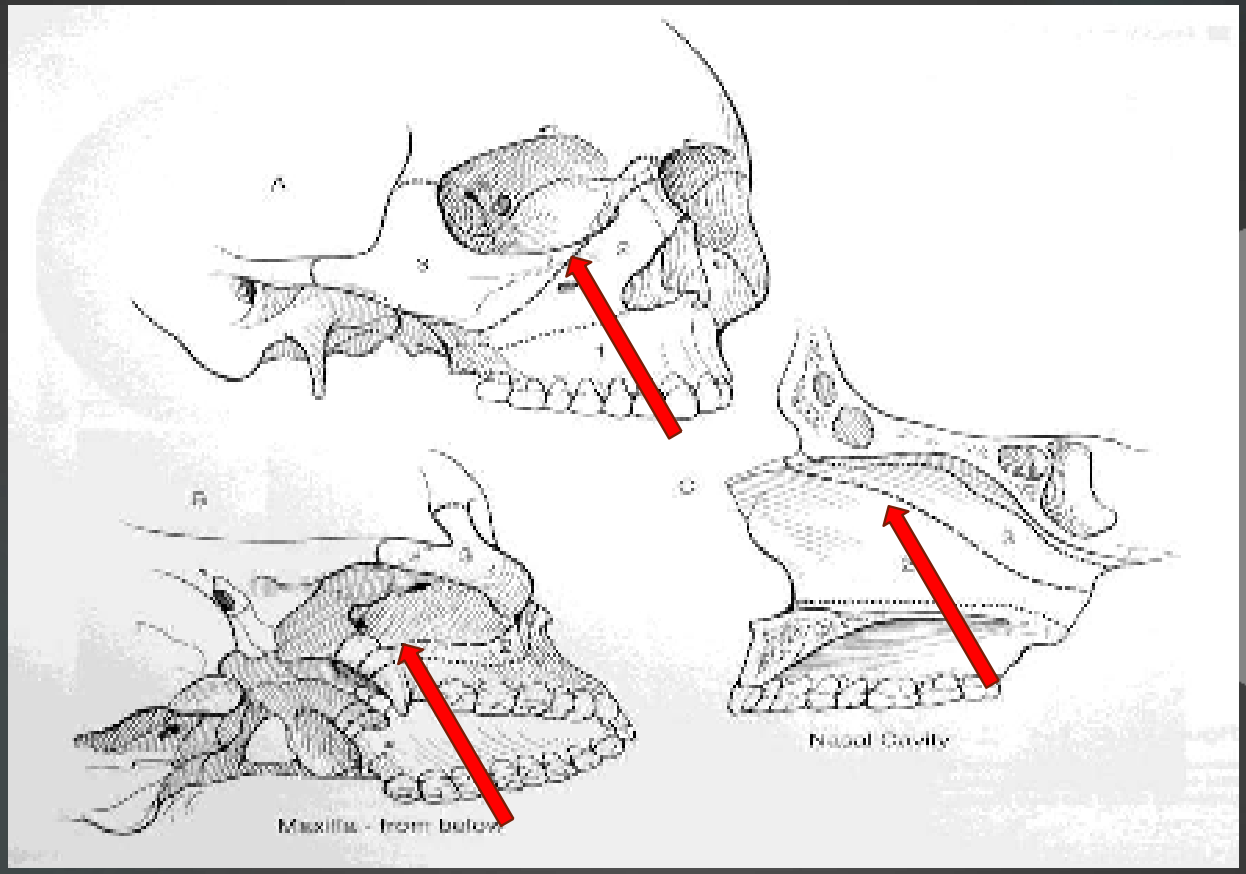
FRACTURE LINE

- it starts just below the frontonasal suture bilaterally
- Runs from the thin middle area of the nasal bones down either side.
- Crossing the frontal processes of the maxillae into the medial wall of each orbit.
- Within each orbit, the fracture line crosses the lacrimal bone behind the lacrimal sac.





- Before turning forwards to cross the infra- orbital margin slightly medial to or through the infra-orbital foramen.
- The fracture now extends downwards and backwards across the lateral wall of the antrum below the zygomatic-maxillary suture.
- Divides the pterygoid lamina about halfway up.



LE FORT 2: Fracture Line

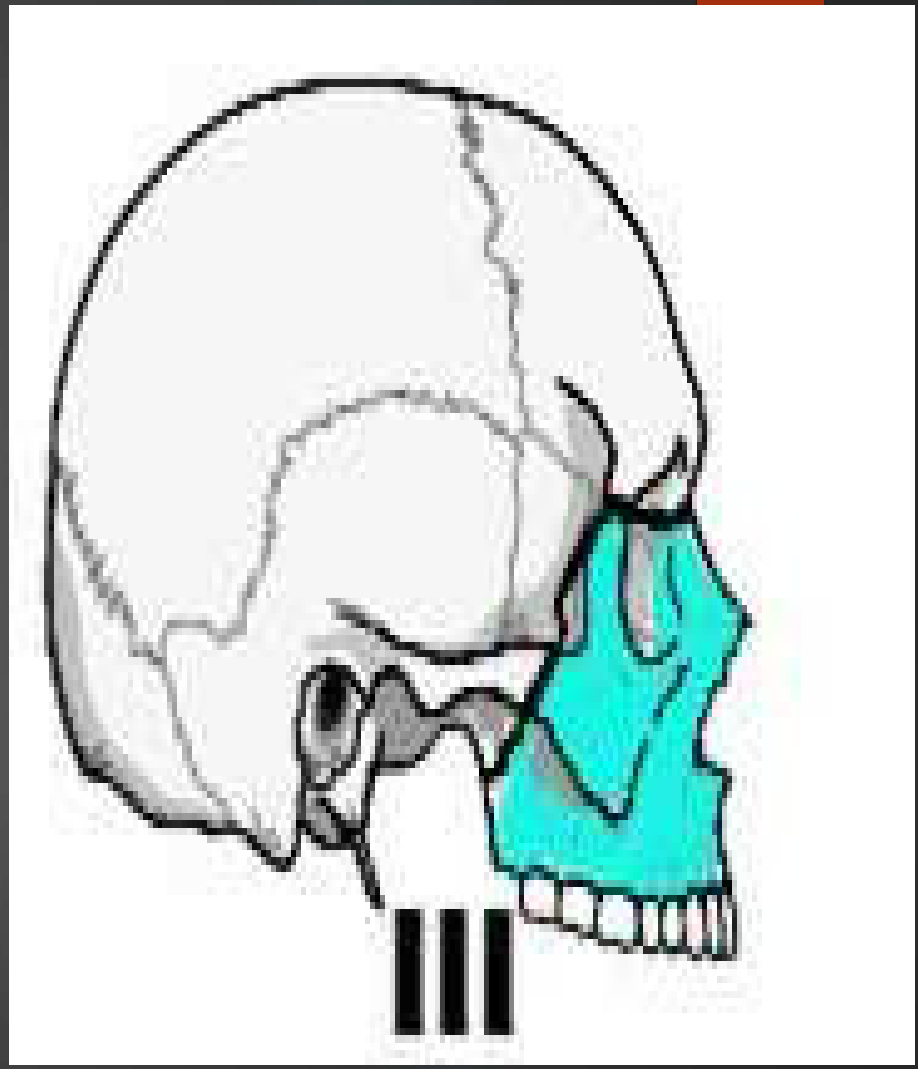

LEFORT
III

LEFORT III

- Suprazygomatic or transverse fracture or high level fracture.
- The line of fracture extends above the zygomatic bones on the both sides as a result of trauma being inflicted over a wider area, at the orbital level.

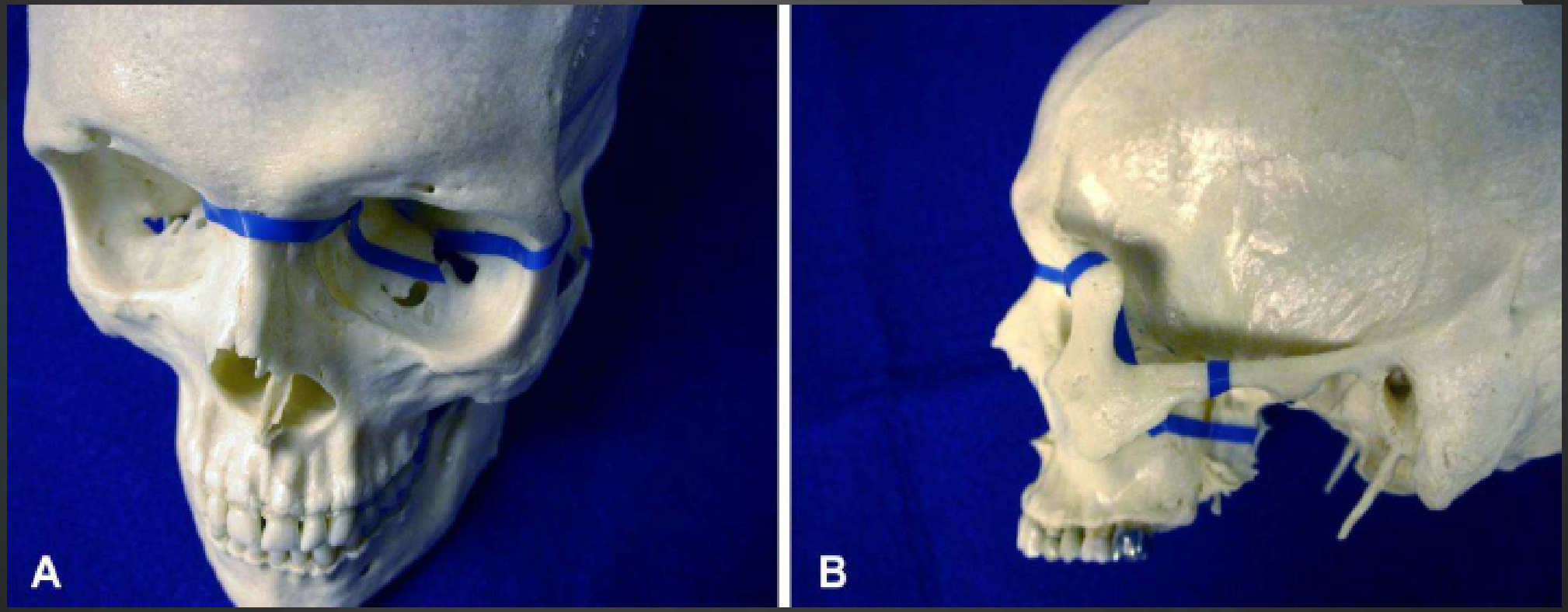
Mechanism of LF3 #:

- Initial impact is taken by the zygomatic bone resulting in depressed fracture.
- Then because of the severe degree of the impact, the entire middle third will then hinge about the fragile ethmoid bone.
- The impact will then be transmitted on the contralateral side resulting laterally displaced zygomatic fracture of the opposite side.

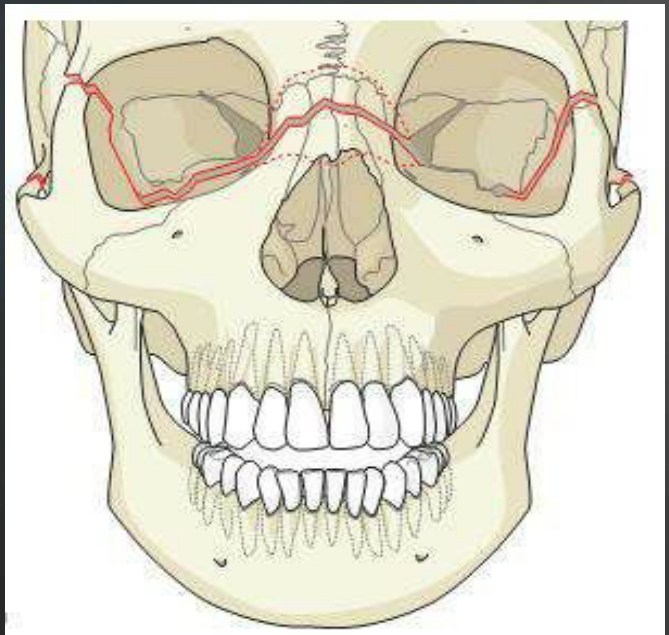


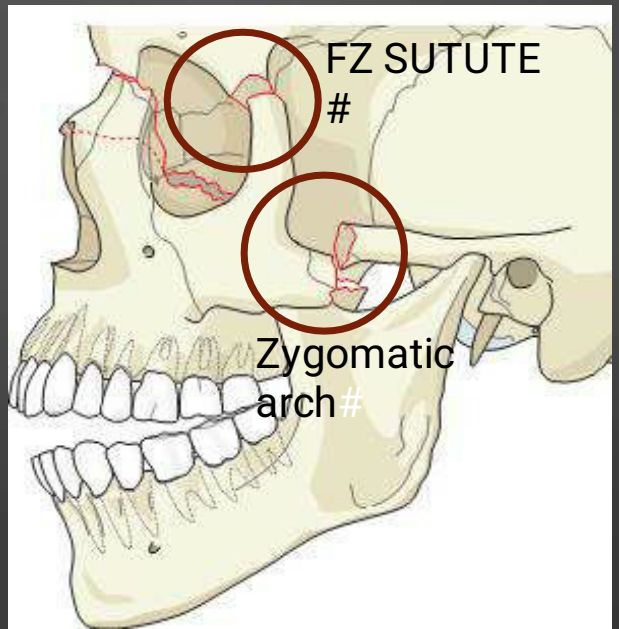
THE FRACTURE LINE

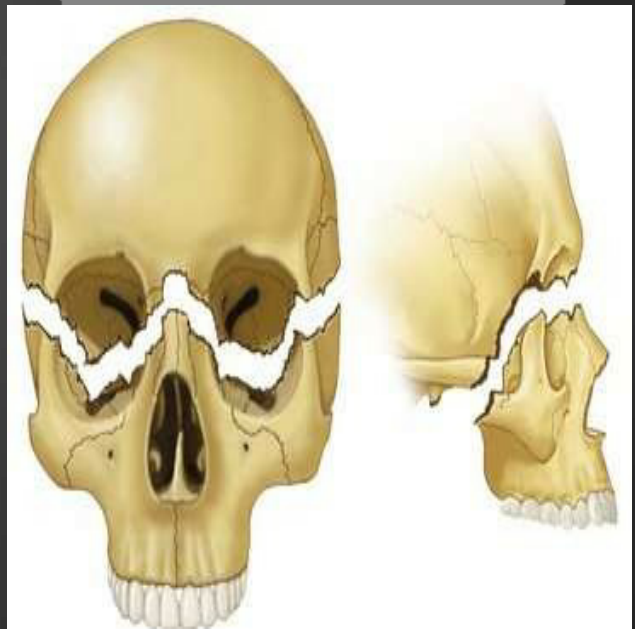
- Runs from near the frontonasal suture transversely backwards, parallel with the base of the skull and involves the full depth of the ethmoid bone, including the cribriform plate.
- Within the orbit, the fracture passes below the optic foramen into the posterior limit of the inferior orbital fissure.



- From the base of the inferior orbital fissure the fracture line extends in two directions:
- Backwards across the pterygo-maxillary fissure to fracture the roots of the pterygoid laminae.
- Laterally across the lateral wall of the orbit separating the zygomatic bone from the frontal bone by fronto-zygomatic suture.
- The entire mid-facial skeleton becomes detached from the cranial base.







CLINICAL ASSESSMENT OF MIDFACE FRACTURES

- Extra-oral & Intra-oral examination.

- Inspection.

- Palpation.

Extra-oral examination

***Inspection** of midface-*

- Swelling & Facial Asymmetry.
- Bruising of upper lip and lower half of mid-face.
- Circum-orbital Ecchymosis (bilateral = Racoon's eye)

.

- Subconjunctival Hemorrhage.
- Periorbital Oedema.

Extra-oral examination

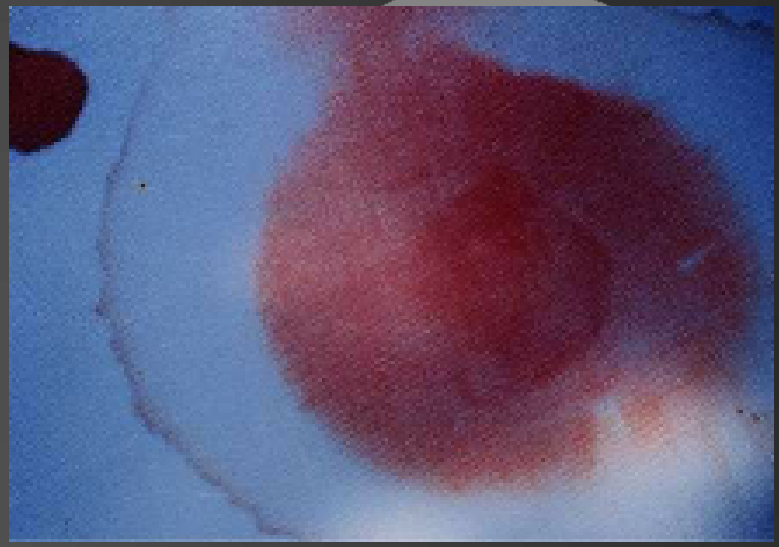
- Cerebrospinal fluid rhinorrhoea
- Lengthening of Midface
- Depressed midface (dish face)
- Saddle shaped depression of nose
- Enophthalmos
- Proptosis
- Diplopia

- Cerebrospinal Fluid Rhinorrhoea

-Watery nasal or postnasal salty discharge.

CSF content assessment- most reliable

ß2 Transferrin isoenzyme- most diagnostic (pathognomonic of CSF)

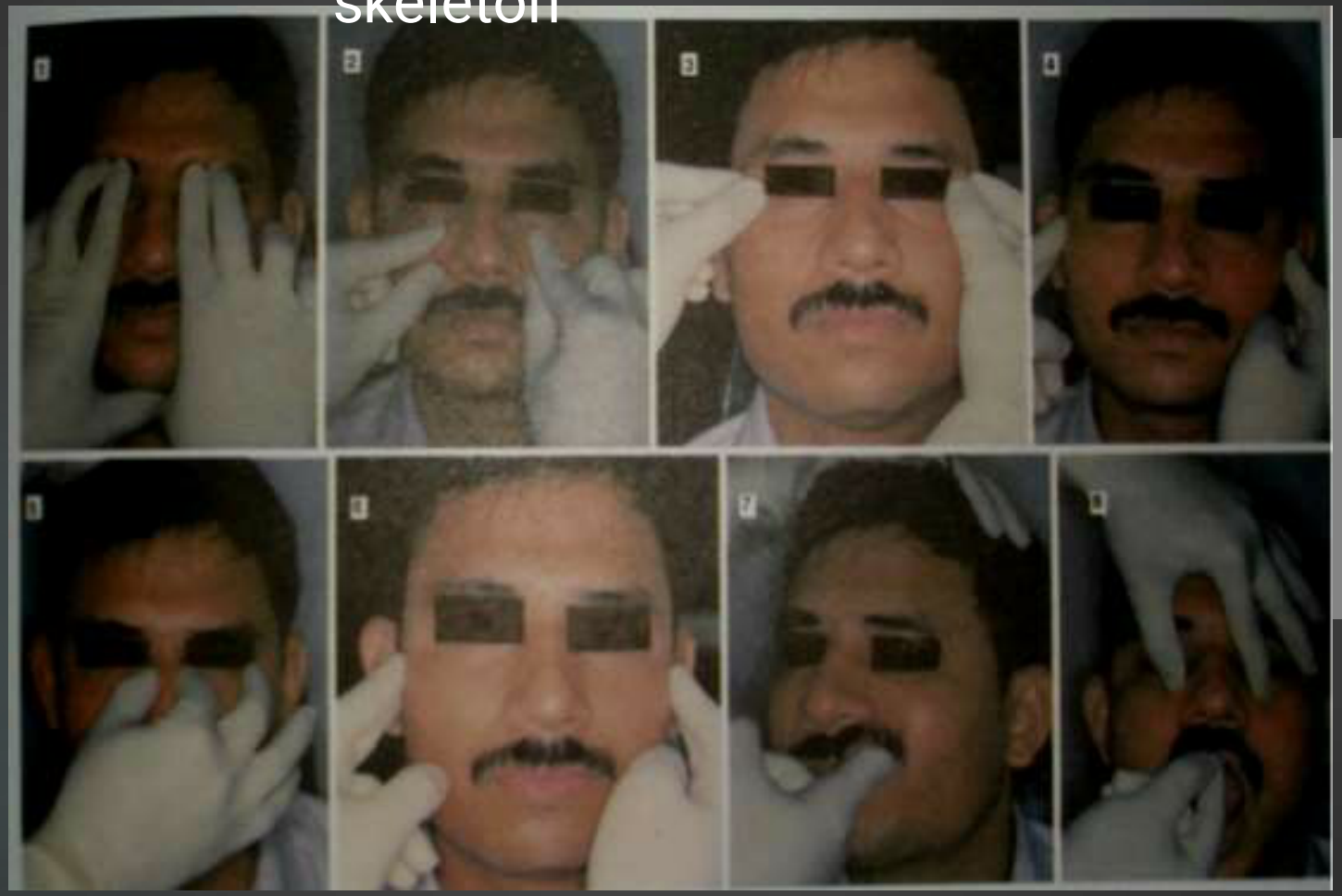


“HALO” sign

Palpation -

1. Subcutaneous Emphysema – Crepitus
2. Tenderness
3. Step Deformity
4. Abnormal Mobility of bone
5. Impairment of sensation

