

Content Warning

Please Note:

This slide deck contains graphic clinical/surgical images of facial and oral injuries. Viewer discretion is advised. Proceed at your own comfort level.

Some slides have been removed in this slide deck from the live presentation.

Oral & Facial Trauma Management

TREASURE VALLEY ORAL & FACIAL SURGERY

Cole W Anderson DMD, MS

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Educational Objectives

- Oral & Facial Trauma Management
- Historic perspective on oral and facial trauma care
- Regional history of facial trauma care
- Accessing emergent services within the Trauma system
- Comprehensive Facial Trauma Management
- Management of Dento-alveolar injuries
- Soft tissue management of oral injuries

An Enigmatic Specialty

- USA: a dental specialty
- Internationally: a medical specialty
- BAOMS, EA Cranio-Maxillofacial Surgery
 - Practicing the full scope of the specialty requires training in both medicine and dentistry



Multi-disciplinary

- OMFS
- ENT
- Plastics

Historical Perspective

Facial Trauma

- After lying in a tomb in Thebes, Egypt, for over 3,000 years, the papyrus was sold to the antiquities dealer Edwin Smith in 1862.
- 1906 was donated to 'The New York Historical Society' by his daughter. It was not until...
- 1920 Egyptologist James Henry Breasted for translation.
- The papyrus includes 48 cases of wounds, injuries and fractures

Historical Perspective

Facial Trauma

- Middle ages through Renaissance, Rudimentary basic splinting and bandaging
- Europeans 15th-19th Centuries experimentation on fracture fixation and primitive reconstruction
- WWI was a turning point due to significant progress in many areas of surgery as well as the large scale injuries as a result of modern warfare



Historical Perspective

Facial Trauma

- OMFS is a relatively young specialty 1918 AAOMS
- Roots in Dentistry and Medicine
- WWI; Trench warfare, Turning Point
 - 15% with Facial Injuries, unprecedented numbers
 - Plastic and Jaw Unit 83rd G.H. Wimereux, France
 - Dr. Auguste Charles Valadier, Dental Surgeon
 - British War Office: Commissioned a center for maxillofacial injuries
 - Dr. Harold Gillies (ENT, OMFS, Anest), Dr. Morestin, Dr. Ganzer

Facial Surgery Operating Theater



Queens Hospital For Facial Surgery



USA

- WWI
- Vilray Papin Blair-General Surgeon
 - Organized the Military Facial Trauma Unit
 - Patterned after Dr. Gillies
 - Blair and Robert Ivy OMFS
 - Multidisciplinary Center (ENT, Plast, OMFS, GS, Neuro)
 - Transport Prone, Early Tracheostomy, Jaw stabilization

Saint Alphonsus circa 1900



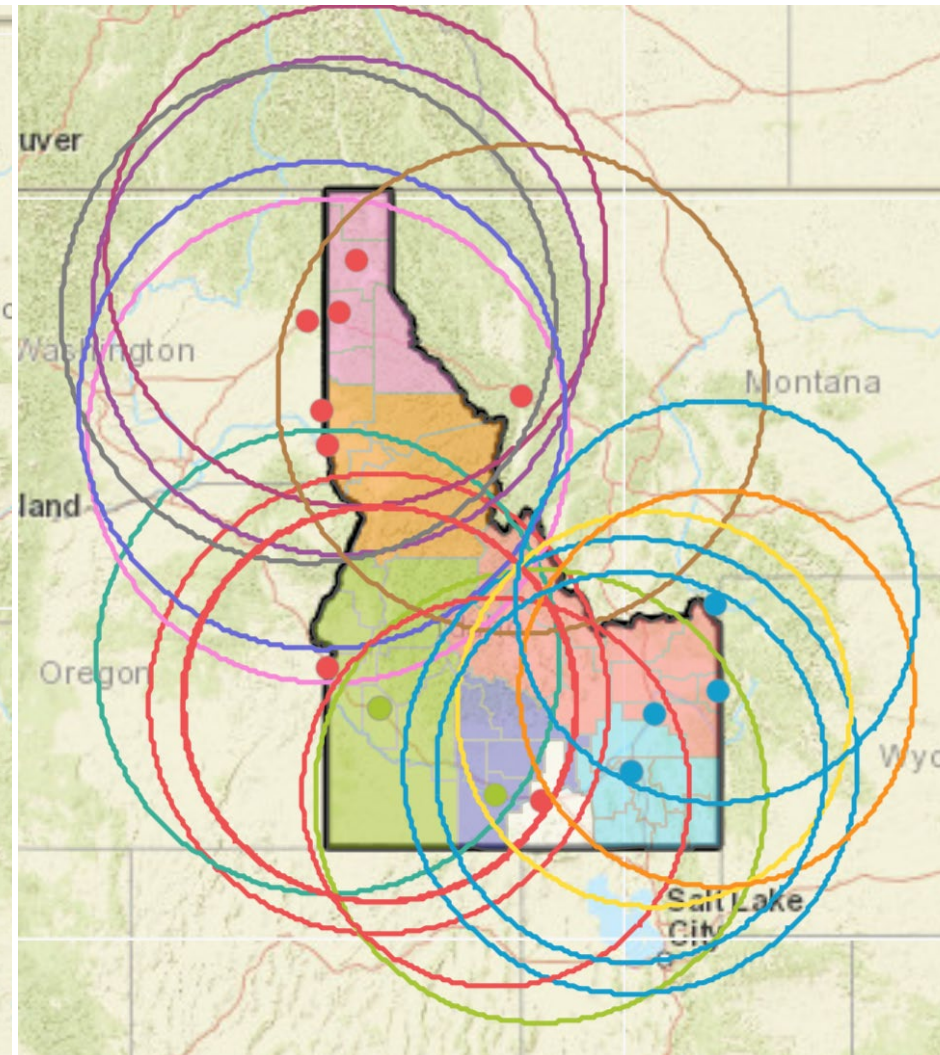
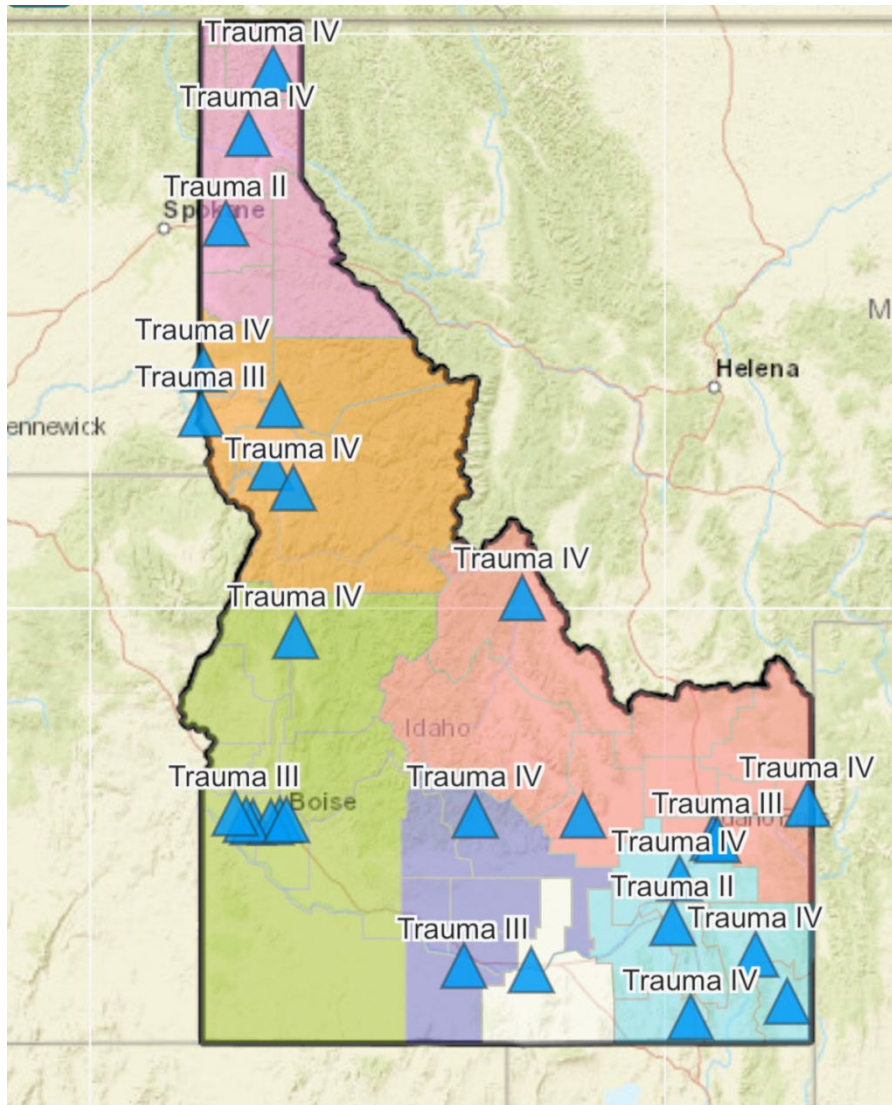
Regional history of facial trauma care

- . Saint Alphonsus was the first in Boise est. 1894 by the Sisters of Holy Cross: 5 sisters, 2 doctors and 9 employees
- . St. Luke's 1902, initially 6 bed facility now the largest health care organization in the state.

Regional history of facial trauma care

- . Traditional Hospital Dynamics between Privileging and Obligation. Turf Wars
- . Major changes in sub-speciality delivery of care
- . Status in 2012-present

Time Sensitive Emergency System

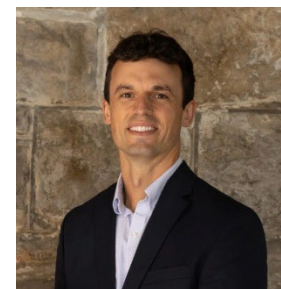
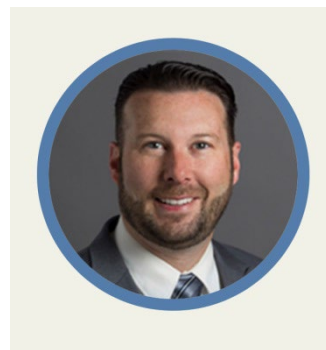


A new perspective

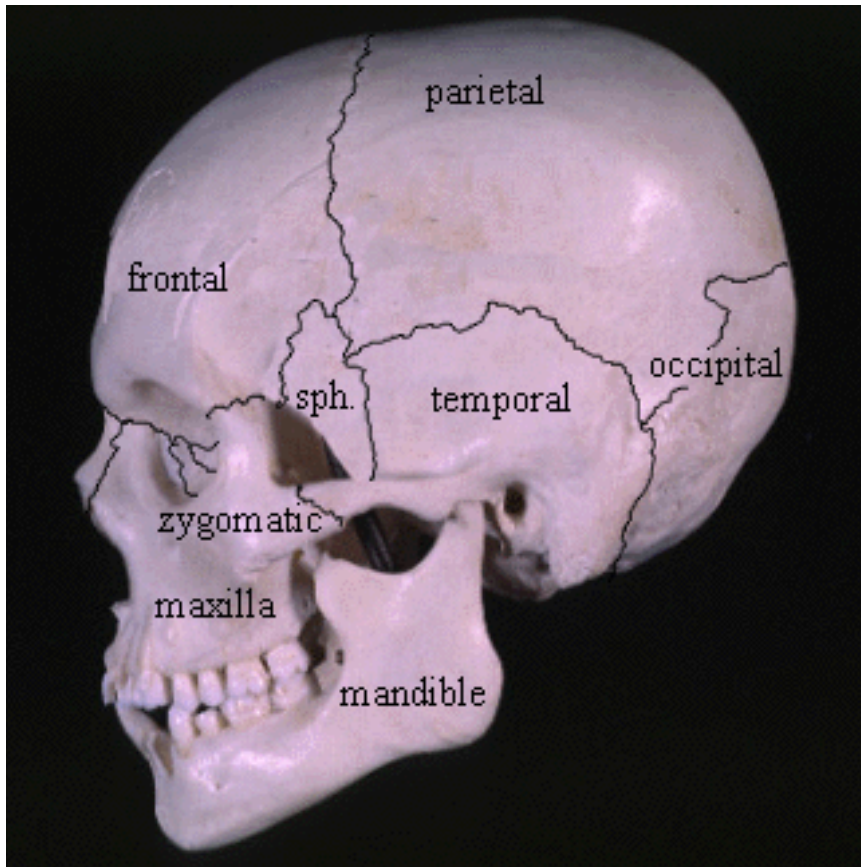
- . Altruism and professional ethics
- . Watershed case
- . Community need
- . A compelling priority from the hospital system

Facial Trauma Associates

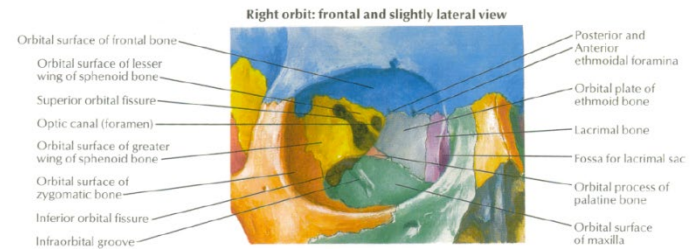
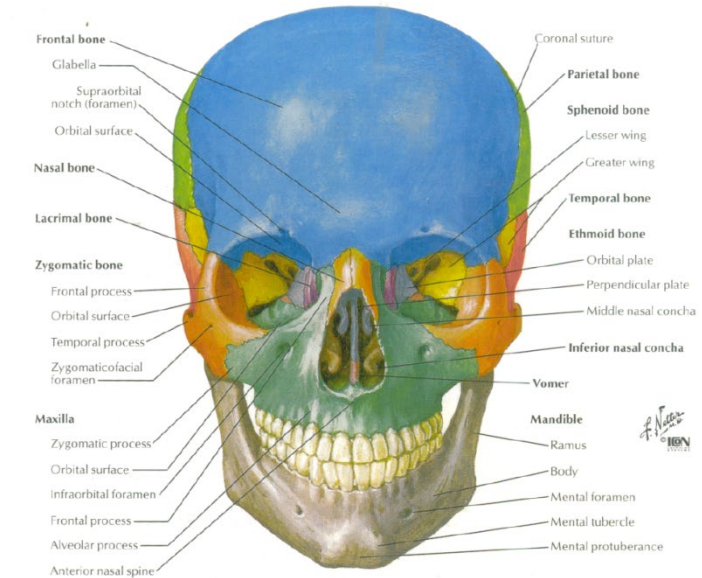
- Cole Anderson
- Jeremy Hixsom
- Arman Haghighi
- Brian Rowan
- Tim Obrien



