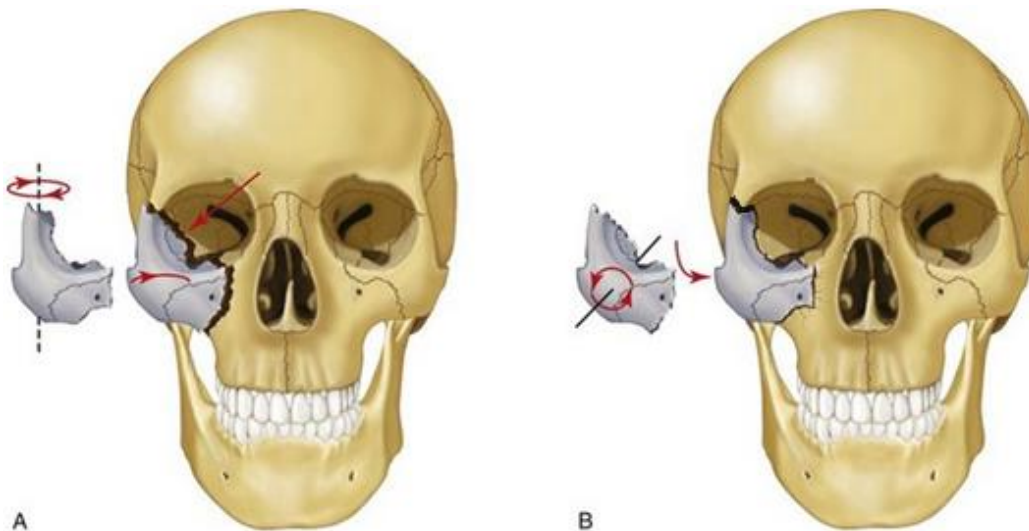
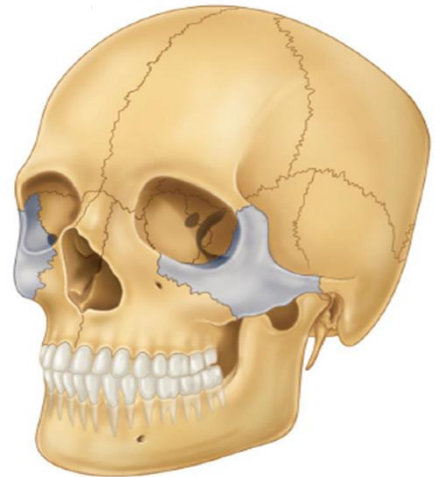


Maxillofacial Trauma - Midface Fractures/P.II

FRACTURES OF THE ZYGOMATIC COMPLEX

- ✓ Anatomically the zygoma has four processes (zygomaticofrontal, zygomaticomaxillary, zygomaticotemporal, and zygomaticosphenoidal).
- ✓ The zygomatic bone is intimately associated with the maxilla, frontal and temporal bones, and because of the involvement of these bones during fractures; it is more accurate to refer to such injuries as 'zygomatic complex fractures' ZMC fractures.
- ✓ The zygomatic complex usually fractures in the region of the sutures; frontozygomatic, the zygomaticotemporal and the zygomaticomaxillary sutures. It is unusual for the zygomatic bone itself (the body of the bone) to fracture unless there is high energy injury (e.g. Missile). The arch of the zygoma may be fractured in isolation from the rest of the bone.
- ✓ An understanding of the nature of the displacement of the zygomatic complex is of value when planning the reduction of the fracture and in evaluating the probable stability of the fragments after reduction. When the zygomatic complex is rotated around a vertical axis-(A); it is more stable after reduction and no need for internal fixation (miniplates), while if the zygoma is rotated around horizontal axis (there is separation at the frontozygomatic suture)-(B) then it is unstable after simple reduction and internal fixation should be applied.



Signs and symptoms

- ✓ Flattening of cheek (can be observed by bird view or worm view)
- ✓ Swelling of cheek
- ✓ Anaesthesia of cheek, temple, upper teeth and gingiva (damage to infra orbital nerve and zygomatic nerves- zygomatico temporal and zygomatico facial-)
- ✓ Circumorbital ecchymosis (panda eye)
- ✓ Sub-conjunctival haemorrhage
- ✓ Palpable step deformity of infraorbital margin
- ✓ Palpable separation at frontozygomatic suture
- ✓ Ecchymosis and tenderness intra-orally in the buccal vestibule over zygomatic buttress.
- ✓ Crepitation from air emphysema; the fracture involve the sinus wall.
- ✓ Interference with mandibular excursion (it may impinge on the coronoid process of the mandible and interfere with mandibular movements_ limitation of mouth opening).
- ✓ Limitation of eye movement and Diplopia (double vision):

The presence of entrapment of orbital contents by the fracture through the orbital floor can be determined with a **forced duction test**.

Diplopia can be tested by holding a finger or object at least an arm's length in front of the eyes and asking the patient to report double vision as the finger is moved. Diplopia should be recorded in each of the nine positions of gaze.