Palpation of facial skeleton



Intra-oral examination

Inspection

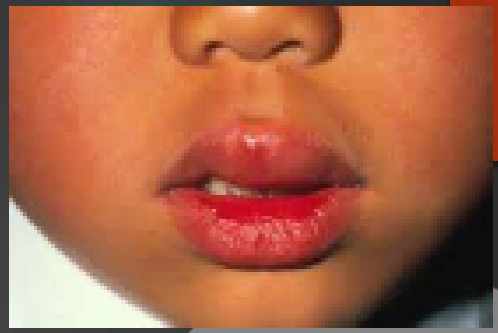
1. Disturbed occlusion (posterior occlusal gagging , open bite)
2. Haematoma intraorally over root of zygoma
3. Haematoma in palate (Guiren's sign)
4. Fractured cusps of teeth
5. Midline diastema

LEFORT- I FRACTURE

Clinical features:

❑ Inspection :

- Slight swelling and edema of the lower part of the face along with the upper lip swelling



- Ecchymosis in the labial and buccal vestibule, as well as contusion of the skin of the upper lip may be seen

- Bilateral nasal epistaxis may be observed

- The patient may develop open bite if the

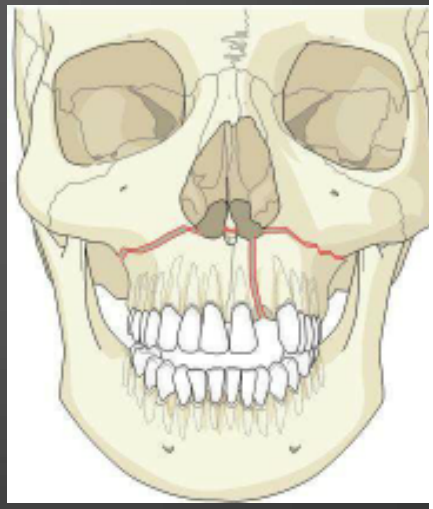
  fractured segment is mobile , due to

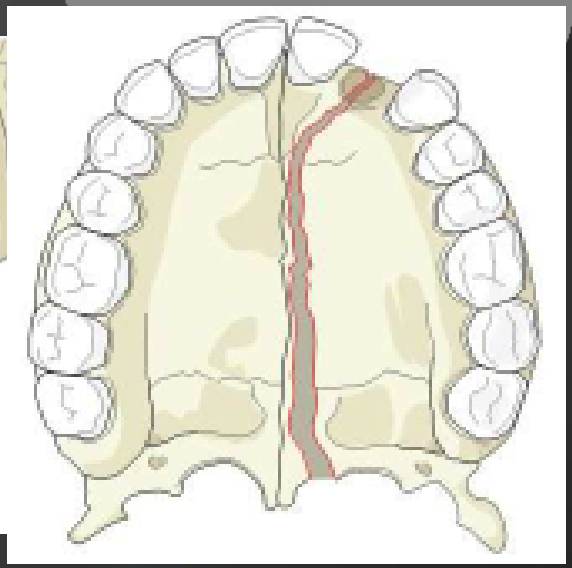
  posterior gagging of occlusion.

- Sometimes fracture of the palate can also

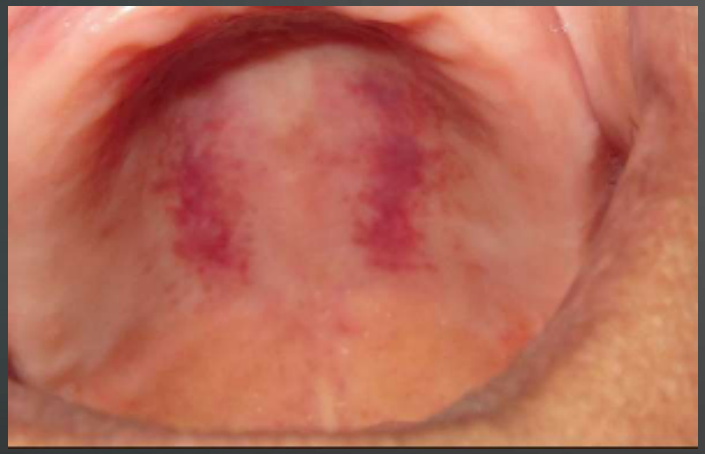
  be associated with

  Le Fort I fracture.





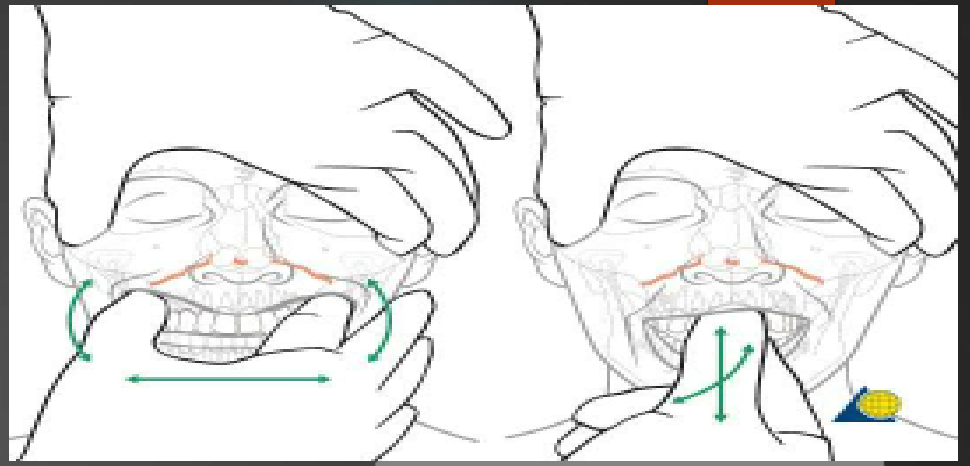
- Occlusion may be disturbed, difficult mastication
- Pain while speaking and moving the jaw



- GUERIN sign: ecchymosis of palate , bilateral greater palatine foramen.

PALPATION :

- In Le Fort I, the teeth and maxilla are mobile (floating maxilla), but the nose and upper face is fixed.



- Sometimes there will be upward displacement of the entire fragment, locking it against the superior intact structures, such a fracture is called as impacted or telescopic fracture.
- Percussion of the maxillary teeth results in distinctive 'cracked-pot sound',
- No tenderness and mobility of the zygomatic arch and bones.

Common features of LF2&3:

- Gross edema of soft tissue
- Bilateral circumorbital ecchymosis
- Bilateral subconjunctival hemorrahge
- Obvious deformity of the nose
- Nasal bleeding and obstruction
- CSF leak rhinorrhea
- Dish-face deformity
- Limitation of ocular movement
- Possible diplopia and enophthalmous
- Retropostioning of the maxilla with anterior open bite
- Lengthening of the face
- Difficulty in mouth opening
- Mobility of the upper jaw
- Occasional hematoma of the palate
- Cracked-pot sound on percussion

SPECIFIC FEATURE OF LF2#:

- Step deformity at infra-orbiatal margin
- Anasthesia of midface
- Nasal bone moves with mid-face as a whole

SPECIFIC FEATURE OF LF3#:

- Tenderness and sepration at FZ suture
- Tenderness and deformity of zygomatic arch
- Depression of occular level and pseudoptosis

LEFORT- II FRACTURE

Clinical features:

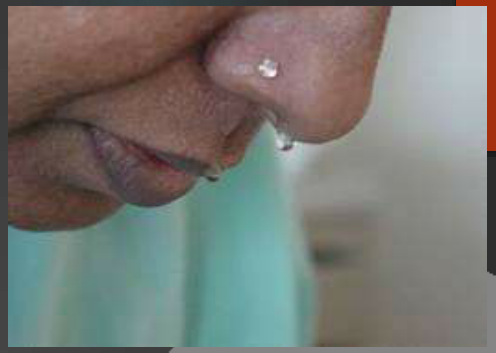
LEFORT II FRACTURE

Clinical features -

- The resulting gross edema of the middle third gives an appearance of "moon face" to the patient.

- Depressed nasal bridge,
- Dish shape deformity.

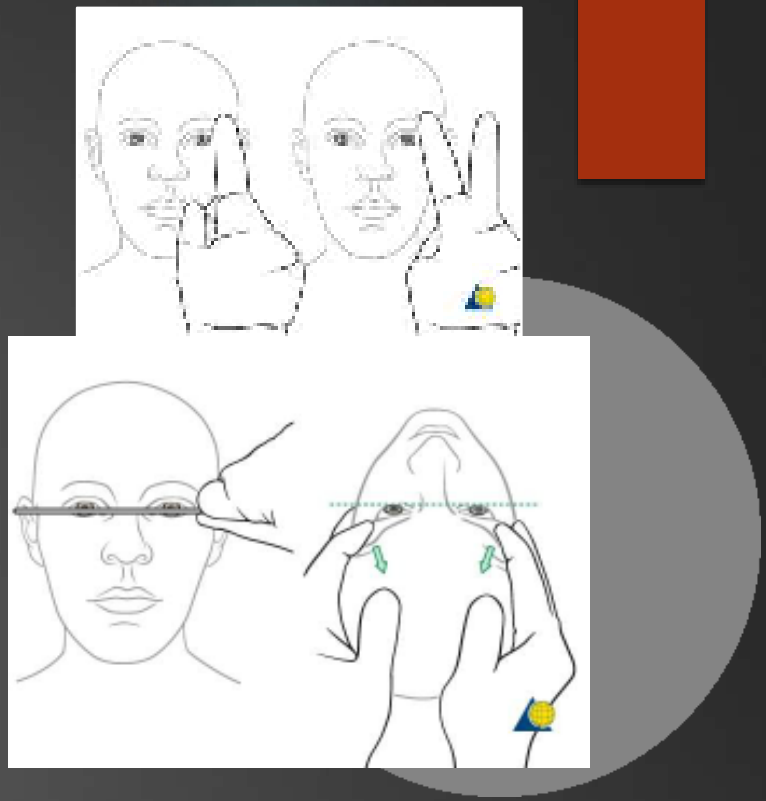
- CSF rhinorrhoea is possible and should be looked for.
- Bilateral circumorbital ecchymosis giving an appearance of 'raccoon eyes' is invariably seen in the fractures of both Le Fort II and Le Fort III.
- Subconjunctival hemorrhage develops rapidly in the area adjacent to the site of injury.(mostly in medial half)



- Diplopia may be seen in cases of orbital floor injury.

- Pupils are at level unless there is gross unilateral enophthalmos.

- Anaesthesia or paraesthesia of the cheek as a result of injury to the infraorbital nerve due to the fracture of the inferior orbital rim.



- On intraoral examination, retropositioning of the whole maxilla

  and gagging of the occlusion are seen.

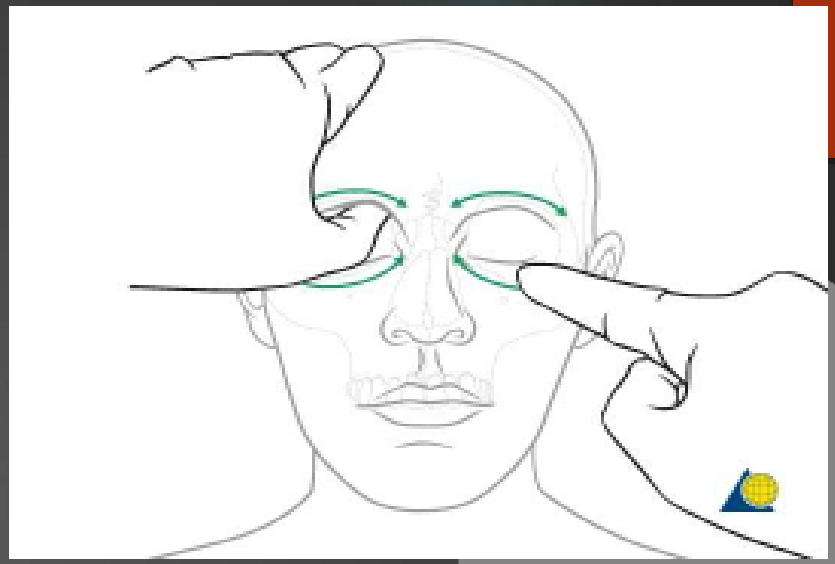
- Hematoma formation is seen in the buccal sulcus opposite

  to the maxillary first and second molar teeth as a result of

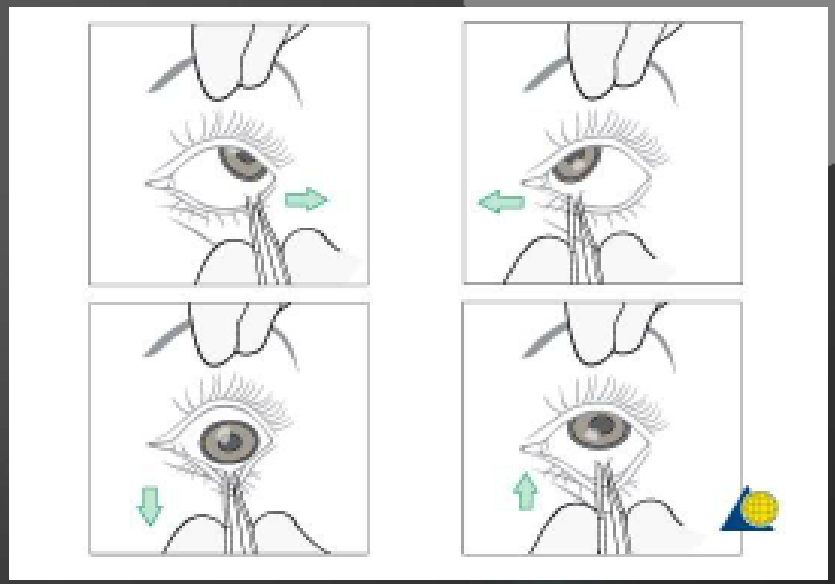
  fracture of the zygomatic b

Extraoral palpation of LFII:

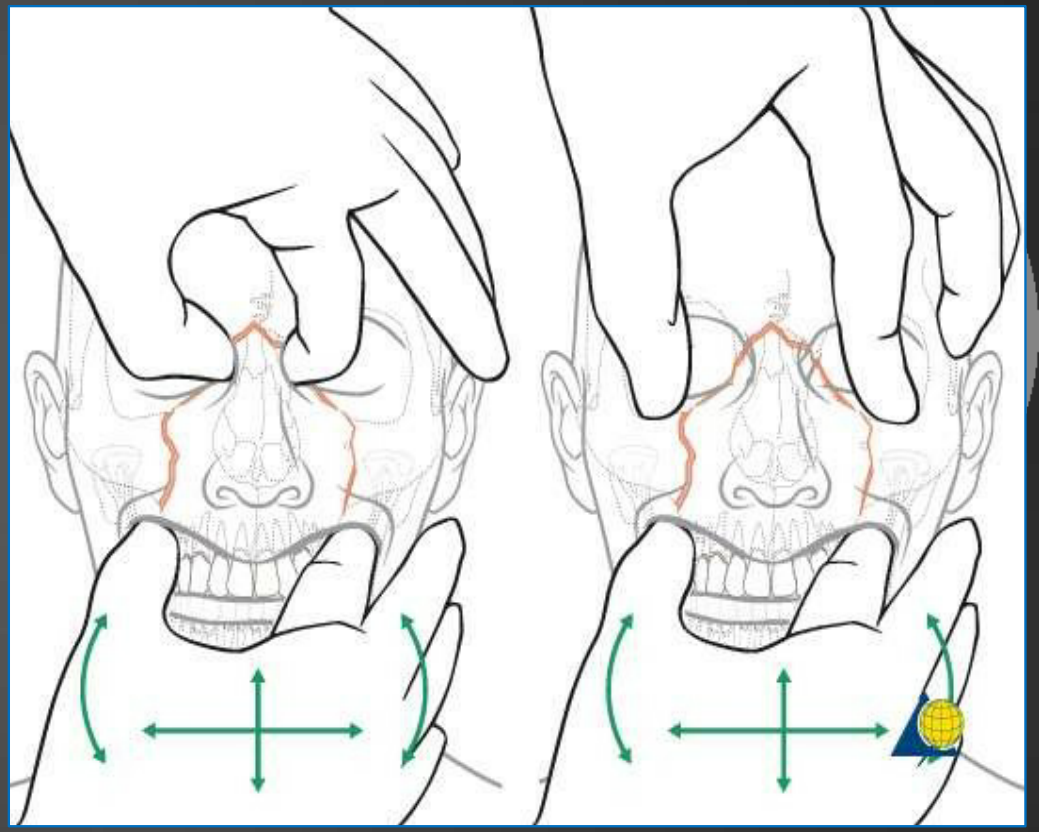
- Step deformity at the infraorbital rims or frontonasal junction is noticed.



- Orbital wall fractures can cause entrapment with limitation of ocular movement.



- When maxillary teeth are grasped, the mid-facial skeleton moves as a pyramid and the movement can be detected at the infraorbital margin and the nasal bridge.



LEFORT- III FRACTURE

Clinical features:

LE FORT III FRACTURE

Clinical features -

- Gross oedema of the face.
- Bilateral circumorbital ecchymosis with subconjunctival hemorrhage.
- Characteristic 'dish face' appearance with lengthening of the face.

- 'Hooding of eyes' may be seen due to separation of the

  frontozygomatic suture.

- Deformity of the zygomatic arches.

- Difficulty in opening the mouth, inability to move

  lower jaw.

- CSF rhinorrhoea.

- Depression of ocula

- ‘Battle’s Sign’

Figure 2—"Donkey face" deformity typical of Le Fort III fracture.

- Tenderness and often separation of the

  bones at the frontozygomatic suture.

- Mobility of the whole of facial

  skeleton as a single unit.

- When lateral displacement has

  taken place tilting of the occlusal

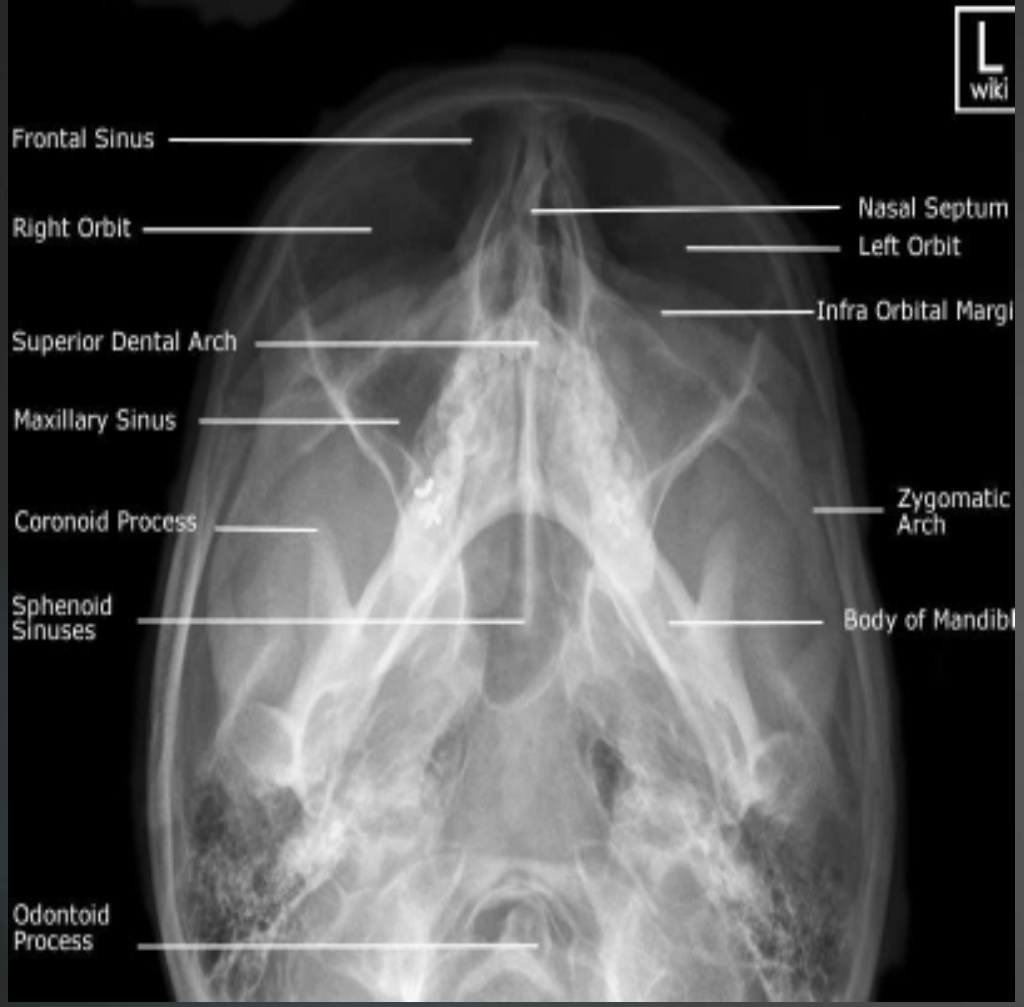
  plane and gagging of one side is

Radiographic Examination :

