


ZYGOMATIC FRACTURES



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CRANIOMAXILLOFACIAL SURGEON

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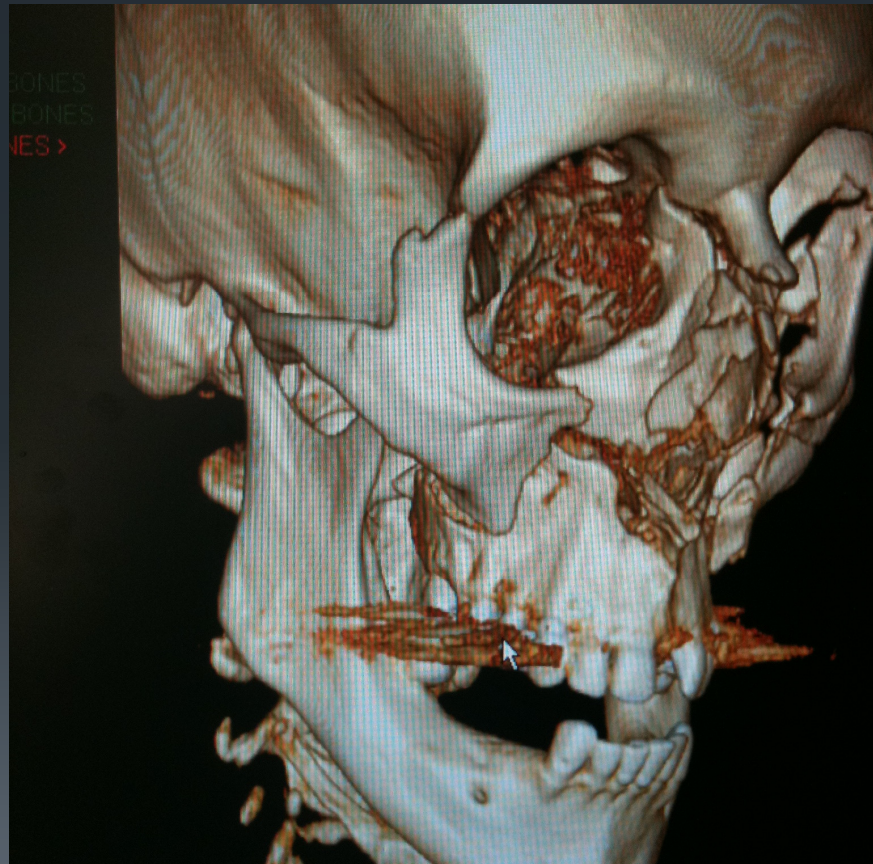


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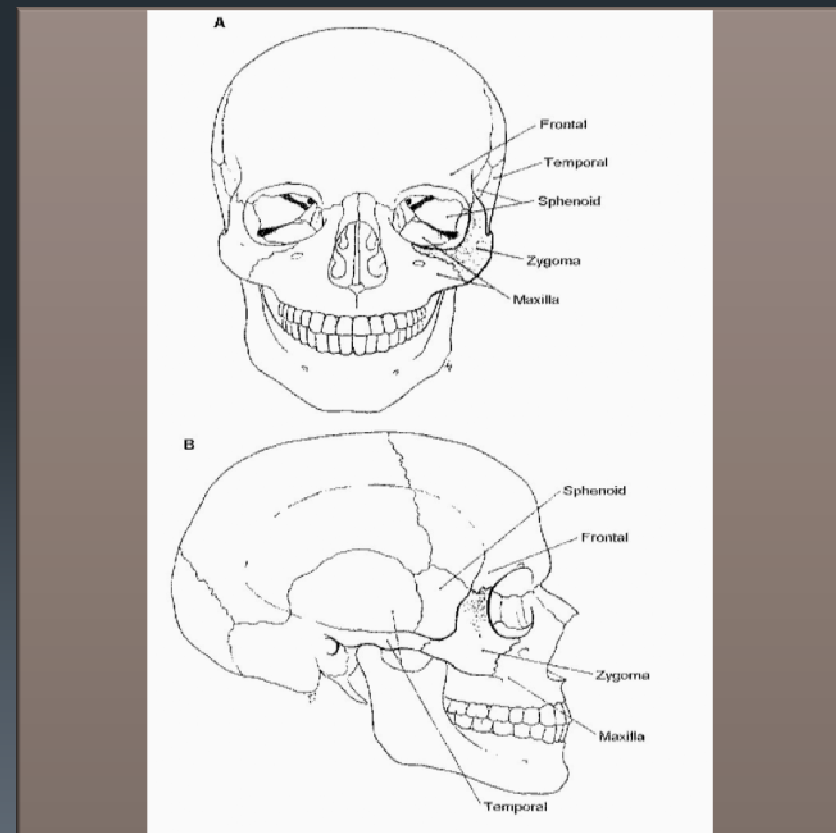
OVERVIEW

