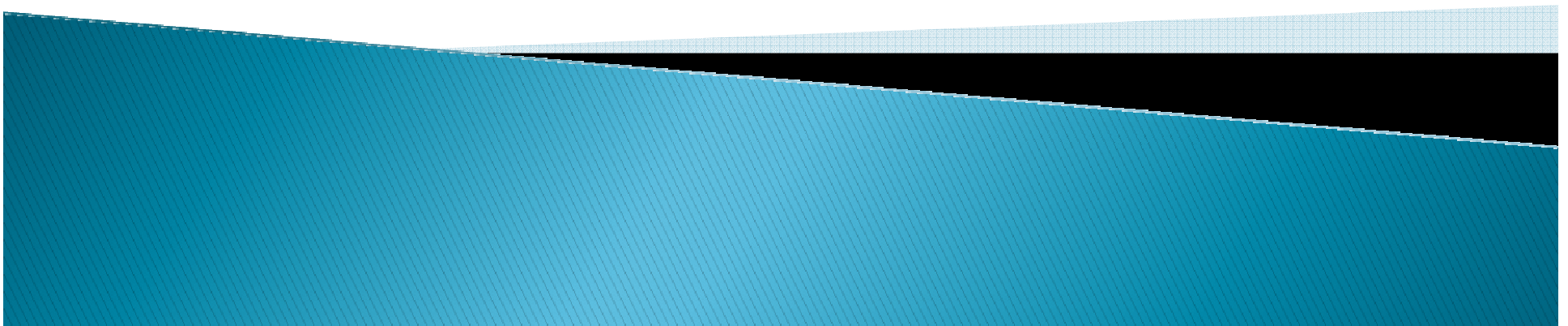


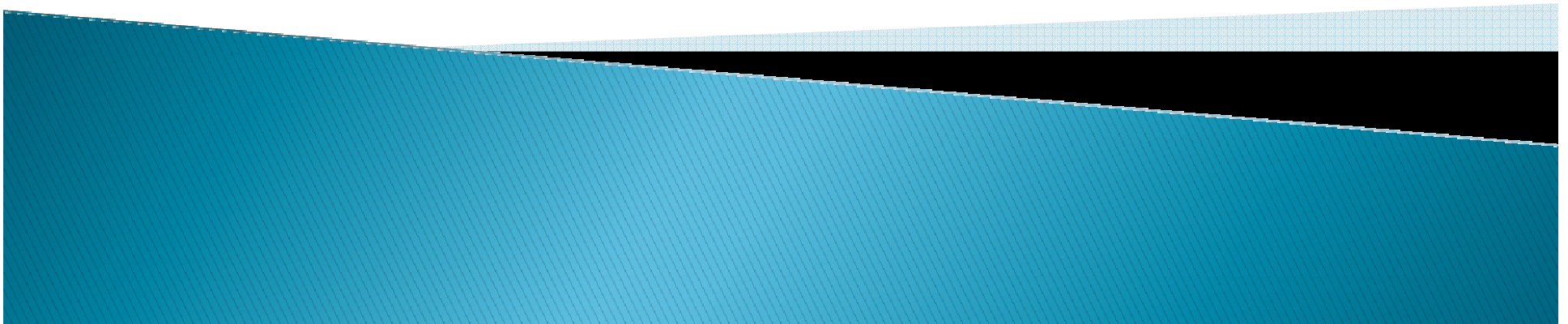
Maxillary Fractures

Richard Lewandowski



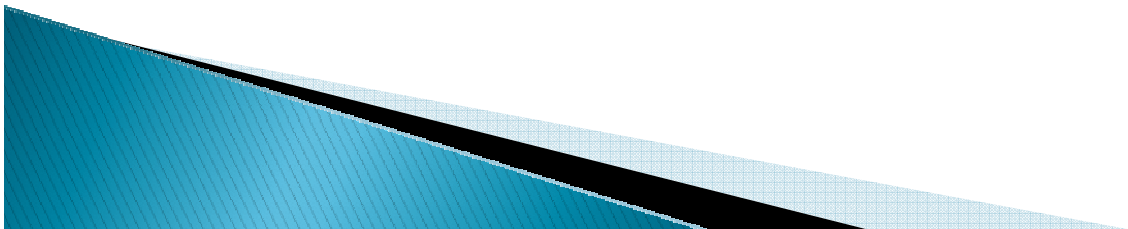
Disclaimer

- ▶ The copy in this file is protected by the copyright of the author or authors. Consent was provided for the express purpose of educating attendees of the 2012 Registrar's Conference in Brisbane.
- ▶ You **MAY NOT** copy or distribute the contents or images in any form.
- ▶ You **MAY PRINT** the document for your own personal use as an educational resource.



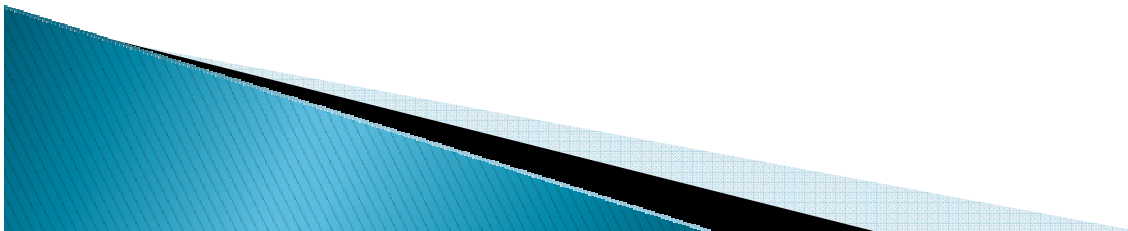
Mechanisms

- ▶ Assault
- ▶ MVA
- ▶ Sports
- ▶ Falls
- ▶ Industrial accidents
- ▶ Gunshot wounds



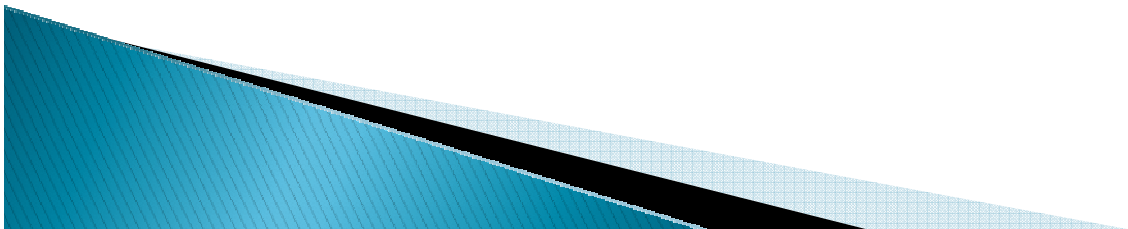
Evaluation

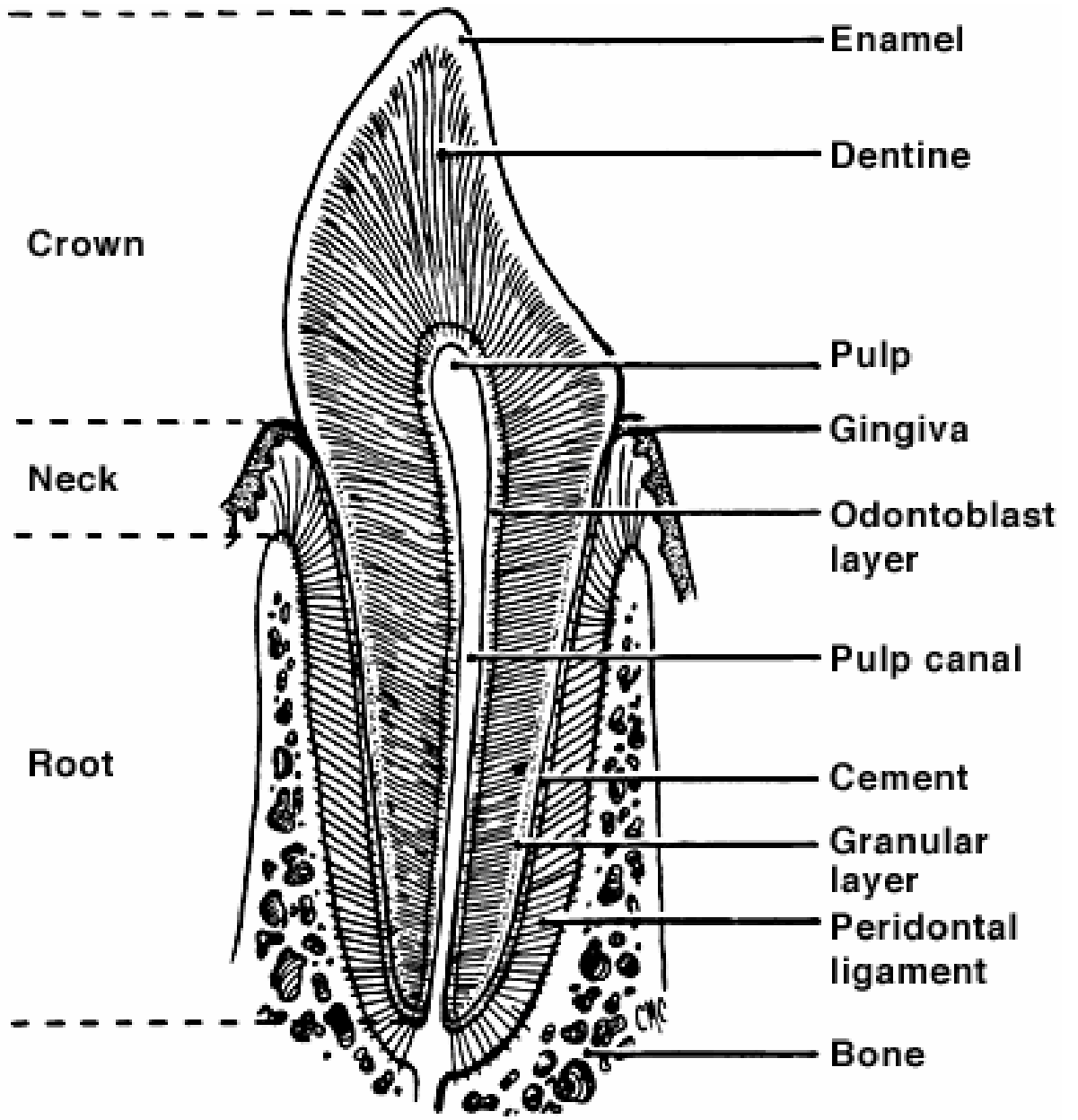
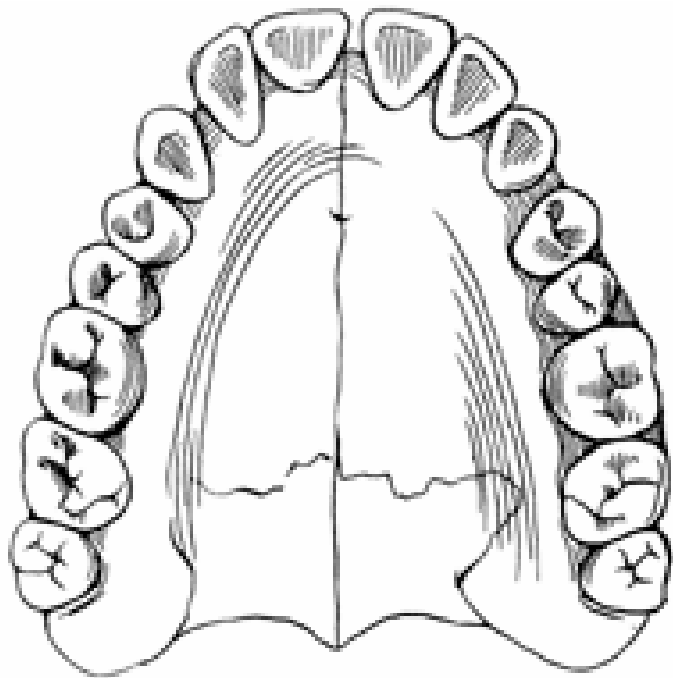
- ▶ ABC's
- ▶ History
- ▶ Palpation of entire facial skeleton
- ▶ Occlusion
- ▶ Ophthalmologic exam / consultation
- ▶ C-spine
- ▶ Imaging - CT



Dental Anatomy

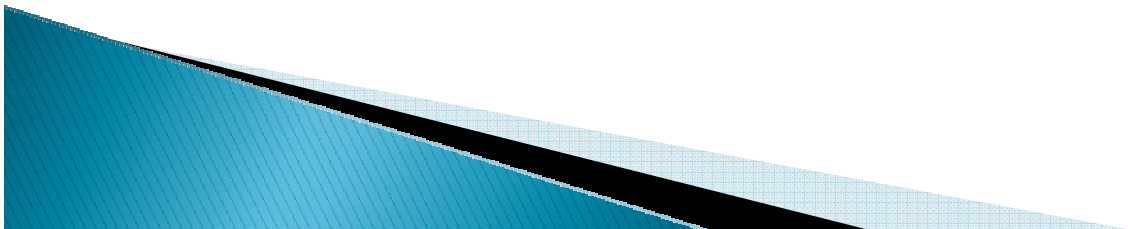
- Jaws support teeth required for mastication
- Each tooth has 5 surfaces
 - occlusal (chewing)
 - labiobuccal (lip/cheek)
 - lingual (tongue)
 - mesial (toward the midline)
 - distal (away from the midline)





Dental Formula

- DECIDUOUS
 - 20 teeth- d=deciduous; i=incisors;c=canines; m=molars
 - md2, cd1, id2 | id2, cd1, md2
 - md2, cd1, id2, | id2, cd1, md2
 - or V,IV,III,II,I | I,II,III,IV,V
 - V,IV,III,II,I, | I,II,III,IV,V



Dental Formula

- PERMANENT

- 32 teeth- p=permanent, p=premolars,i,c,

- Mp3,Pp2,Cp1,Ip2 Ip2,Cp1,Pp2,Mp3

- Mp3,Pp2,Cp1,Ip2 Ip2,Cp1,Pp2,Mp3

- or 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8

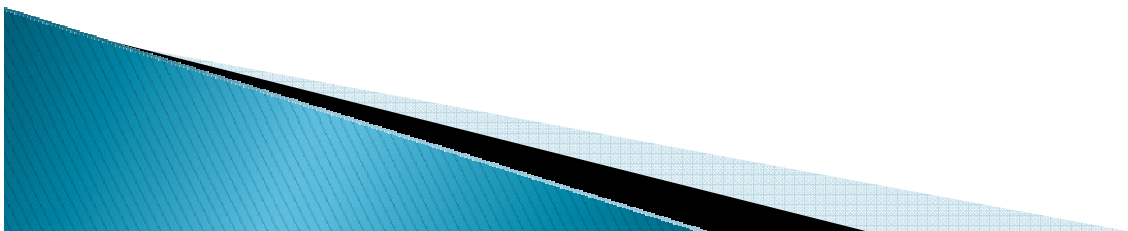
- 8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8