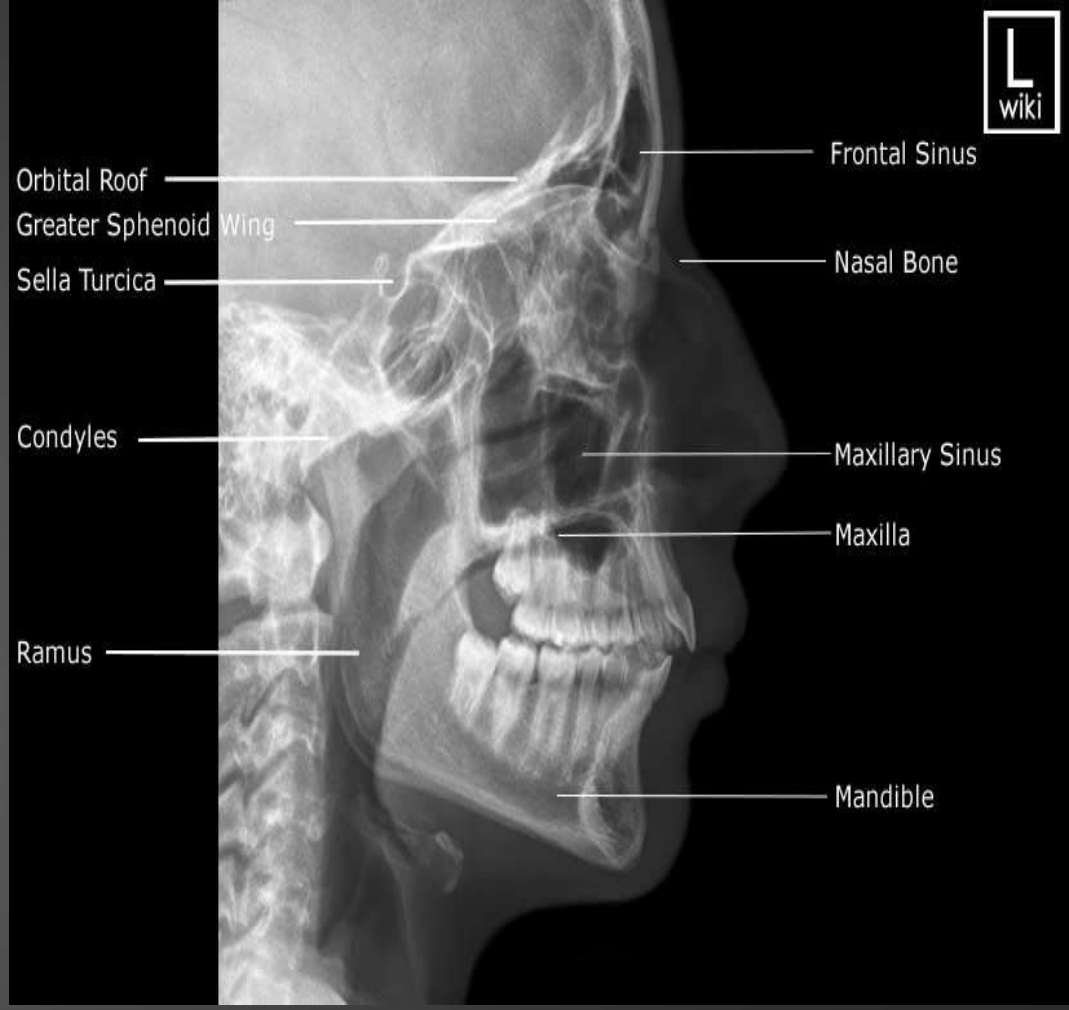
1. plain Radiograph
   - Min 2 radiograph
   - 90* to eachother

2. CT SCAN
   - Coronal and axial view
   - 3d reconstruction

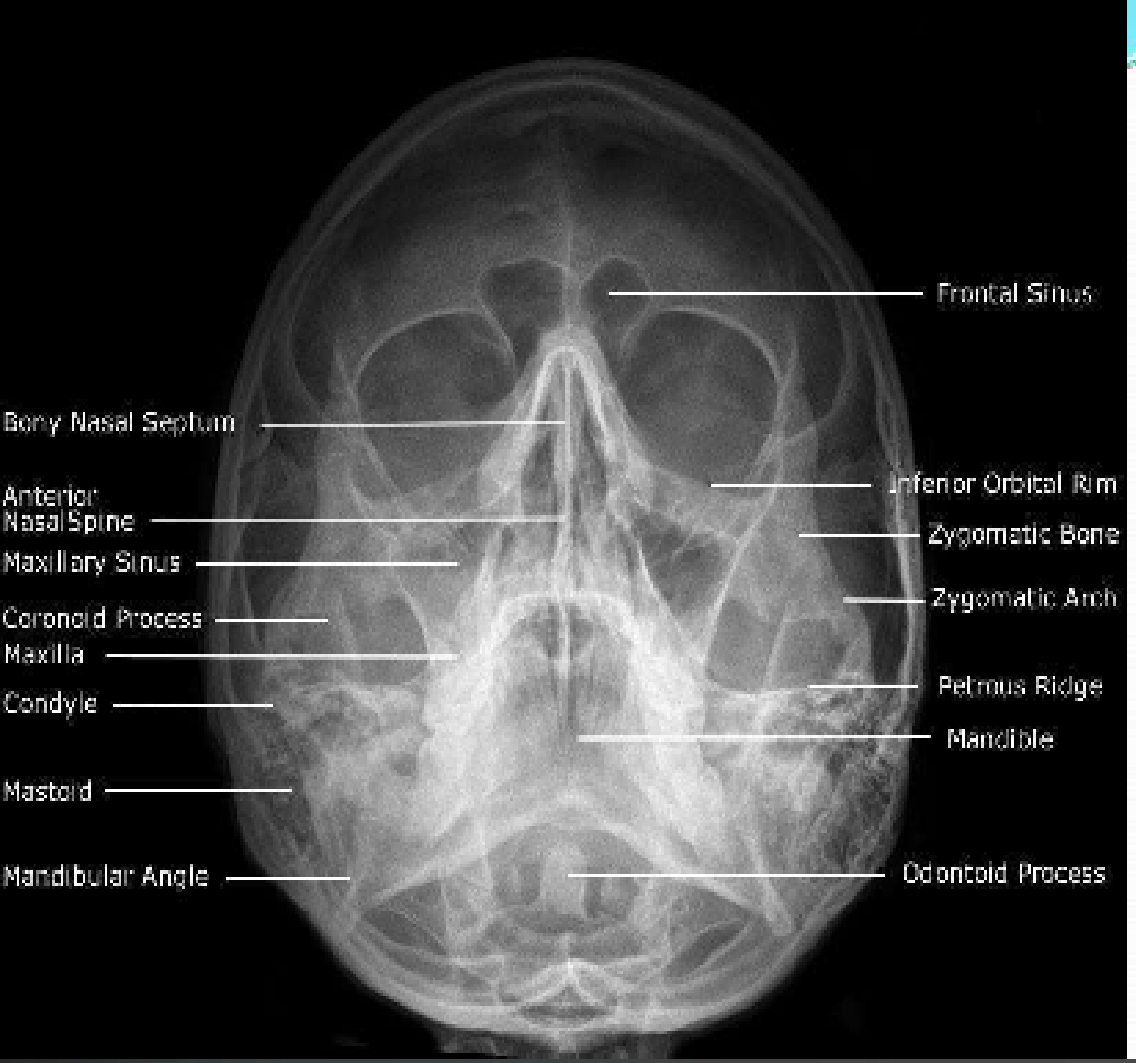
- Opg
- Lateral view
- 15/30 degrees occipitomental view
- Submentovertex view
- Cranial postero anterior view.
- PA view (Water’s View)



30 DEGREE SUBMENTOVERTEX (NORMAL)



LATERAL VIEW



Mc Grigor's /Campbell's line

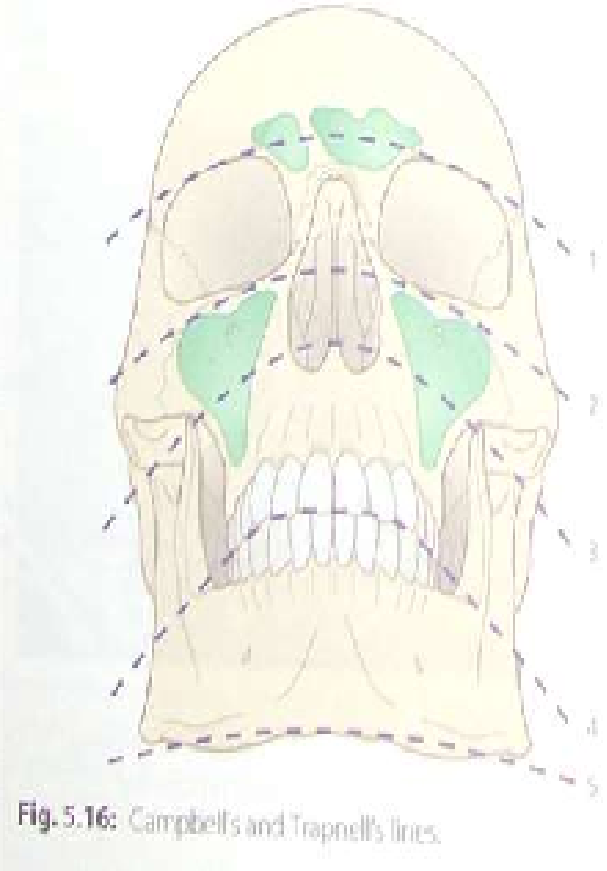
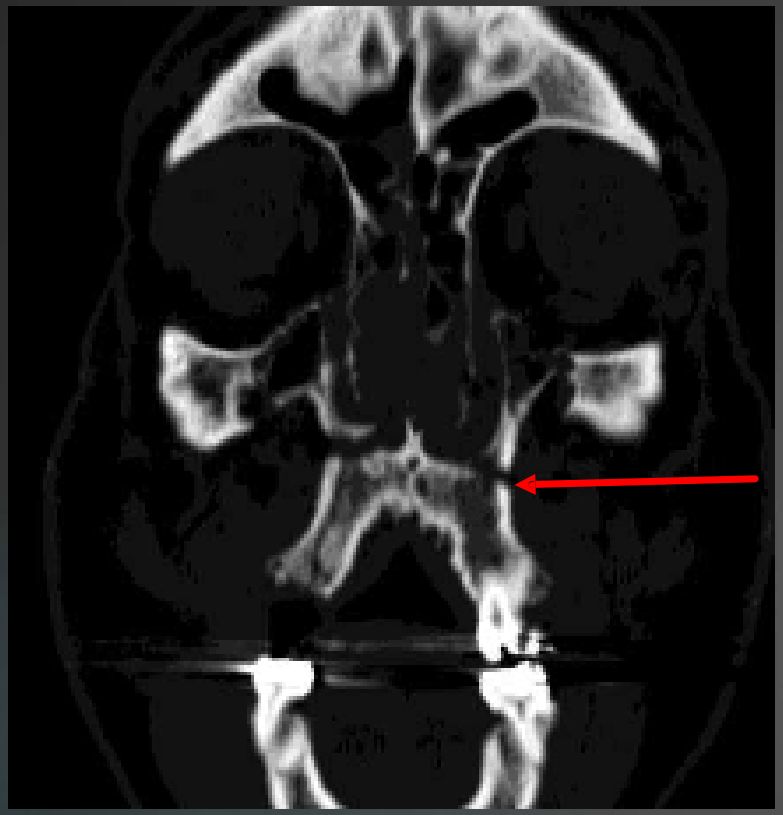


Fig. 5.16: Campbell's and Trapnell's lines.

1. Frontozygomaztic suture & superior orbital rim
2. Zygomatic arches & inferior orbital rim
3. Condyl & coronoid processes
4. Occlusal planc
5. Inferior border of mandible

WATER,S VIEW NORMAL



Coronal CT demonstrating a right Le Fort I fracture and a left Le Fort II fracture.

CT - SCAN

LEFORT- I FRACTURE

radiographic features:

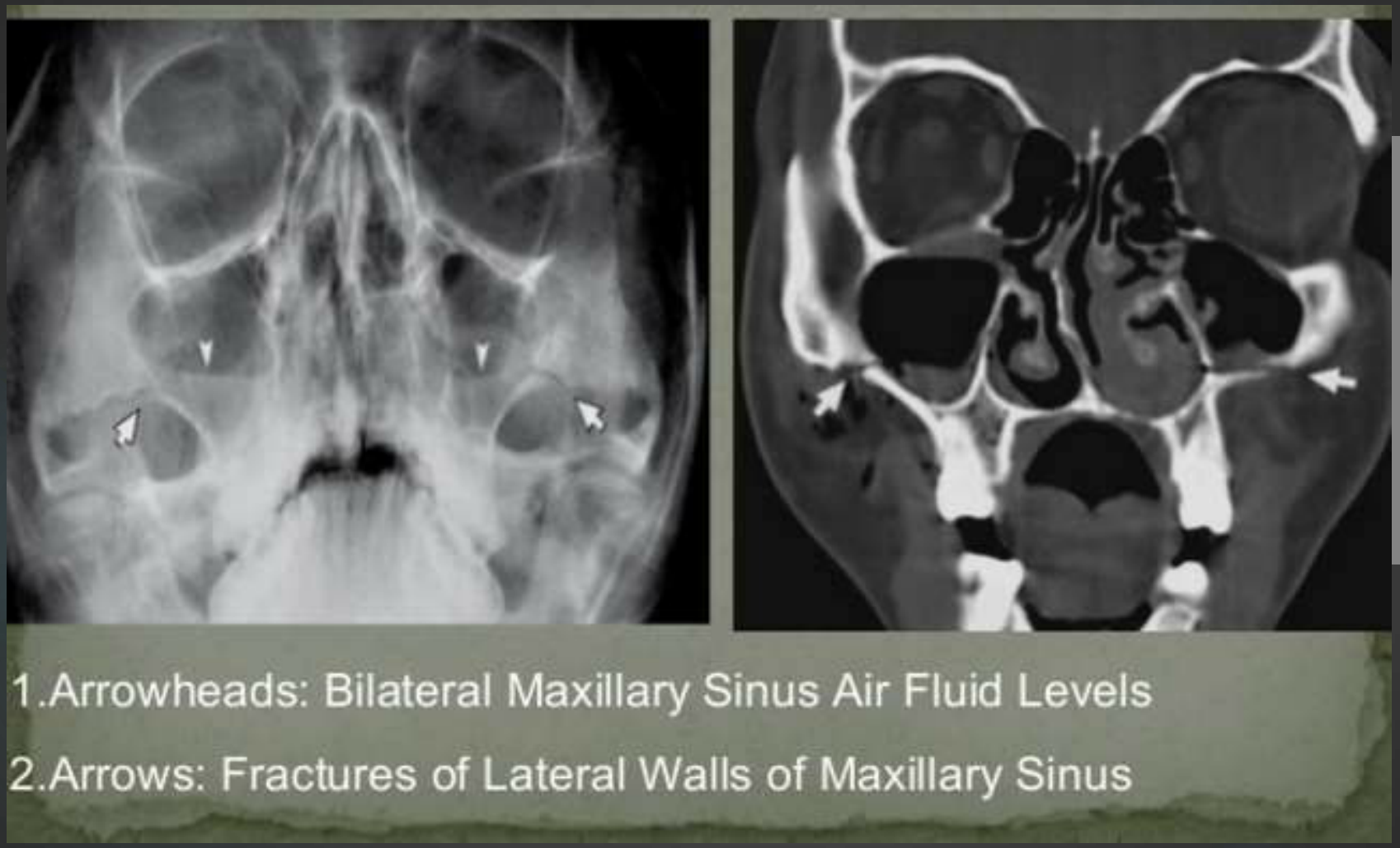
LEFORT I – Waters view

Water's View

The most comprehensive single projection display

Excellent view of

- Maxilla
- Maxillary sinuses
- Zygoma
- Zygomatic arches
- Rims of orbits, esp. floor
- Nasal bones



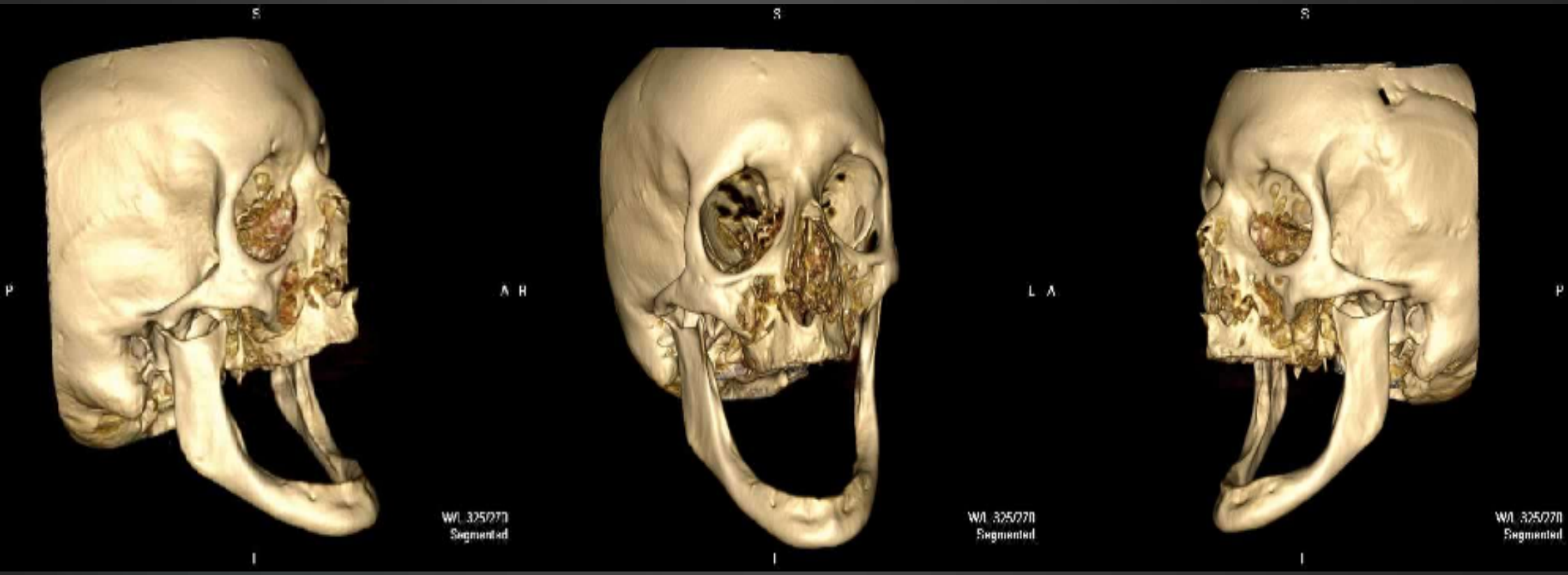
1.Arrowheads: Bilateral Maxillary Sinus Air Fluid Levels

2.Arrows: Fractures of Lateral Walls of Maxillary Sinus

CT findings - axial section

Pterygoid Plate Fractures in lefort I

3D - CT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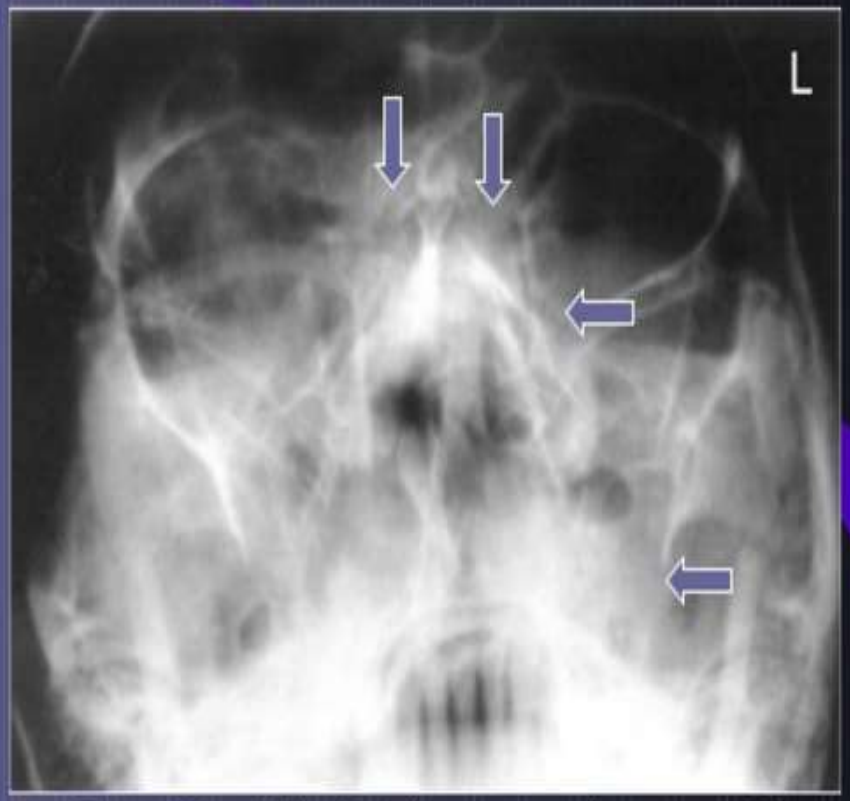
LEFORT- II FRACTURE

radiographic features:



Le Fort II midfacial fracture: fracture lines extend obliquely through nasofrontal sutures, through the medial and inferior aspects of both orbits and the lateral walls of both maxillary sinuses (PA view).