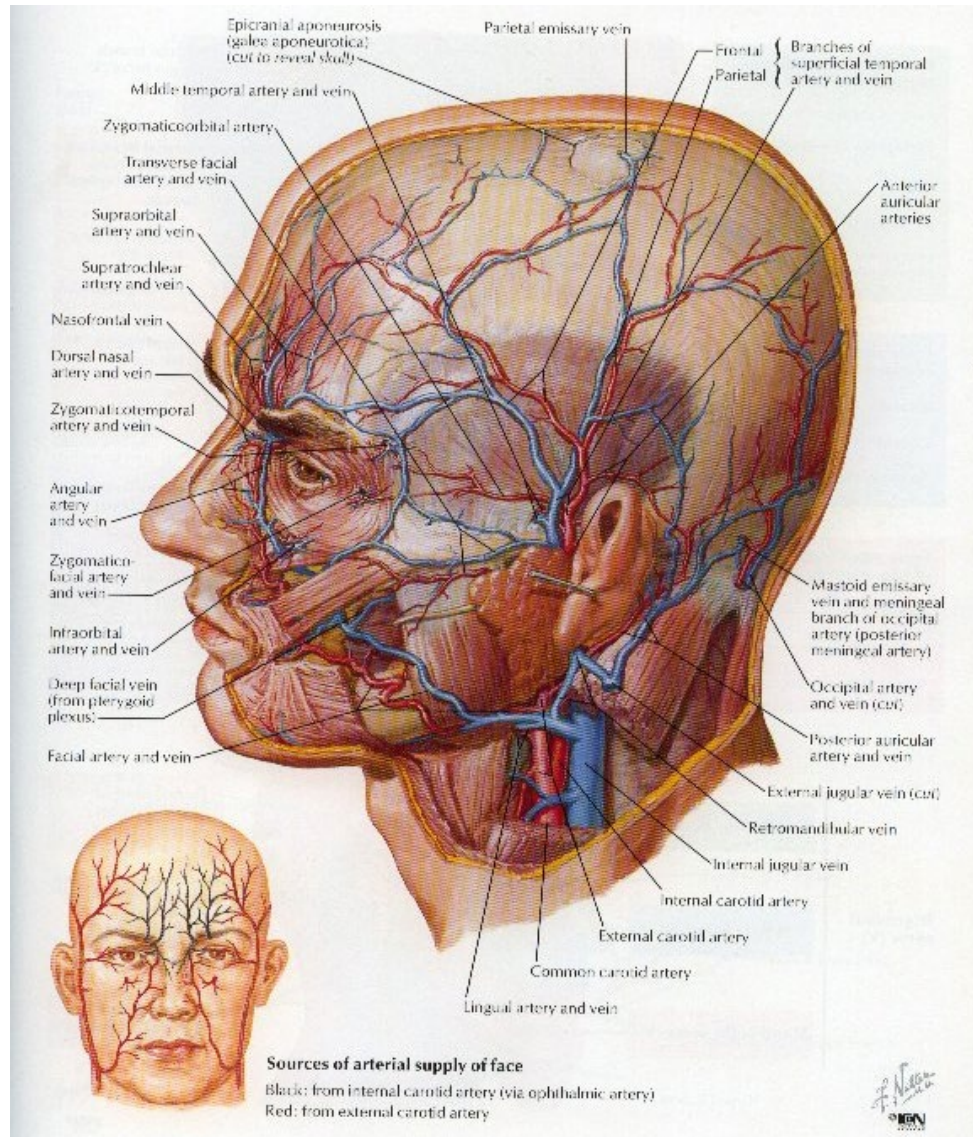
Anatomy: Skeletal



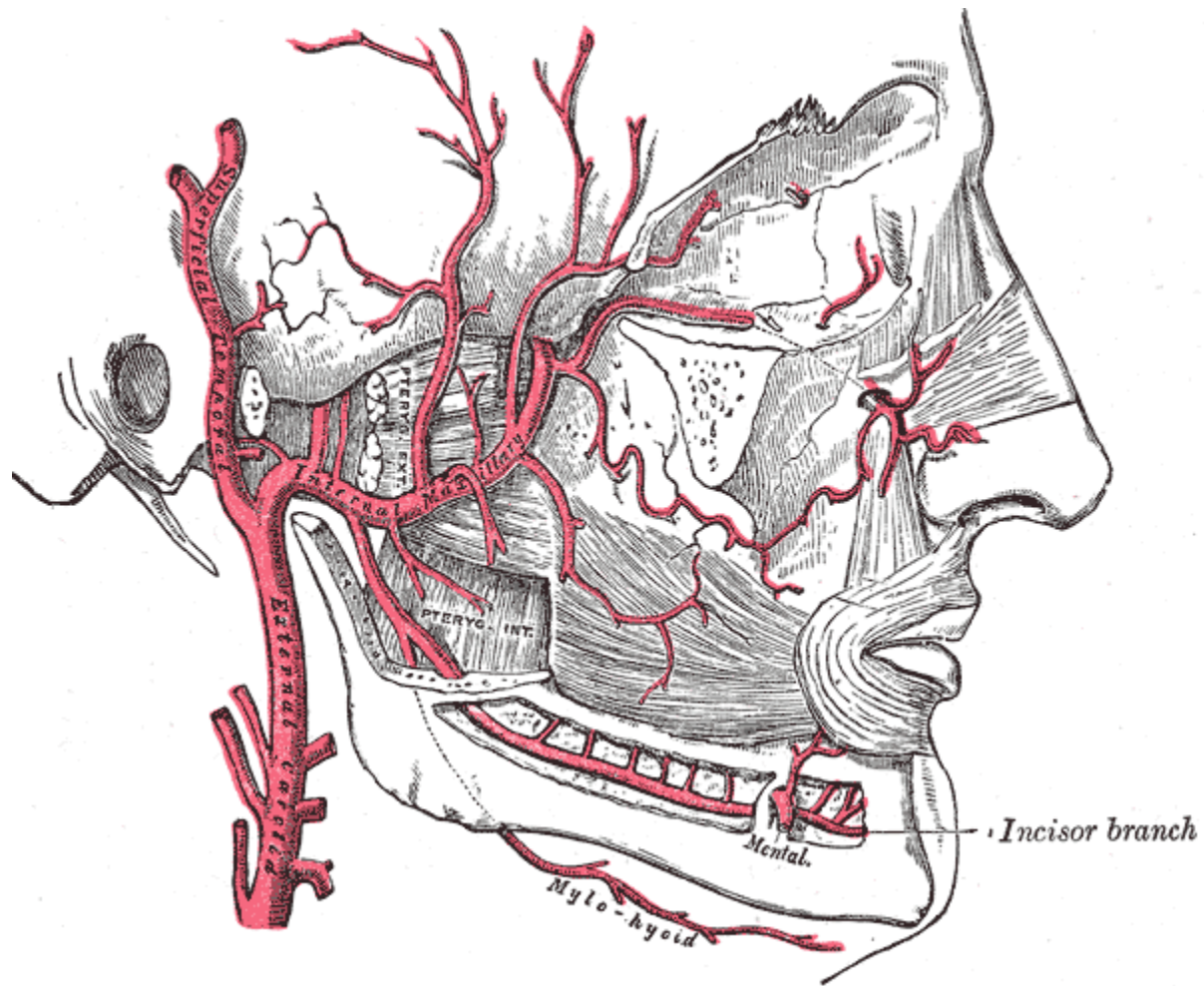
Skull: Anterior View



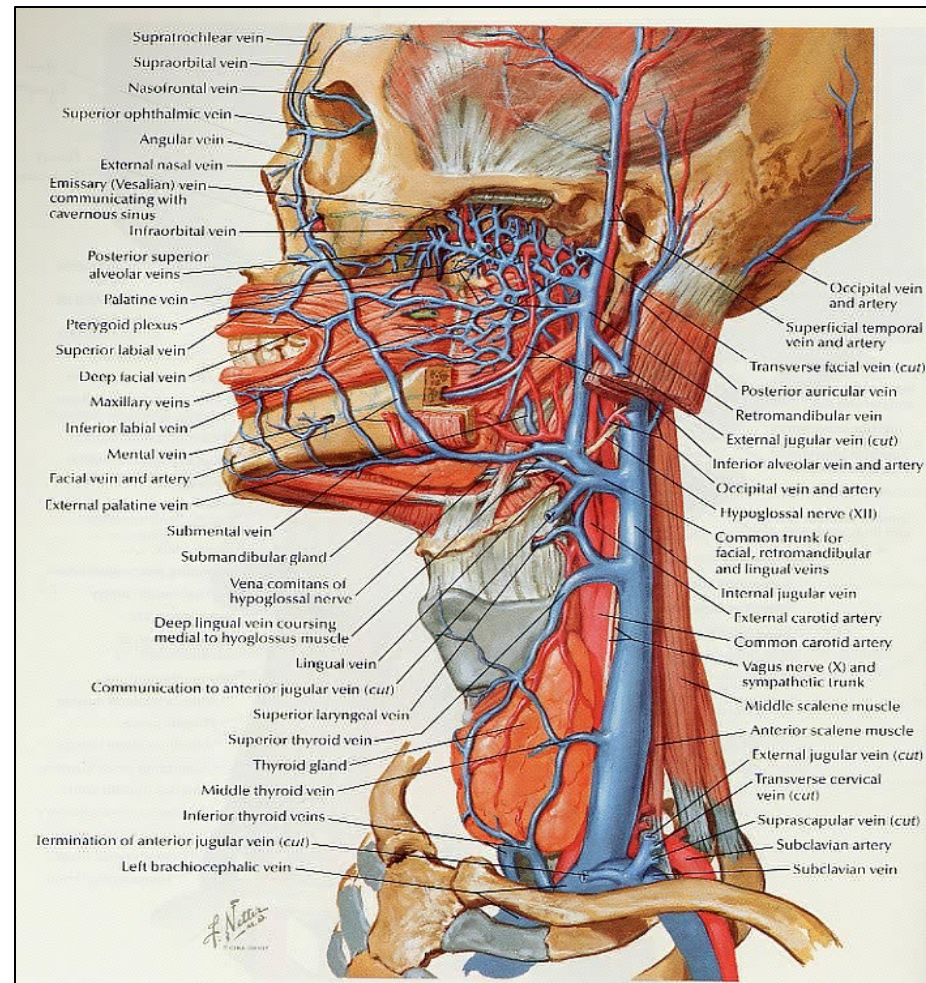
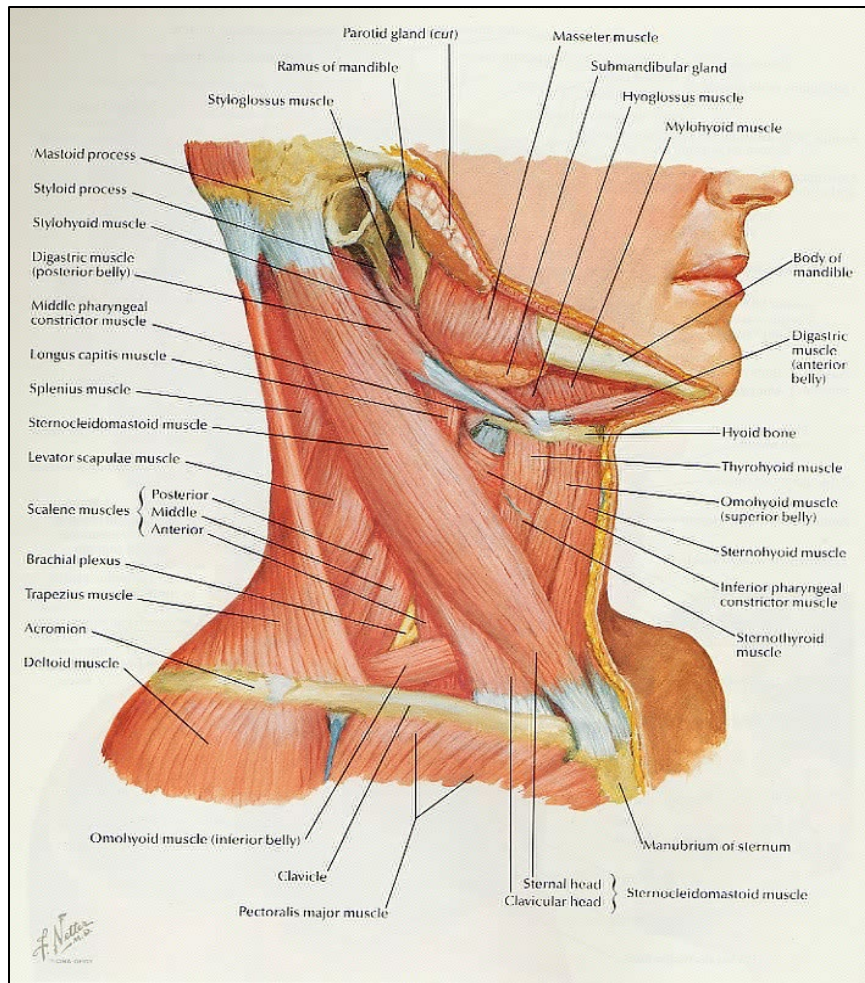
Anatomy: Vascular