- Anatomy
- Aetiology
- Clinical presentation
- Assessment
- Management
- Treatment
- Complications



ZYGOMATIC ANATOMY

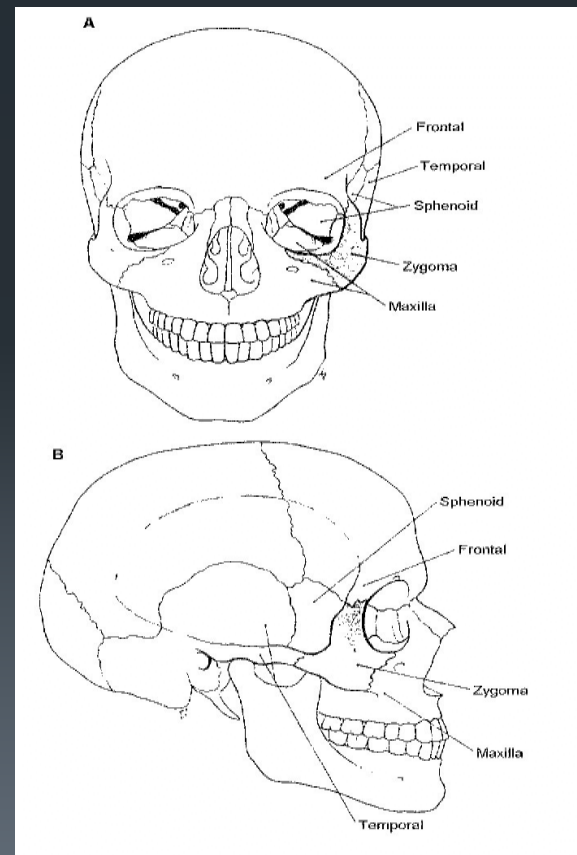
- 'Tetrapod' bone
- The body of the zygoma gives prominence to the cheek
- The arch is formed by union with zygomatic process of temporal bone at temporozygomatic suture



ZYGOMATIC ANATOMY

Articulates with 4 bones:

- Frontal bone
- Greater wing sphenoid
- Maxilla
- Temporal bone



ZYGOMATIC ANATOMY

Two surfaces

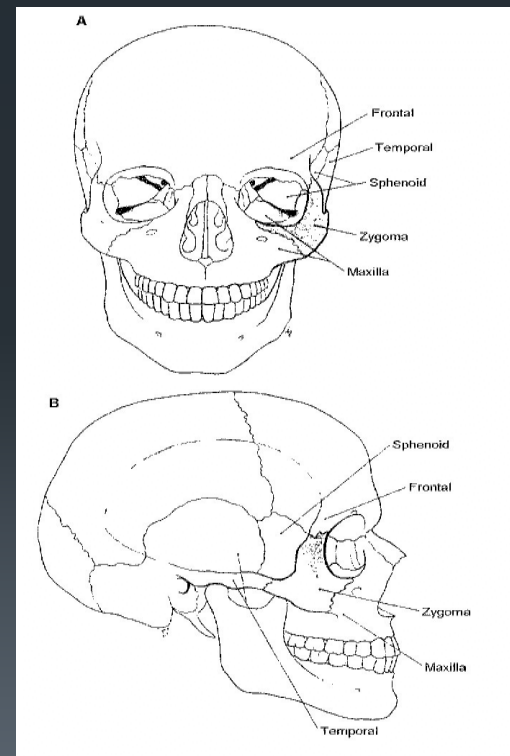
- Malar
- Orbital
(lateral orbital wall & lateral part of floor)