- ie: 2l = right maxillary lateral incisor

- or 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

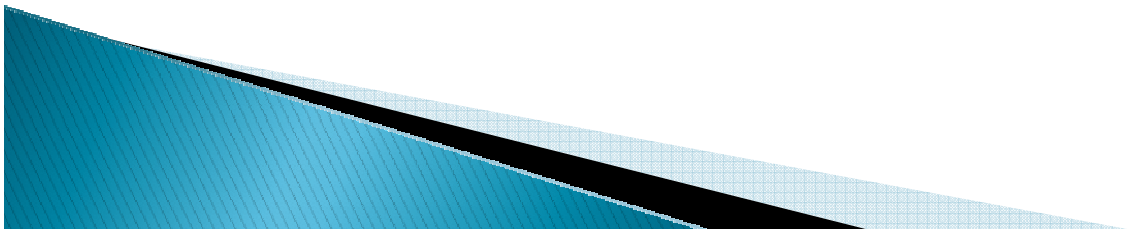
- 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17

- ie: maxillary right to left, mandibular left to right



Occlusion

- Contact Of Upper And Lower Teeth – Ideally
 - Minimal Overjet (Maxillary Incisor Protrusion)
 - Perfect Intercuspatation
 - Wear Facets
 - Mammillons
 - Minimal Overbite(upper Incisors Cover $< 1/3$ Lower)
 - Maxillary Canine $1/2$ Tooth Behind (Distal) Mandibular



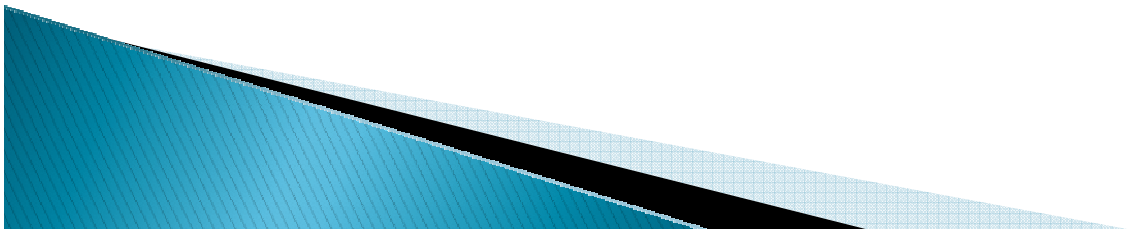
Malocclusion

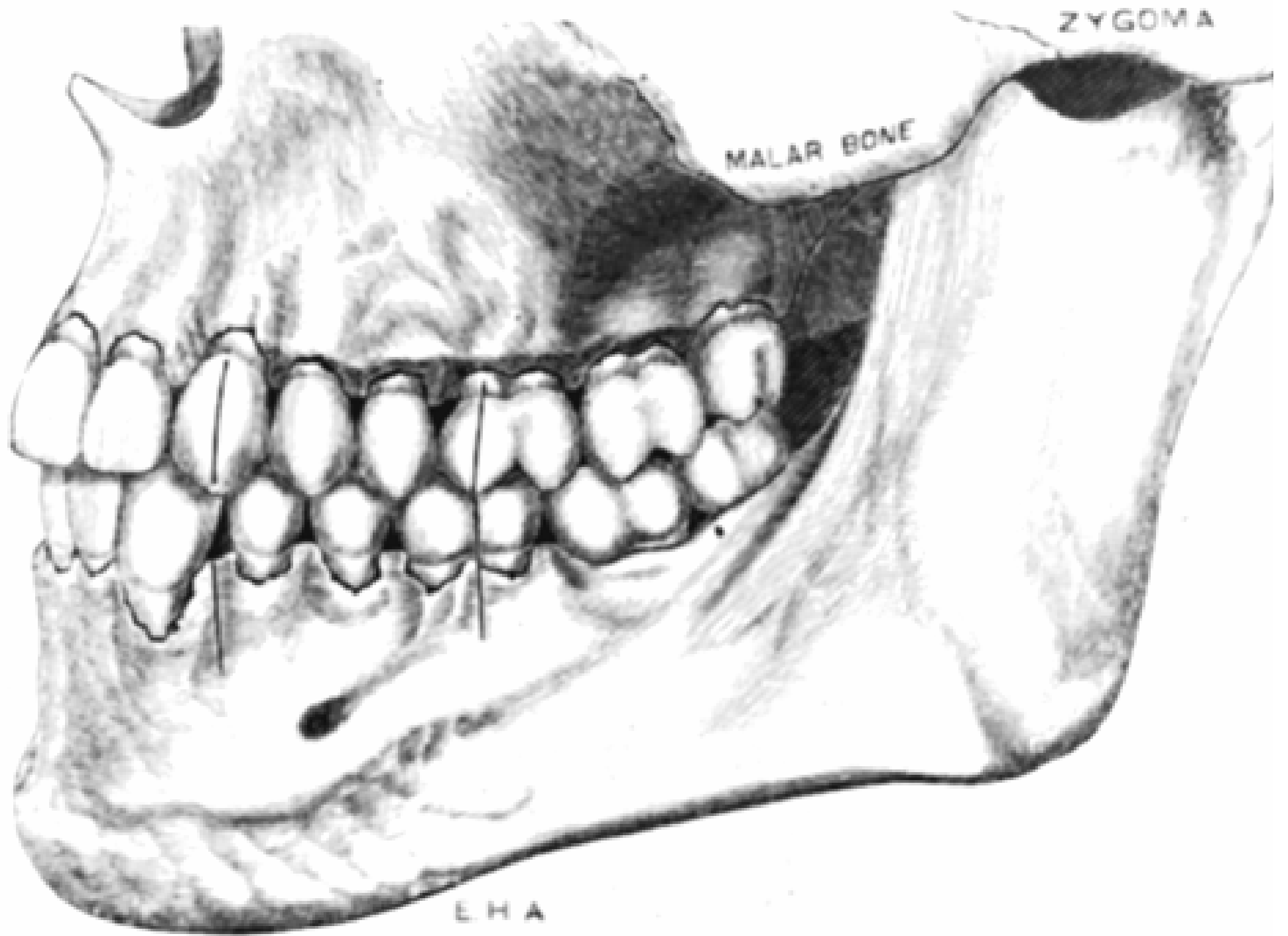
▶ Angle's Classification (1898)

- 1 = NEUTRO= maxillary 1st molar 1/2 cusp behind mandibular (mesiobuccal cusp sits in buccal groove)
- 2 = DISTO= mandibular 1st molar distal /retrognathia-
Division 1 = overjet; Division 2 = overbite
- 3 = MESIO=mandibular 1st molar mesial/pronathia

▶ Crossbite = upper arch smaller than lower

- centric = lingual cusp sits in central fossa
- crossbite= buccal cusp in fossa
- unilateral or bilateral
- anterior or posterior



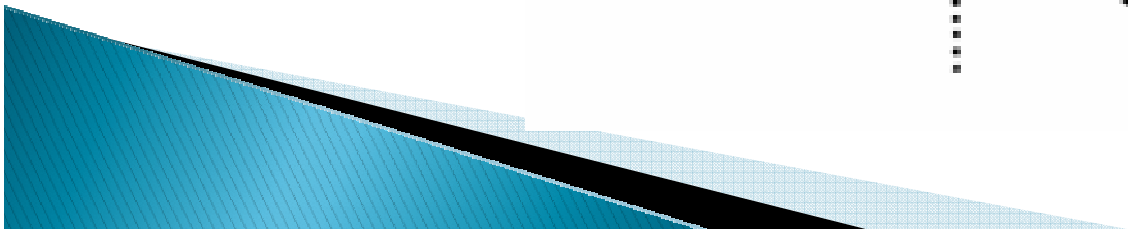
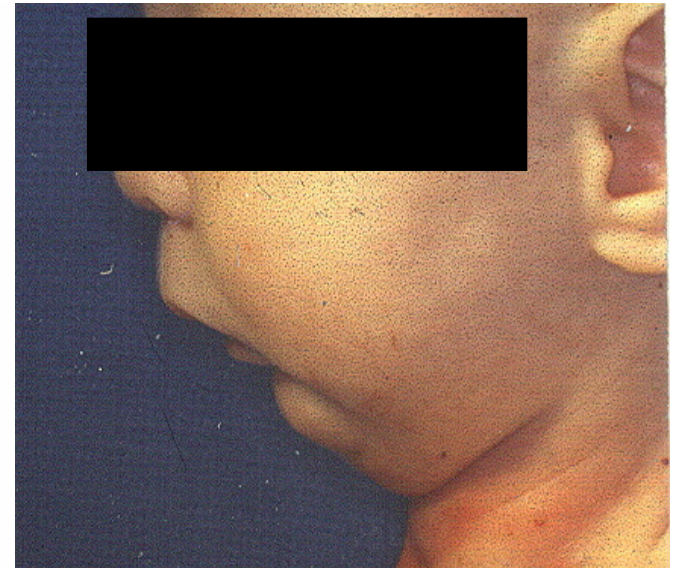
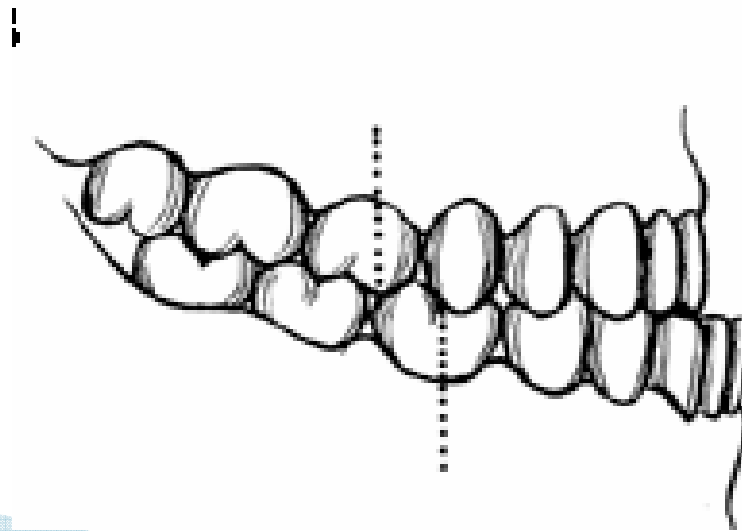
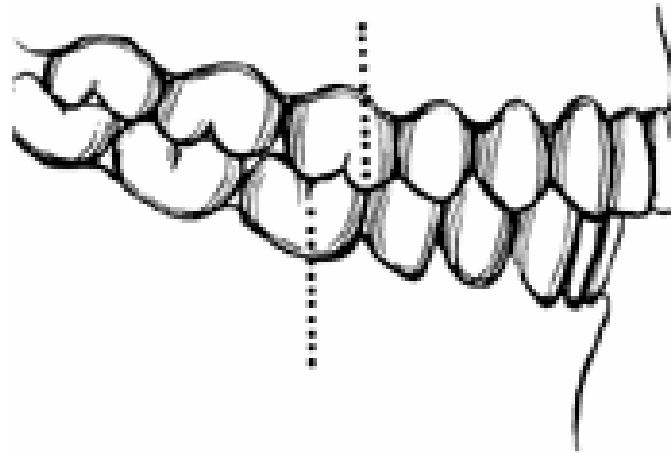


MALAR BONE

ZYGOMA

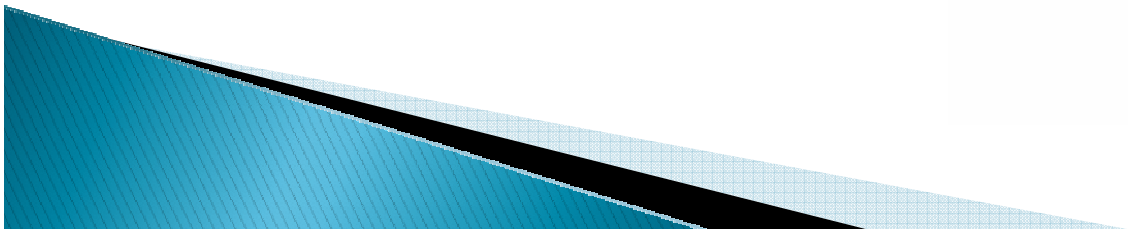
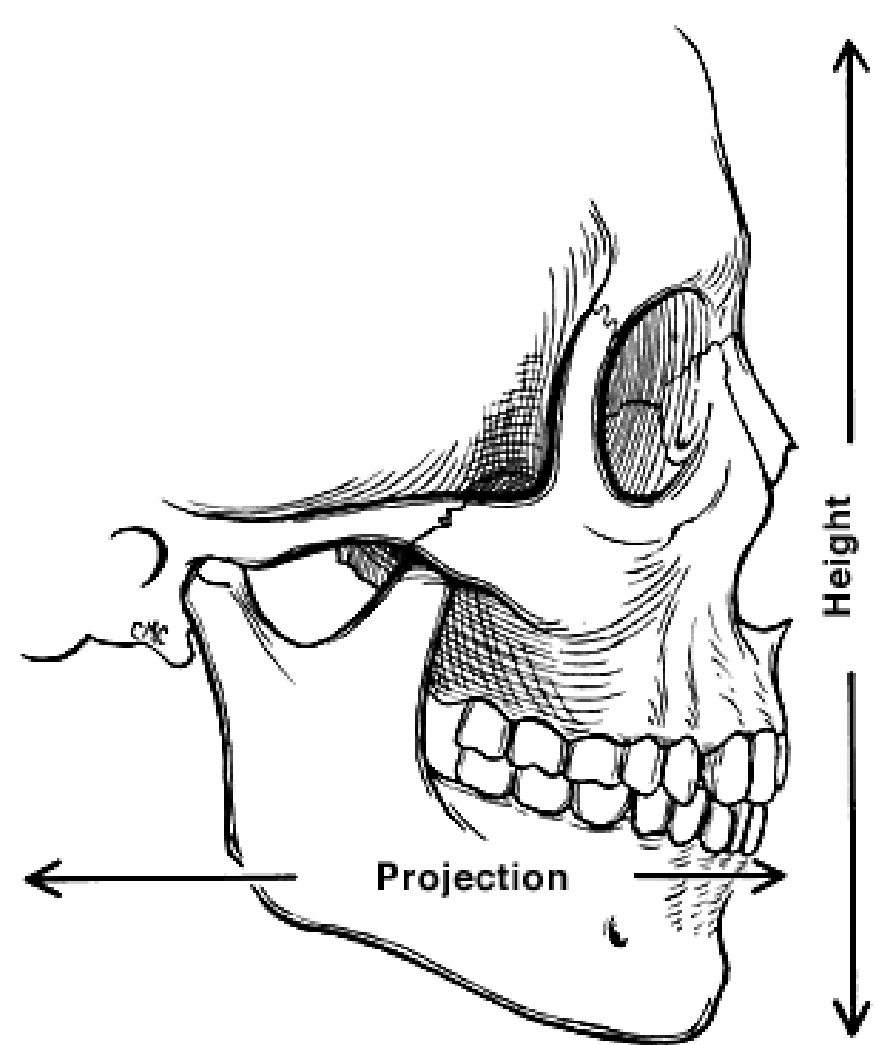
EHA