Le Fort Type II

- Pyramidal fracture across nasal bones and frontal processes of maxilla, extending laterally through lacrimal bones, inferior rim of orbit near zygomaticomaxillary suture, lateral walls of maxilla and pterygoid plates.
- Increased width of frontonasal suture.
- Radiolucent cleavage lines.
- Step defect in orbital rim.
- Sinus shadows obscurred by hemorrhage.
- Disruption in dental occlusion.

CT findings - coronal section

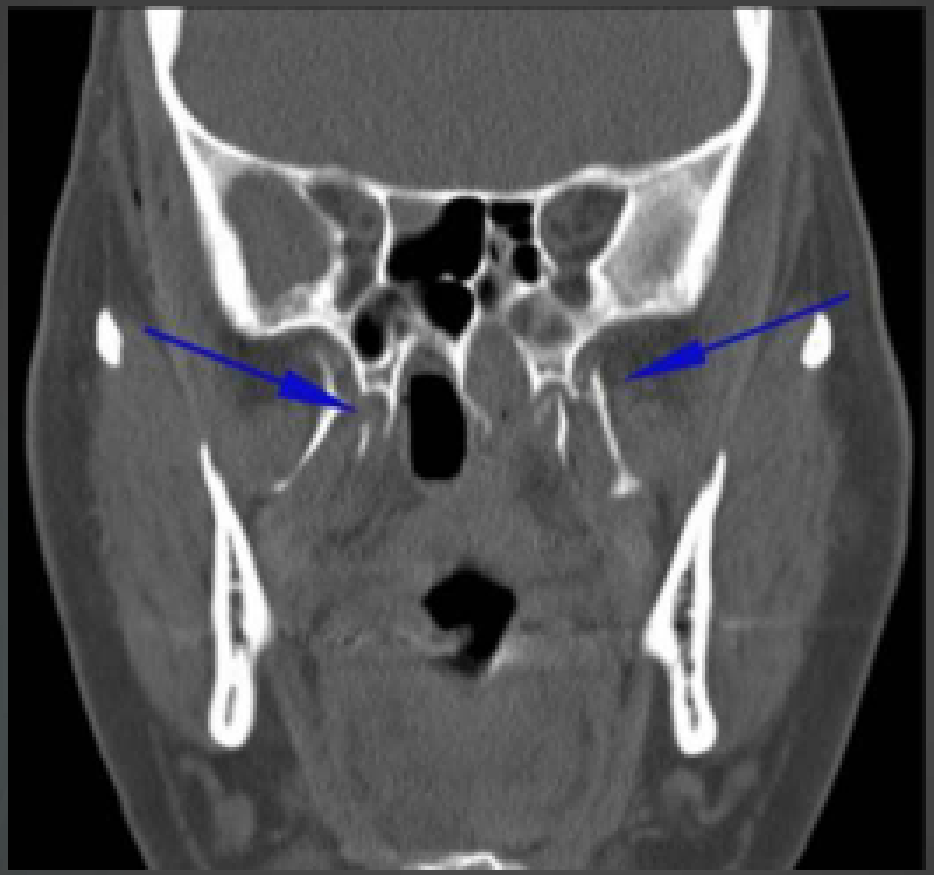
Open Arrows: inf orbit fx

Closed Arrow: no fx to ant/lat nasal margin=no lefort I fx

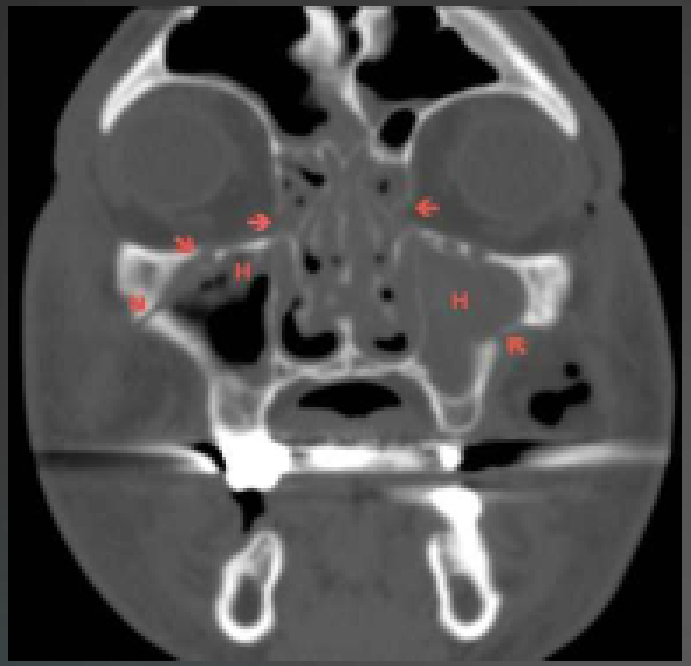
Star:Inferior orbit fx

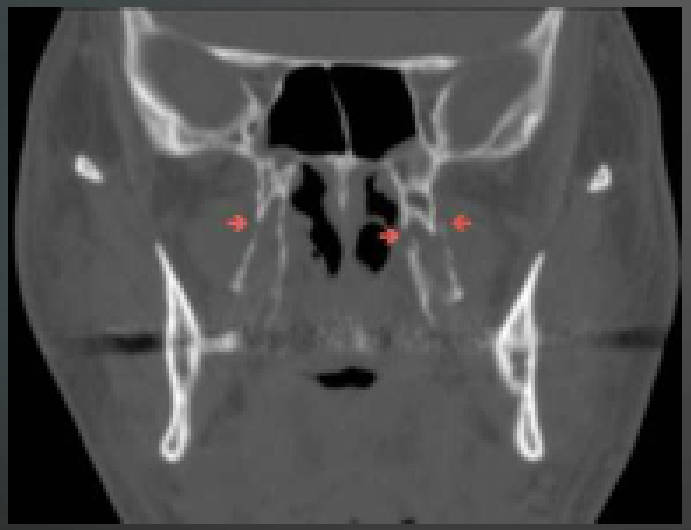
Arrow: B/l pterygoid fxs

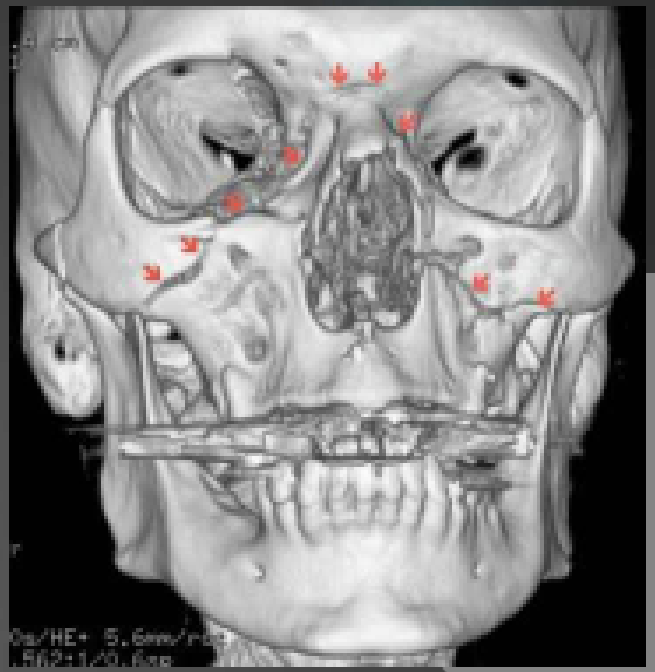
CT findings - axial section



The blue arrows show bilateral fracture of the pterygoid processes, which is a common association in all three types of Le Fort fractures.

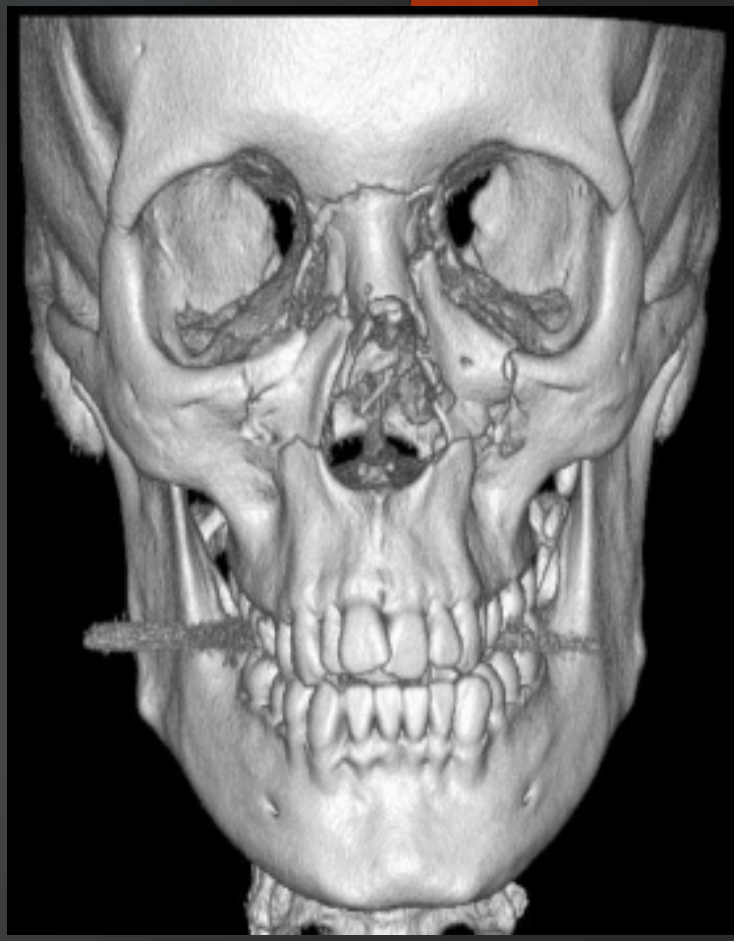






Middle age man in motor vehicle accident. Fracture lines are demonstrated in red arrows.

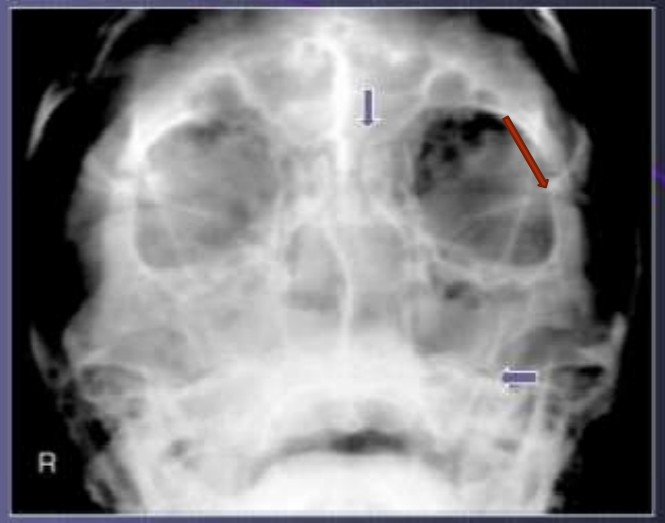
3D - CT



Three-dimensional reconstruction of a patient with right Le Fort I fracture and a left Le Fort II fracture

LEFORT- III FRACTURE

radiographic features:



Le Fort III midface fractures: PA view shows fractures of lateral walls of both maxillary sinuses with concomitant opacification of the sinuses. Glabella and right zygomaticofrontal sutures also evidence fracture lines.

Blowout fracture of right orbital floor indicated by thickening of roof of maxillary sinus (PA tomographic view) – see arrow.

32-year-old man, driver in a motor vehicle accident.

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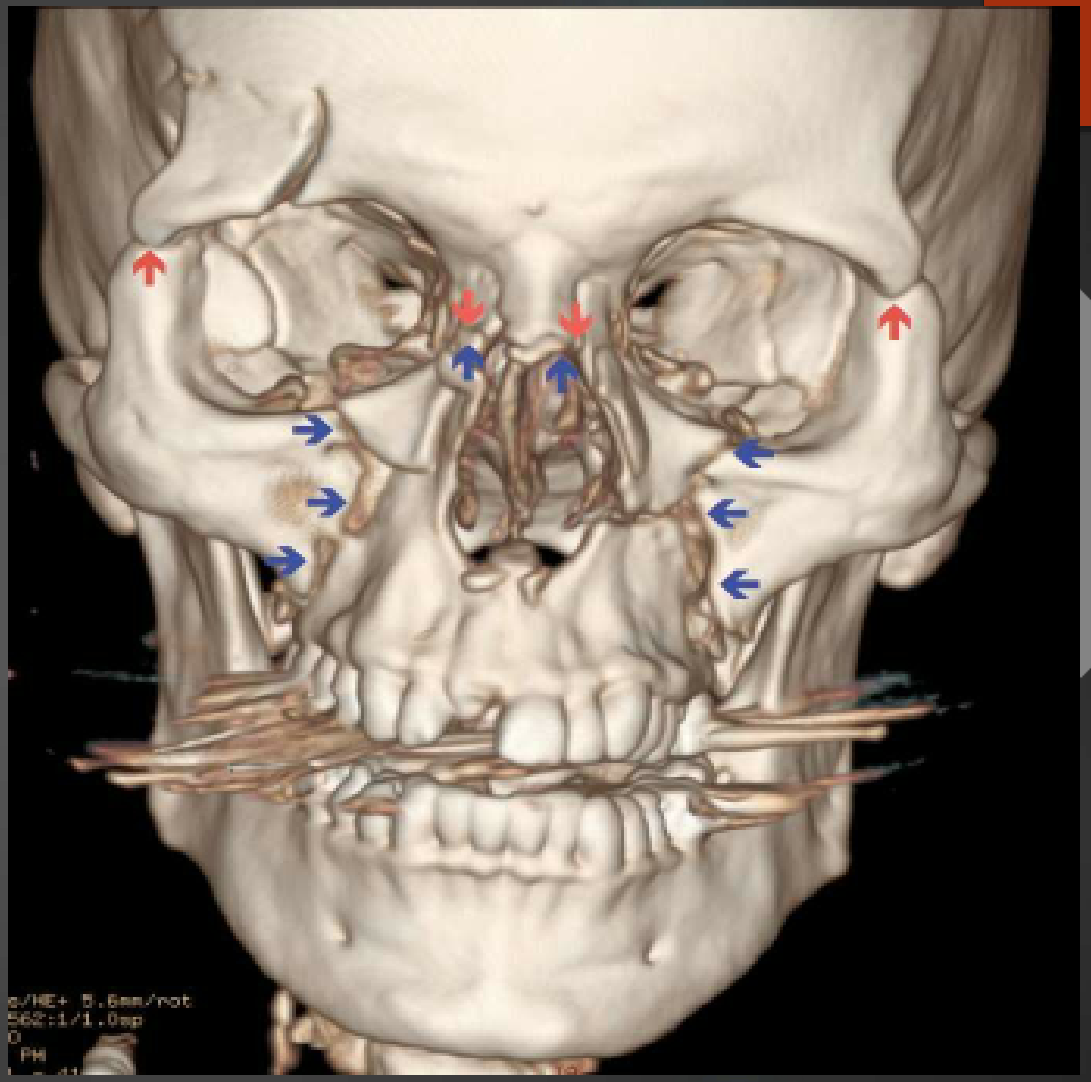
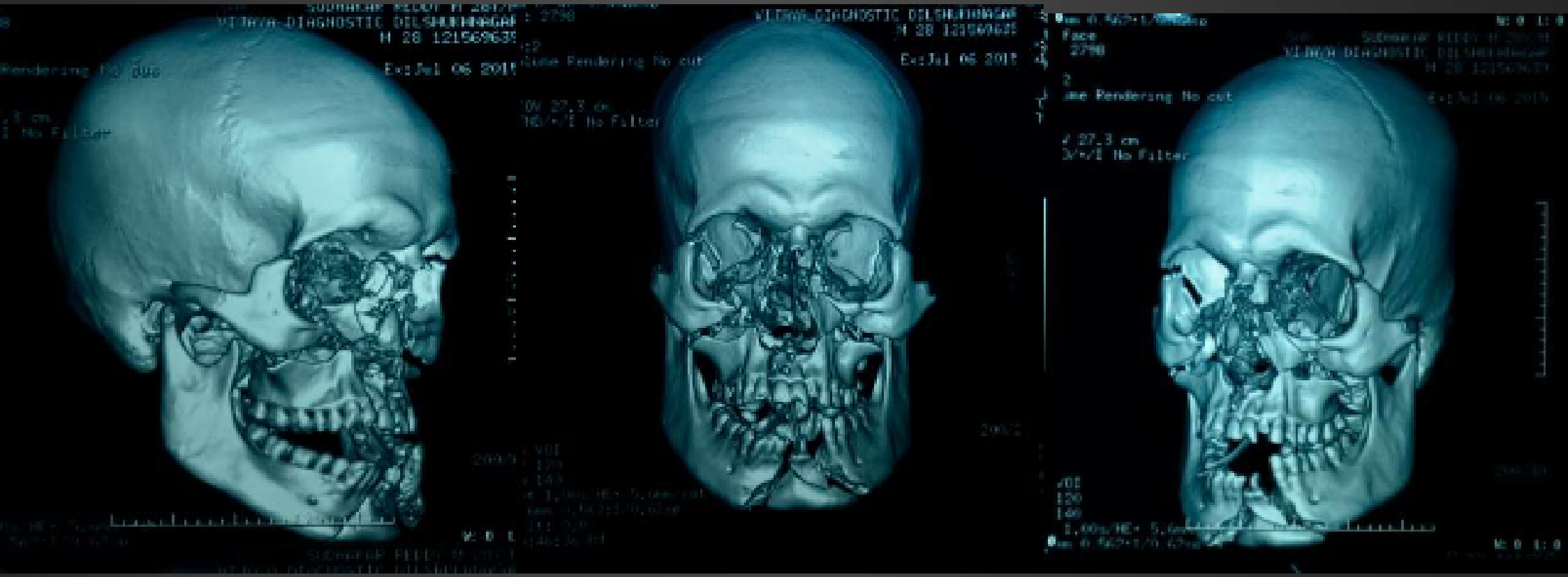


3D - CT



MANAGEMENT

1. Emergency care & Stabilization -
   (First aid and resuscitation)

2. Initial Assessment and Early care-

3. Definitive Treatment-

4. Rehabilitation -

STAGE I - Emergency care & Stabilization

1. Maintenance of airway.
2. Control of hemorrhage.
3. Prevent or control shock.
4. C-Spine stabilization.
5. Control of life-threatening injuries.

Head injuries, chest injuries, compound limb fractures, intra abdominal bleeding.

Airway maintenance with cervical spine protection

Breathing and ventilation

Circulation with hemorrhage control

Disability: Neurologic status

Exposure/**E**nvironmental control: Completely undress the patient, but prevent hypothermia

Emergency Care

A) **Airway Maintainance -**

- Existence & identification of obstruction.
- Manually clear fractured teeth, blood clots, dentures.
- Endotracheal intubation if needed.

NOTE:

- Altered level of consciousness is the most common cause of upper airway obstruction.

B) Breathing and ventilation

- Airway patency alone does not ensure adequate ventilation
- Adequate gas exchange is required to maximize oxygenation and carbon dioxide elimination
- Ventilation requires adequate function of the lungs, chest wall, and diaphragm

C) Circulation & hemorrhage control

- Hemorrhage is most common cause of shock after injury.
- Multiple injury patients have hypovolemia.
  - Monitor vital signs closely.
- Goal is to restore organ perfusion.

Treatment of Blood Loss & Shock

- External bleeding controlled by direct pressure over bleeding site.
- Gain prompt access to vascular system with IV catheters.
- Fluid replacement:
  - Ringer’s Lactate
  - Normal saline
  - Transfusion.

D) DISABILITY (NEUROLOGIC EVALUATION)

- A rapid neurologic evaluation is performed at the end of the primary survey
- The Glassgow Comma Scale (GCS) is a quick, simple method for determining the level of consciousness

Glasgow Coma Scale	
Action	*Score*
Eye opening	
Spontaneously	4
To speech	3
To pain	2
None	1
Motor response	
Obeys	6
Localizes pain	5
Withdraws from pain	4
Flexion to pain	3
Extension to pain	2
None	1
Verbal response	
Oriented	5
Confused	4
Inappropriate	3
Incomprehensible	2
None	1

PATIENT SCORE DETERMINES CATEGORY OF NEUROLOGIC IMPAIR

SCORE

>15 = NORMAL
13-14= MILD INJURY
9-12 = MODERATE INJURY
3-8 = SEVERE INJURY

E) EXPOSUREANDENVIRONMENTAL CONTROL

- The patient should be completely undressed
- usually by cutting off his or her garments to facilitate a thorough examination and assessment

The patient’s body temperature is more important than the comfort of the healthcare providers.

Stabilization of associated injuries

- C-spine injury is primary concern with all maxillofacial trauma victims.
  - Signs/symptoms of C-Spine injury
    - Neurologic deficit.
    - Neck pain.