Anatomy



Anatomy



Patient Evaluation

- Primary Survey
 - Airway
 - Circulation
- Secondary Survey
 - HEENT



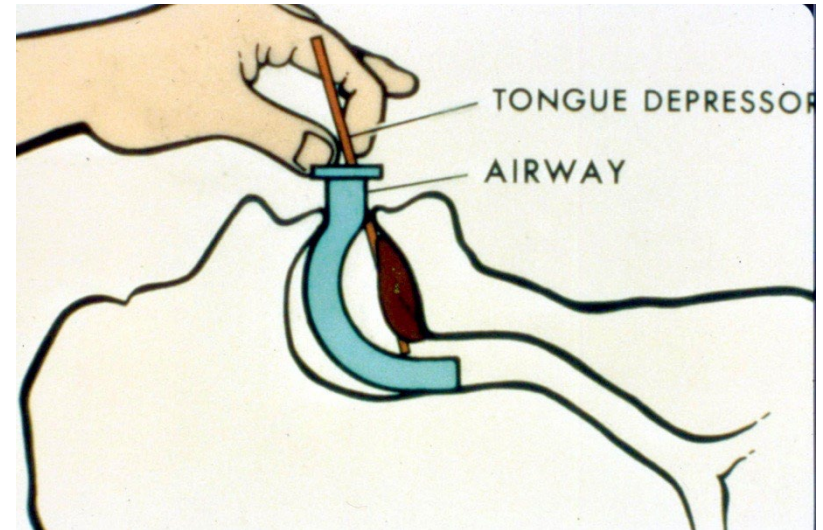
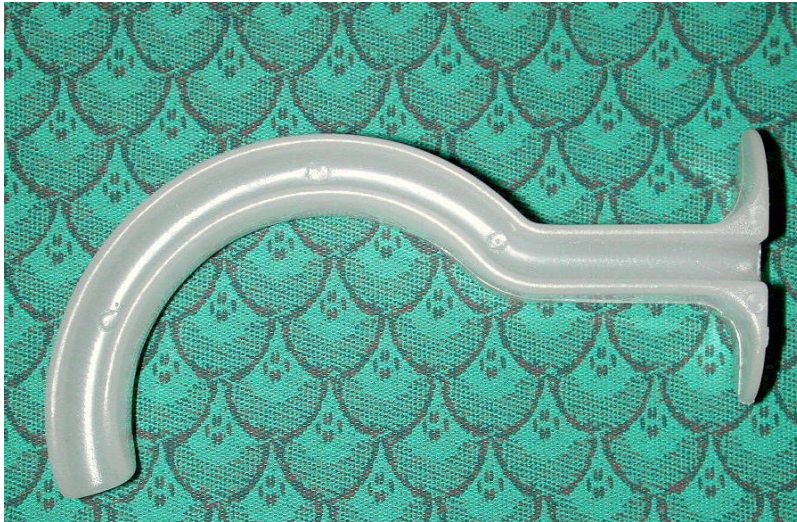
Primary Survey

- Airway
 - C-spine immobilization
 - Secure airway
 - Chin Lift
 - Jaw thrust
 - OPA
 - Nasal airway



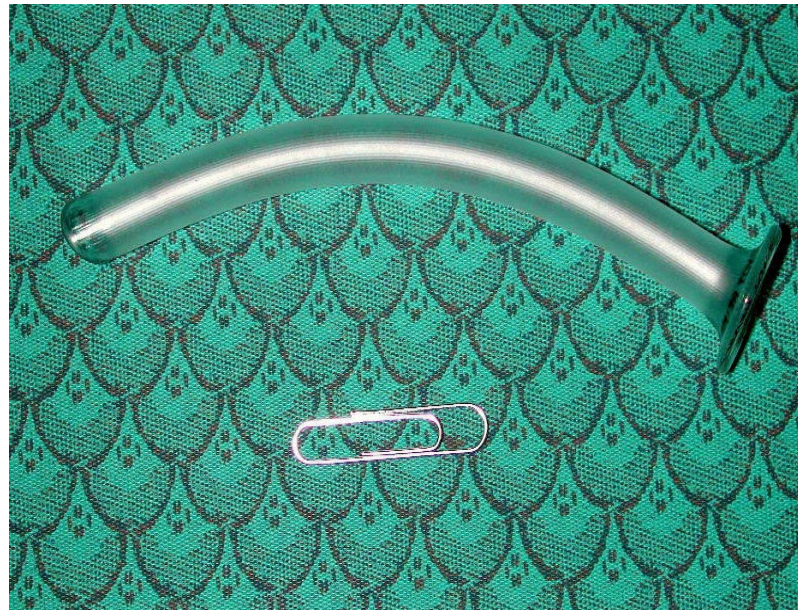
Airway Management

Oropharyngeal Airway



Airway Management

Nasopharyngeal Airway



Definitive Airway

- Intubation
 - Oral
 - Nasal
 - Submental



Primary Survey

- Surgical Airway
 - Cricothyroidotomy
 - Tracheostomy



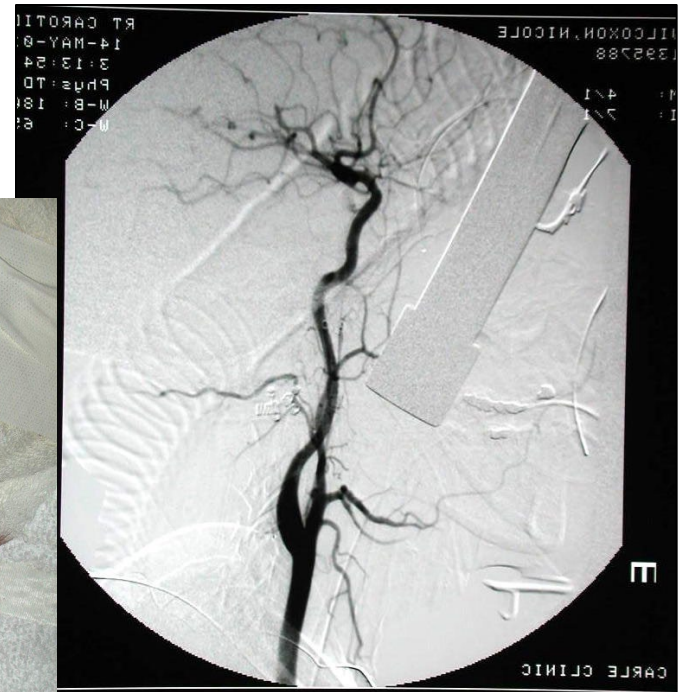
Primary Survey

- Circulation
 - Restoration of blood volume + C.O.
 - Control of Bleeding
 - Vascular injury
 - Epistaxis



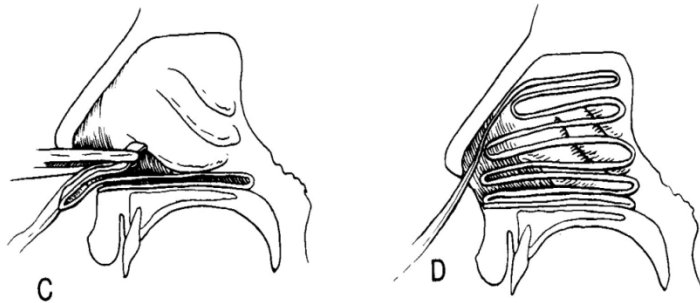
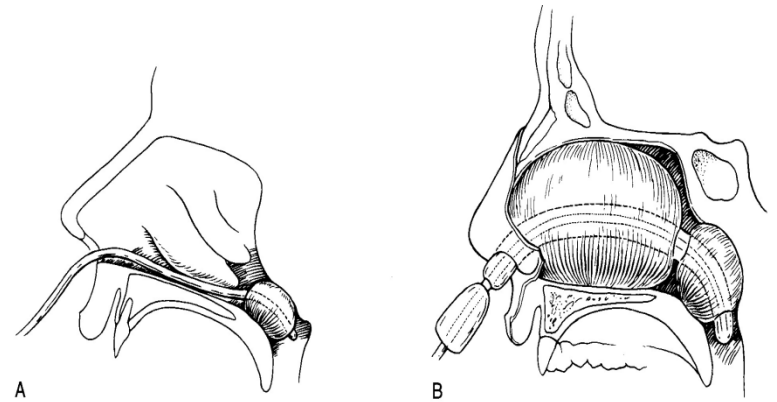
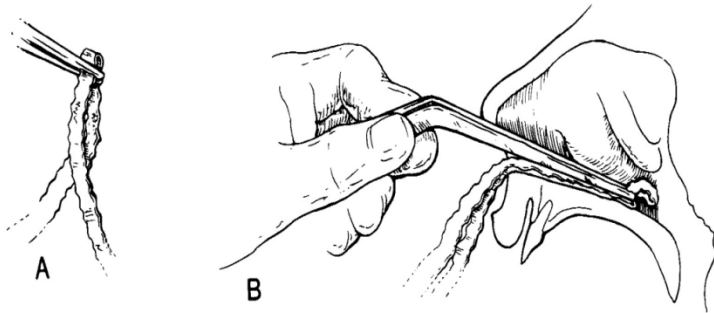
Vascular Injuries

- Penetrating head and neck trauma
- Angiography
- Plain films
- CT
- MRI





Anterior & Posterior Nasal Packs

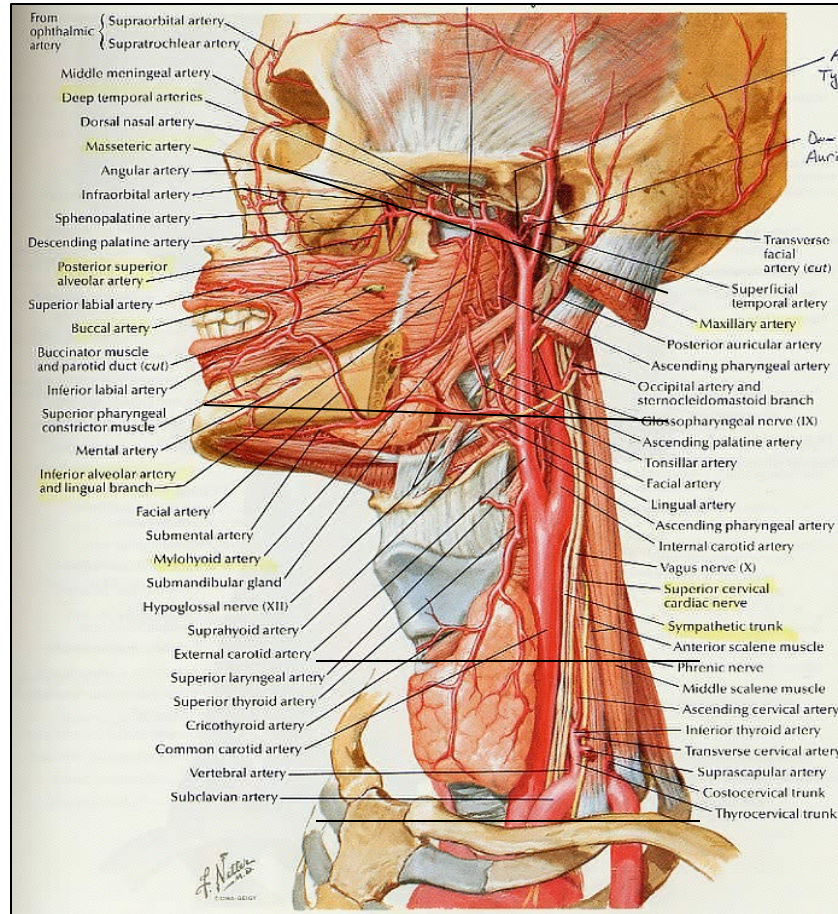


Neck Injuries

- Zone III

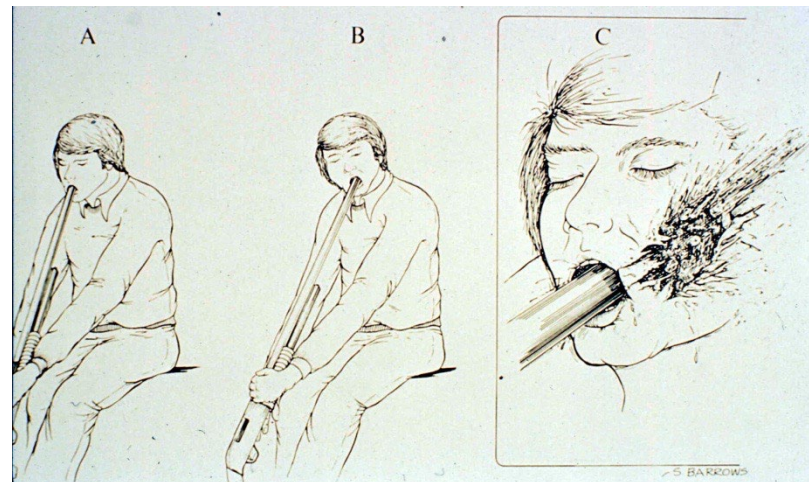
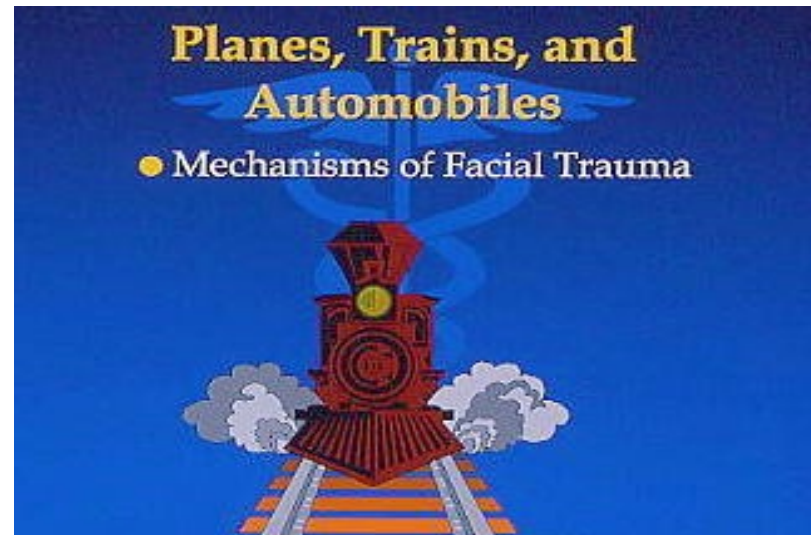
- Zone II

- Zone I



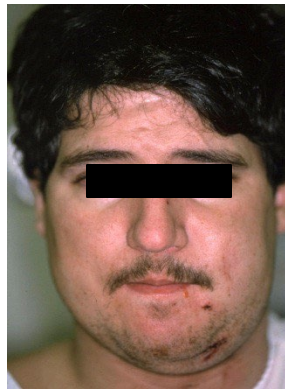
Secondary Survey

- History
 - Mechanism of injury
 - High Energy Injuries
 - MVA
 - Gun Shot Wounds