- ✓ **Enophthalmos:**
Means (Sinking inward of the eye); it may itself be a cause of diplopia, enophthalmos occurs when the injury increases the volume of the orbit by fracture of its walls. It became worse by herniation of orbital fat through a defect in the floor or the thin lamina papyracea of the medial wall.
- ✓ **Orbital Dystopia:**
The level of the globe is normally maintained by a ligament known as the "suspensory ligament of Lockwood". This passes from its medial attachment on the lacrimal bone to be inserted laterally into

"Whitnall's tubercle" situated on the inner aspect of the zygomatic bone just below the frontozygomatic suture. If the fracture passes inferior to Whitnall's tubercle, the zygomatic bone can be grossly displaced downwards without significant alteration in the level of the globe of the eye that is maintained in place by Lockwood's suspensory ligament, but if the fracture occurs above Whitnall's tubercle and the bone is significantly displaced downwards, the globe will drop, resulting in vertical ocular dystopia.

In case of dystopia the upper lid will drop and produces a characteristic 'hooding' of the globe or pseudoptosis, a physical sign that is exacerbated if there is enophthalmos.

Management

Zygomatic complex fractures with minimal displacement that are not causing symptoms do not necessarily require treatment. The indications for treatment are:

1. To restore the normal contour of the face both for cosmetic reasons and to re-establish skeletal protection for the globe of the eye.
2. To correct diplopia.
3. To remove any interference with the movement of the mandible.
4. When pressure on the infraorbital nerve results in significant numbness or dysaesthesia.

Reduction

- ✓ Surgical reduction of the displaced zygomatic complex becomes increasingly difficult with the passage of time. If necessary the operation can be delayed for up to 10 days to allow the swelling to settle.
- ✓ Many zygomatic complex fractures are stable after reduction without any form of fixation, particularly where the displacement is essentially a medial or lateral rotation round the vertical axis without separation of the fronto-zygomatic suture.
- ✓ Indirect reduction of a zygomatic fracture can be carried out by a temporal, percutaneous or intraoral approach.

Temporal approach

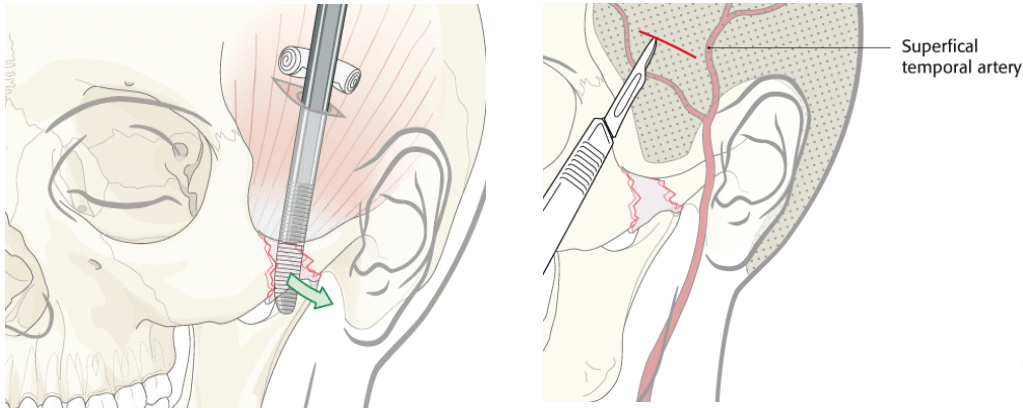
The temporal approach (Gillies approach) is popular and straightforward. The operation depends on the fact that the deep temporal fascia is attached along the superior surface of the zygomatic arch, while the temporalis muscle passes beneath the arch to be attached to the coronoid process and anterior ramus.

If an incision is made in the hairline in the temporal region (oblique 2 cm incision is made between the bifurcation of the superficial temporal vessels). The temporalis fascia is exposed and incised; it is then easy to pass an instrument superficial to the surface of the temporalis muscle and deep to the zygoma.

A Rowe's or Bristow's elevator passed down beneath the zygomatic bone then elevated back into position. The position of the bone is confirmed by palpation of the infra orbital rim and the cheek prominence using the uninjured side for comparison.

When a satisfactory stable reduction has been obtained the temporal fascia and skin are sutured.

The Gillies approach is one the most versatile methods of indirect reduction. It is simple to perform and gives excellent control of the fractured zygomatic complex during all stages of reduction.



The percutaneous approach (Poswillo approach): is a rapid method most useful in non-comminuted fractures with medial displacement with the use of bone hook

Intra oral Buccal sulcus approach (Keen approach); an incision is made in the upper buccal sulcus immediately beneath the zygomatic buttress and a curved elevator is passed supra-periosteally to engage the deep surface of the zygomatic bone.

Open Reduction and Internal Fixation by miniplates

- It is indicated in:
 - ✓ Displaced fractures that are not stable after reduction (horizontal rotation and separation at the frontozygomatic suture).
 - ✓ Comminuted fractures.
 - ✓ Fractures that are more than 2 weeks old.
 - ✓ When orbital exploration is required due to the presence of diplopia or enophthalmos.
- There is a controversy about the number of points of fixation (number of buttresses to be fixed by miniplates) in zygomatic complex fractures, however there is an agreement that two or three points are sufficient (minimum two points).
The preferable points of fixation are the zygomaticomaxillary and frontozygomatic buttresses, if an additional point is needed then it is the infraorbital rim.