Stabilization of associated injuries

- C-spine injury suspected:
  - Avoid any movement of neck
  - Establish & maintain proper immobilization until vertebral fractures or spinal cord injuries ruled out
    - **Lateral C-spine radiographs**
    - **CT of C-spine**
    - **Neurologic exam**

STAGE II. Initial Assessment and Early care

- Emergency care has stabilized patient.
- Initial stabilization of fractures.
- Debridement & dressing of soft tissues.
- Physical exam & history.
- Laboratory tests.
- Clinical & Radiographic Assessment of Patient. Diagnosis of maxillofacial injuries.
- Pre-operative planning.

STAGE II. Initial Assessment

- **Pre-operative planning**

1. Need for Tracheostomy
2. Surgical Approaches to Midface
3. Whether ‘Open’ or ‘Closed’ methods of reduction are to be employed.
4. Necessity for & type of Maxillary fracture Fixation.

STAGE II. Initial Assessment

- **Pre-operative planning**

- Surgical Approaches to Midface

Pre-operative planning

- *Principle of treatment for Mid face #:*

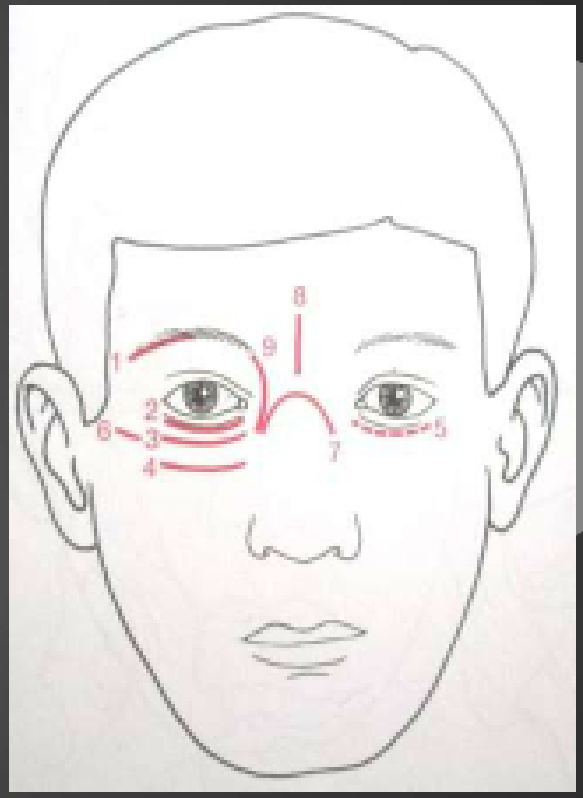
- *CONSERVATIVE*
- *OPERATIVE/SURGICAL: REDUCTION and FIXATION*

- Indications for Closed Reduction:
- Non displaced fracture,
- Grossly comminuted fractures,
- Fractures exposed by significant loss of overlying soft tissues,
- Edentulous maxillary fractures,
- In children with developing dentition.

- Indications for open reduction:
- Displaced fractures,
- Multiple fractures of the facial bones,
- Fractures of the edentulous maxilla with severe displacement,
- Delay of treatment and interposition of soft tissues between non-contacting displaced fracture segments, Specific systemic conditions contraindicating IMF.

Incisions for exposure of LeFort fracture

1. Supraorbital eyebrow incision (Lefort s III)
2. Subciliary incision (LeFort II & III)
3. Median lower lid (LeFort II & III)
4. Infraorbital incision (LeFort II & III)
5. Transconjunctival (LeFort II)
6. Zygomatic arch
7. Transverse nasal (LeFort II & III)
8. Vertical nasal incision (LeFort II & III)
9. Medial orbital incision.
10. Intra-oral vestibular incision. (LeFort I)



Classification of methods of Maxillary Fracture Fixation

A) Internal Fixation-

1. Suspension Wires
2. Direct Osteosynthesis

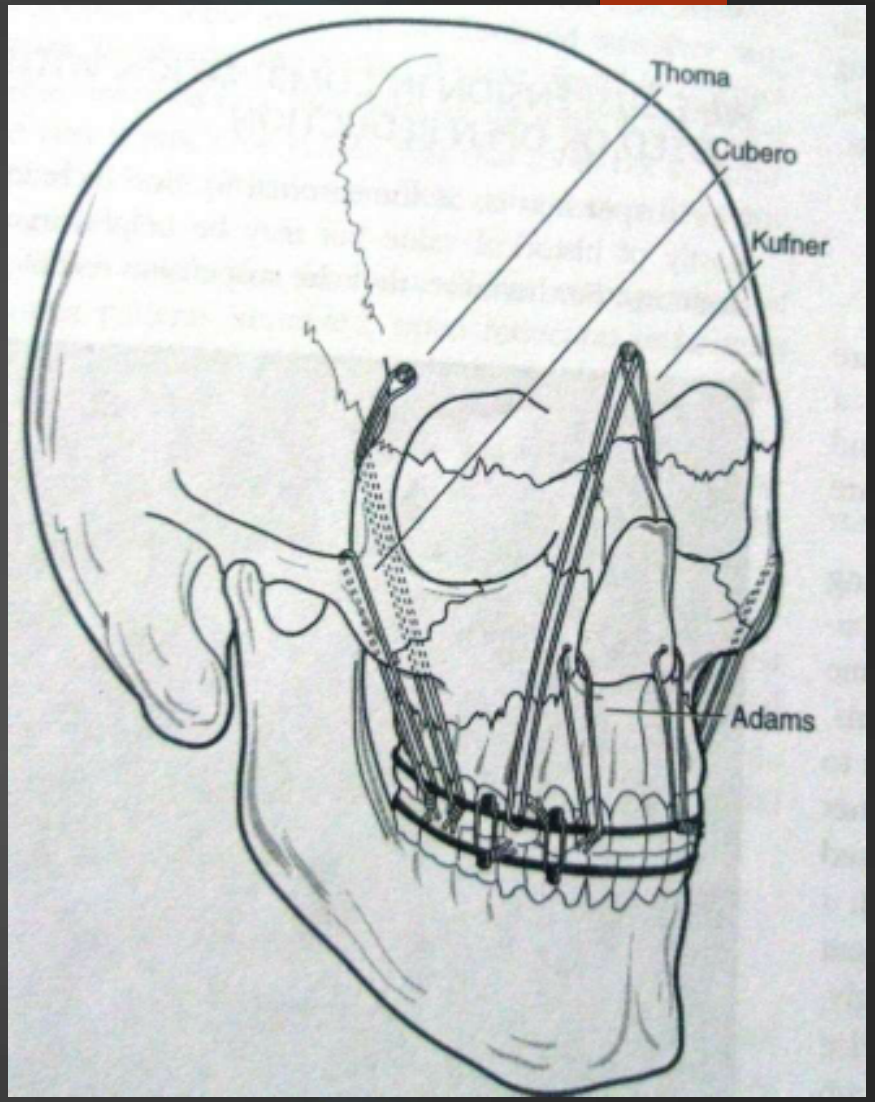
B) External Fixation-

1. Craniomandibular
2. Craniomaxillary

Internal Fixation

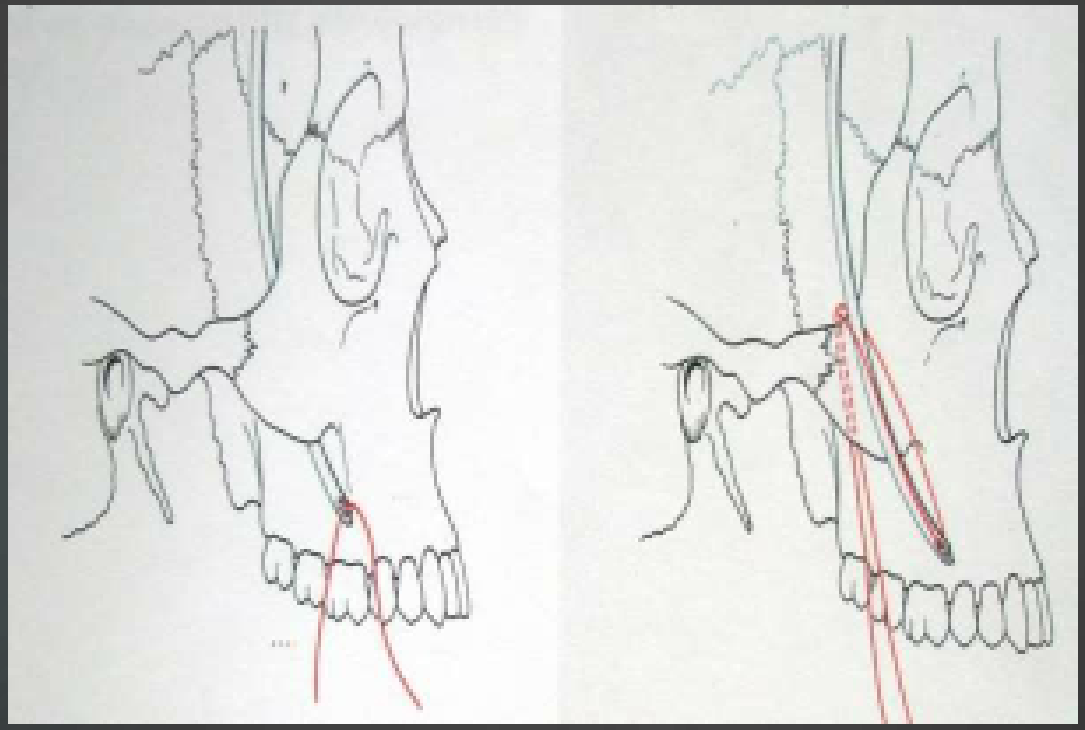
Suspension Wires – non-rigid osteosynthesis -

i. Frontal-central or laterally placed
ii. Circumzygomatic
iii. Zygomatic
iv. Circumpalatal/palatal screw
v. Infraorbital
vi. Piriform Aperture
vii. Peralveolar



Internal Fixation

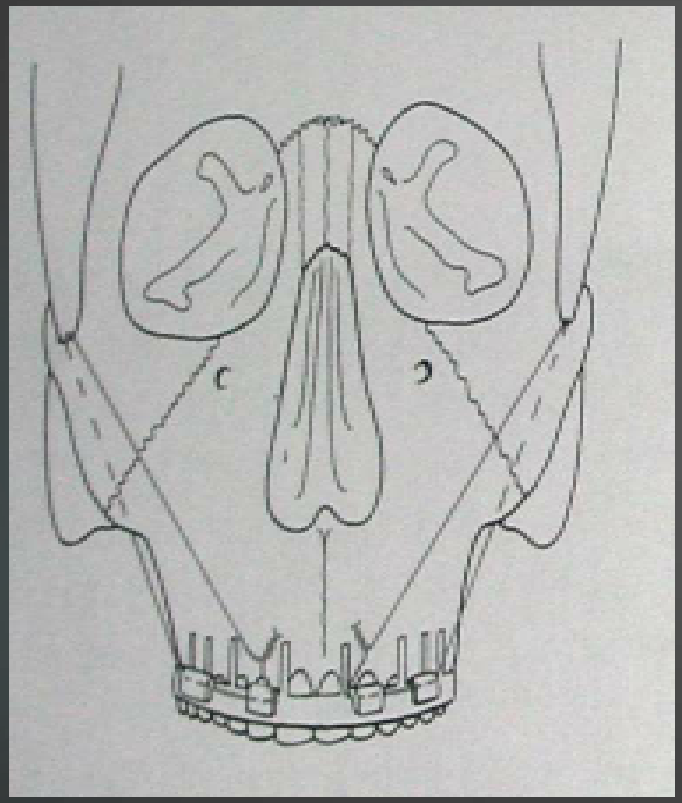
Suspension Wires- Circum*zygomatic wiring by Obwegeser.*

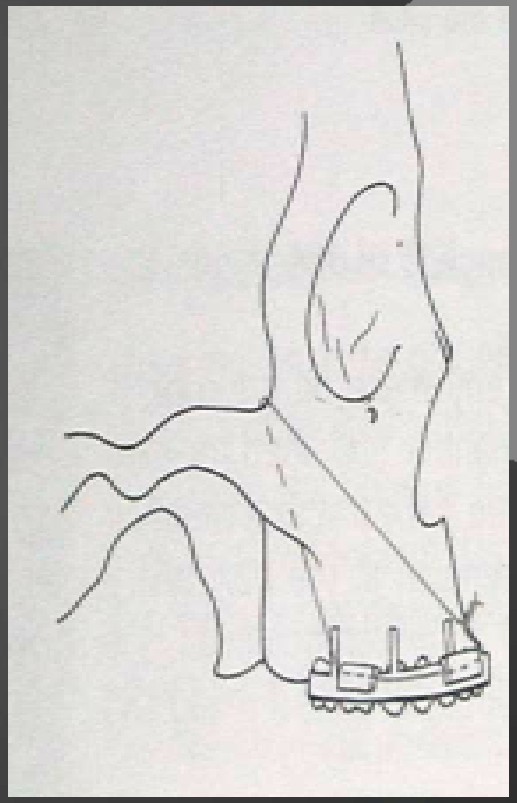


Internal Fixation

Suspension Wires-

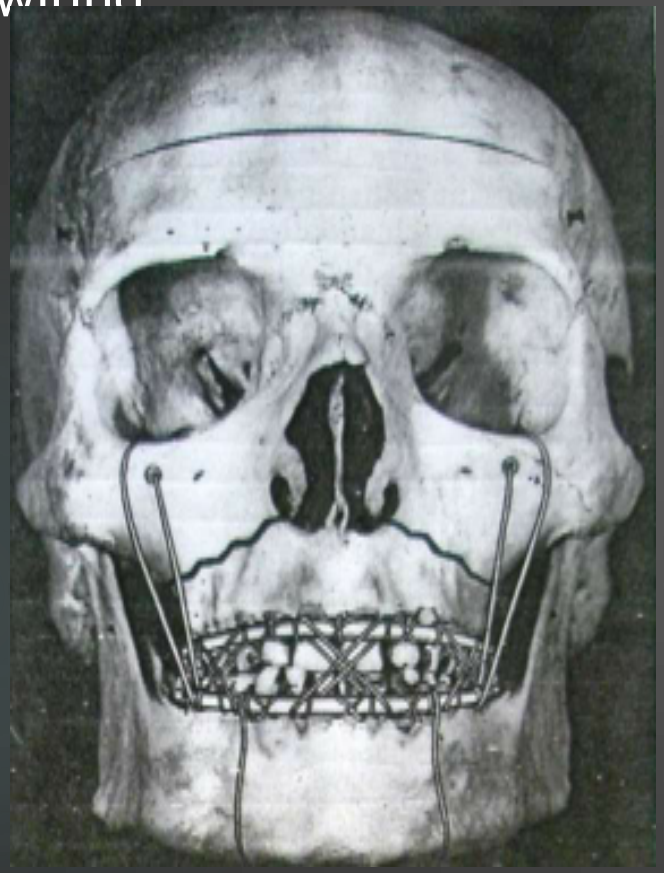
Circum*zygomatic wiring by Obwegeser*

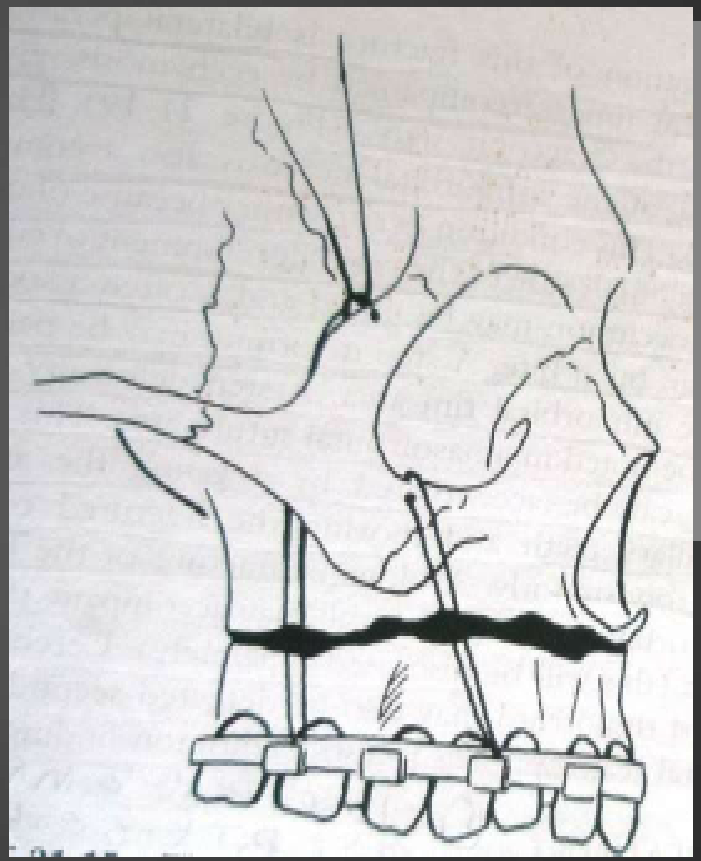




Internal Fixation

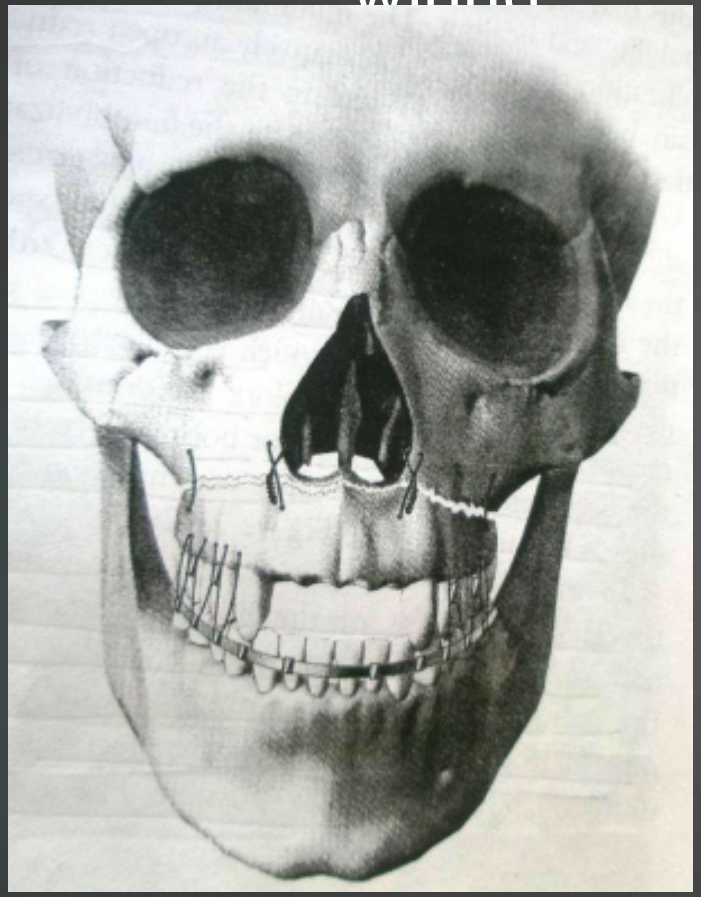
Suspension Wires- Orbital rim wiring

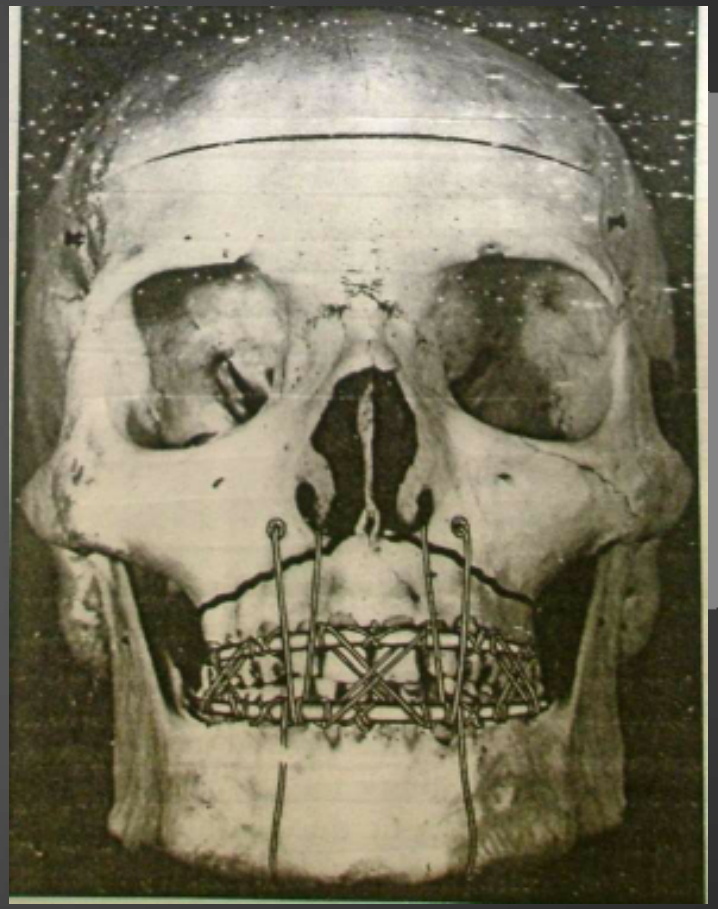




Suspension Wires-

Piriform aperture wiring





Summary of Suspension wiring according to fracture site

Type of Suspension Wire	Type of Le Fort Fracture
1. Frontal	
a. Central	Le Fort III & II
b. Lateral	Le Fort III & II
2. Circumzygomatic	Le Fort I & II
3. Zygomatic	Le Fort I
4. Infraorbital	Le Fort I
5. Piriform Aperture	Le Fort I

Disadvantages of Suspension Wiring

- Incomplete fixation of fractured fragments
- Insufficient visualization of fractures by closed reduction
- Compression against the cranial base
- No 3-dimensional stability
- Patients dislike intra-oral splints as it hinders oral hygiene maintainence.