Muscle Attachments

- Masseter & fascia
 - Superficial head to inferior border
 - Deep head to concave medial surface
- Temporalis
 - fascia to sharp superior border
 - muscle deep to arch slides freely up & down
- Zygomaticus
 - Major from surface
 - Minor from Z-M suture

Foramen

- Zygomaticofacial nerve





ZYGOMATIC FRACTURES

Zygomatic complex (malar)
fractures

Zygomatic arch fractures



Zygomatic Complex Fractures

- Usually involve separation at frontozygomatic / zygomaticotemporal / zygomaticomaxillary sutures
- Zygomatic bone may be split in high velocity injuries
- May have profound impact on globe position-increase orbital volume & enophthalmos



Zygomatic Arch Fractures

- Isolated arch
- Comminuted arch



AETIOLOGY

- Sports (Soccer elbows, cricket balls)
- Assault ('minding my own business Doc & I was king hit...')
- Falls (especially elderly)
- Traffic accidents (often in combination with other facial fractures)



Clinical presentation-History

- Mechanism:
 - Low velocity (punch) vs High velocity (MVA)
 - HV more likely to be displaced or complex, involving orbit, need operative intervention with wider exposure for reduction
- Loss of consciousness, GCS/neuro signs
- Visual disturbances, diplopia
- Numbness (infraorbital / zygomaticofacial, zygomaticotemporal nn)
- Mandibular excursion (under arch)
- Other injuries
- PMHx including previous facial injuries/social history/employment etc.



Assessment: PHYSICAL EXAMINATION

EMST principles, ABCDE, primary & secondary survey

- Flattened cheek
- Swelling cheek
- Tenderness orbital rim/ZF suture
- Step infraorbital margin/over Z-F suture
- Ecchymosis & tenderness intraorally over zygomatic buttress
- Anaesthesia
- Periorbital oedema
- Subconjunctival haemorrhage
- Limited ocular movements (oedema or soft tissue trapping)
- Diplopia (EOM/trapping/N palsy-isolated 6th; diplopia on downward gaze)
- Enophthalmos)
- Lowered pupil level (only if canthi involved)
- Epistaxis
- Limited mandible excursion/Trismus (entrapment/pressure on coronoid)



ASSESSMENT: RADIOGRAPHIC IMAGING

NB NEED TO CLEAR C SPINE BEFORE SOME VIEWS

Plain x-rays:

- Waters view 30deg occipitomeatal projection identifies the lateral wall of the maxillary antrum, the inferior orbital rim and the orbital floor.
- Submentovertex view shows the zygomatic arch and the relationship of the malar prominence
- Caldwell view demonstrate the distraction of the zygomaticofrontal suture
- Facial series: Waters, Lat, PA, Submentovertex, Caldwell, C spine & PEG

CT Scan:

- Fine cuts
- Axial, coronal, sagittal, +/- 3D reconstructions



Assessment: Classification of zygomatic fractures

Knight & North (1961):

- Undisplaced
- Arch #
- Depressed body
- Depressed body with medial rotation
- Depressed body with lateral rotation
- Comminuted #

Zygomatic complex involving orbit:

- a. minimal or no displacement
- b. inward & downward displacement – most common with punch
- c. inward & posterior displacement (entrapment orbital contents in floor)
- d. outward displacement (increased orbital volume, enophthalmos)
- e. Comminution

of zygomatic arch alone not involving the orbit:

- a. minimal or no displacement
- b. V type in-fracture
- c. Comminuted



Management of zygomatic fractures

- C spine, other injuries
- Ophthalmology
(relatively significant risk of anterior chamber haemorrhage)
- Fracture management, most important features are:
 - displacement
 - comminution



Treatment of undisplaced fractures

- Treat the patient not the CT
- No operative intervention
- Soft diet 6/52
- Avoid sleeping on fracture
- Close follow up weekly for 3/52 for occult orbital floor fracture or displacement



Management of displaced zygomatic arch fractures

Two indications for surgery:

- contour deformity
- trismus

Timing:

- <7-10 days optimum, unlikely to get successful lift after this time



Operative management of displaced zygomatic arch fractures

Isolated arch:

1. Gillies temporal approach 'Gillies Lift'
2. Gingivobuccal approach
3. Dingman lateral brow approach

Comminuted arch:

If tripartite or posterior arch fracture near temporal bone; # may not be stable with elevation alone, consider whether to ORIF through a coronal incision



Gillies 'lift'

- Depends on fact that deep temporal fascia is attached along superior surface of arch & temporalis muscle passes under arch
 - 2cm Incision in hairline along line follicles
 - between bifurcation superficial temporal artery
 - through superficial temporal fascia
 - see white glistening deep temporal fascia
 - Incise fascia to expose temporalis
 - Pass Dingman / Bristow elevator along surface of temporalis behind arch
 - assistant holds head stable
 - lift fragment up & out (punch commonly inward & down)



Other approaches

1. Gingivobuccal approach

- sulcus incision
- Dingman elevator passed cephalically under arch to lift fragment

2. Dingman approach

- Lateral eyebrow incision
- Dissect behind lateral orbit rim from Z-F suture inferiorly
- Pass Dingman elevator behind rim and under arch to elevate fragment



Arch fracture fixation

- Usually not required as the periosteal attachments, & surrounding soft tissues tend to splint the reduced fracture
- K wires have been described
- Can pass 2 heavy sutures around the reduced arch and tie over a splint to protect reduction



ORIF

Open reduction, access incisions:

- 1. Gillies Temporal
- 1. Orbital rim/floor (transconjunctival, mid lid, subciliary incisions)
- 1. ZF suture at lateral brow
- 1. Gingivobuccal sulcus
- 1. Coronal incision for comminuted/panfacial



Bony Fixation

- Nature & location debated & depend on type of fracture

Most imp is ZF suture:

- is like fulcrum for reduction so if not intact can't reduce the other parts of #
- if ZF diastasis 2mm + likely to need ORIF

- 2 point most common with punch injury-usually ZF & infraorbital rim
- 3 point if complex-add Z-M



ORIF

- Zygomaticofrontal region first
 - 1.0-1.2mm plate-low profile (palpable)
 - corrects vertical position & aligns orbital rim & zygomaticomaxillary buttress
- Infraorbital rim second
 - 1.0-1.5mm plate
 - locks in the position of the fragments
 - place superiorly (anteriorly risk palpability)
- Zygomaticomaxillary buttress last
 - 1.5-2.0mm L plate
 - larger plate ok because buttress & not palpable post-op



Orbital floor

Alloplastic:

- Medpor (high density porous polyethylene): (vasc ingrowth)
- Titanium mesh/plate
- Medpor with inner titanium mesh
- Lactisorb (resorbs but scar left so orbital contacts don't usually fall back)
- Silicon sheet: extrude & infection

Autogenous:

- Bone graft



ORIF COMPLICATIONS

EARLY:

- Diplopia
- Bleeding (incl retrobulbar haemorrhage)
- Bradycardia (oculocardiac reflex)
- Nerve injury

LATE:

- Plate infection/extrusion/migration
- Scars & cicatricial ectropion
- Union problems; delayed, mal, non
- Maxillary sinusitis 4-8 %, reduce with careful reduction, orbital floor reconstruction, biocompatibility of graft and avoidance of antral packing
- soft-tissue descent with loss of malar prominence
- enophthalmos



Diplopia

- 10% acutely (upward & downward), 5% permanent (upward only)
- orbital floor fracture usually due to entrapment near inferior rectus (downward gaze)
- upward gaze usually with posterior floor fractures
- injury to nerves/extraocular muscles
- scar tissue tethering muscles
- mechanical restriction from floor implant
- follow closely
- most settle but if not after 4-6 months may need to rebalance extraocular muscles



Haemorrhage

- Circumoral ecchymosis
- Subconjunctival haemorrhage as extension of subperiosteal haematoma
- Unilateral epistaxis
 - fracture near zygomaticomaxillary suture
 - zygomatic bone displaced into maxillary antrum
 - antrum fills with blood and empties into nose
- Hyphaema, microhyphaema
- **Retrobulbar haemorrhage**-usually following surgical reduction



Retrobulbar haemorrhage

- rise in pressure within intraconal space
- pain, proptosis, dilating pupil, ophthalmoplegia, decreasing visual acuity
- blindness if not decompressed
- ischaemia of optic nerve or spasm of short posterior ciliary arteries



Management of retrobulbar haemorrhage

- Acetazolamide 500mg
- Mannitol 20% 500mls
- Canthotomy
- Call ophthalmologists urgently
- Release orbital spetum; mid lid, incise septum
- Decompress lateral orbital wall through same incision, punch through with Howith elevator
- To ICU
- 48-72h to close



Traumatic Optic Neuropathy

- rare, 1.3-2.1%, high velocity
- caused by direct trauma to nerve or ischaemia from pressure via haemorrhage or oedema, may be related to fracture reduction
- many unnoticed-range from diminished colour perception to complete blindness
- may be associated with head injury without # but outcome worse if associated fracture
- treat with megadose steroids (30mg/kg methylprednisone IV loading dose & 2 hours later start 15mg/kg q6h) +/- surgical decompression (more successful if initially able to perceive hand movements or better)



Persistent infraorbital nerve anaesthesia

- fracture commonly through nerve foramen because the course of the nerve weakens the area
- lower rates of permanent hypaesthesia reported with plate fixation cf wire fixation, although plate fixation more commonly employed



Bradycardia

- Before or during reduction of orbitozygomatic fracture or from manipulation of the globe
- Oculocardiac reflex:
 - Triad; bradycardia, nausea, syncope
 - Afferent: ophthalmic division Trigeminal nerve through reticular formation to the Vagus nerve's visceral motor nuclei
 - Efferent: Vagus nerve to heart & stomach
 - Suspect incarcerated orbital fat or muscle even if undisplaced fracture if bradycardic
 - More common acutely in paediatric orbital floor
 - Release reduces risk of life-threatening arrhythmia & ischaemic muscle necrosis



Soft Tissue Descent

- After open reduction complex orbitozygomatic fractures
- Suggest periosteal suspension of soft tissues to restore contour & support lower eyelid to reduce ectropion
- Consider sutures through drill holes or around plate
- Consider Frost sutures, taping
- Ectropion etc as consequence of orbital rim access incision



Enophthalmos

- 3%
- more severe in untreated malar fracture because entire lateral wall & lge portion of floor involved and is behind axis of orbit
- orbital asymmetry & malar retroposition
- to address both recreate fracture with saw & reposition
- aim to look overdone post op to get good position once swelling reduced
- In treated #, enophthalmos is usually due to:
 - Undercorrection
 - Fat atrophy



Follow up

- 6/52 to assess for displacement, enophthalmos, diplopia, symmetry, persistent numbness
- if associated with head injury may be prudent to involve neuropsychologist prior to returning to responsible job/driving etc



QUESTIONS?