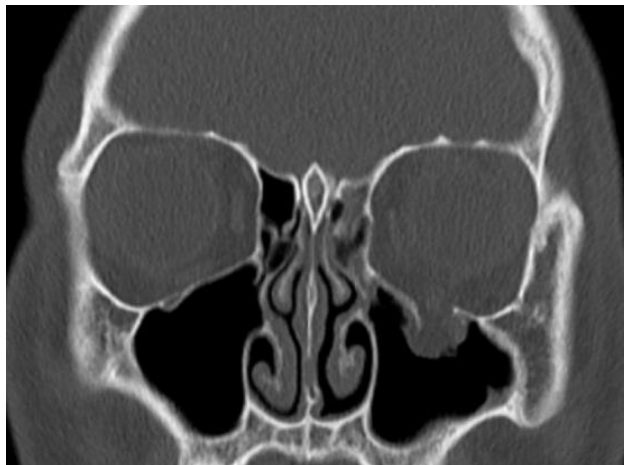
ISOLATED ORBITAL FLOOR FRACTURES

- The orbit is said to be roughly pyramidal in shape with its apex at the optic foramen, the junctions between its walls are rounded resembling a cone.
- It is described as having a medial and lateral wall, a roof and a floor. The floor of the orbit that slopes upwards towards the optic foramen is also extremely thin, particularly in the region of the infraorbital canal.

- The eyeball normally protrudes slightly beyond the orbital rim. The eyeball itself is relatively tough and is filled with incompressible vitreous humour. Apart from the extra-ocular muscles the remainder of the orbital cavity is largely filled with fat.
- When an object of slightly greater diameter than the orbital rim strikes the protruding incompressible eyeball, the rapid increase in intra-orbital pressure results in fracture of the weak part of the orbital floor. This type of injury is commonly called an 'orbital blow-out fracture'. Rarely a 'blow-in' fracture (inward buckling of the orbital floor) occurs in children.
These orbital injuries occur in isolation from inferior orbital rim (intact inferior orbital rim) therefore its preferable to be termed as 'isolated' orbital floor fractures.
- In blow-out fractures; the fragments of bone are displaced downwards into the antral cavity remaining attached to the orbital periosteum like a trap-door. The periorbital fat tends to herniate through the defect and this has the effect of interfering with the action of the inferior rectus and inferior oblique muscles (that are contained within the same fascial sheath), it may result in enophthalmos and prevents upward movement and outward rotation of the eye with resulting double vision (diplopia) in these directions of gaze.

Signs and symptoms:

- Periorbital (circum orbital) ecchymosis
- Sub-conjunctival haemorrhage
- Diplopia
- Limitation of eye movement especially in upward gaze (the tethering of the inferior rectus and inferior oblique muscles can be demonstrated by the forced duction test).
- Globe retraction on upward gaze (due to eye ball displacement in the orbital floor defect)
- Enophthalmos
- Surgical emphysema of eyelids (air escape from paranasal sinuses)
- Paraesthesia within distribution of infraorbital nerve
- **(Hanging drop)** appearance on imaging due to the herniation of orbital fat or orbital fat and muscles in large defect. (As shown in the figure on the left; coronal section of CT with hanging drop)



Management

- The management for isolated orbital injuries differs from the management of other orbital injuries which occur as part of fractured zygoma or lefort II and III fractures.
- The surgical exploration with freeing of the tethered tissue and insertion an implant (usually titanium mesh or bone graft) is the standard surgical treatment, but not always necessary because many fractures managed conservatively without exploration.
- The **indications** for surgical exploration of orbital floor are:
 1. Significant restriction of eye movement (diplopia) with CT confirmation of entrapment
 2. Significant enophthalmos
 3. Large ‘blowout’ defect
 4. Significant orbital dystopia
- The **contraindications** for the surgical exploration are:
 1. Proptosis
 2. Visual impairment

NASO-ORBITO-ETHMOID (NOE) FRACTURE

Summary of possible clinical findings in nasal complex fractures

1. Bruising and Laceration of skin of bridge of nose
2. Bilateral medial orbital ecchymosis
3. Epistaxis
4. Crepitus of bones of nasal complex
5. Cerebrospinal rhinorrhoea
6. Unilateral or bilateral telecanthus

Telecanthus: is widening of the medial intercanthal distance (normal value is 32 ± 3) due to detachment of medial canthal ligament from its insertion in medial orbital wall

Management

- The main objective of the reduction is to restore both the intercanthal distance; and the anterior projection and width of the nasal bridge.
- Open reduction and internal fixation (ORIF) is the treatment of choice by using microplates or titanium mesh in case of comminution.
- Medial canthal re attachment by canthopexy.

This is the end of the Lecture, Good Luck