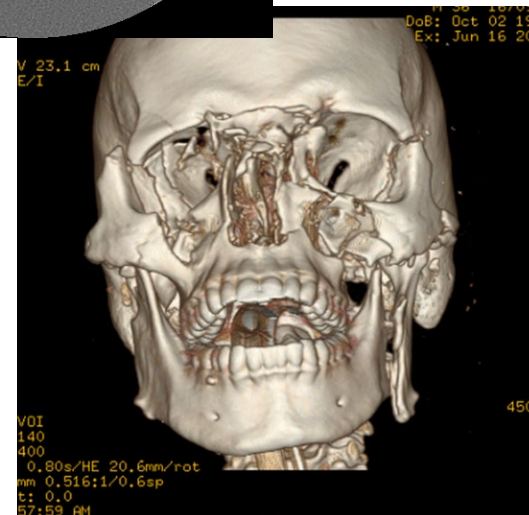
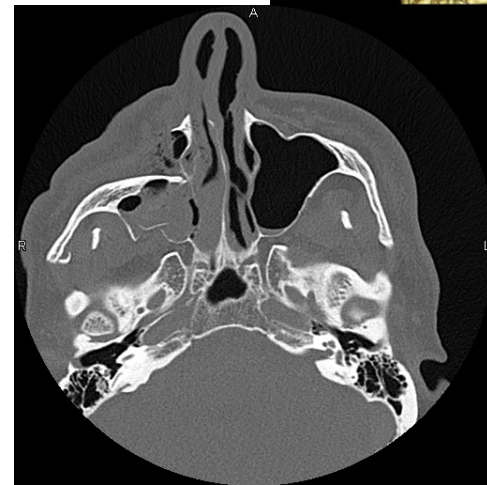
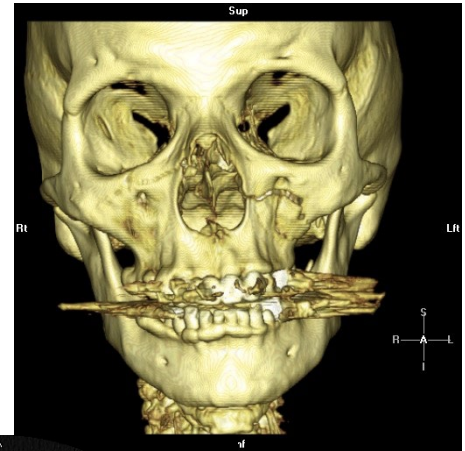
Secondary Survey

- History
 - Mechanism of injury
 - Low-Moderate Energy Injuries
 - Assaults
 - Sports Related



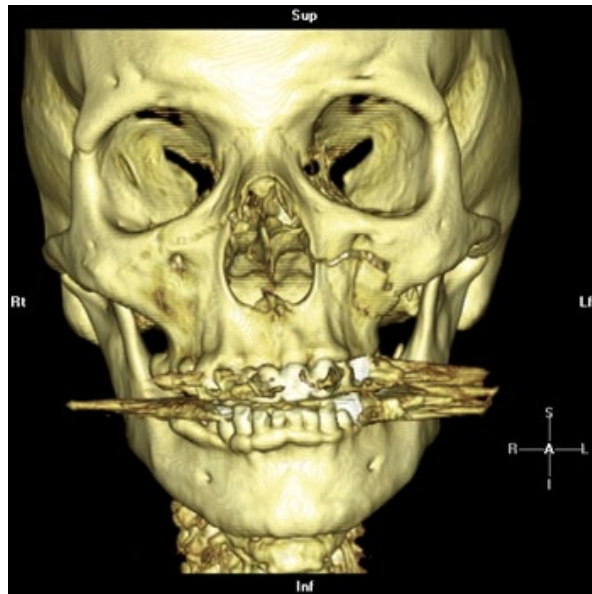
CT Images

- Low Energy
 - Fall from standing height
 - Fist to face
- Moderate Energy
 - Crash; bicycle, skate board
 - Baseball bat, hammer
- High Energy
 - MVC
 - GSW



Low energy

- Soft tissue injury; contusion, laceration
- Hard tissue injury; minimal comminution
 - Minimally to non-displaced fractures
- Limited concomitant injuries

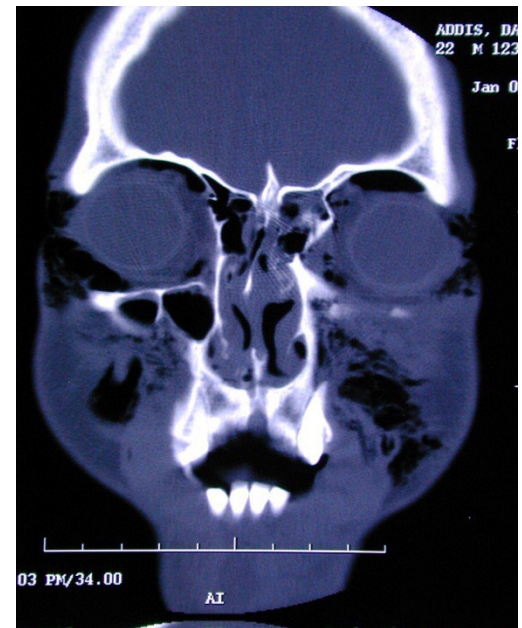


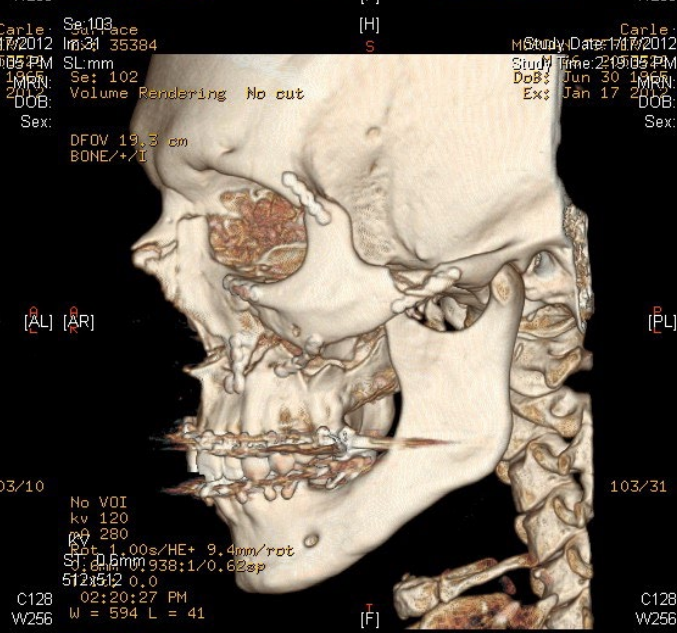
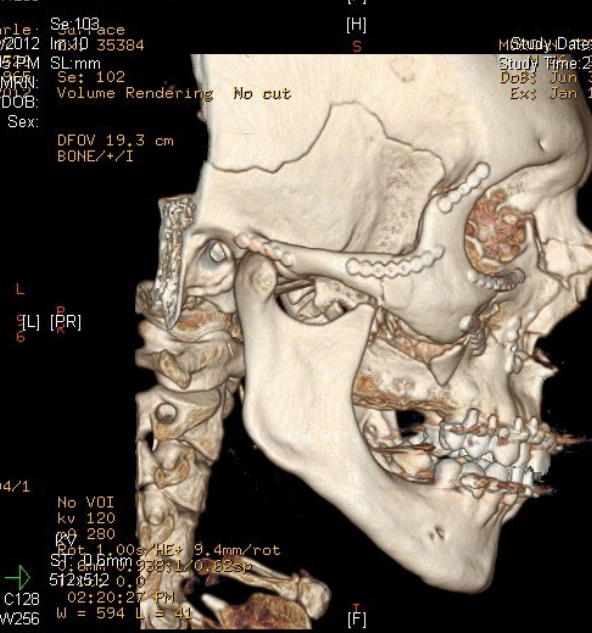
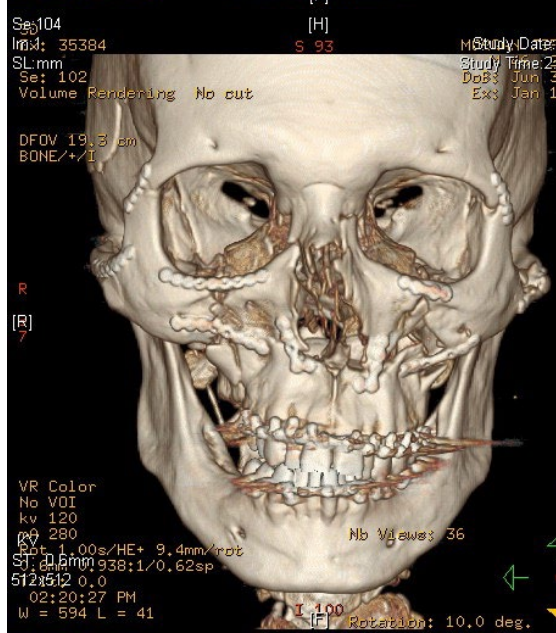
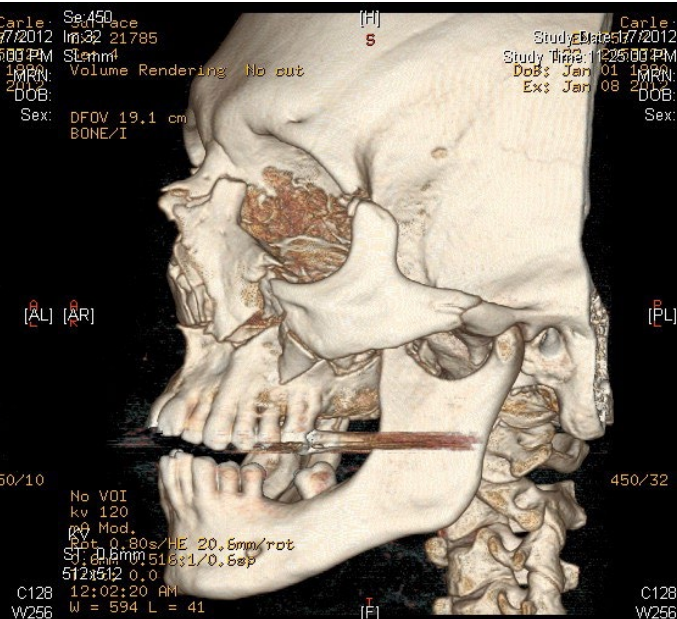
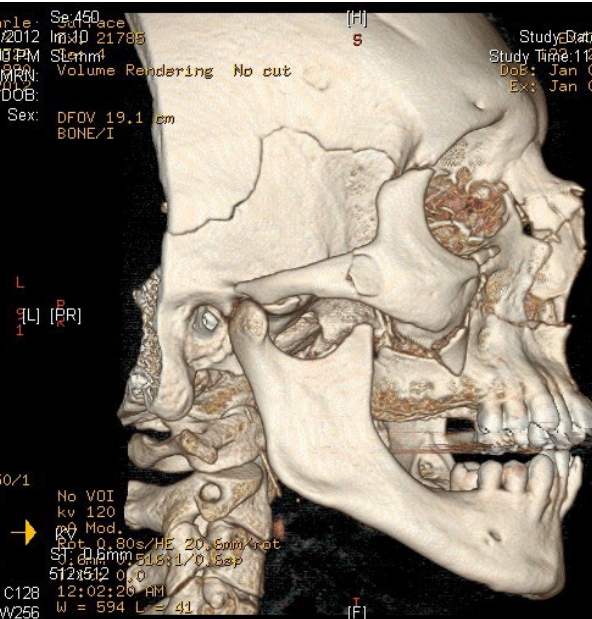
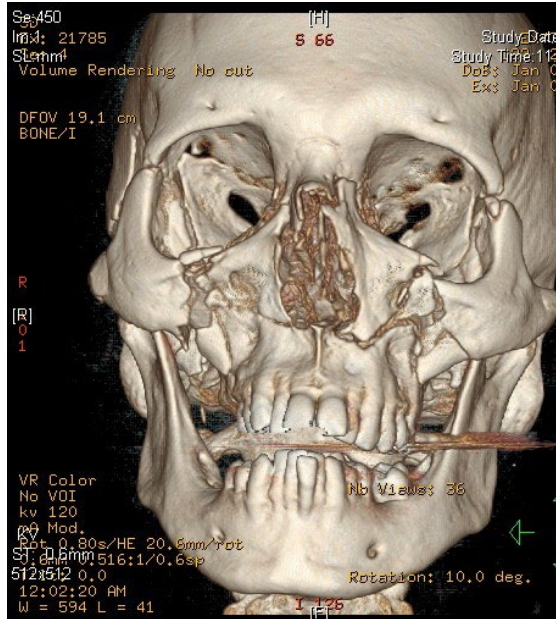
Moderate Energy