Class II and III



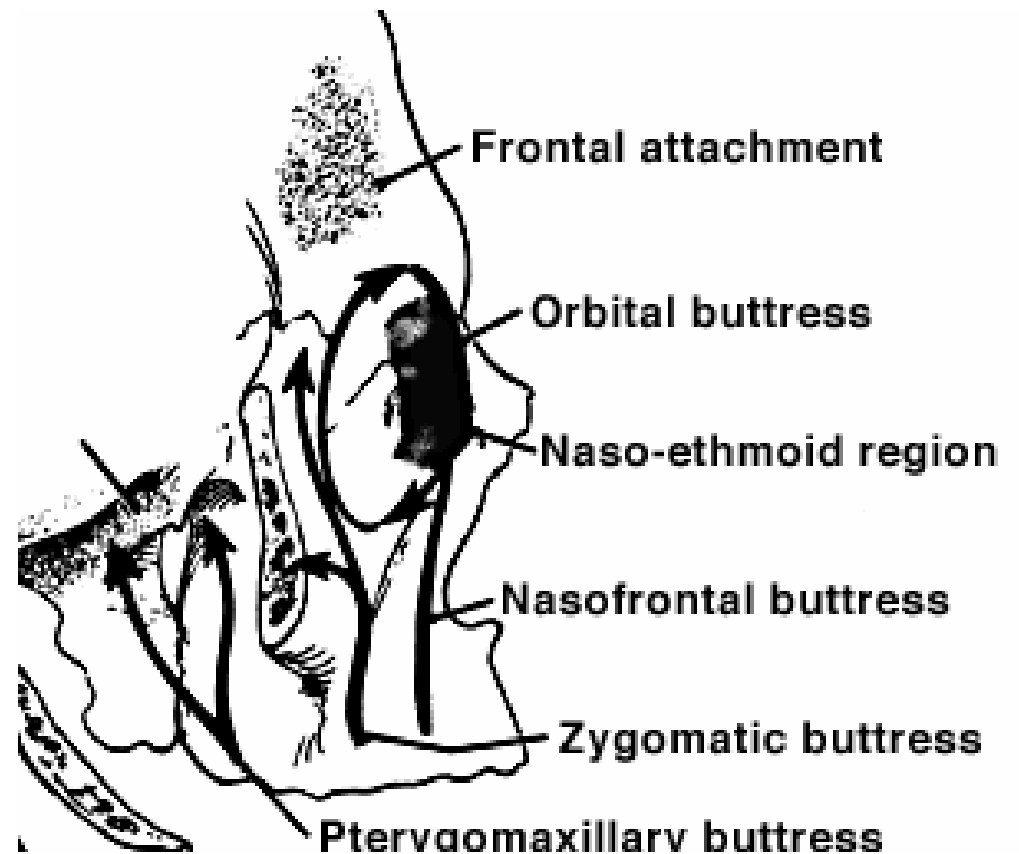
Skeletal Anatomy

- ▶ Upper 1 / 3
 - Frontal + Supra Orbital
- ▶ Middle 1 / 3
 - Zygomata
 - Maxillae
 - Nasal Bones
- ▶ Lower 1 / 3
 - Mandible

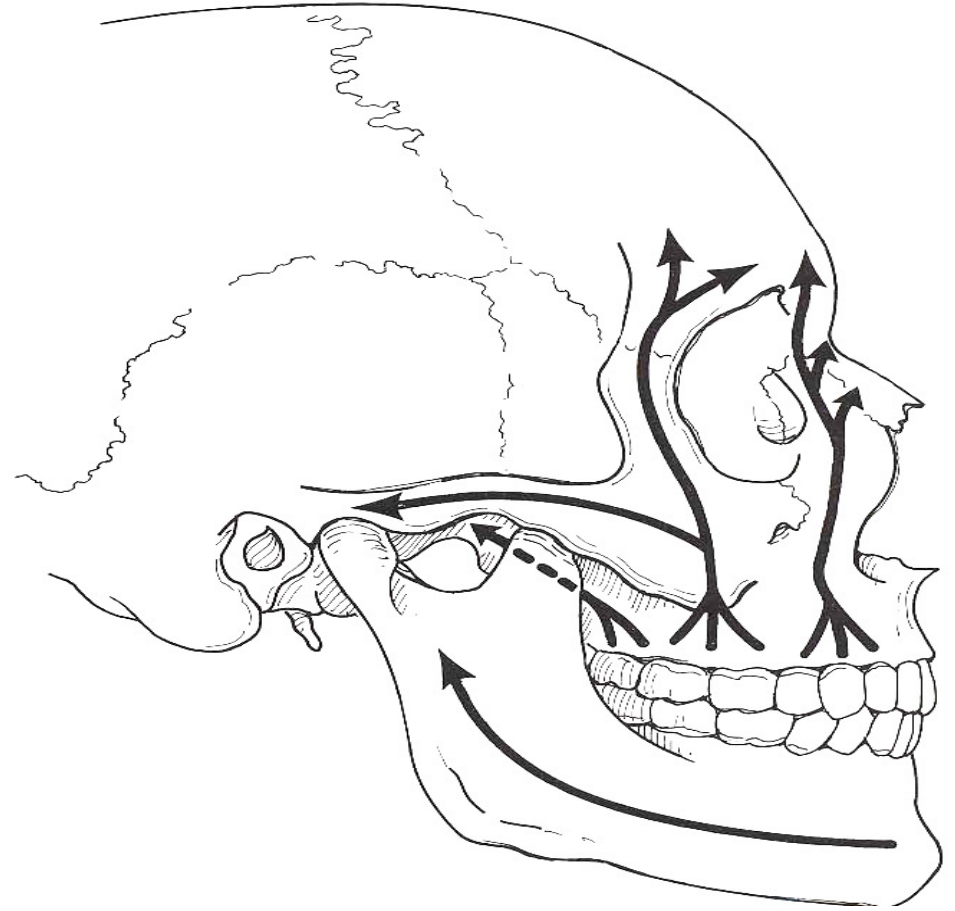
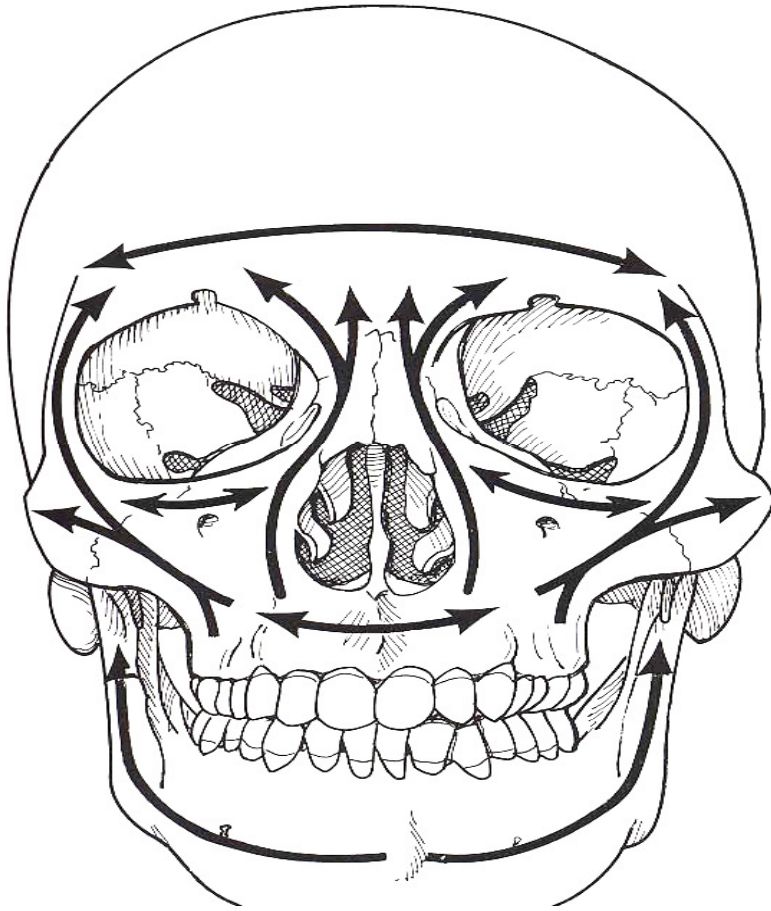


Bones

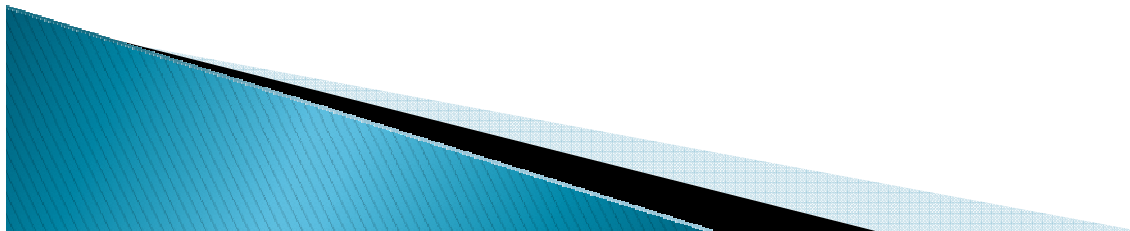
- ▶ alveolar = tooth bearing
- ▶ buttresses = load bearing
- ▶ sinuses = air cavities