Internal Fixation

Direct Osteosynthesis -

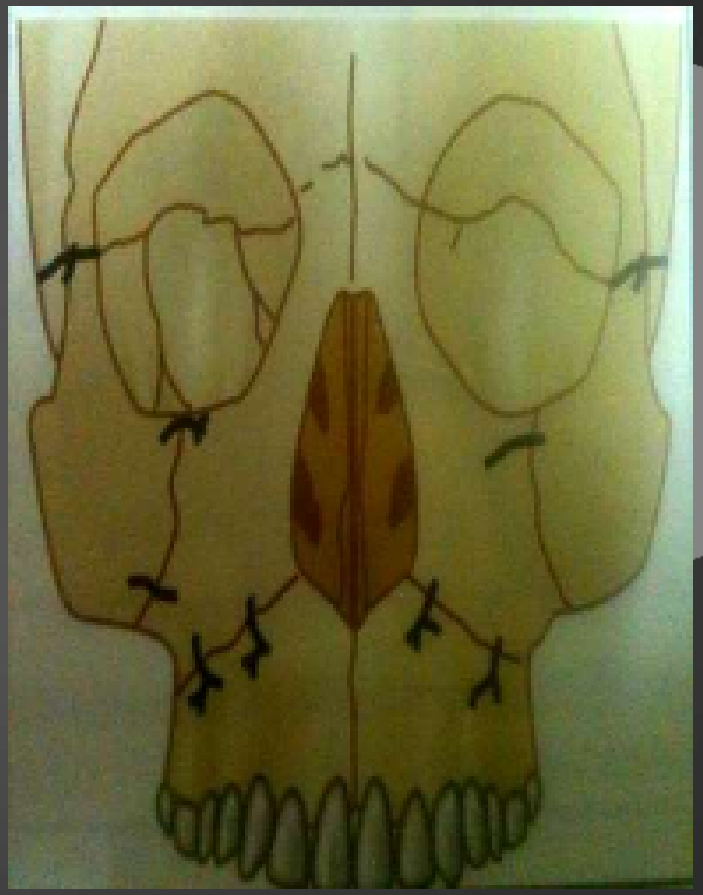
1. Interosseous Wires.

2. Plates and Screws.

Direct osteosynthesis

Intraosseous Wires-

1. Maxillary (Lefort –I)
2. Zygomaticomaxillary (Lefort –
3. II) Frontonasal (LeFort –II &III)
4. Zygomaticofrontal (Lefort III)
5. Zygomatic bone (comminuted)



Disadvantages

- Non rigid type of osteosynthesis
- No 3 dimensional stability, it provides only monoplane traction.
- IMF is always needed
- Interfragmentary pressure can not be controlled.
- Under functional stress, wire loses rigidity, direction control and surface contact.
- Delayed healing because of micromovement at fracture site.

Direct osteosynthesis-

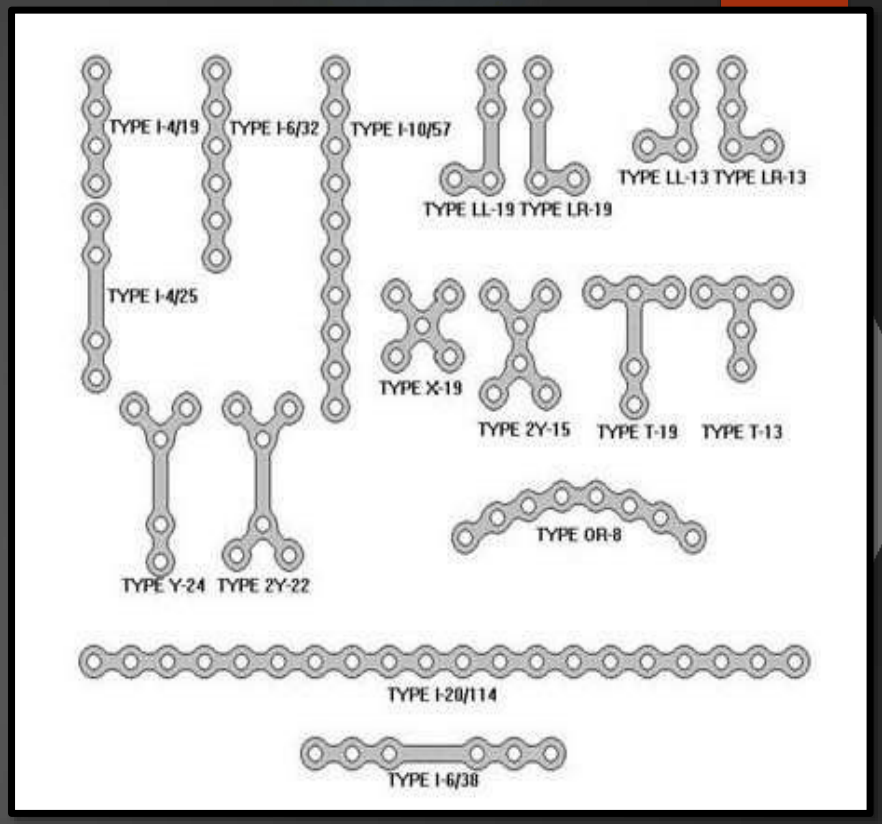
2. Plates & Screws for midface fractures -

- Stainless steel mini-plating system
- Titanium mini-plating system
- Vitallium, Cobalt chromium, molybdenum alloy plates
- Bioresorbable plating system.

Miniplates and screws

These are monocortical, semi-rigid fixation
device which provide 3D stability.

Designs: X, H, L, T, Y Thickness:0.6-1 mm



Type of metals: Stainless steel, Titanium, Vitallium

Advantages:Easily adaptable, Monocortical, Functional stability, Reduced surgical access

Micro plates

Harle & duker(1975;Luhr(1979) 0.3 – 0.6 mm

Used for : FN region ,Frontal bone,Frontal process of maxilla

Sites of application:Linear/T/Y plate at FN region,Long curve plate for frontal process of maxilla or frontal bone

Mesh fixation Used for retention and alignment of
small fragments or bone grafts.

Sites of application: Anterior and lateral wall of maxilla and Anterior table of frontal bone

Bone plate osteosynthesis

Advantages –

1. Simple & less intraoperative time
2. Intraoral approach is sufficient
3. Postoperative IMF is not needed or period of IMF is reduced.
4. Three dimensional stability and early return of function.

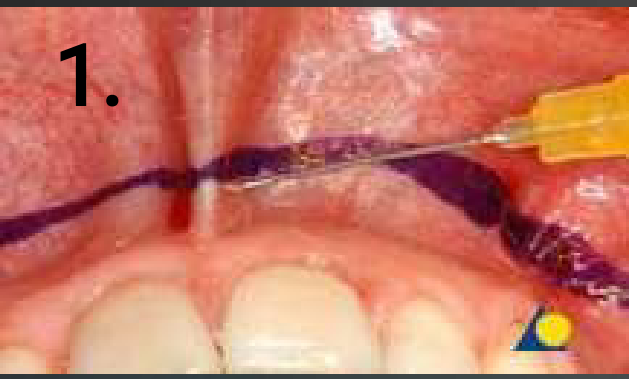
STAGE III. DEFINITIVE TREATMENT

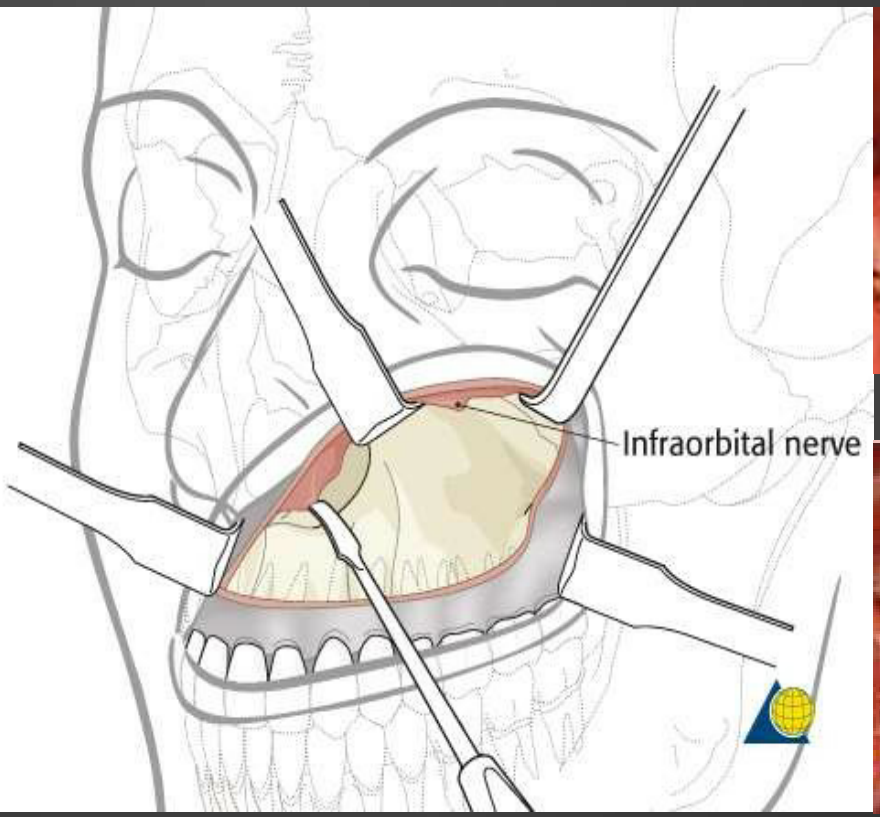
- LEFORT I FRACTURE
- LEFORT II FRACTURE
- LEFORT III FRACTURE

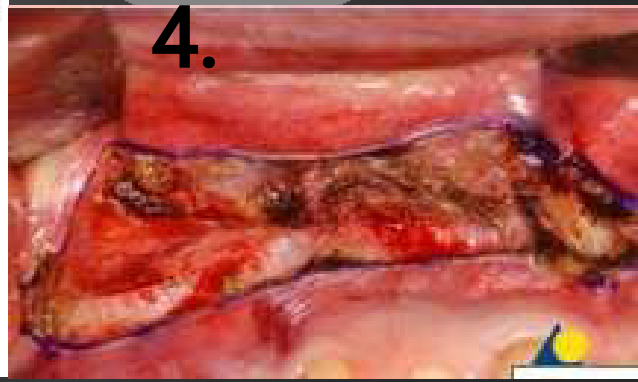
STAGE III. DEFINITIVE TREATMENT

LEFORT I FRACTURE

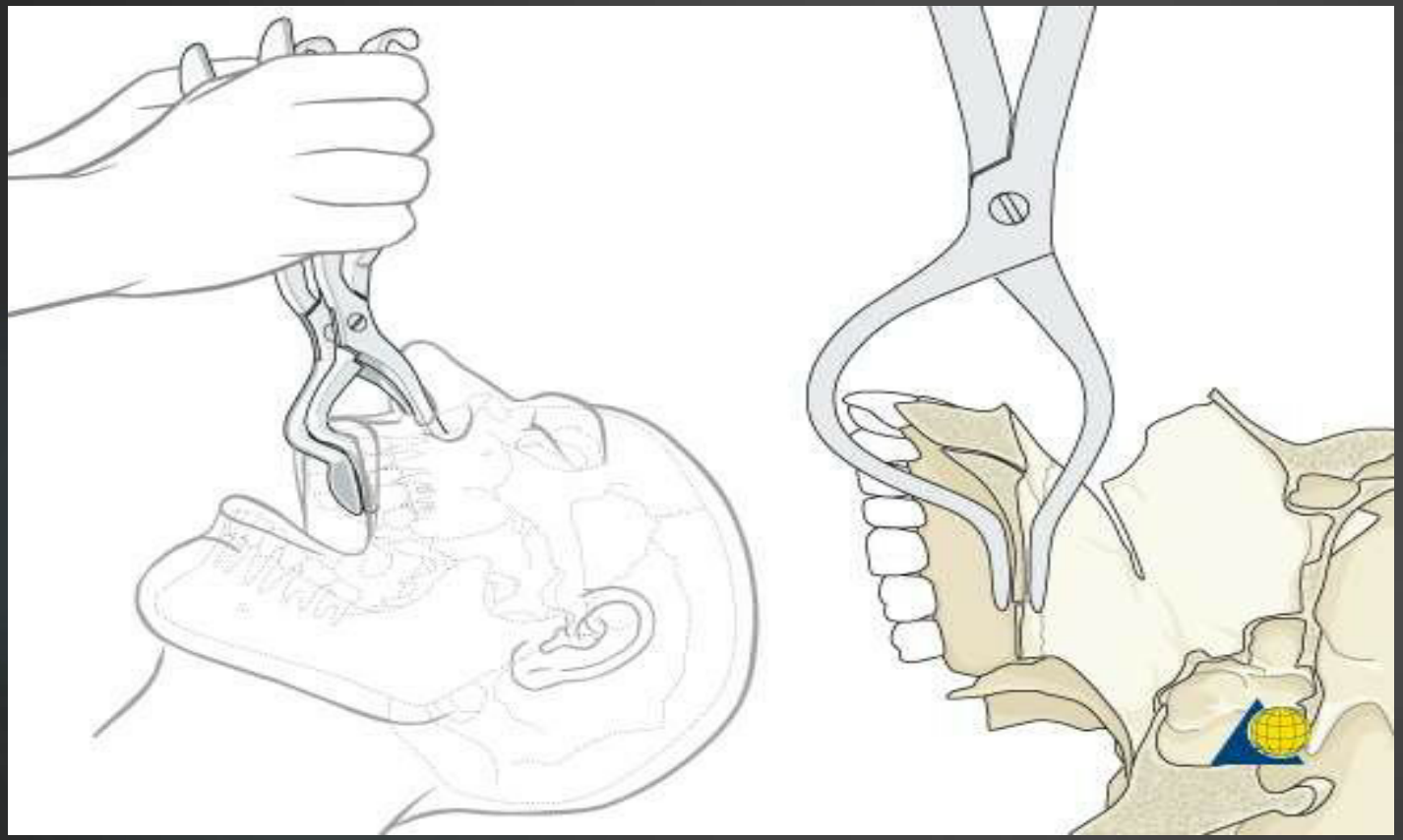
SURGICAL APPROACH- MAXILLARY VESTIBULAR



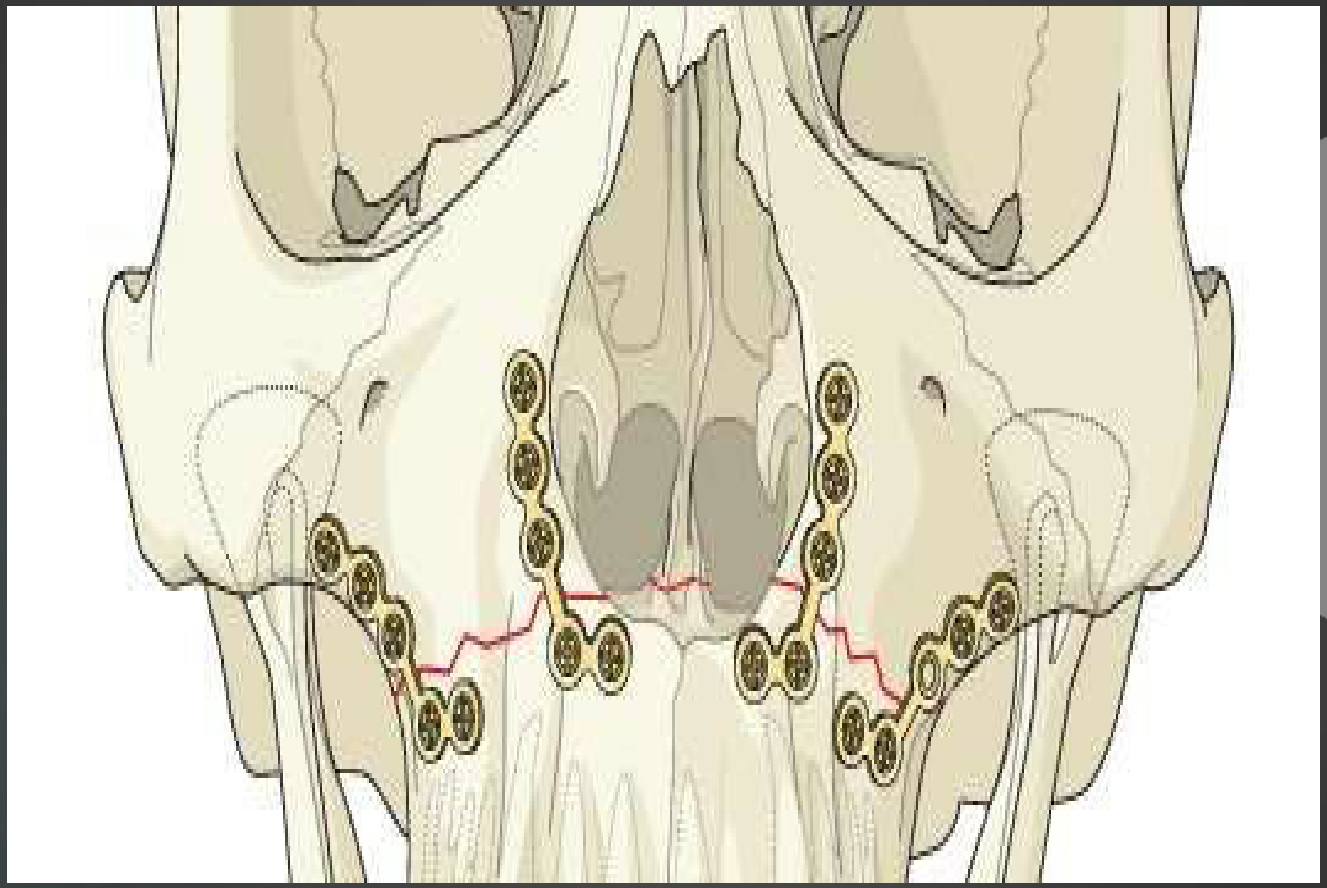




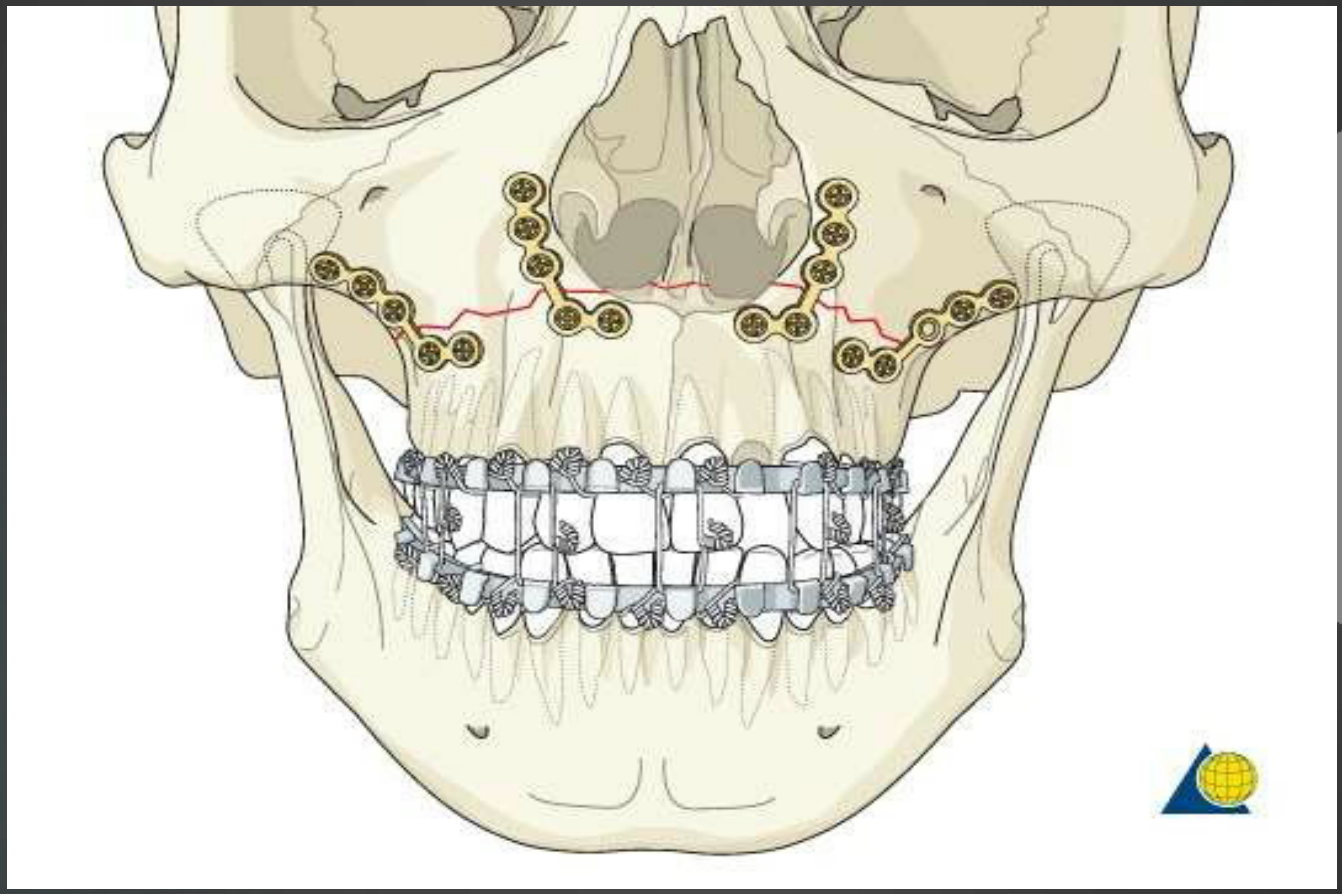
REDUCTION- ROWE OR HAYTON WILLIAMS FORCEP



FIXATION- 4-point fixation with MINIPLATE.