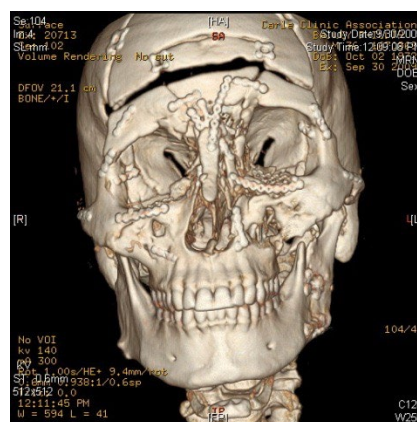
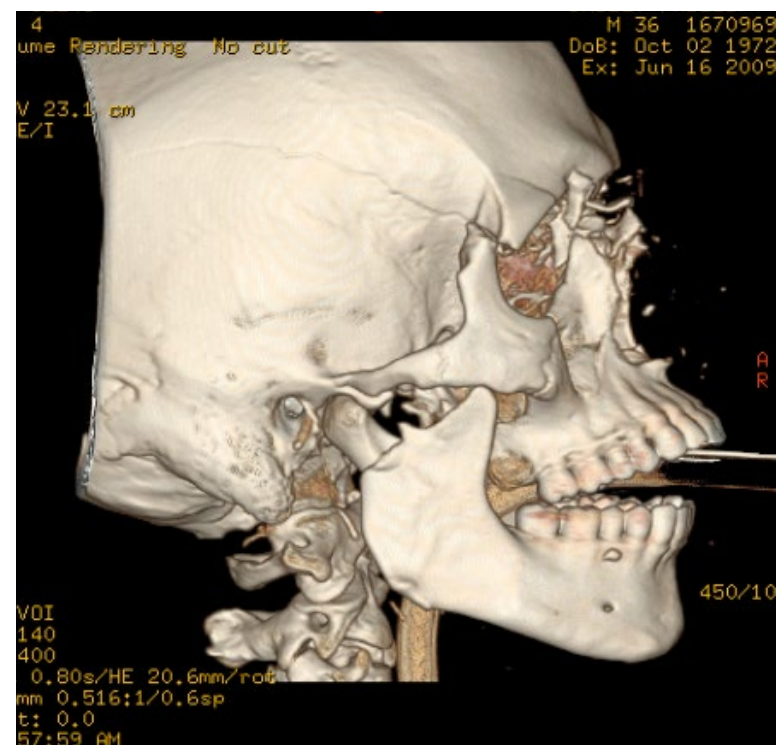
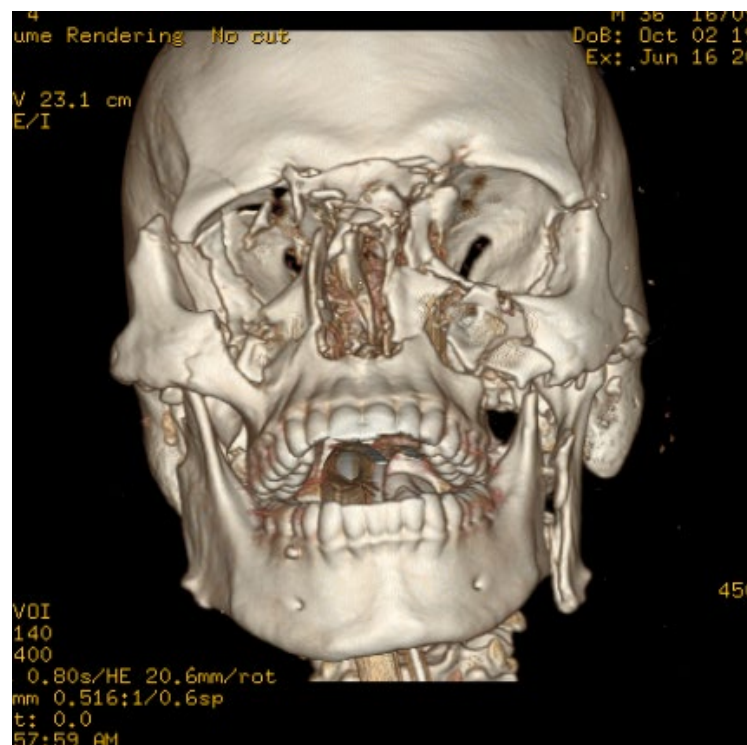
- Soft tissue; can be avulsive, generalized abrasions
- Hard tissue; increased comminutia, vector of energy observed with displaced bone segments
- Concominant injuries; Intra-cranial injury, ocular injury

High Energy

- Soft Tissue: avulsive, crush injuries, lacerations
- Collapse of the buttress of the facial skeleton
- Facial width increase
- High degree of comminutia, Pan-facial fractures
- Skull base and intra-cranial injury







Secondary Survey

- Physical Examination
 - Periorbital Ecchymosis
 - Battle's sign
 - Subconjunctival Heme
 - Facial Deformity
 - Occlusal step
 - Numbness



Secondary Survey

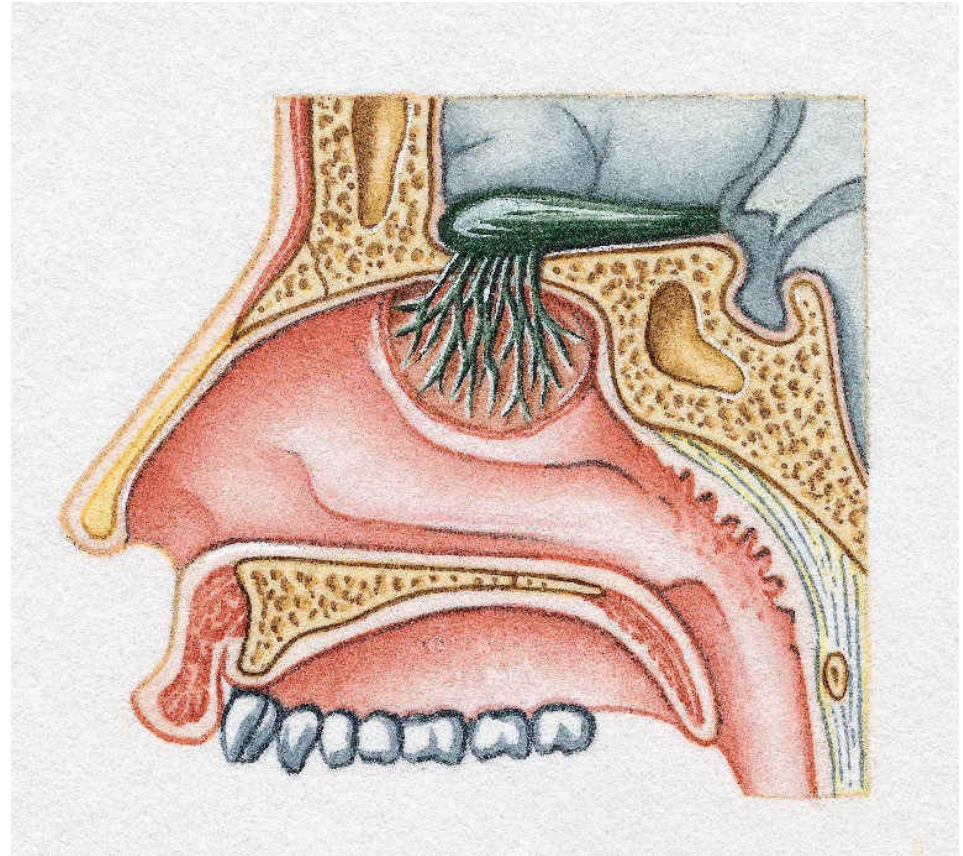
- Pitfalls:
 - Pending airway obstruction
 - Changes in airway status
 - Expanding hematoma
 - Loss of mandibular support of airway
 - Exsanguinating fractures
 - Lacrimal duct injuries
 - Facial nerve injuries

Secondary Survey

- Cranial Nerve Examination
 - CN I – Olfactory Nerve
 - CN II – Optic Nerve
 - CN III – Oculomotor Nerve
 - CN IV – Trochlear Nerve
 - CN V – Trigeminal Nerve
 - CN VII – Facial Nerve

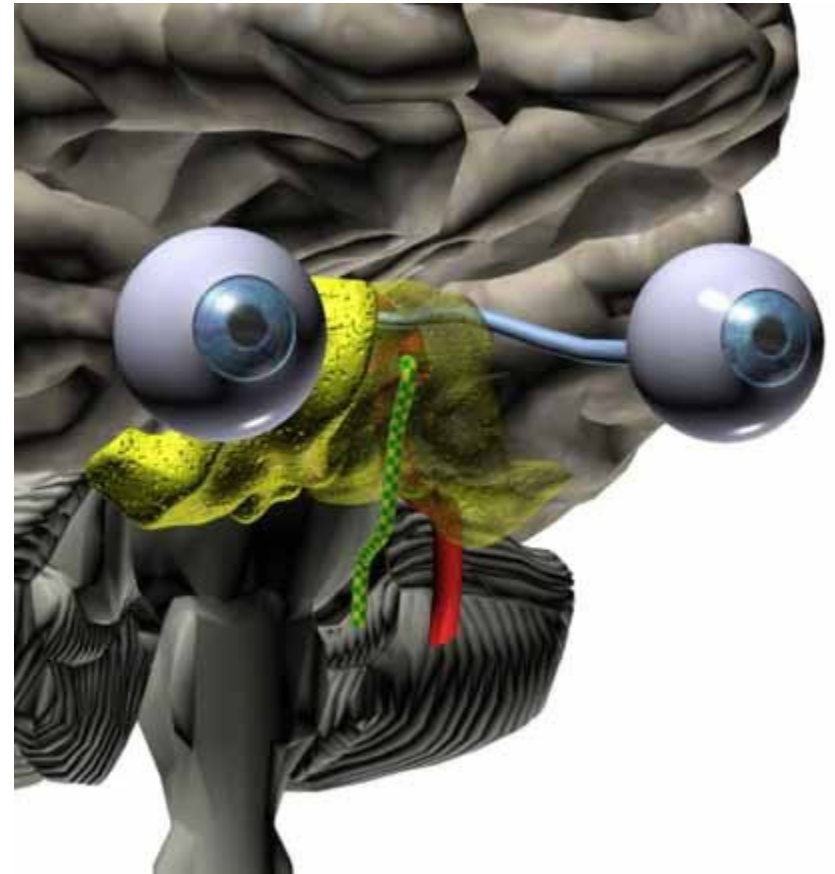
CN I – Olfactory Nerve

- Sense of Smell
- Cribriform Plate
- Injured with LeFort II and III Fractures



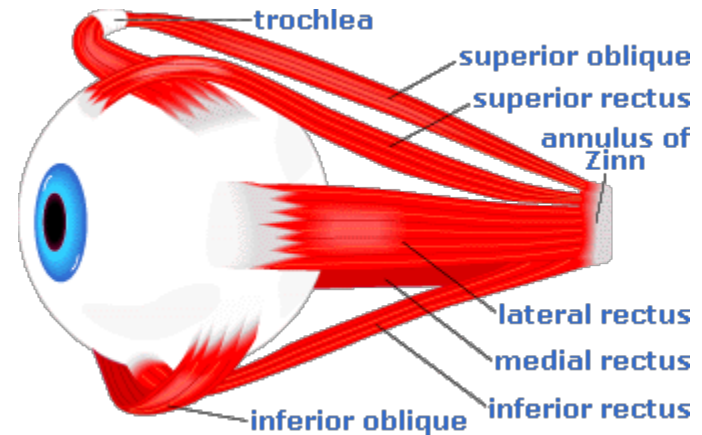
CN II – Optic Nerve

- Function – Vision
- Sensory limb of Pupillary Reflex
- Dysfunction may be associated with Orbital or Midface Fractures



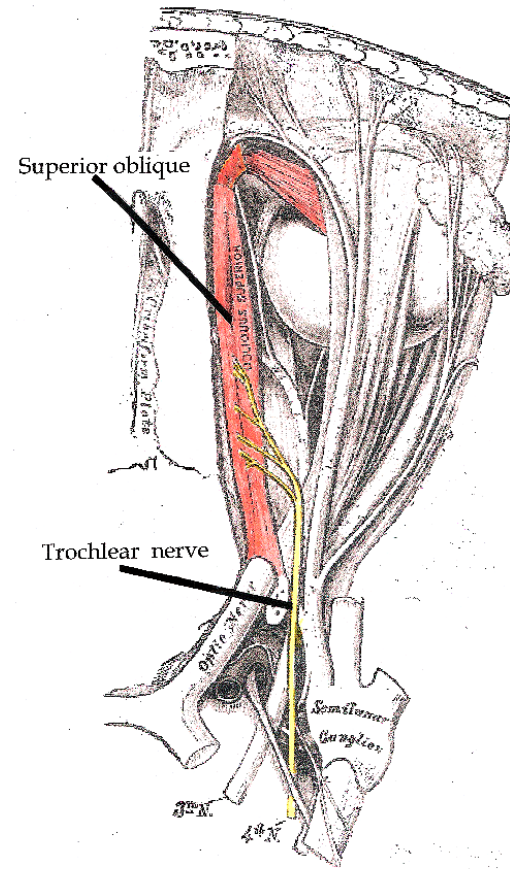
CN III – Oculomotor Nerve

- Extraocular Muscles
 - Medial Rectus
 - Superior Rectus
 - Inferior Rectus
 - Inferior Oblique muscle
- Pupillary Constriction
- Eyelid Elevation
- May be injured in orbital or midfacial fractures



CN IV

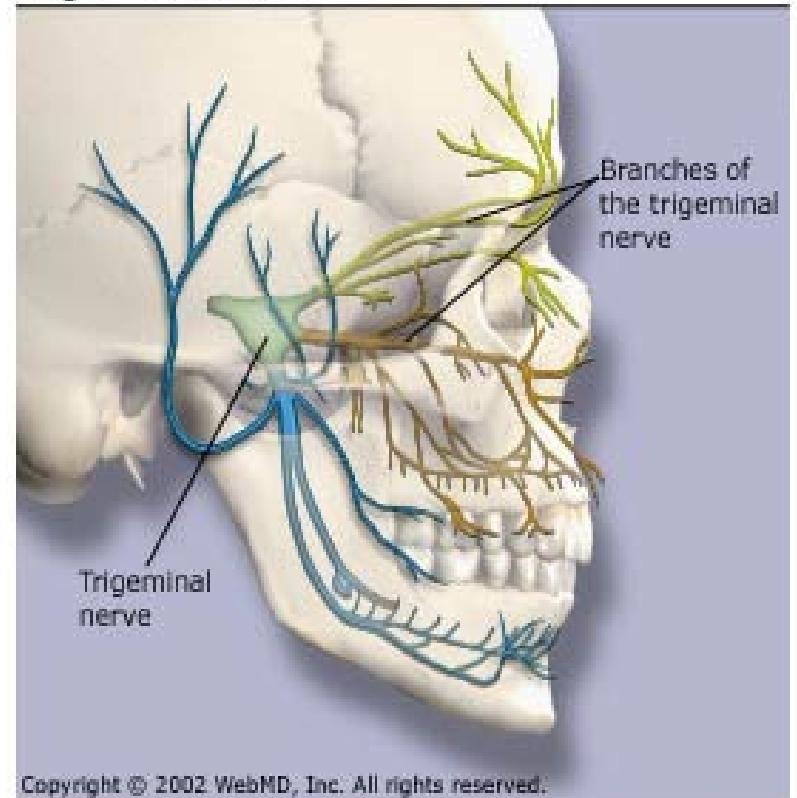
- CN IV – Trochlear
 - Superior Oblique Muscle
 - Injury – Inability to gaze inferio-medially