Facial Buttress system

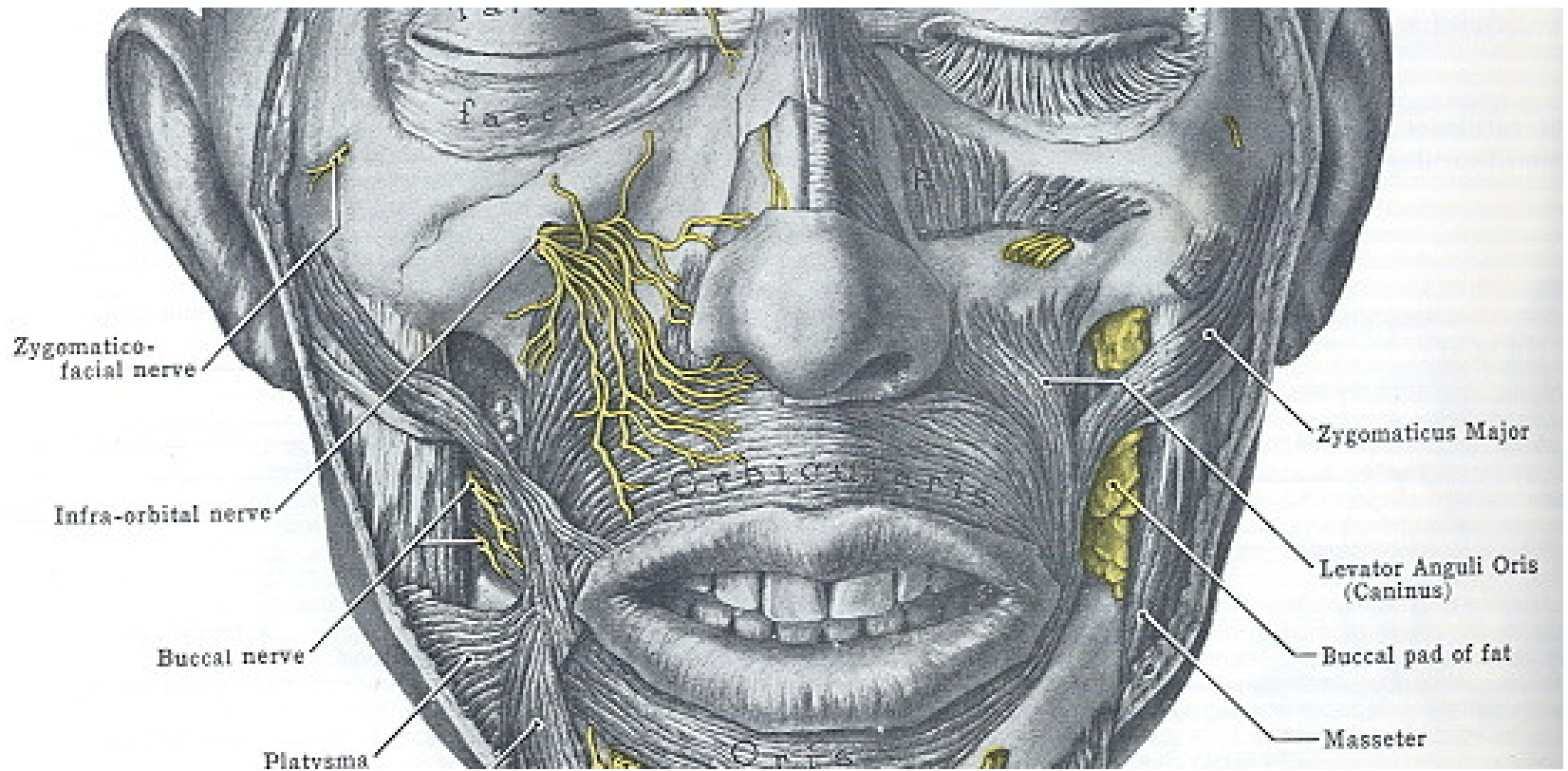


R



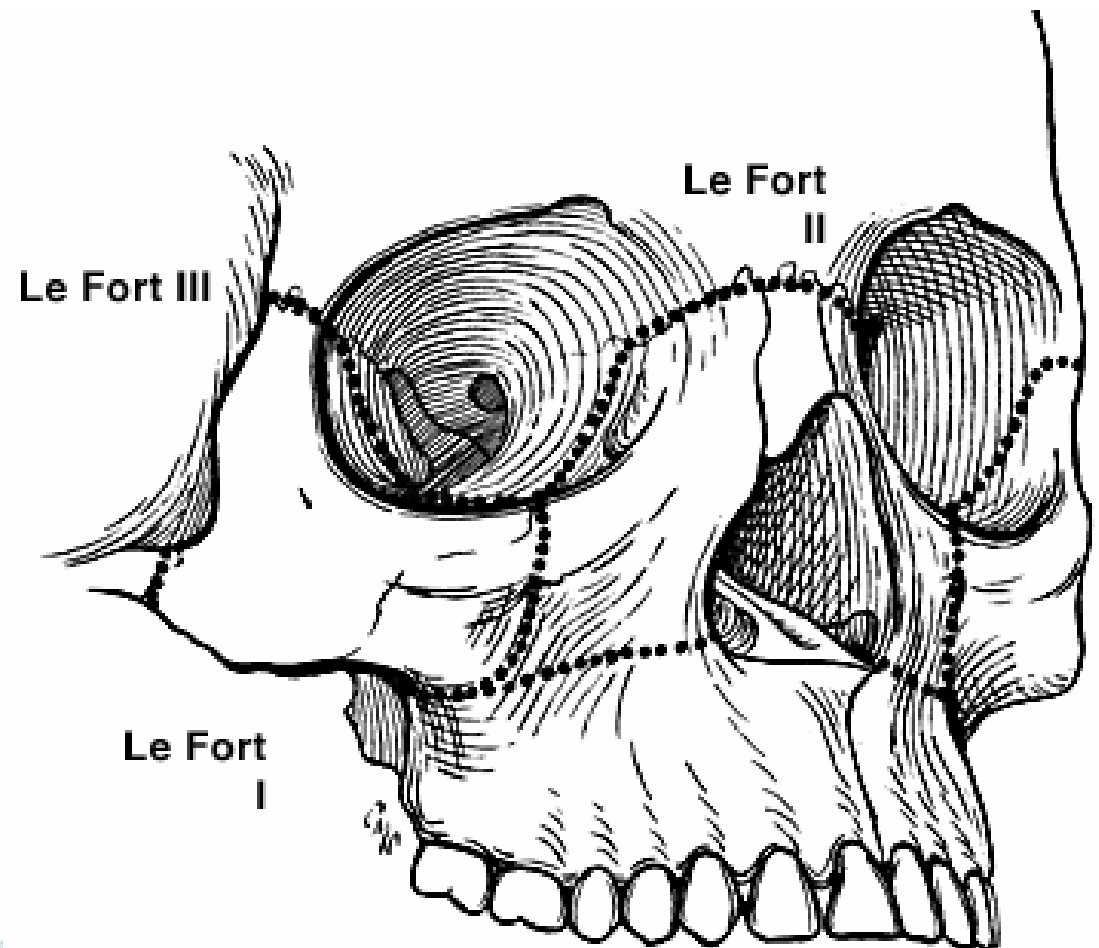
Nerves

Infra orbital Facial



Fracture Patterns

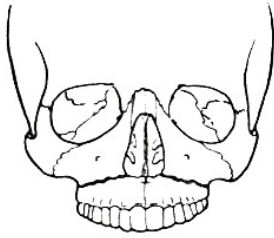
- ▶ Le Fort – Useful but not pure



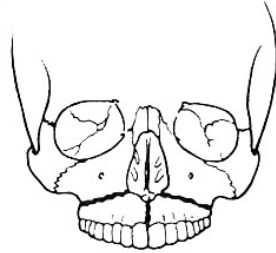
Variants

Le Fort

I

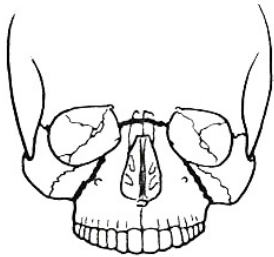


IA

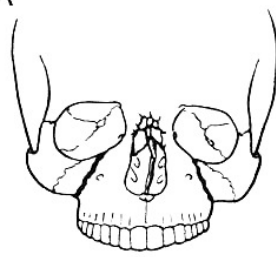


Le Fort

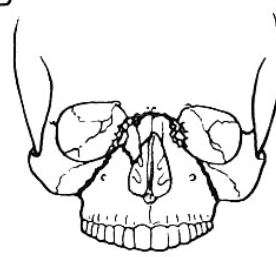
II



IIA

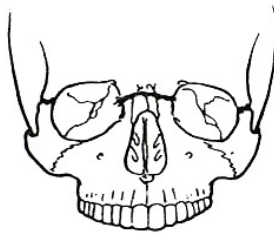


IIB

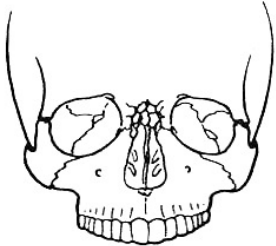


Le Fort

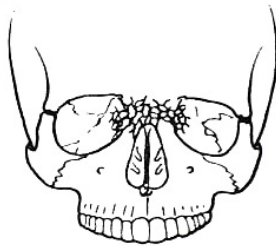
III



IIIA

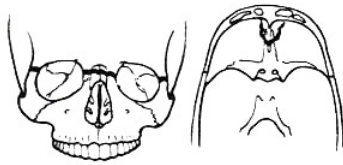


IIIB

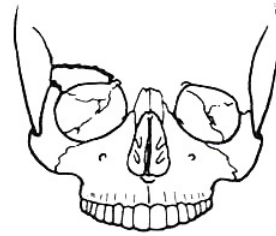


Le Fort

IV



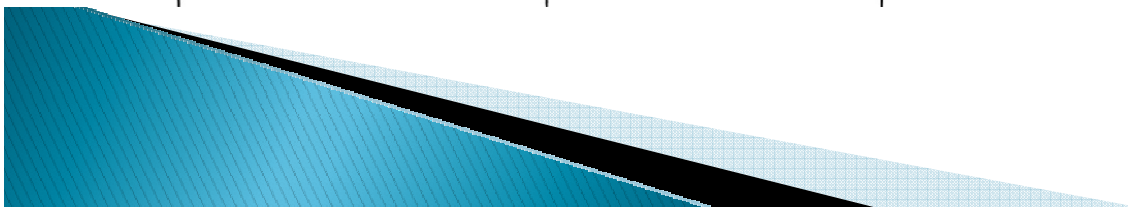
IVA



IVB

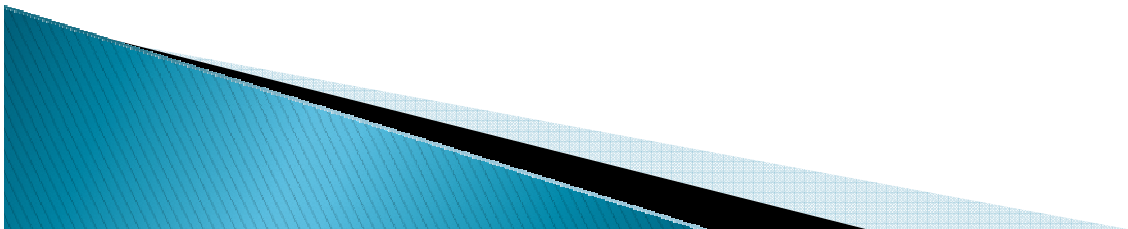
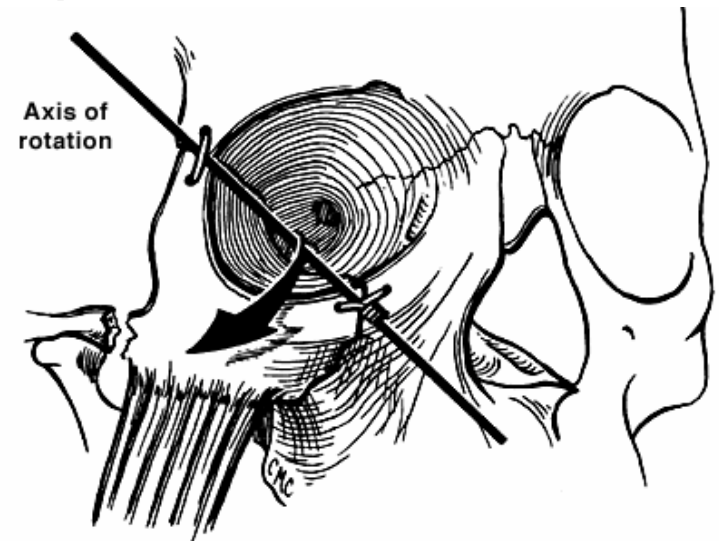
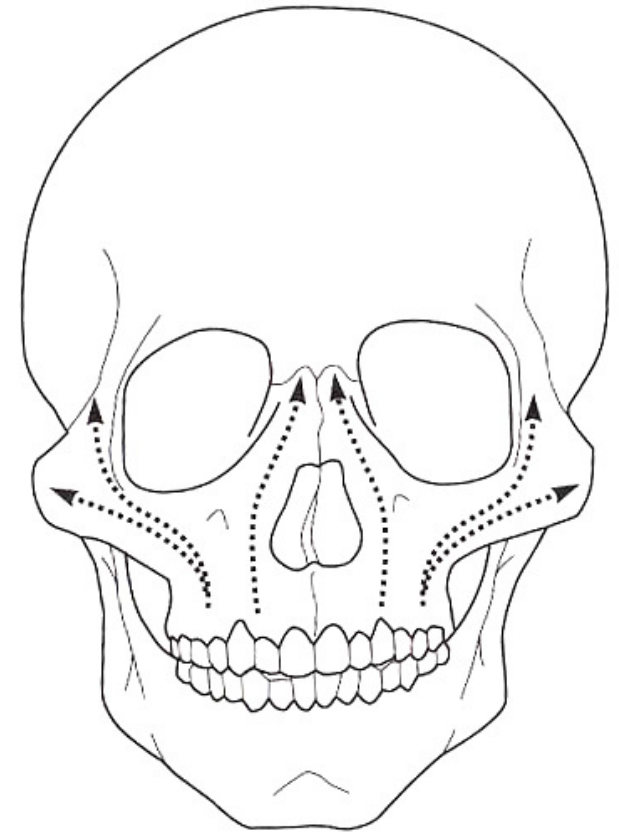


IVC

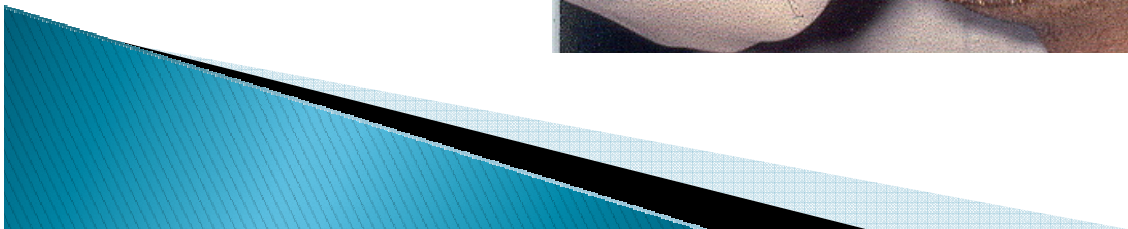
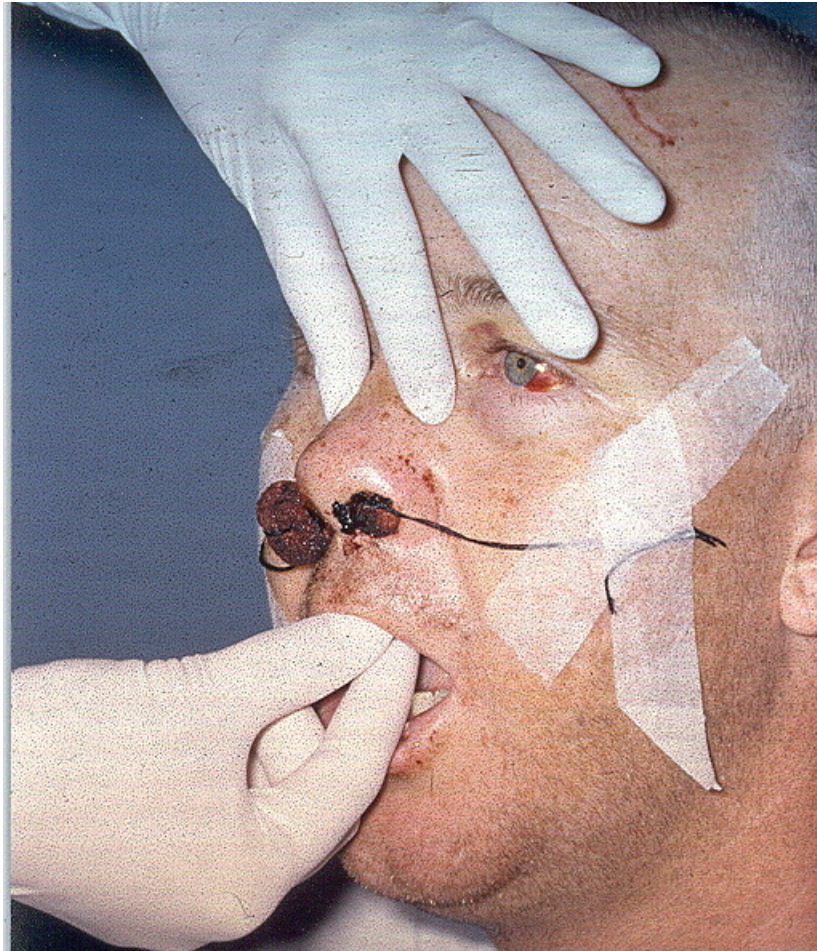


Muscle Forces

- direct skeletal development
- displace fracture fragments
- resist movement of segments
- contribute to relapse after surgery

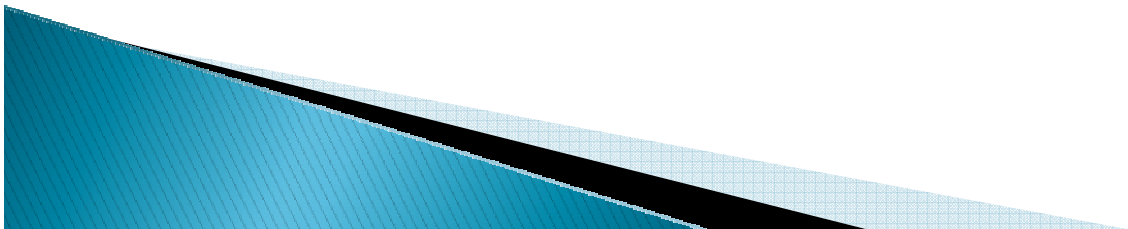


Diagnosis – Clinical



Diagnosis – Radiological

- ▶ Plain X-rays
 - Pterygoid Plates
- ▶ CT Scans
 - 2D
 - 3D
- ▶ Interventional Techniques