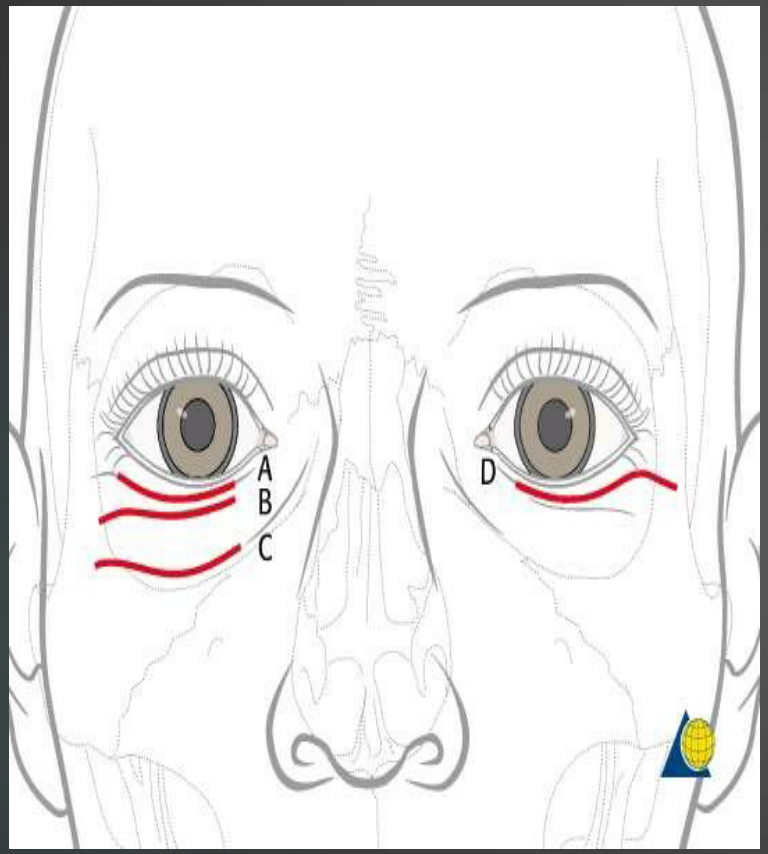


IMMOBILISATION- MAXILLOMANDIBULAR FIXATION(MMF)