CN V – Trigeminal Nerve

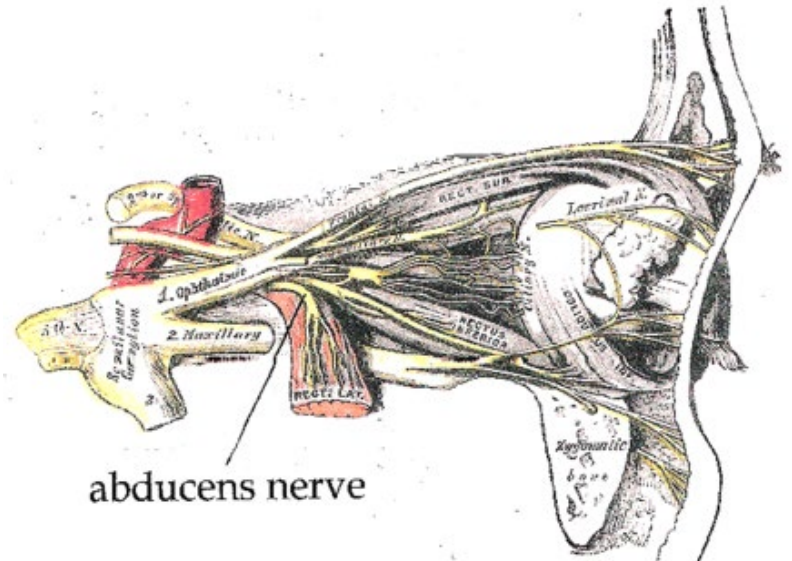
- CN V – Trigeminal Nerve
 - Sensory Nerve
 - Injured in blunt trauma associated with facial fractures

Trigeminal Nerve



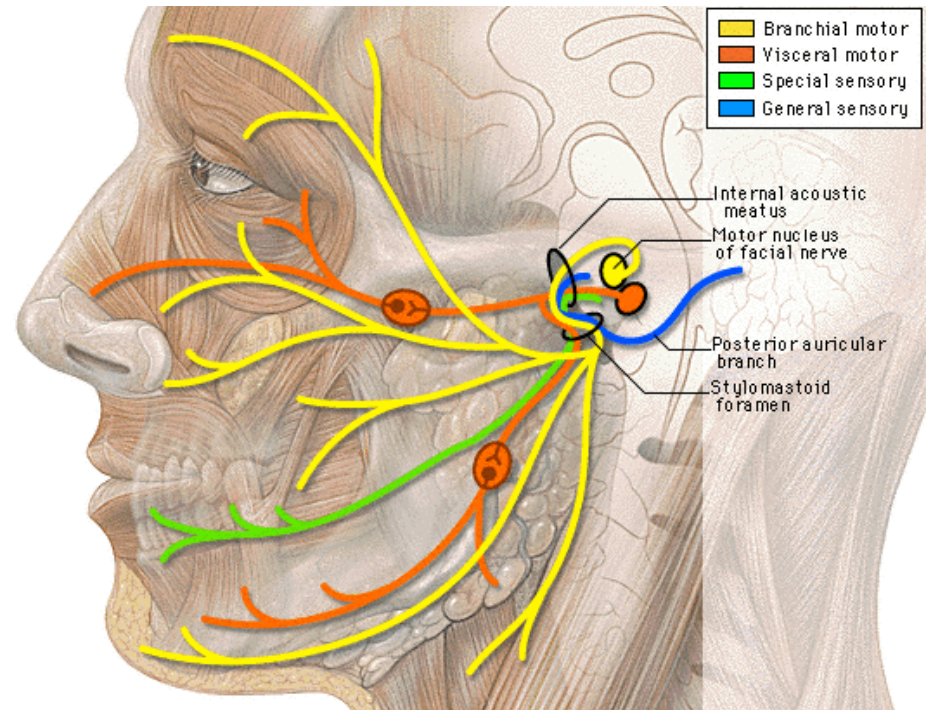
CN VI – Abducens Nerve

- CN VI – Abducens
 - Lateral Rectus Muscle
 - Long intracranial course
 - Injury – inability to gaze laterally



CN VII – Facial Nerve

- CN VII – Facial Nerve
 - Motor nerve which moves face
 - Most commonly injured in penetrating Trauma
 - Injury causes unilateral paralysis of facial muscles



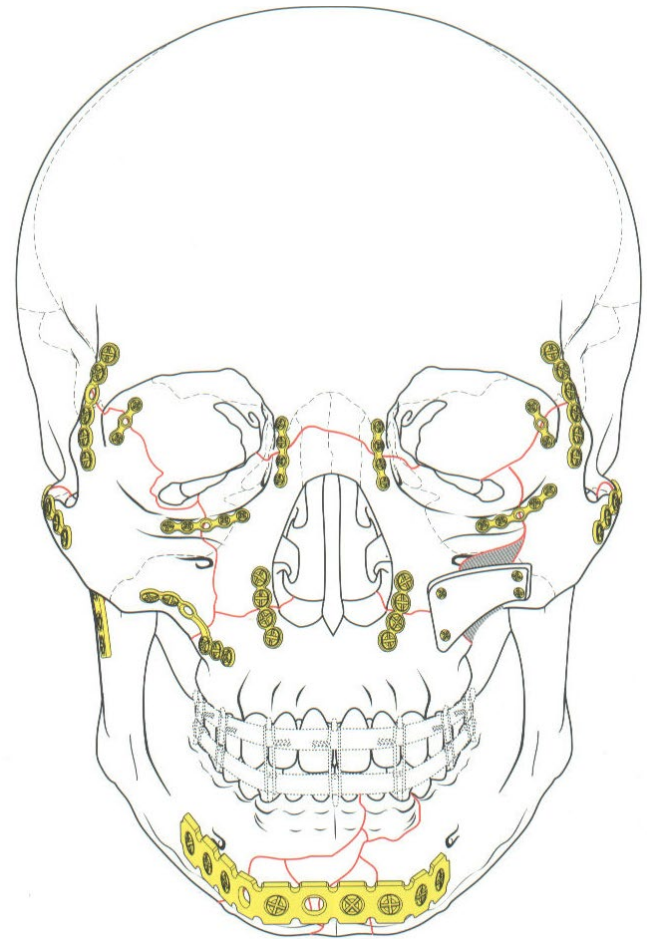
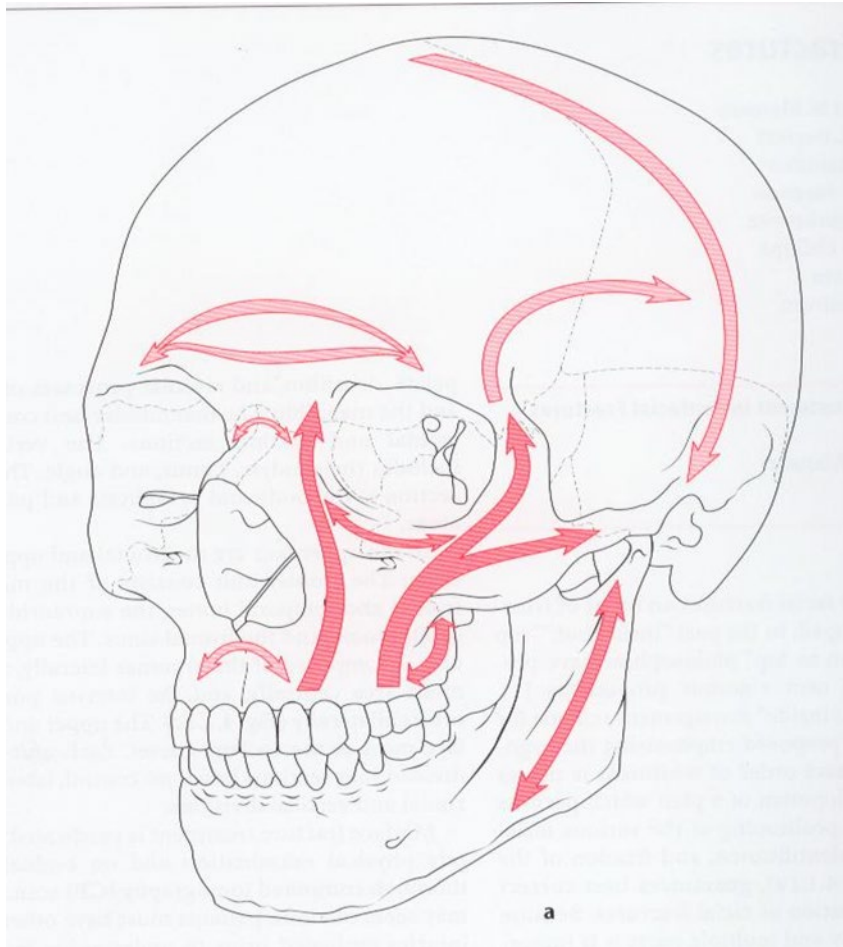


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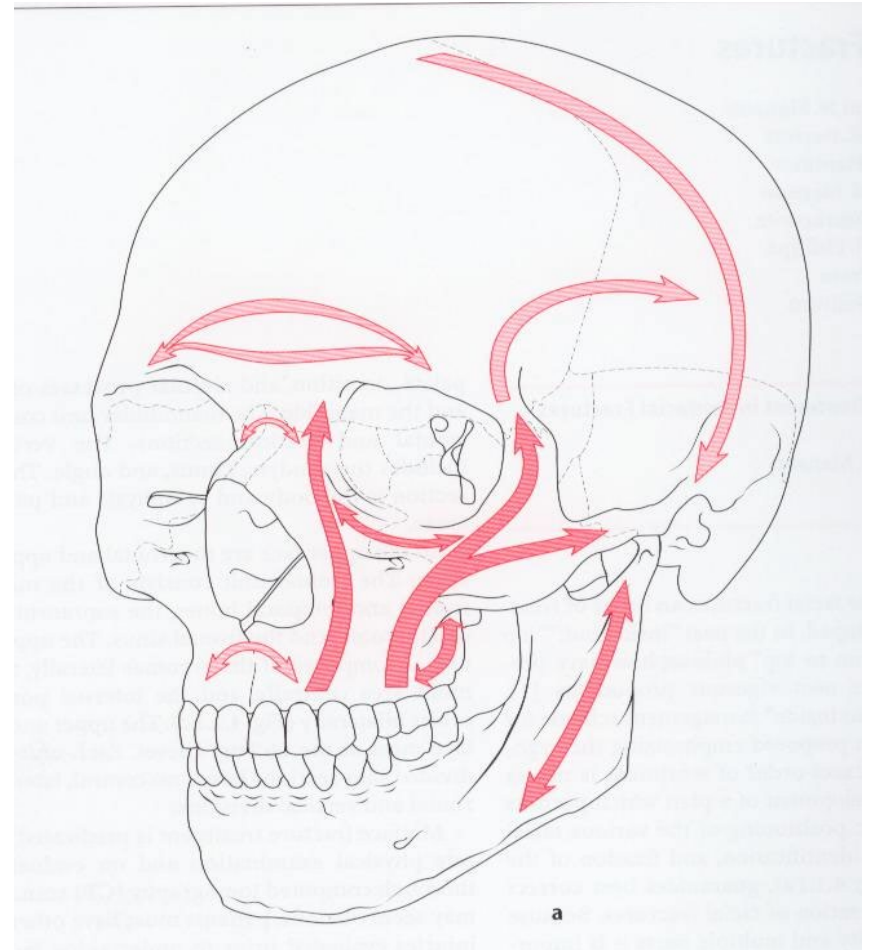
B

Principles of Craniofacial Trauma Surgery



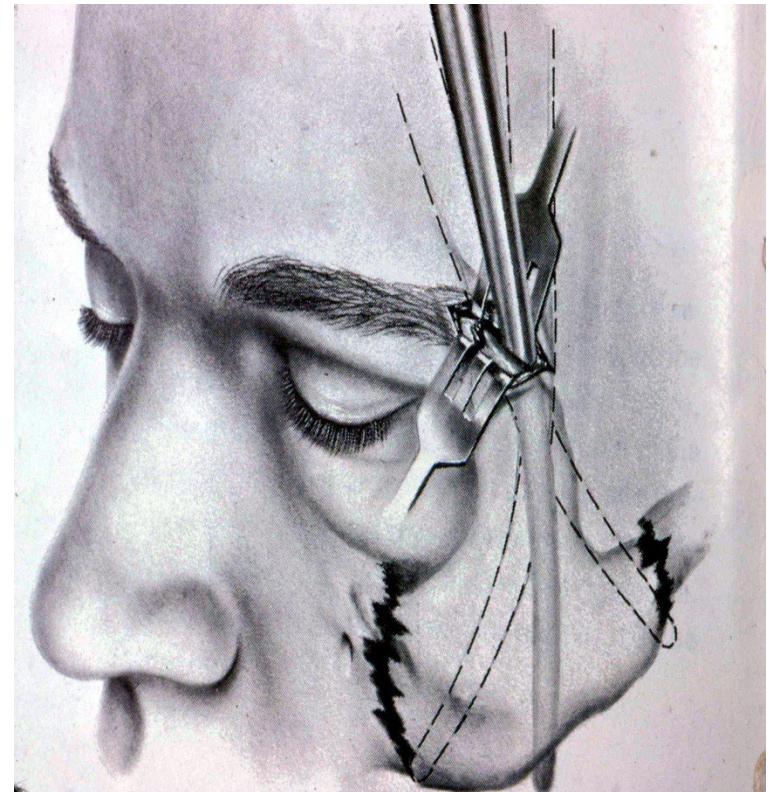
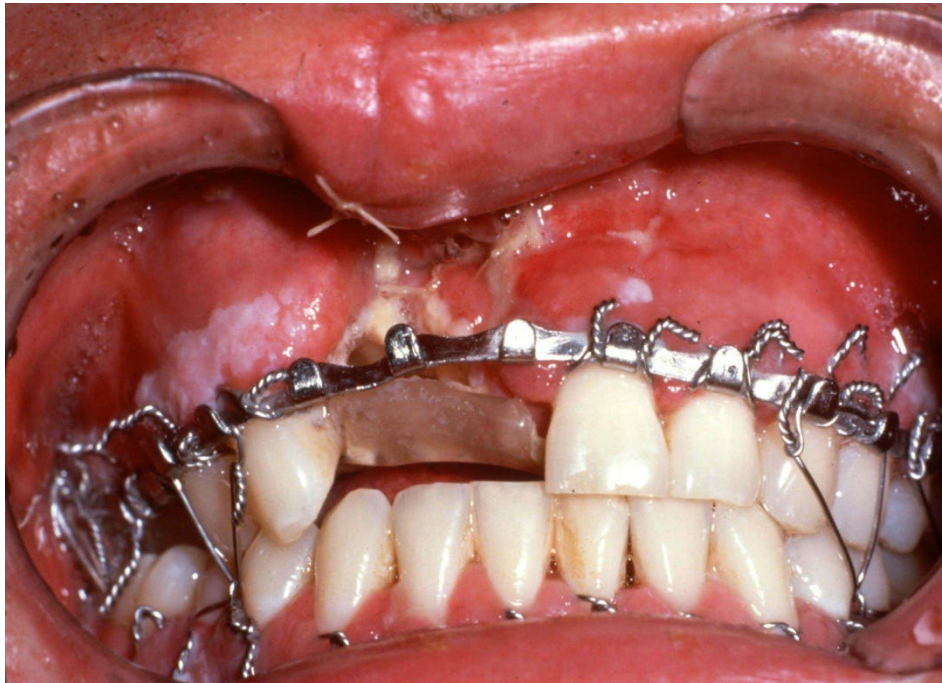
Facial Buttresses