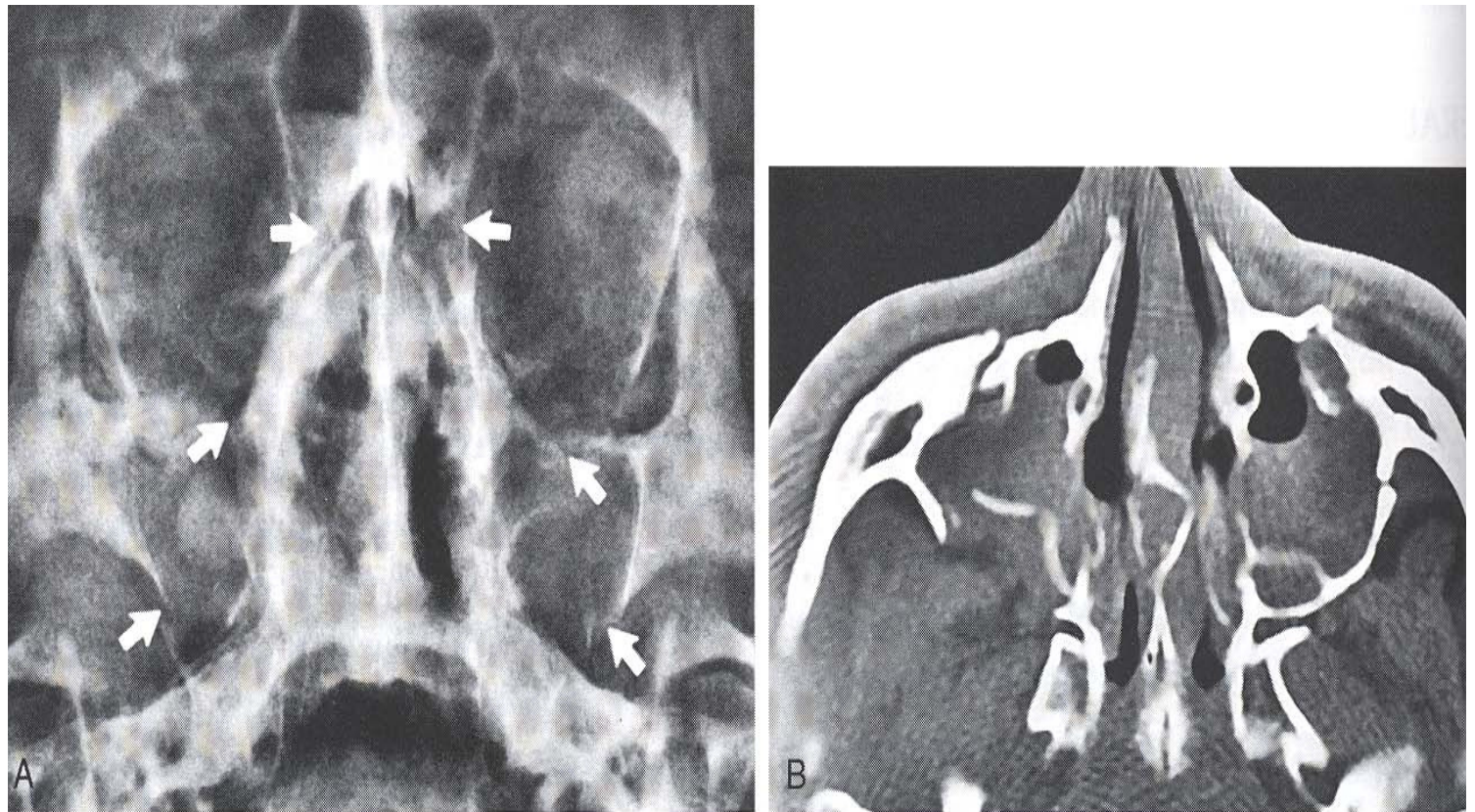


FIGURE 7-16 Waters view (A) shows a Le Fort II fracture (*arrows*) that creates a pyramid-shaped fracture segment. Axial CT scan (B) shows a Le Fort II fracture. The midface fracture segment is clearly seen, and the zygomas are uninvolved. On more caudal scans the pterygoid plates were fractured, and on more cranial scans the ethmoid sinuses and orbital floors were fractured.

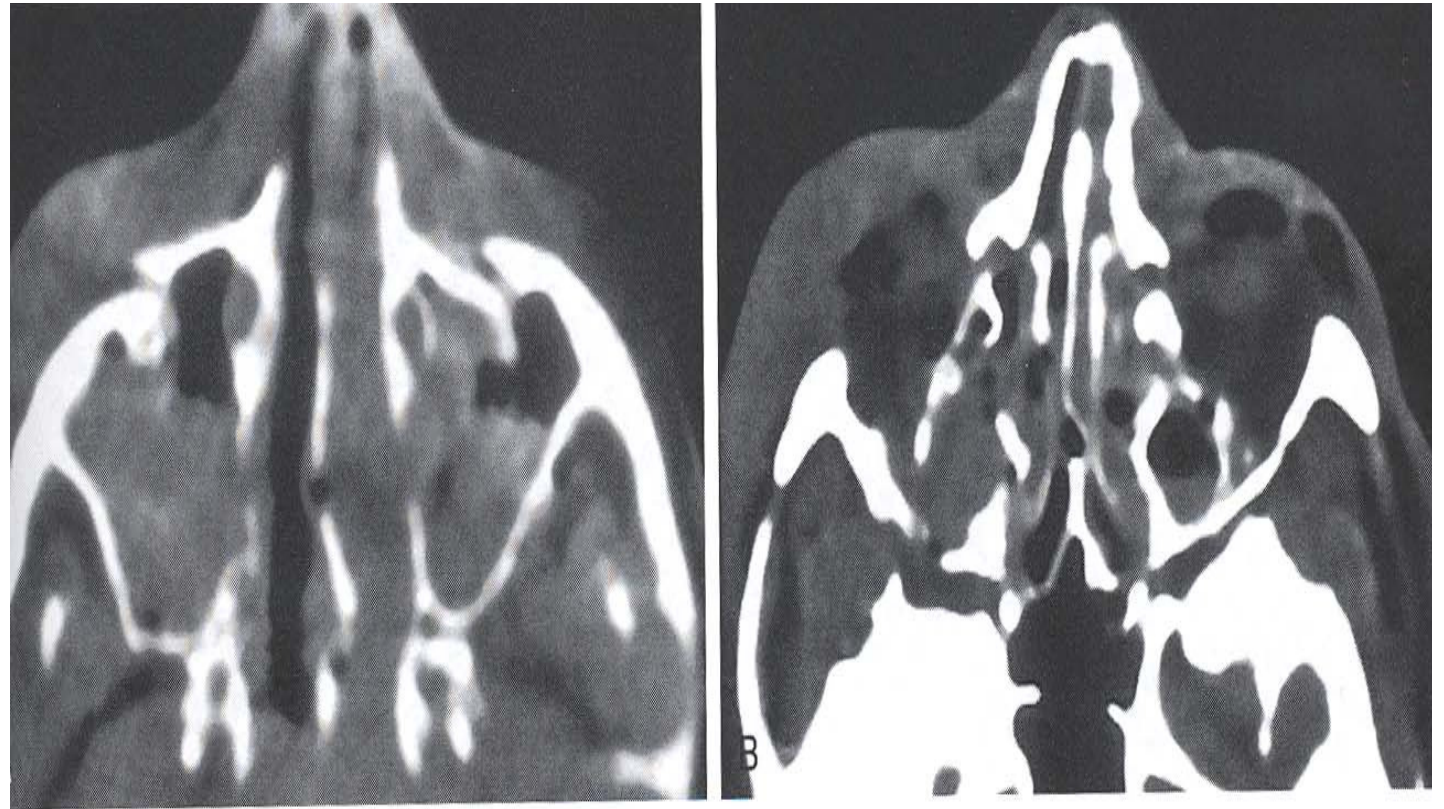


FIGURE 7-19 Axial CT scans show a Le Fort III fracture. The more caudal aspects of the fracture (**A**) are similar to those of a Le Fort II fracture. However, the more cranial fractures (**B**) separate the facial bones from the cranium.

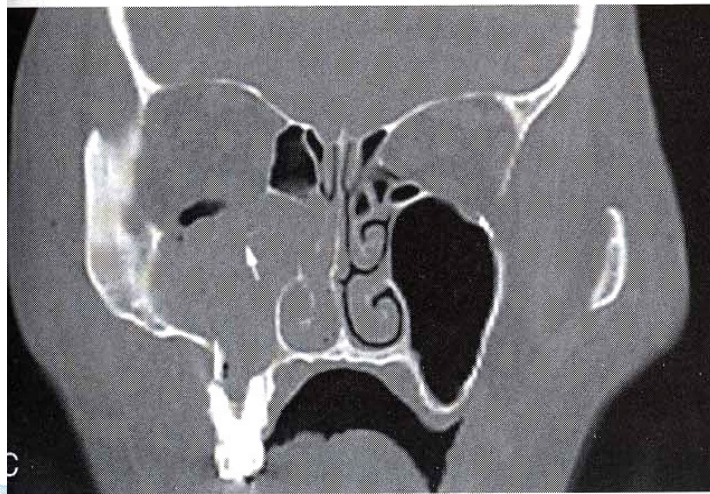
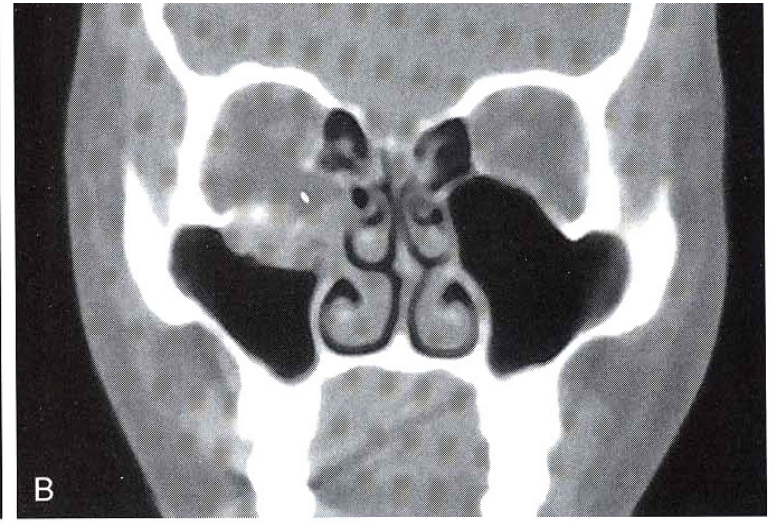
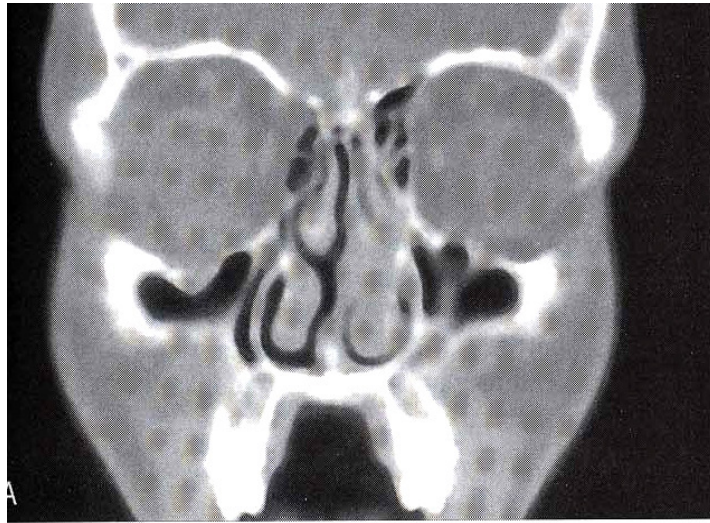
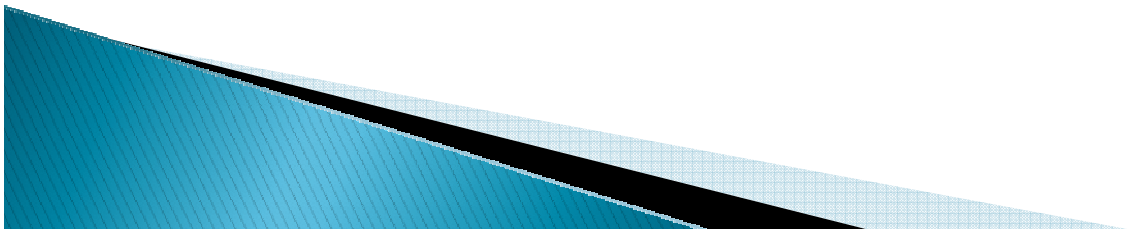


FIGURE 7-31 Coronal CT scans. In (A) there is a small, depressed blow-out fracture of the right orbital floor. In (B) there is a comminuted right orbital floor fracture that also involves the lower medial orbital wall. A large, depressed bone fragment is seen in the antrum. In (C), there is hemorrhage within the right antrum and nasal fossa. There is a depressed, comminuted fracture (*arrow*) of the orbital floor. There is also orbital emphysema and another fracture of the lower antral wall.