LEFORT II FRACTURE

- SURGICAL APPROACH-



A – Subciliary incision

B – Sub tarsal incision

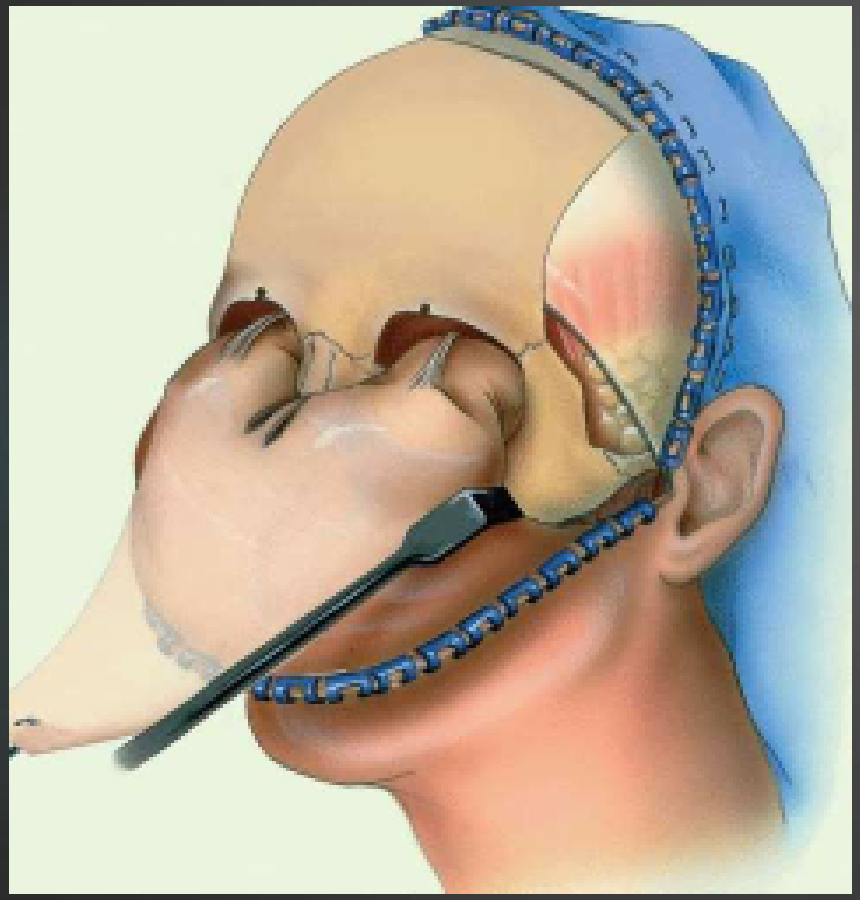
C - Infraorbital incision

D - Extension of Subciliary incision

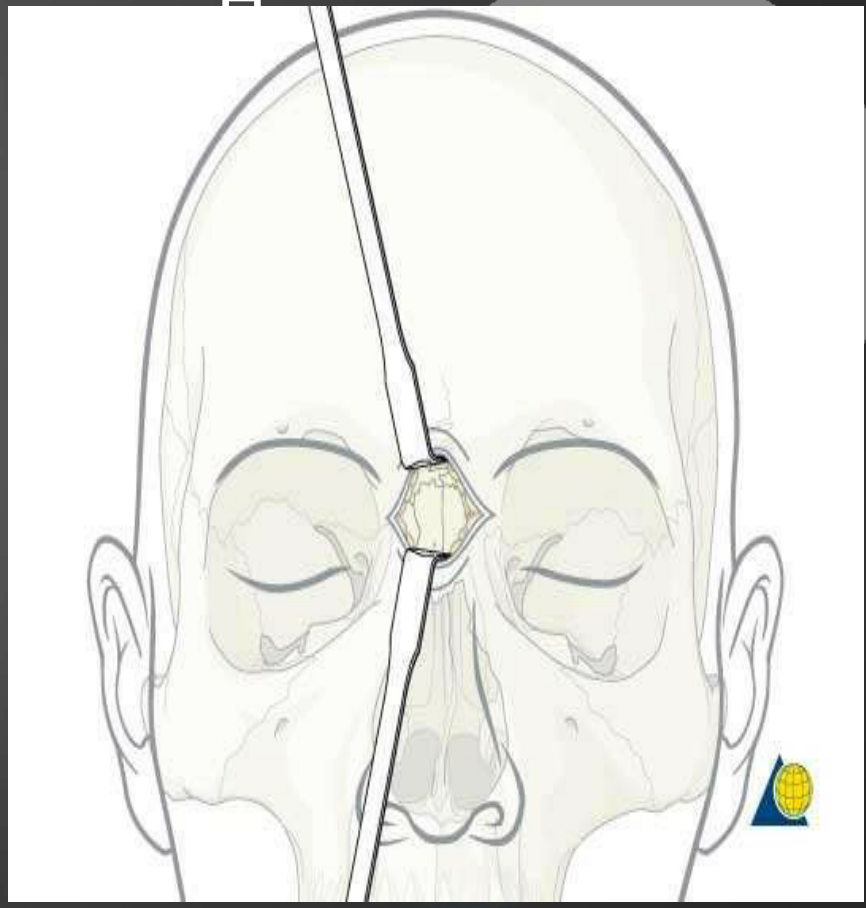
Existing Laceration

Maxillary vestibular approach can also be taken for LeFort II fracture

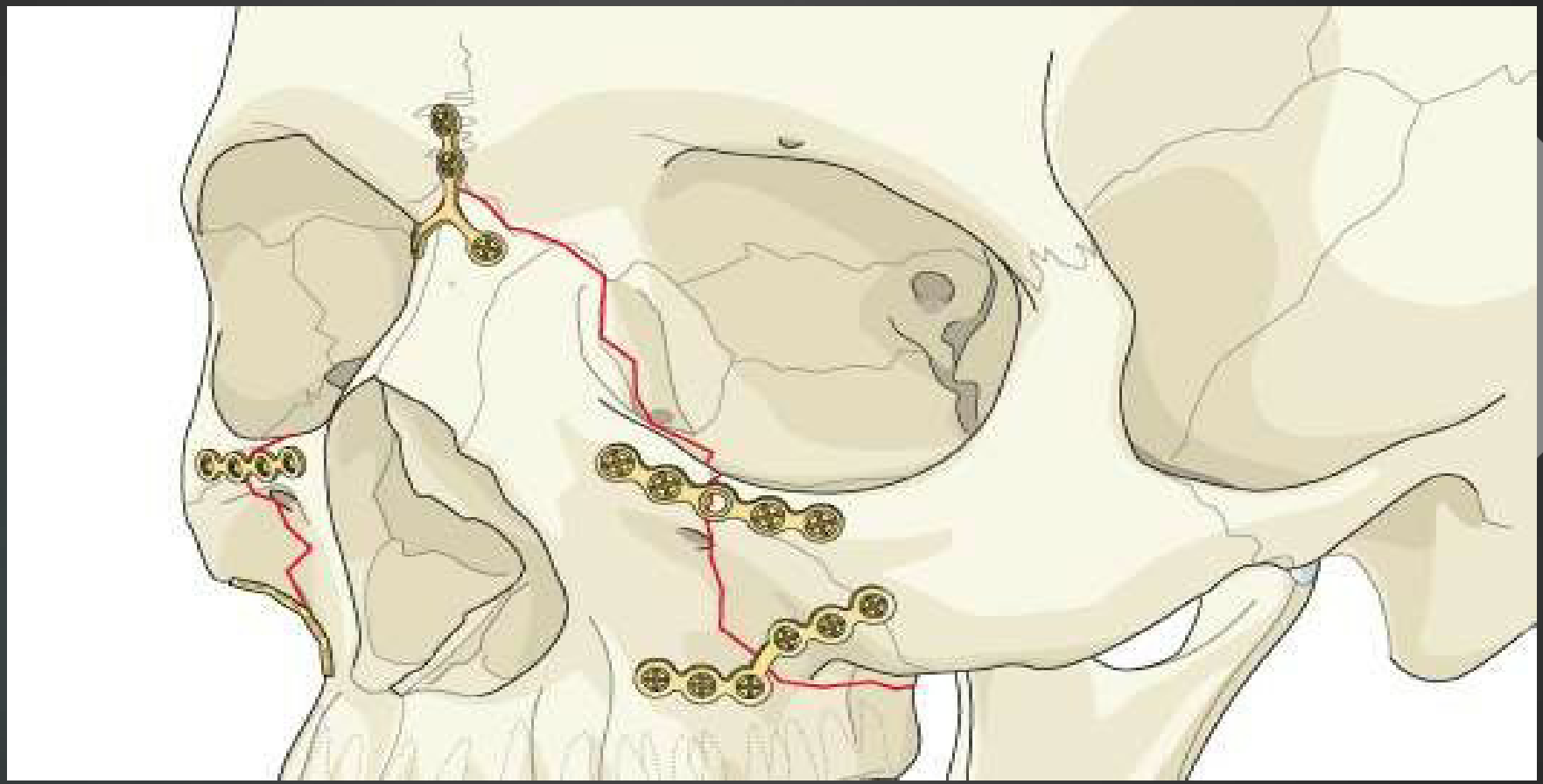
CORONAL APPROACH



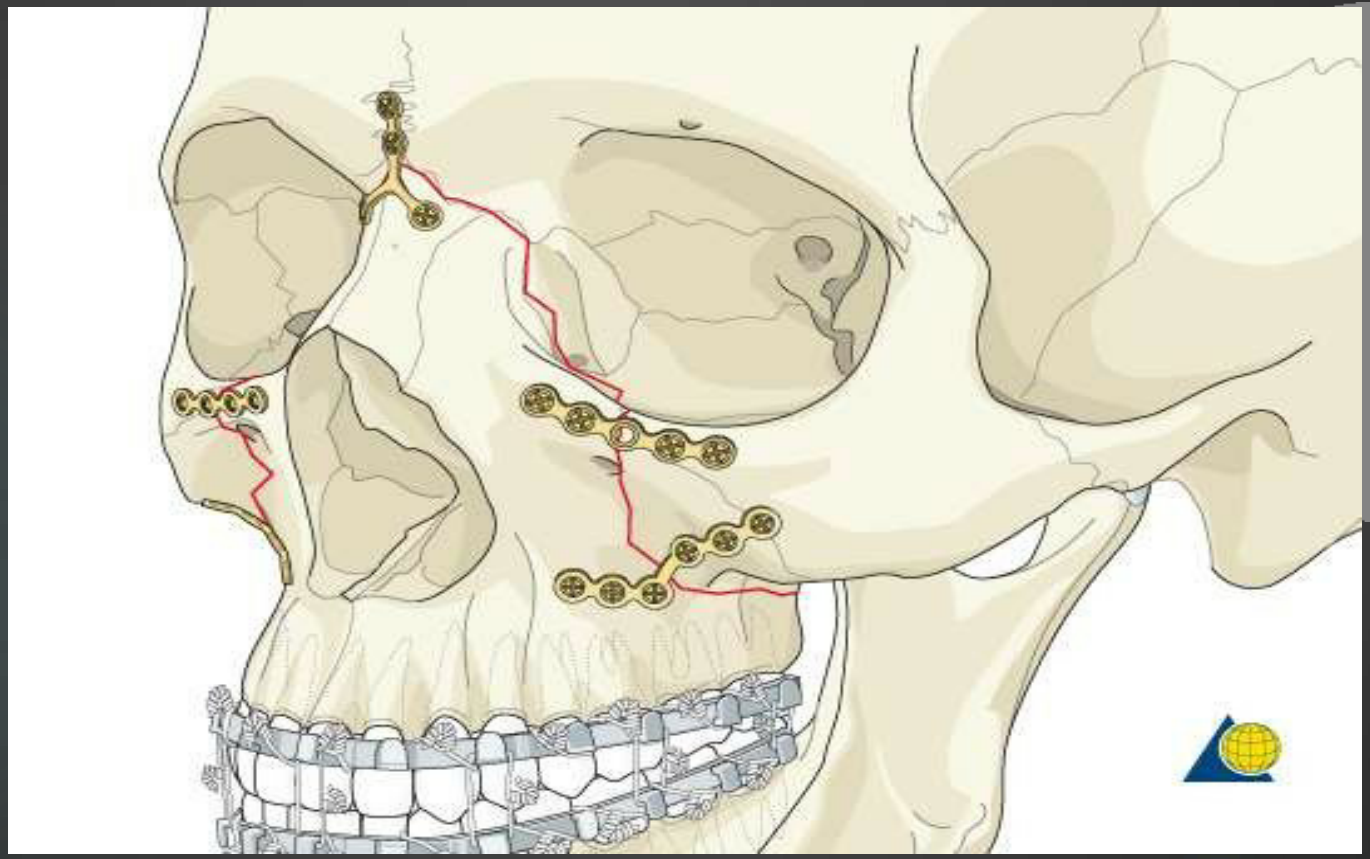
GLABELL APPROACH



- FIXATION- 3-POINT fixation



- IMMOBILISATION- MAXILLOMANDIBULAR FIXATION



- **STAGE III. DEFINITIVE TREATMENT**

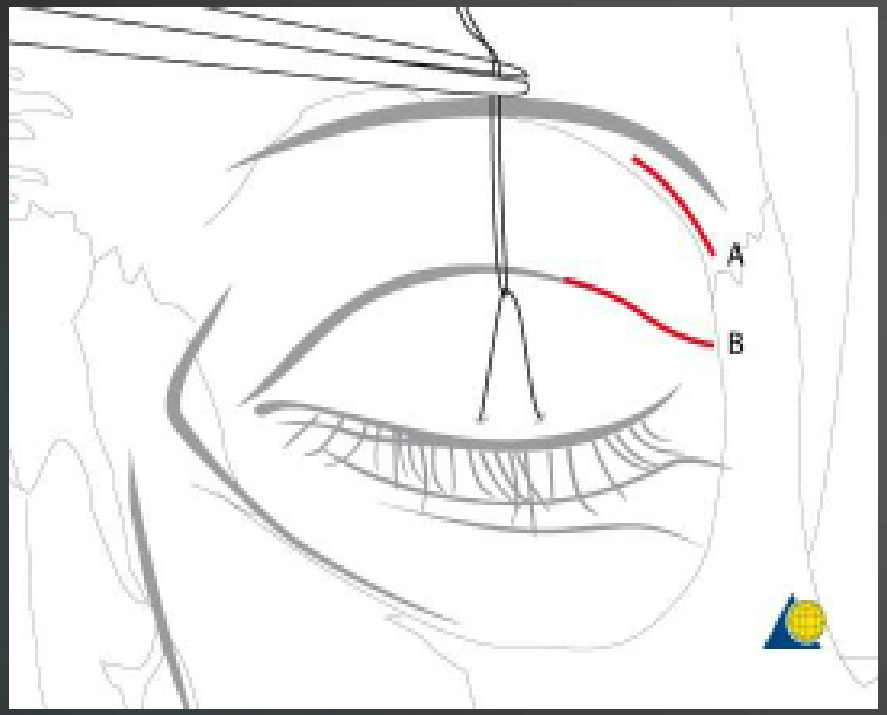
LEFORT III FRACTURE-

- SURGICAL APPROACH-

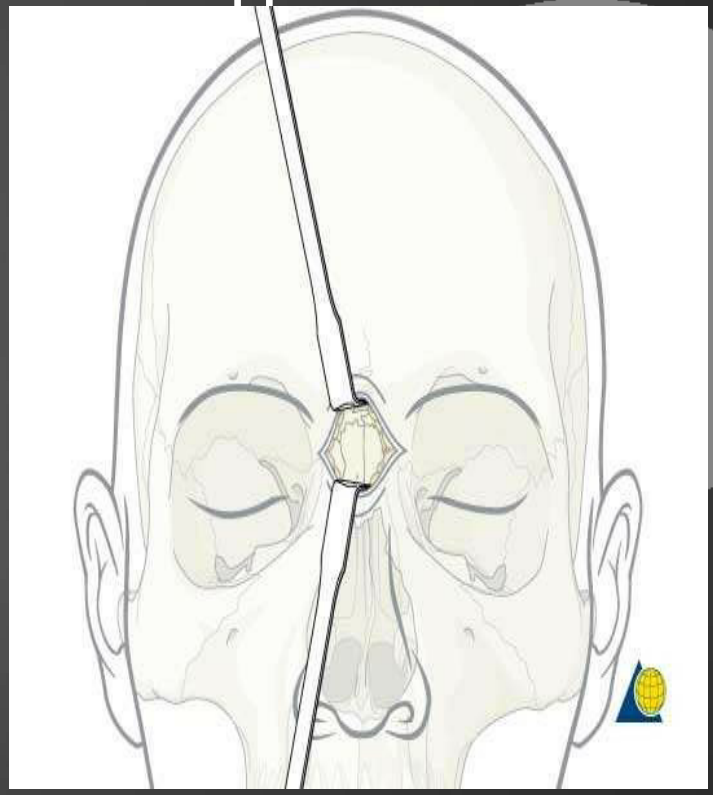
Existing Laceration

A . Lateral eyebrow approach

B. Upper-eyelid approach

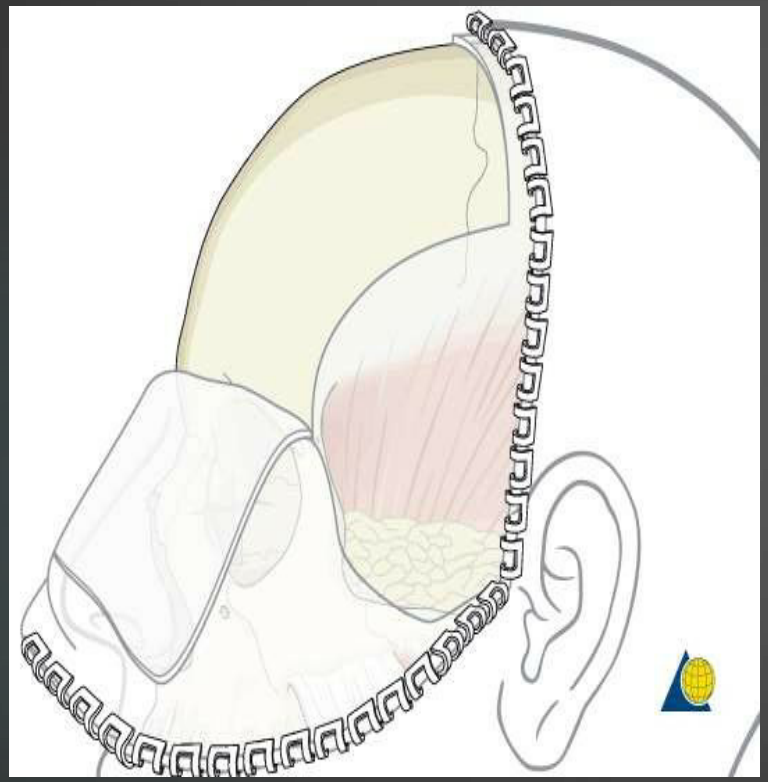


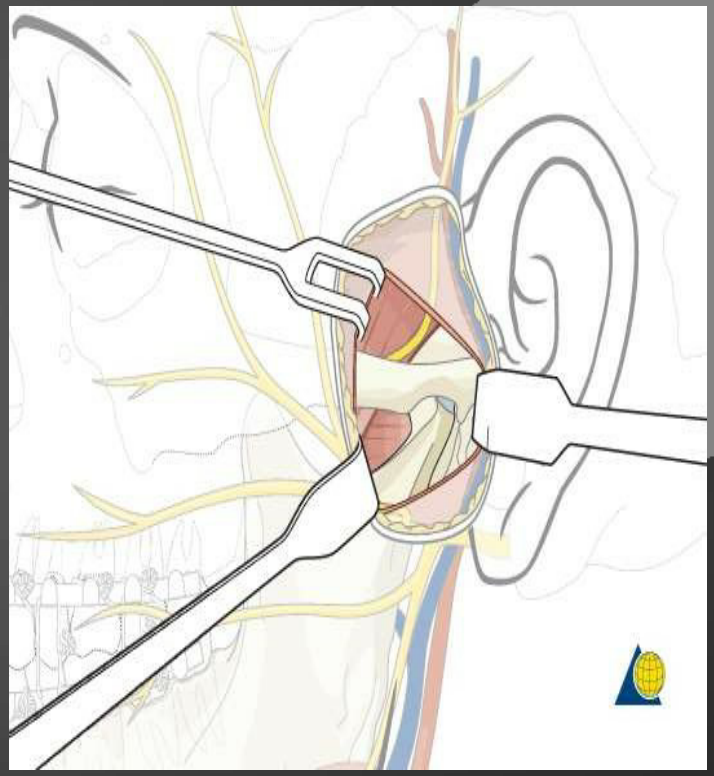
GLABELL APPROACH



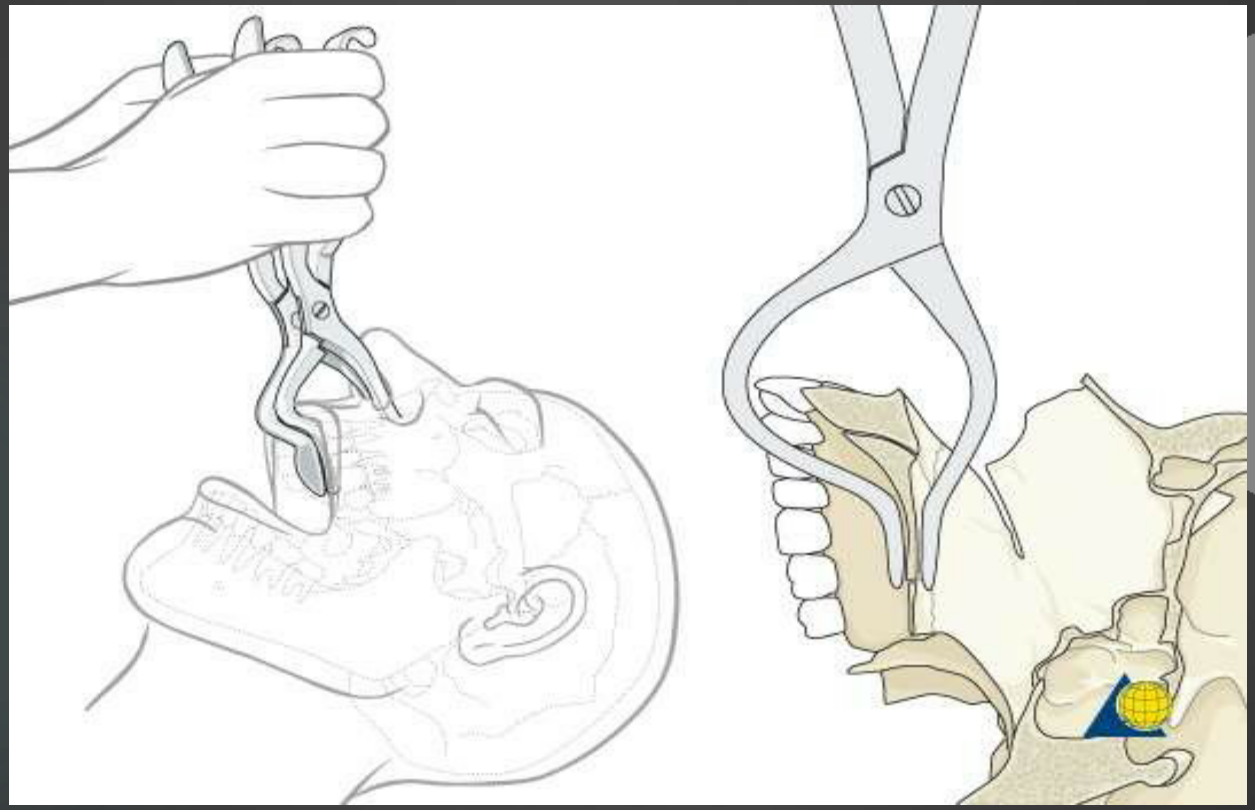
Coronal approach -

PREAURICULAR APPROACH

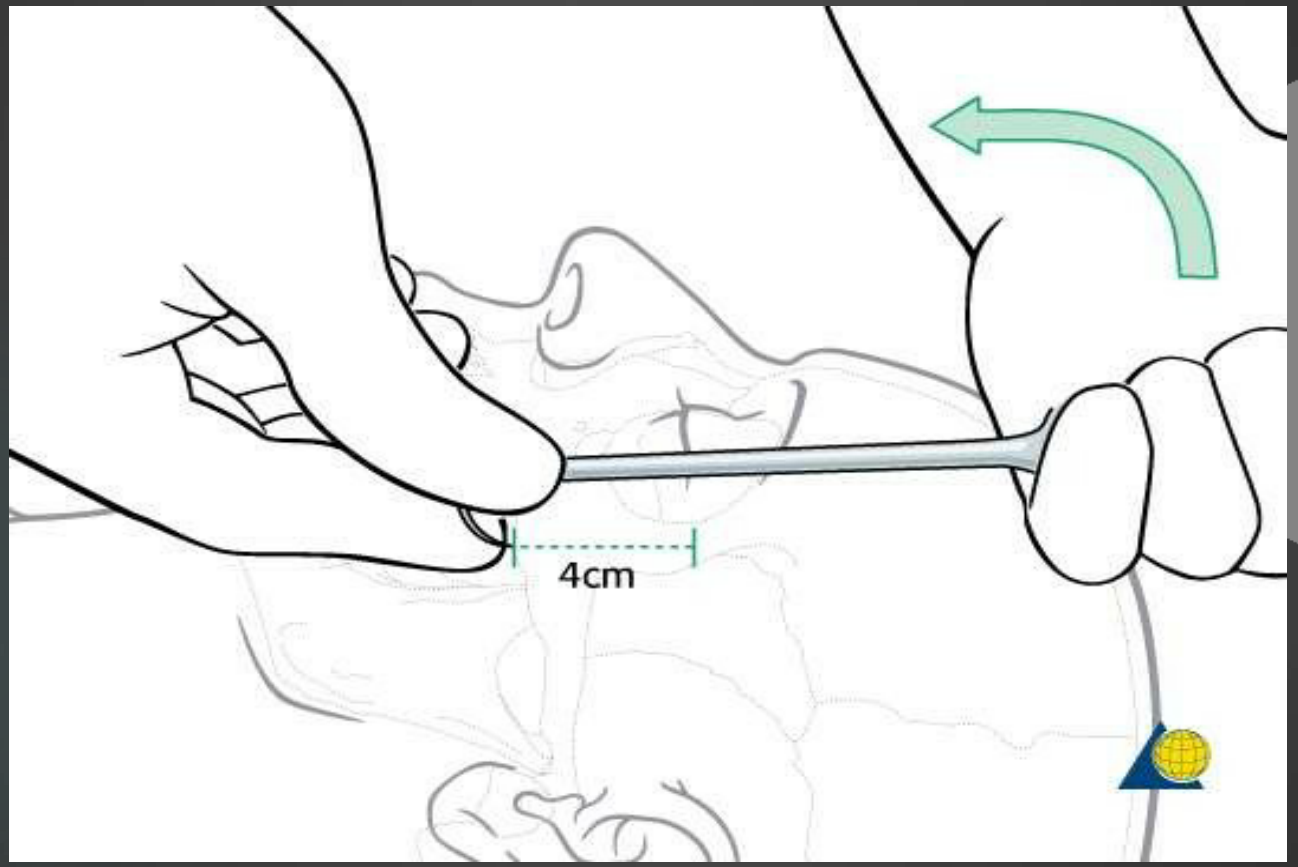




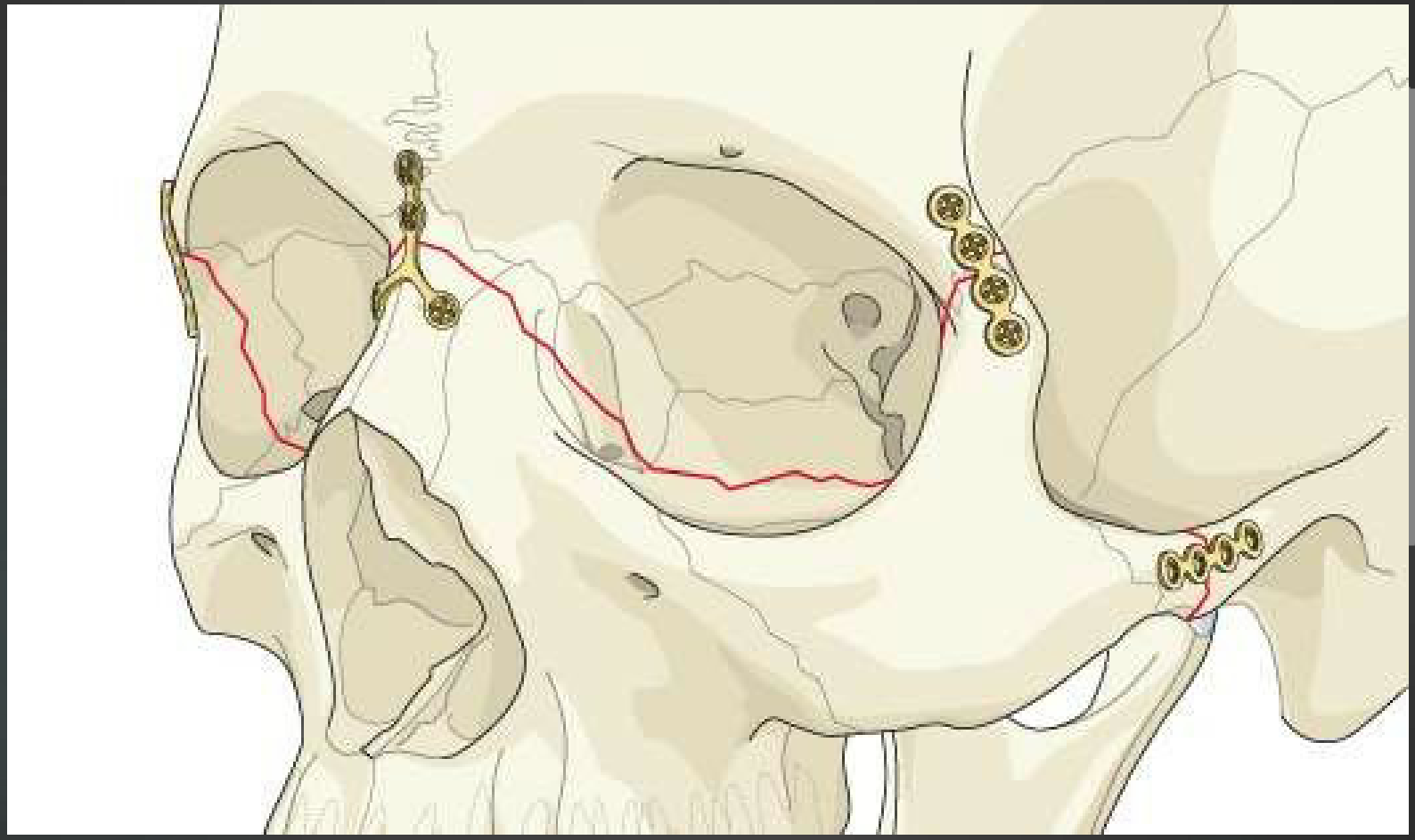
REDUCTION- ROWE OR HAYTON WILLIAMS FORCEP



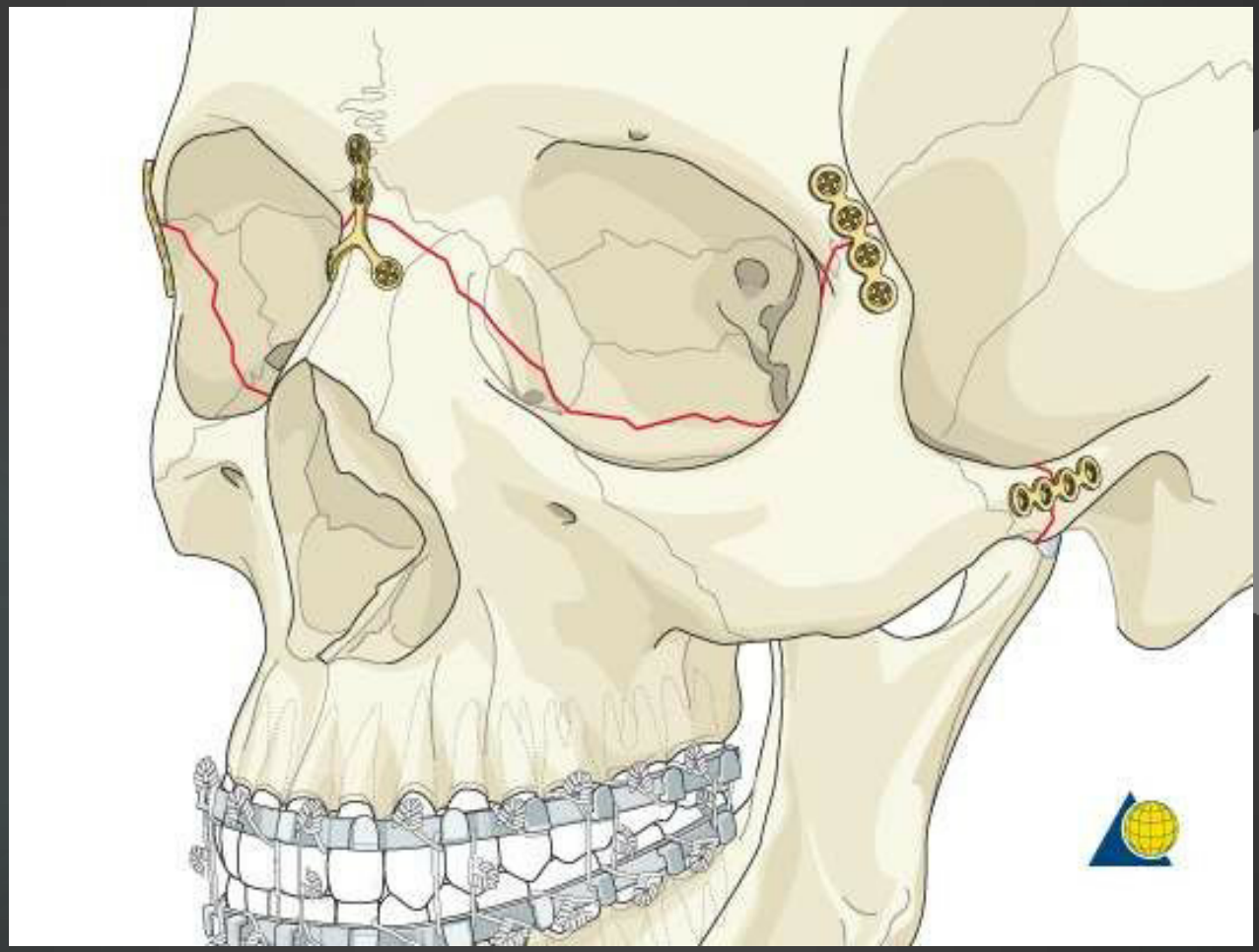
Zygoma hook



- FIXATION- 3-point fixation



- IMMOBILISATION- MAXILLOMANDIBULAR FIXATION if required



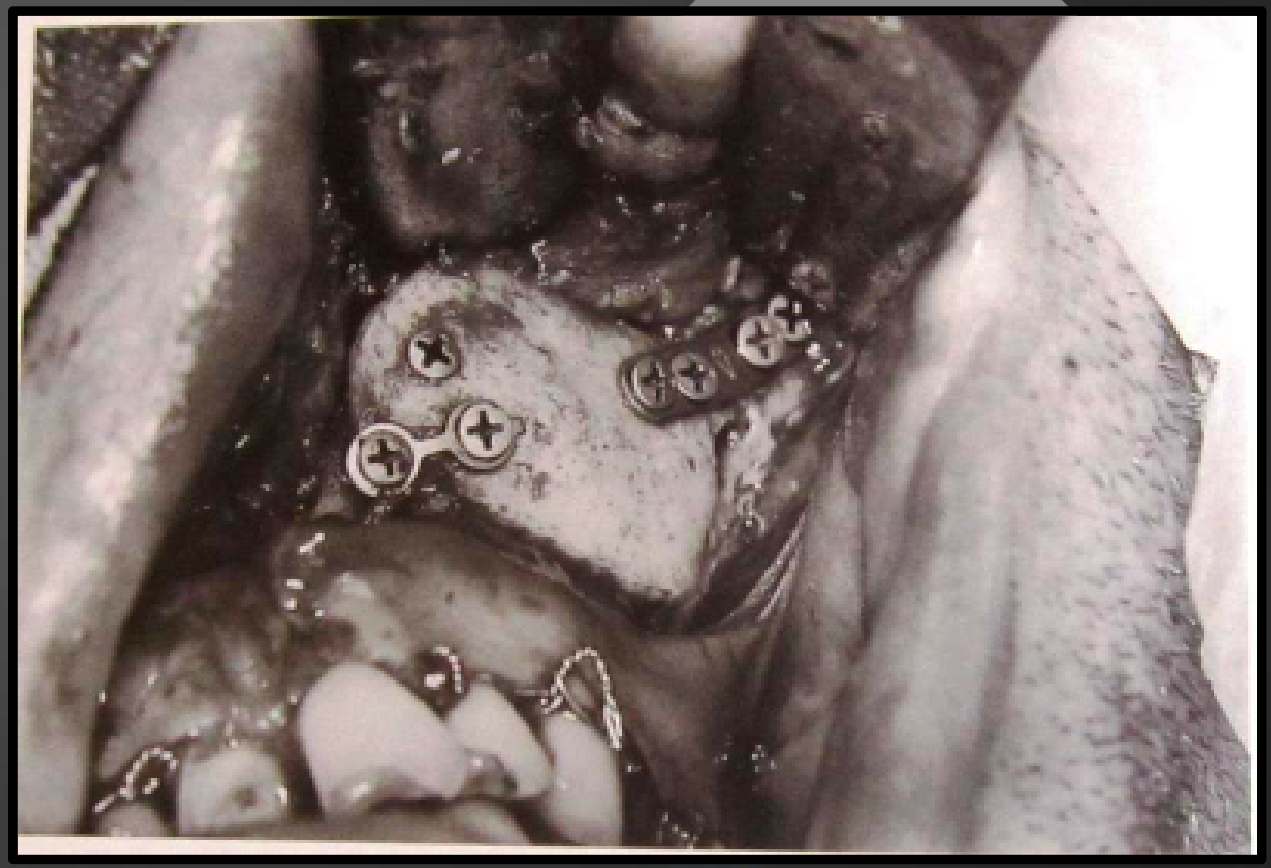
Principles of Maxillary Reconstruction

- Miniplates can bridge gaps of up to approximately 0.5cms
- Gaps >0.5cms – bone grafts
- Bone grafts bridging the gap should be wedged underneath the plate & held in place with screws fixed from plate directly into the graft.

Immediate Bone Grafting

Buttress reinforcement retained by plates or screws can assist in restoring maxillary height & preventing Contour deficiencies.

- Rib graft
- Iliac crest
- Calvaria
- Mandibular bone graft
- Alloplastic bone graft



CONCLUSION:

Le fort fractures are common in the trauma patient. They require accurate radiologic diagnosis and surgical management to prevent severe functional debilities and cosmetic deformity.

A thorough understanding of the anatomy, craniofacial buttresses and treatment options will give the maxillofacial surgeon the optimal tools for achieving a successful result.

THANK YOU