- Anterior Buttress (height)
 - Nasomaxillary
 - Zygomaticomaxillary
- Horizontal (Transverse)
 - Alveolus/Palate
 - Pyriform Aperature
 - Orbital Rims
- Posterior Buttress (Height)
 - Pterygomaxillary
- Sagittal Buttress(Projection)
 - Zygomatic Arch



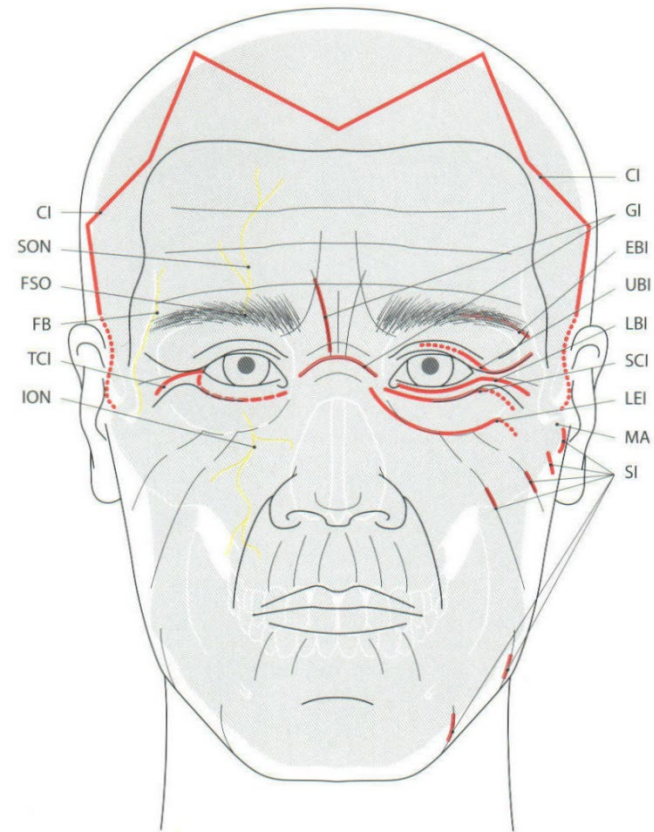
Principles of Craniofacial Trauma Surgery

- Anatomic Reduction
 - Intermaxillary fixation



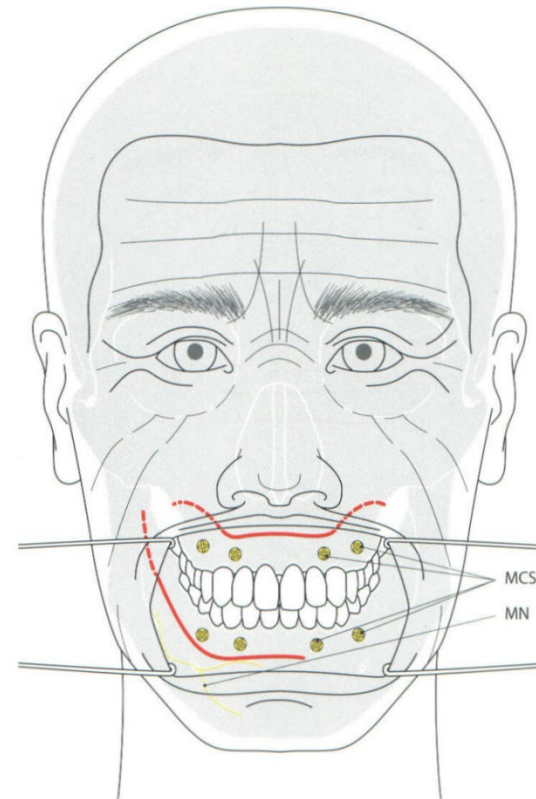
Principles of Cranio-Maxillofacial Trauma Surgery

- Surgical Exposure
 - Coronal Flap
 - Lefort II, III
 - ZMC
 - Transconj + Subciliary
 - ZMC
 - Orbital Floor Fractures



Principles of Craniofacial Trauma Surgery

- Surgical Exposure
 - Maxillary Vestibular
 - Lefort I
 - ZMC
 - Mandibular Vestibular
 - Mandibular Fractures

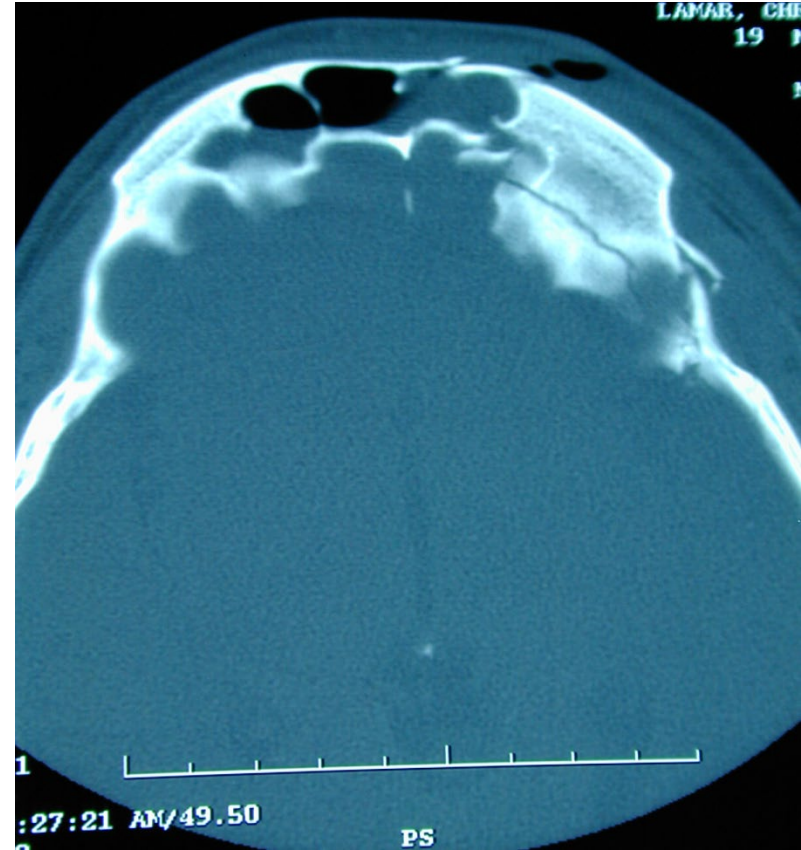


Categorized fractures

Top to Bottom

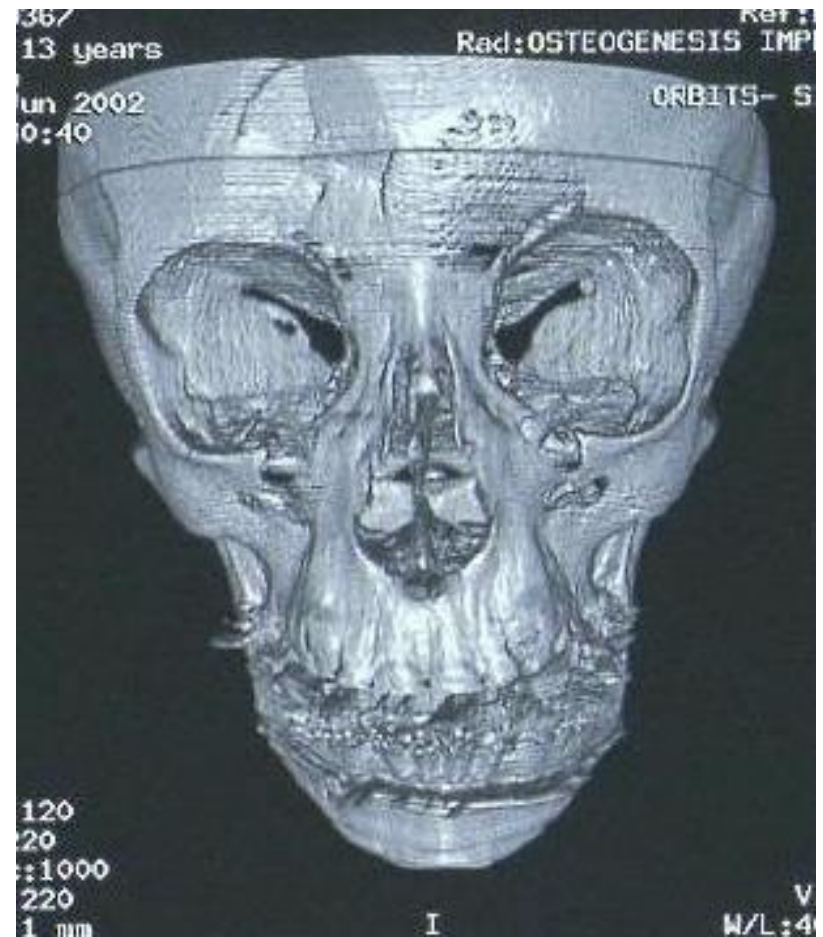
- Frontal Sinus
- NOE
- Orbital Fracture
- ZMC
- Lefort Fractures
- Mandibular
Fractures

Frontal Sinus Fractures

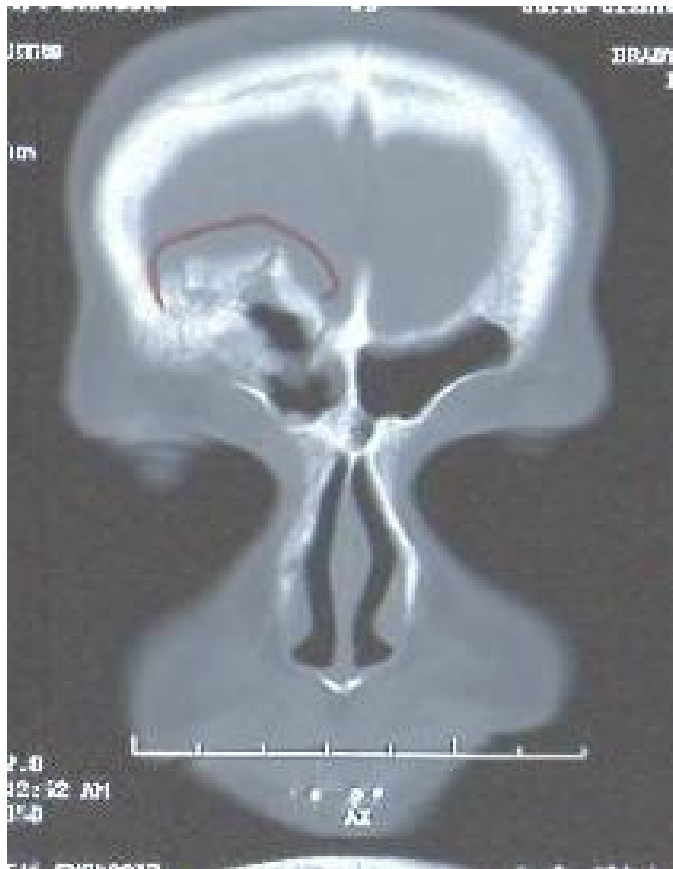


- Usually high energy injury with Periorbital ecchymosis and edema
- CSF leak – Sinus precautions, Antibiotics???
- Treatment – within 7-10 days