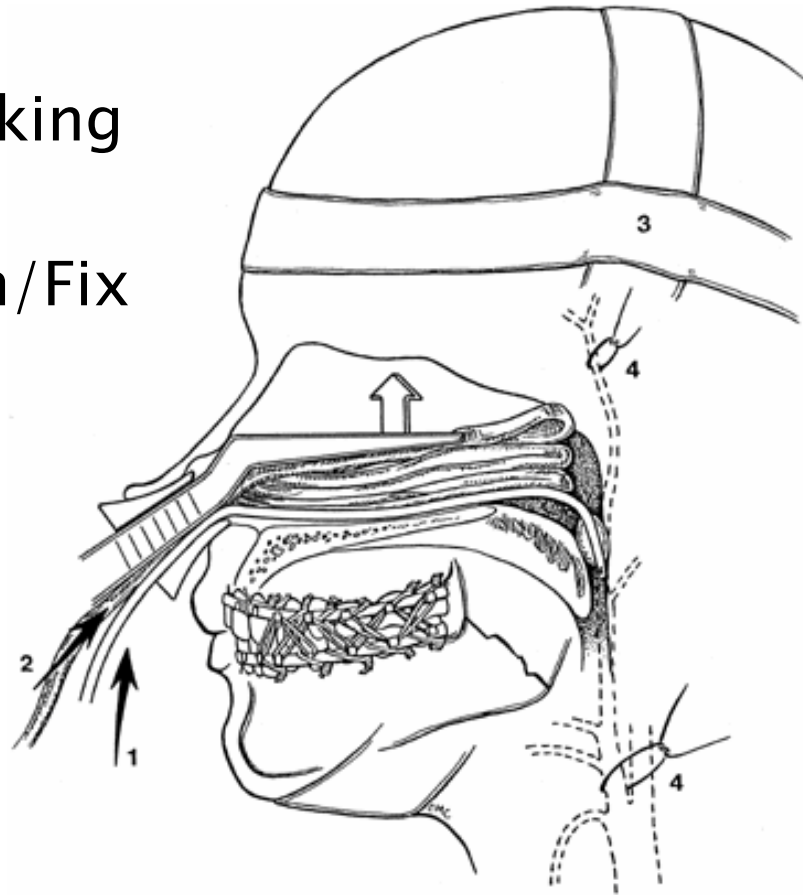
Associated Injuries

- Brandt et al 1991
 - 59% caused by MVA had intracranial injury
 - 10% caused by fall/beating had intracranial injury
- Haug et al 1990 – 402 patients
 - Lacerations 43%
 - Orthopedic injuries 32%
 - Additional facial fractures 22%
 - Neurologic injury 27%
 - Pulmonary, abdominal, cardiac 7%, 4.1%, 1%

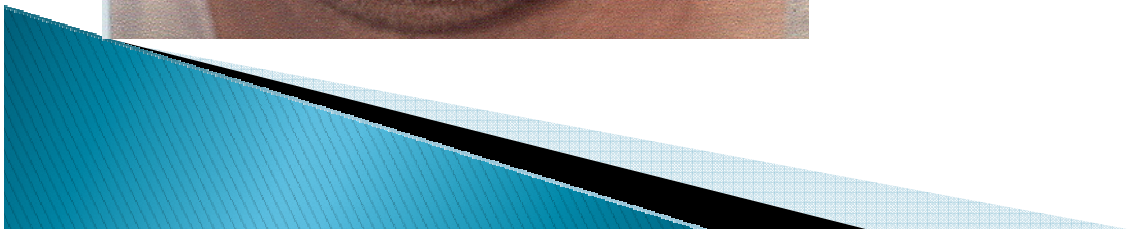
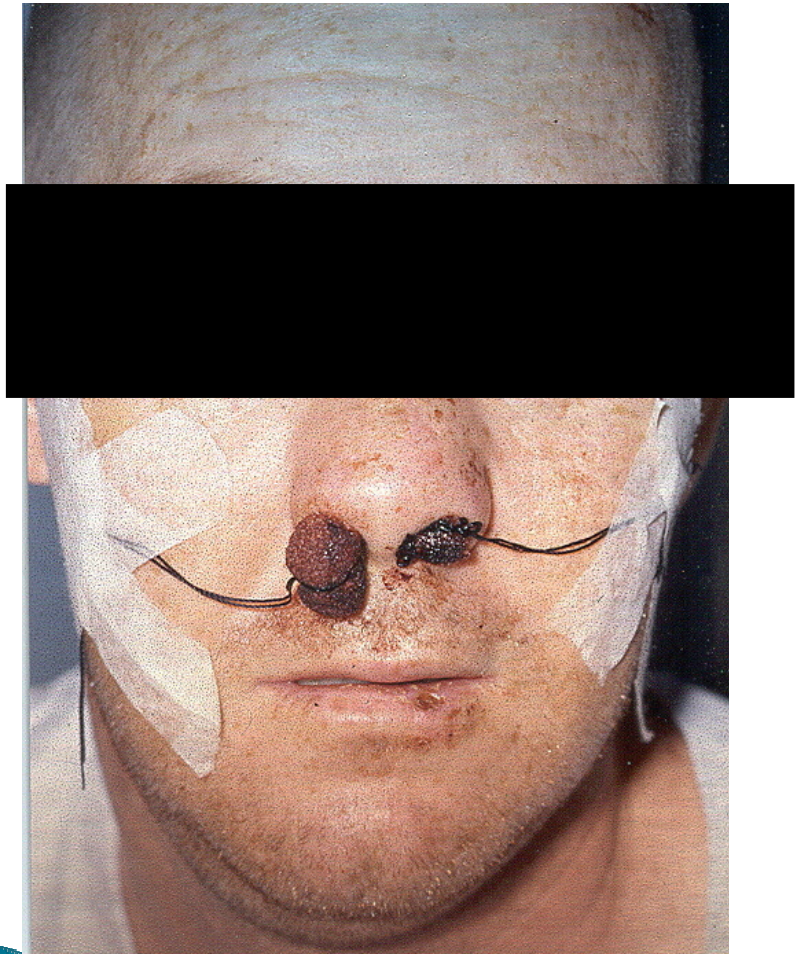


Bleeding Control Techniques

- 1. Post-nasal Balloon
- 2. Anterior Nasal Packing
- 3. Fracture Reduction/Fix
- 4. Vessel Control –IR

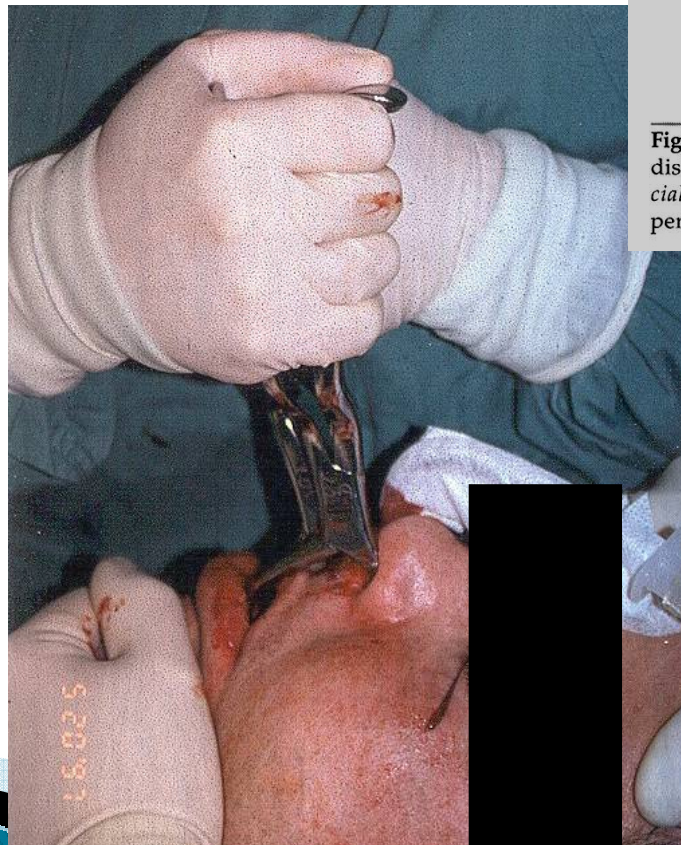
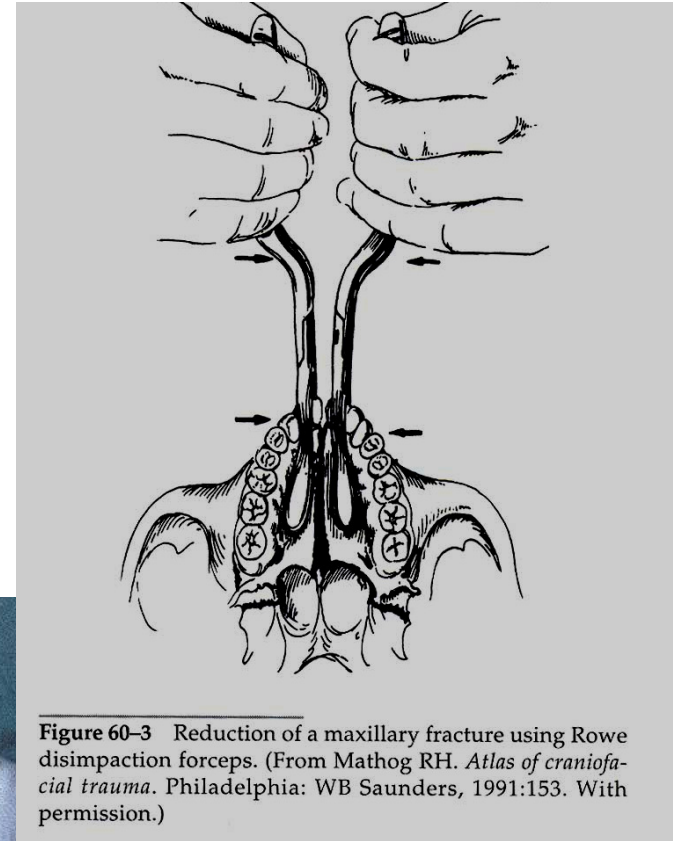


Bleeding Control- Packing

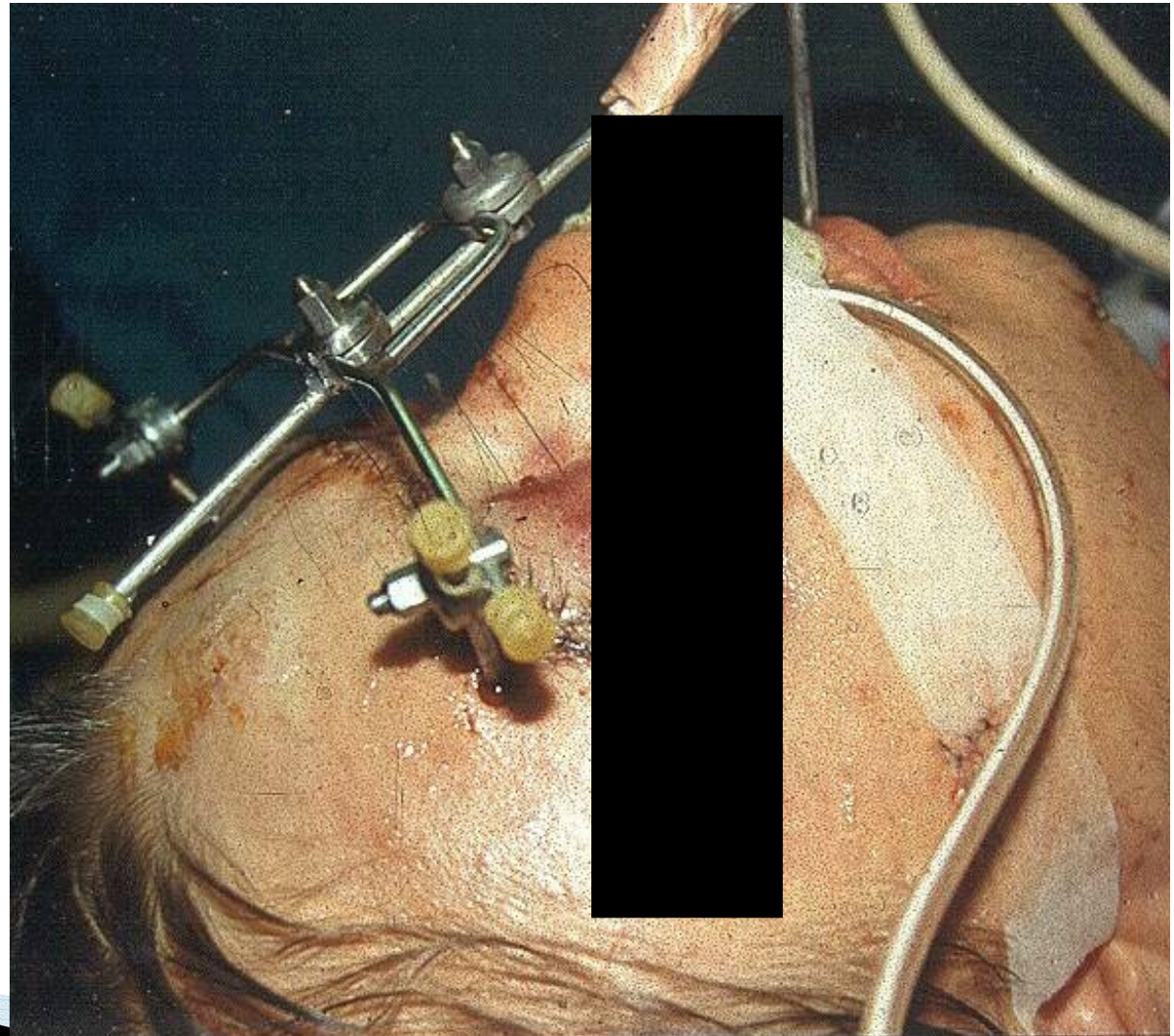


Fracture Reduction

- ▶ Disimpaction
- ▶ Mobilisation
- ▶ Relocate
- ▶ Stabilisation

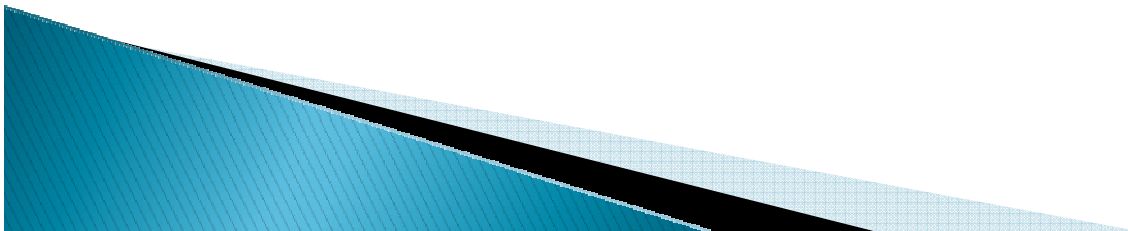


Balloon/Pack/Reduction/Fix



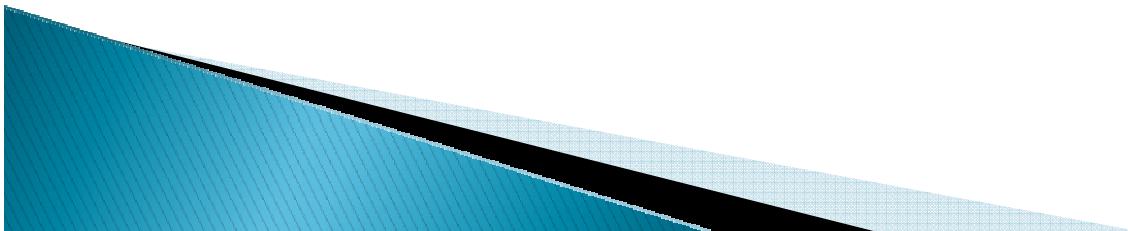
Treatment of maxillary fractures

- ▶ Early repair
- ▶ Single-stage
- ▶ Extended access approaches
- ▶ Rigid fixation
- ▶ Immediate bone grafting
- ▶ Re-suspension of soft tissues



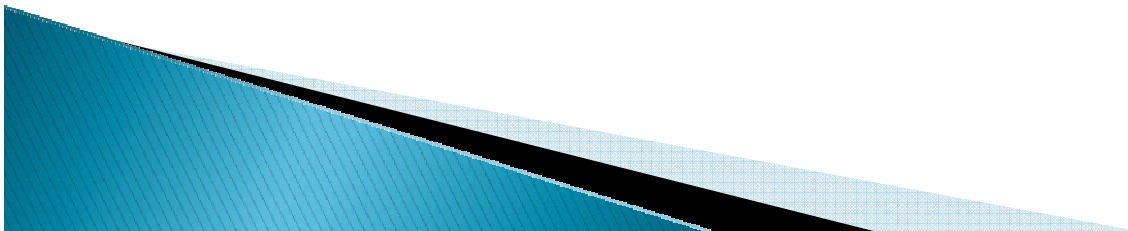
Treatment of maxillary fractures

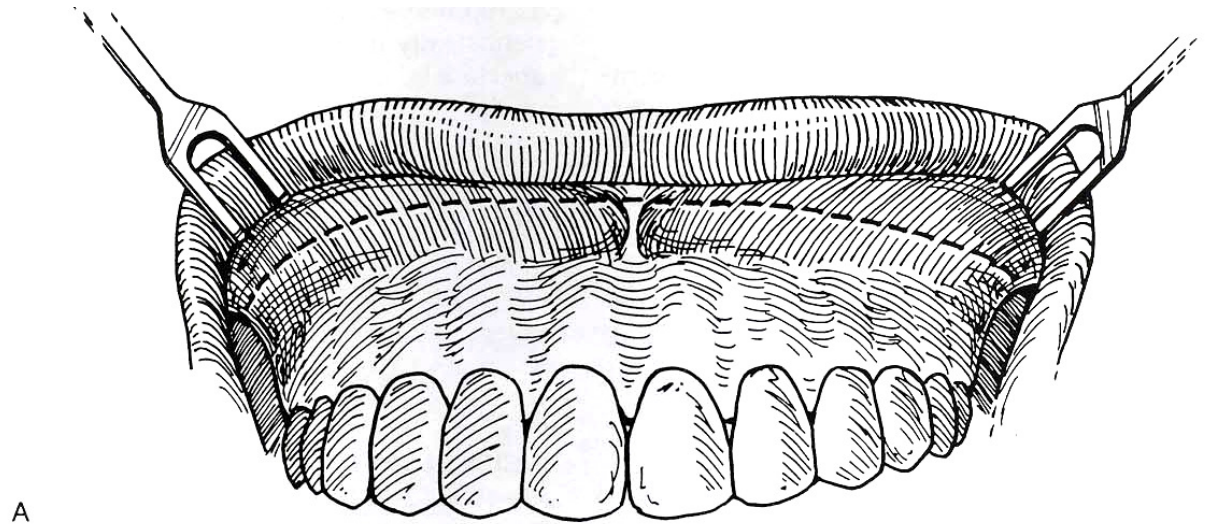
- ▶ Early repair
- ▶ Single-stage
- ▶ Extended access approaches
- ▶ Rigid fixation
- ▶ Immediate bone grafting
- ▶ Re-suspension of soft tissues



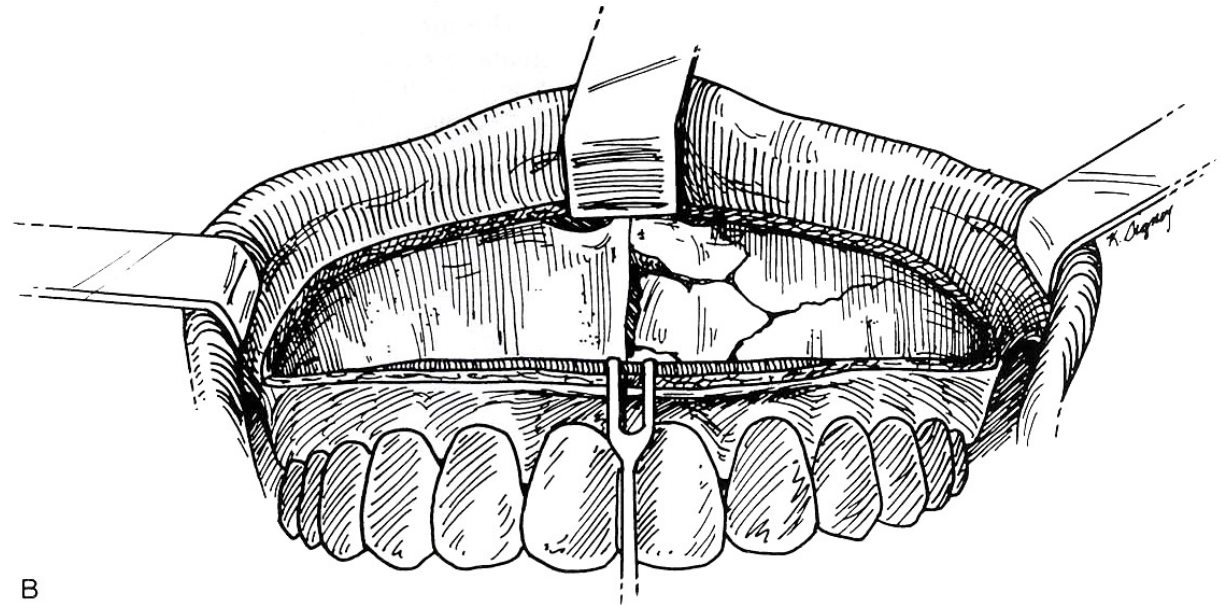
Approaches

- ▶ Circumvestibular
- ▶ Facial degloving
- ▶ Bicoronal
- ▶ Transconjunctival





A



B

Figure 16. A, The circumvestibular incision is created 5 to 10 mm above the attached gingiva, transmucosally from first molar to first molar. B, Access to low-level maxillary fractures is provided by this intraoral approach.

Coronal

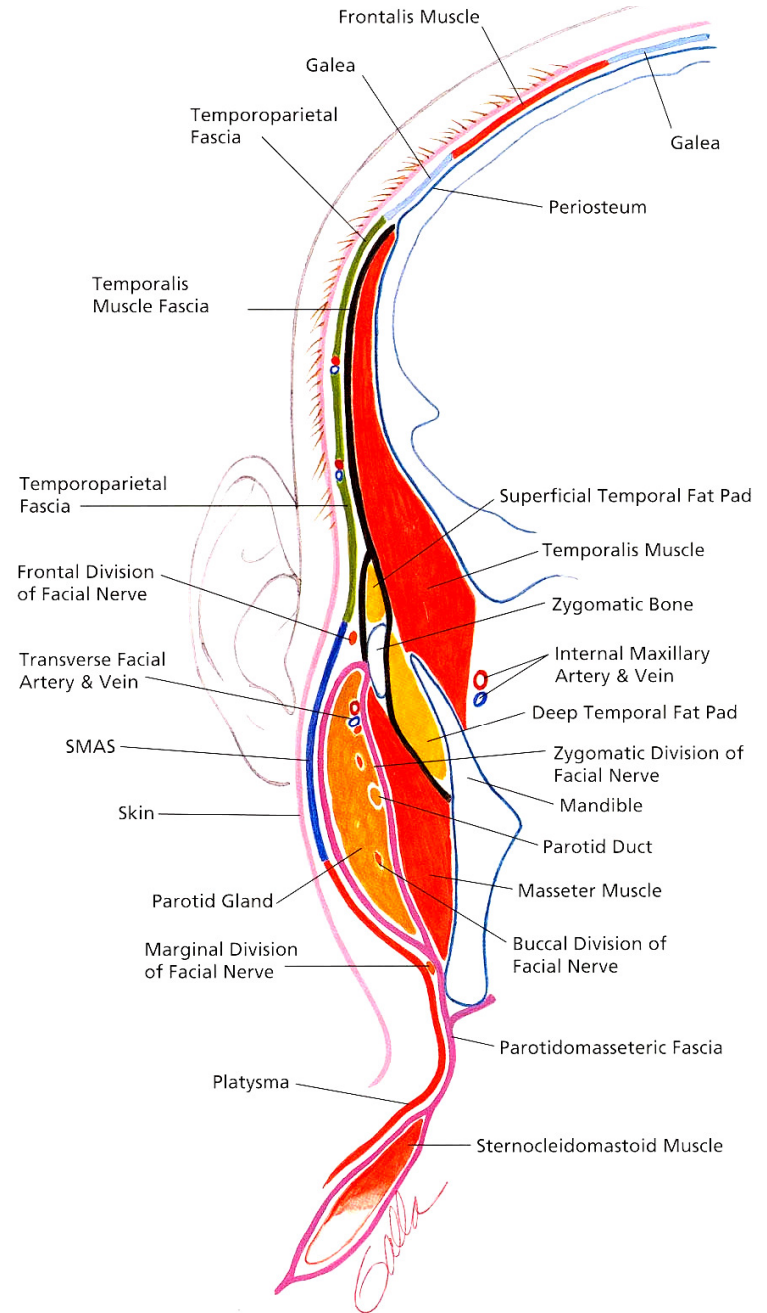
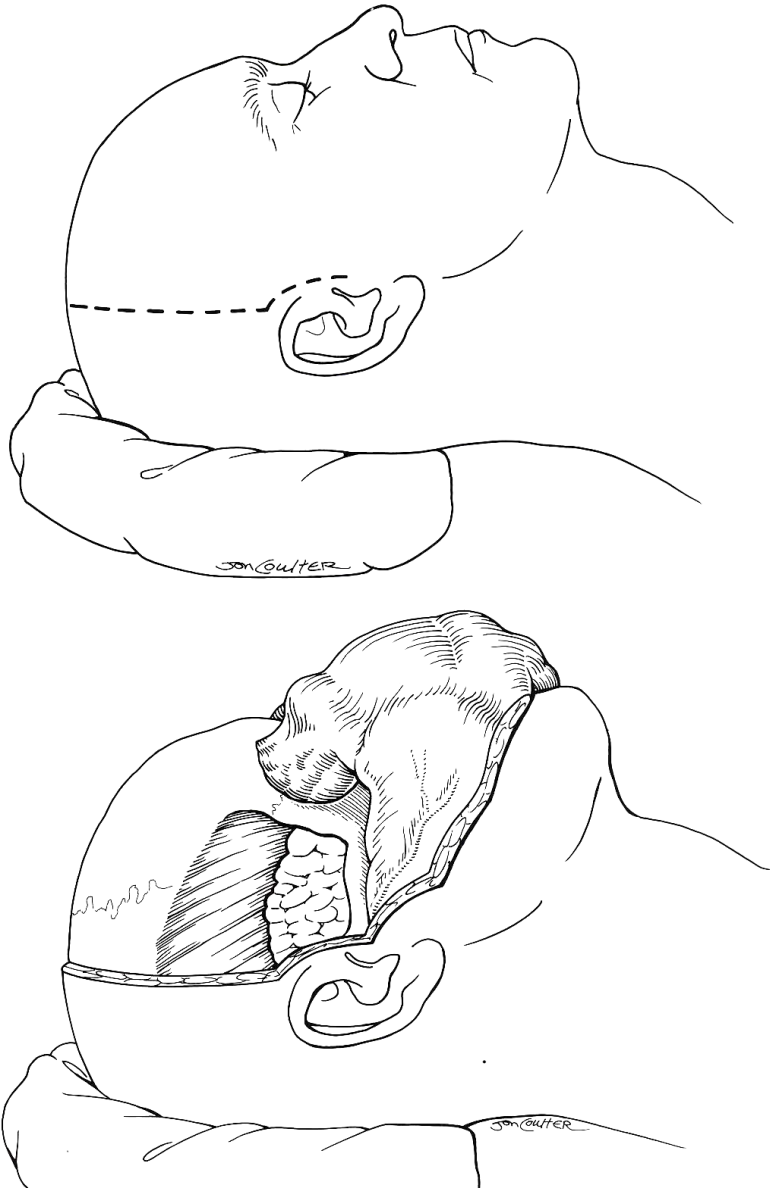


FIG. 1.3. Coronal view of the muscles and fascial planes of the face and scalp. (From Cheney ML. *Facial Surgery: Plastic and Reconstructive*. Baltimore: Williams & Wilkins, 1997, with permission.)

Approaches to FZ buttress

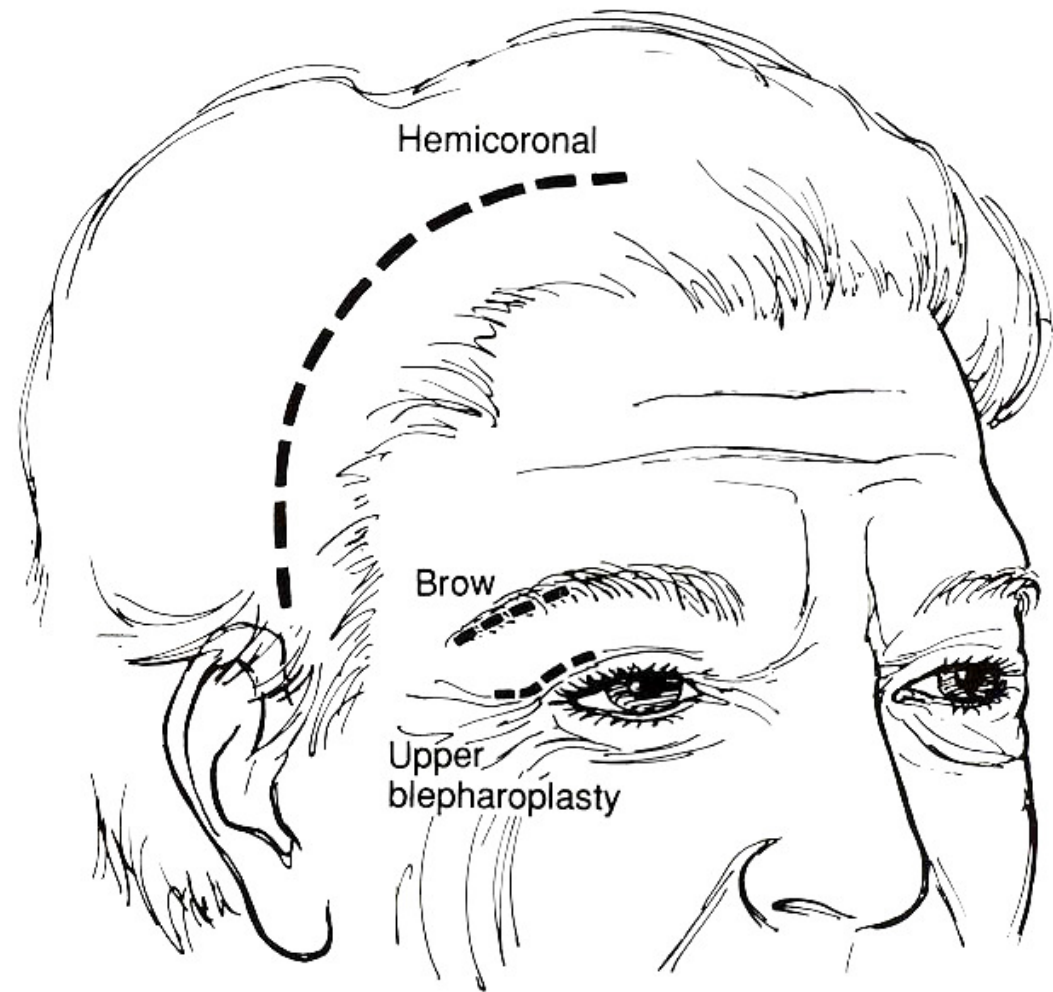
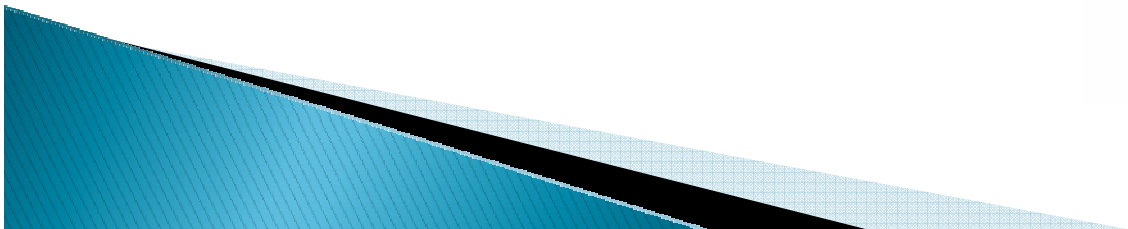
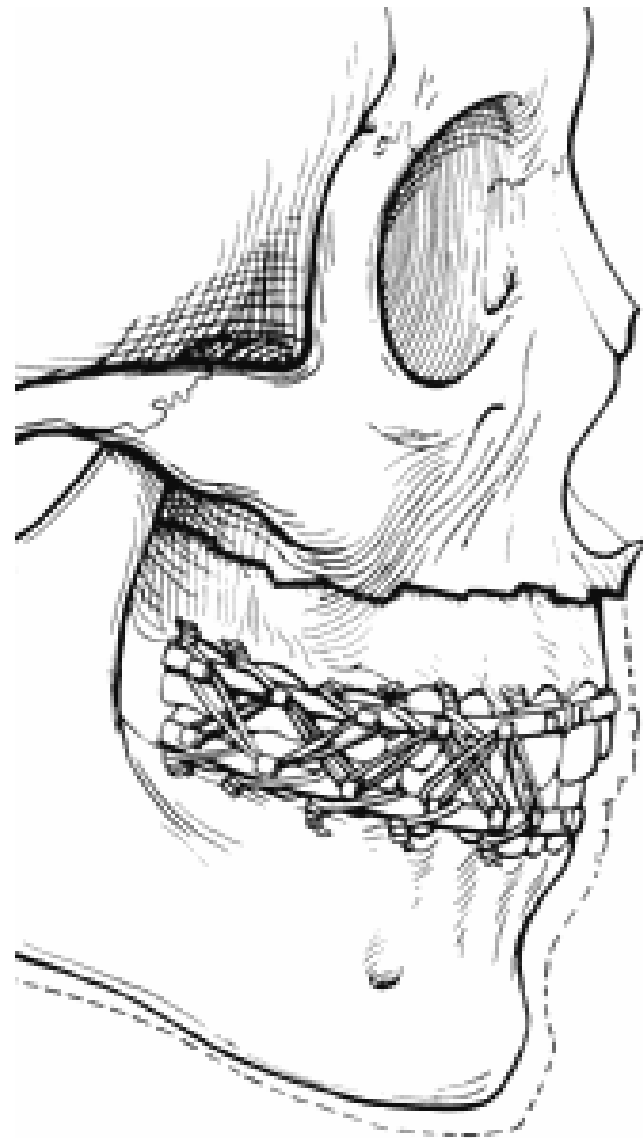


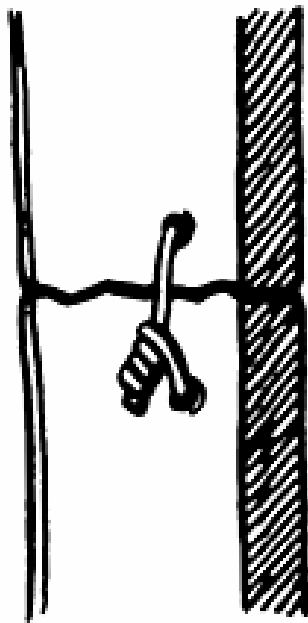
Figure 5. Approaches to the frontozygomatic buttress: hemicoronal, brow, and upper blepharoplasty incisions.

Reduction

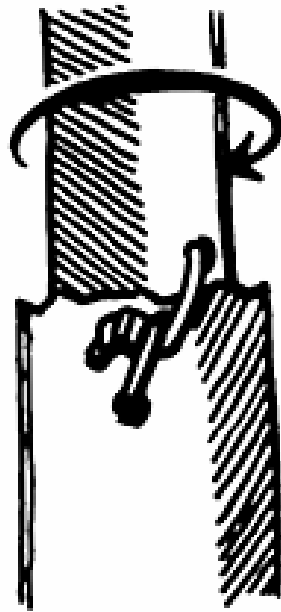
- Wide exposure
- Accurate reduction
 - Temporary IMF
 - Bone to Bone Contact
- Zygomatic Arch
 - Restores facial
 - Projection
 - Width



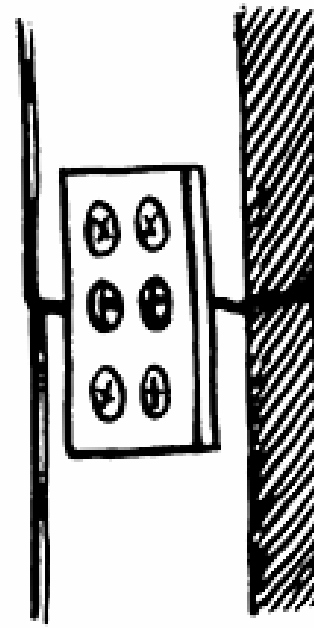
Wires Vs Plates



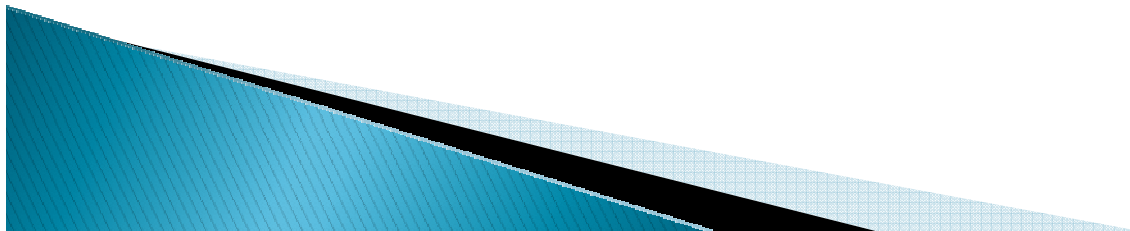
A



B

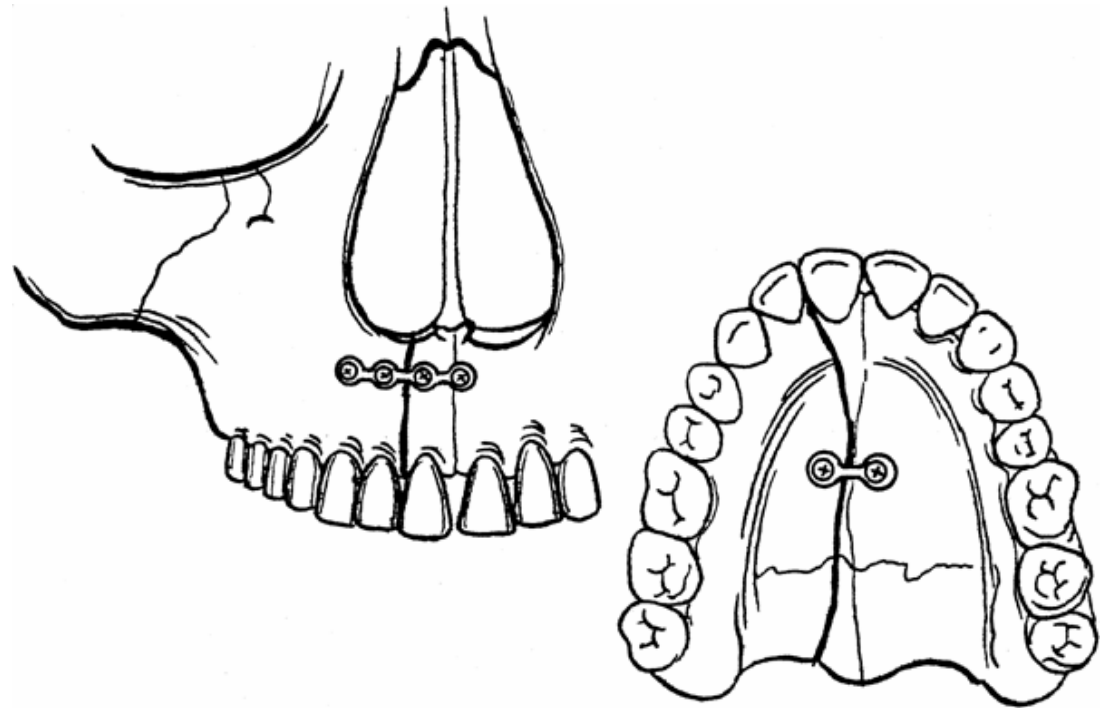
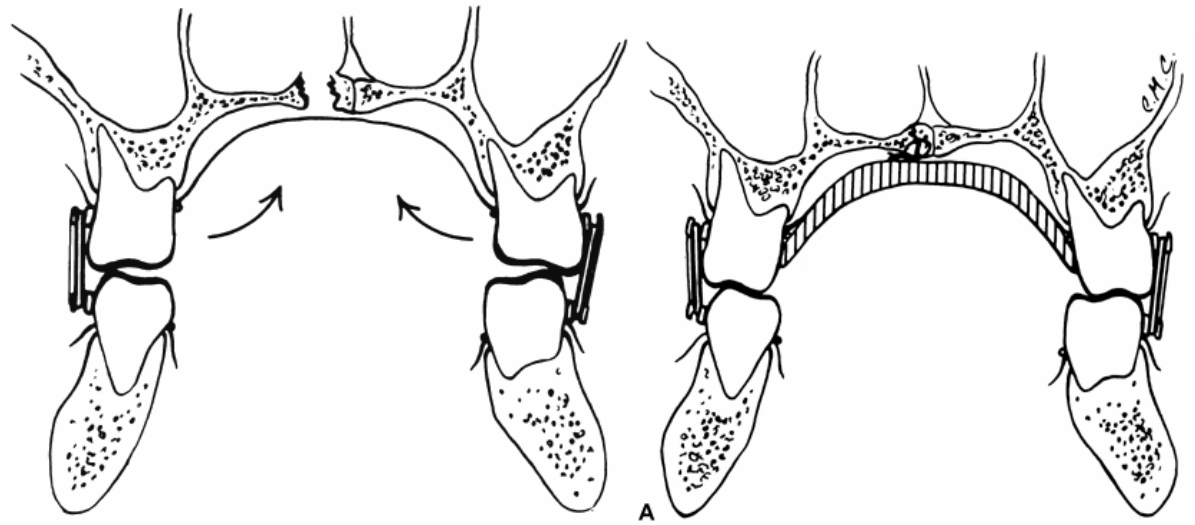


C



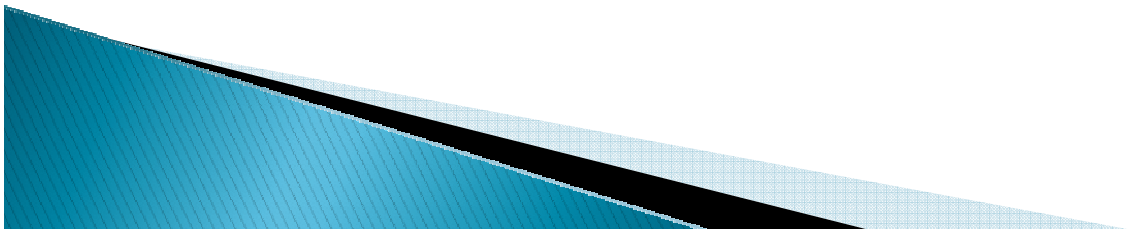
Split Palate

- ▶ Suspect
- ▶ Diagnose
- ▶ Explore
- ▶ Reduce
- ▶ Fix



Soft tissue resuspension

- ▶ Wide exposure allows more accurate fracture reduction but may lead to problems in soft tissue covering of face
- ▶ Need to close periosteum and provide suspension sutures to prevent descent of soft tissues



Conclusions

- ▶ Occlusion Is The Key
- ▶ Simple Dental Anatomy Is Within The Scope Of Plastic Surgery
- ▶ Basic Principles Most Important
- ▶ High index of suspicion for associated injuries– especially ocular
- ▶ Assessment of buttress system
- ▶ Wide exposure via cosmetically acceptable incisions
- ▶ Rigid fixation
- ▶ Soft tissue resuspension