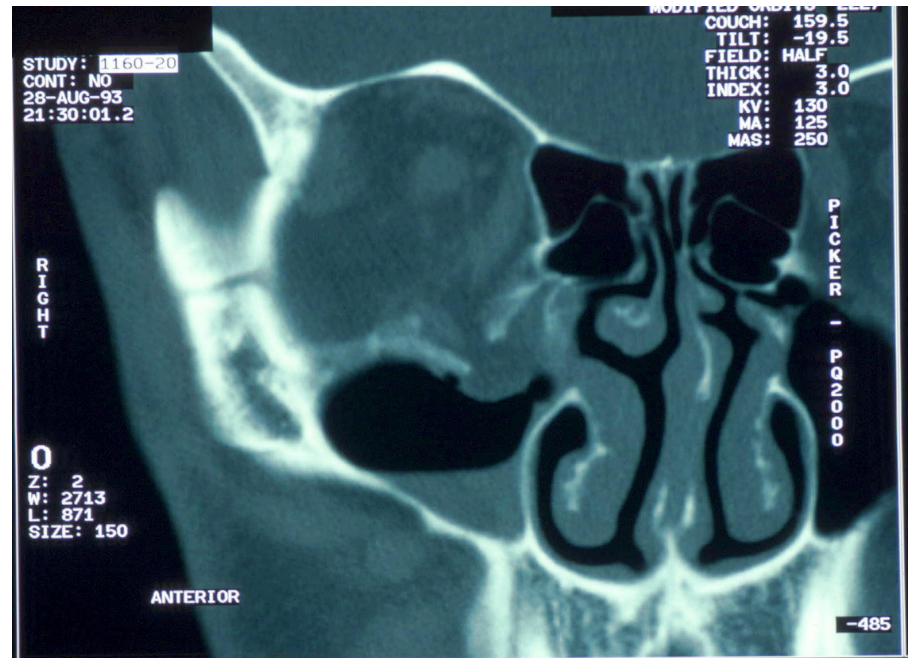
Frontal Sinus Fractures



Frontal Sinus Fractures

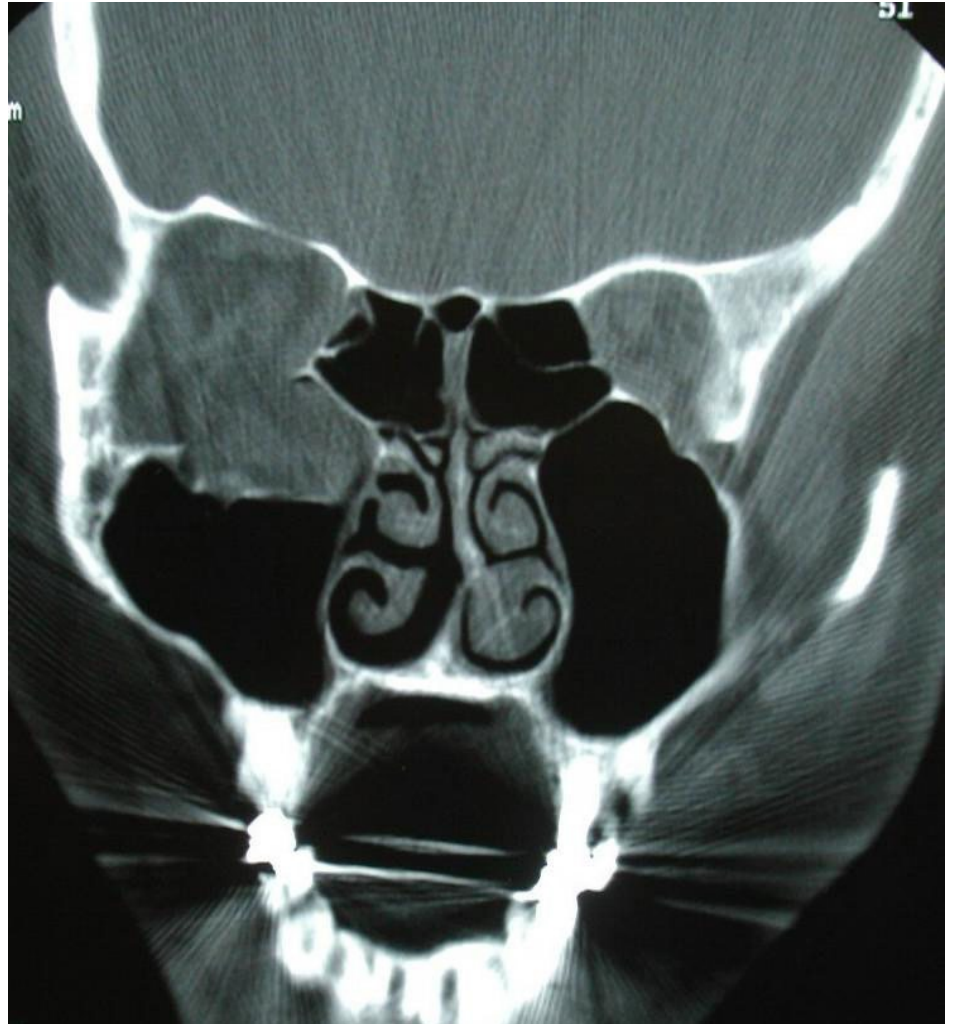


Orbital Fractures



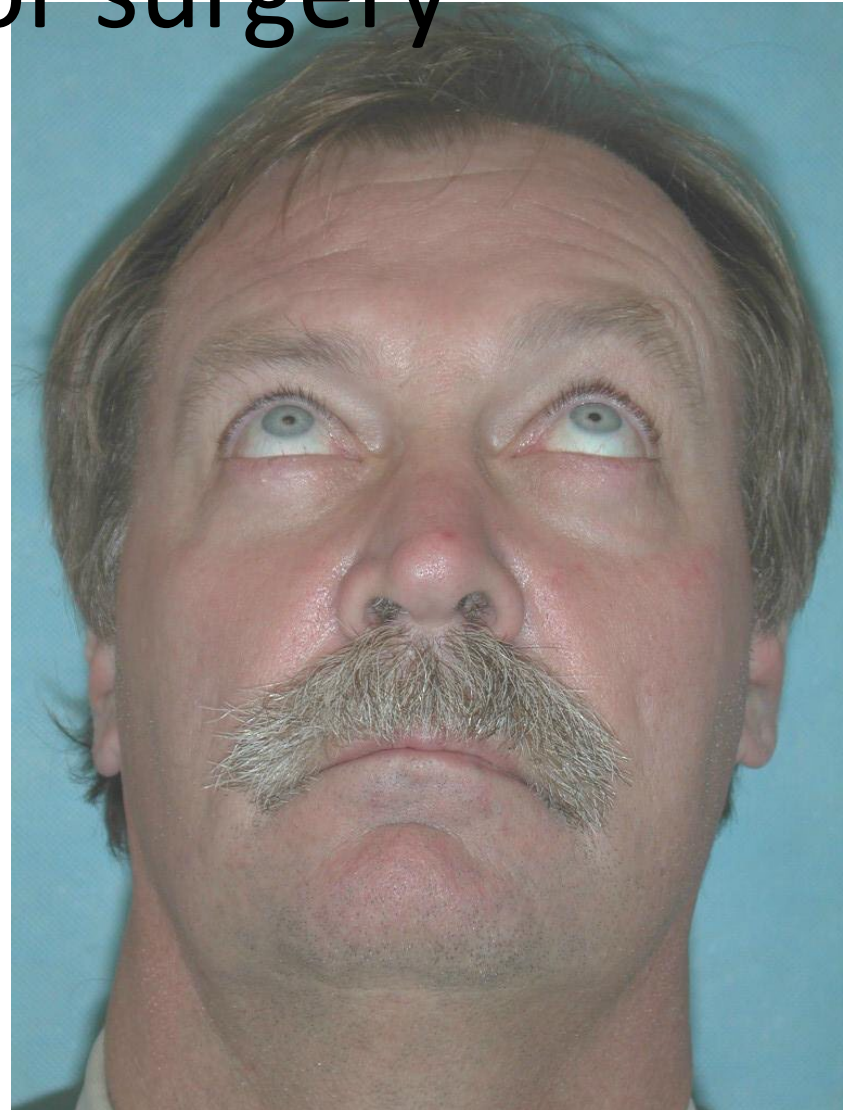
- Presentation – orbital pain, periorbital ecchymosis and edema, visual changes, enophthalmos, restriction of gaze, palpable rim deformity
- Ophthalmology Consultation???
- Compartment Syndrome; emergent decompression, anticoagulation
- Closely evaluate vision, extraocular muscle function
 - Sinus precautions
 - Antibiotics ???
 - Surgery 7-14 days

Orbital Fractures

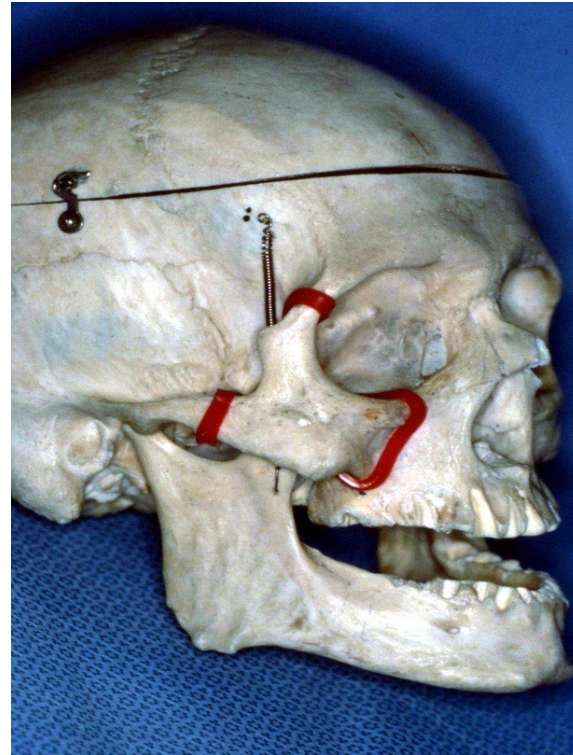
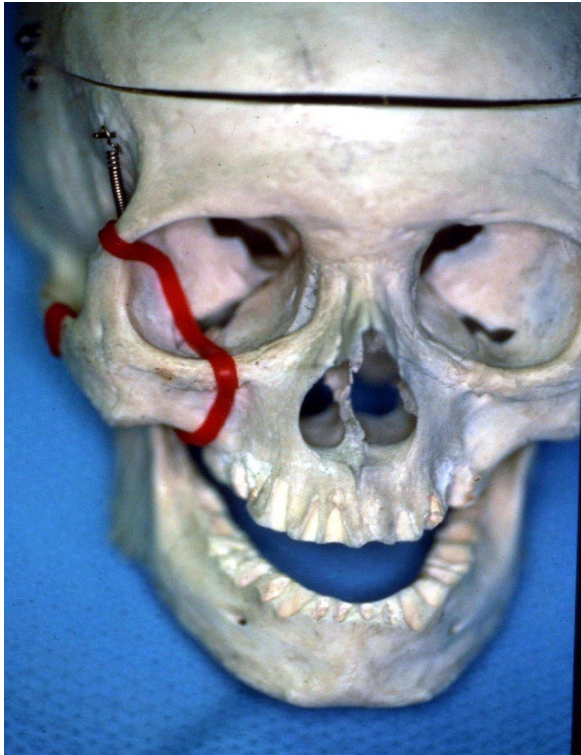


Indications for surgery

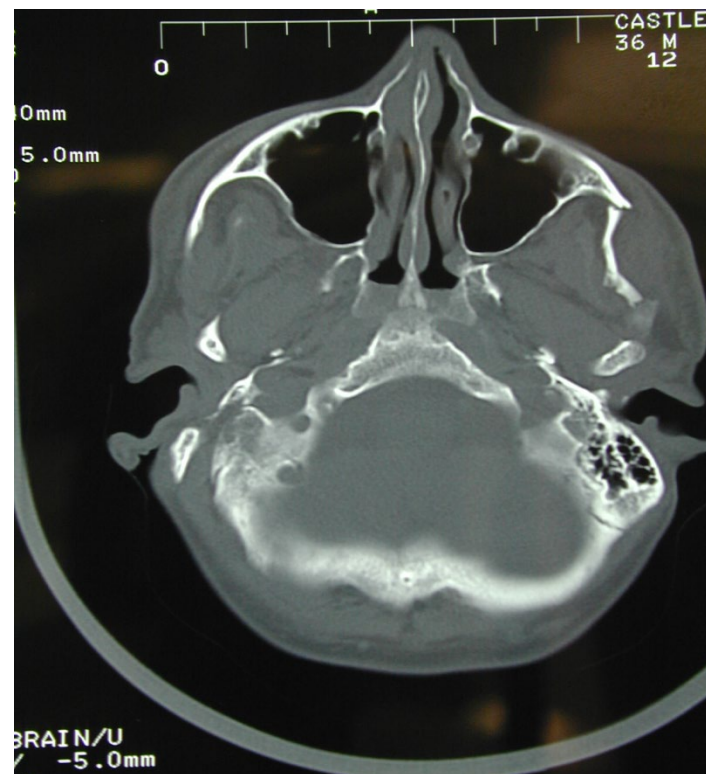
- Peri-orbital Entrapment
 - Diplopia, restriction of gaze
- Compartment Syndrome
 - Retrobulbar hematoma
 - Anticoagulation
 - Blow out Vs. Trap door
- Expanded orbital volume
 - Enophthalmus risk



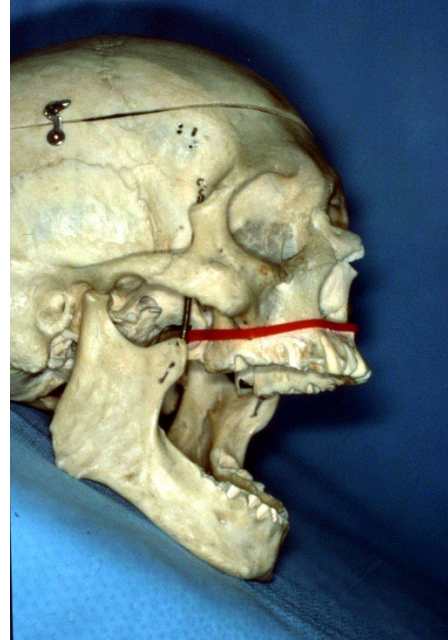
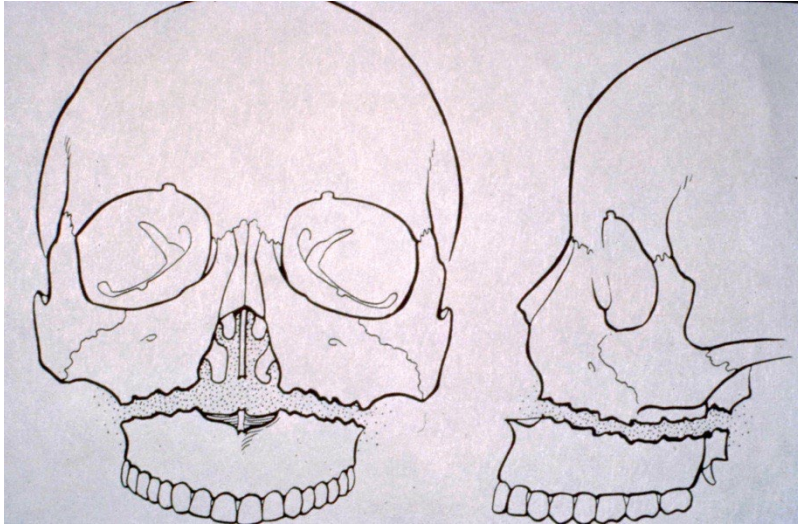
Zygomatic Complex Fractures



- Presentation – flattened malar eminence, periorbital ecchymosis, paresthesia of cheek, upper lip(CN V), enophthalmos, rim step
- High energy injuries – Evaluate globe, vision closely
 - Sinus precaution; Air emphysema
- Treatment – 7-10 days

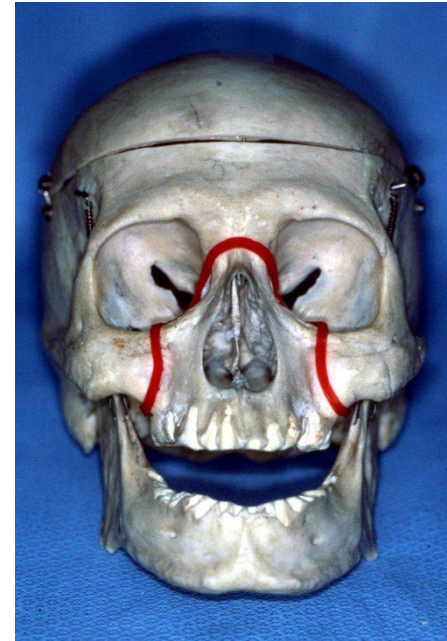
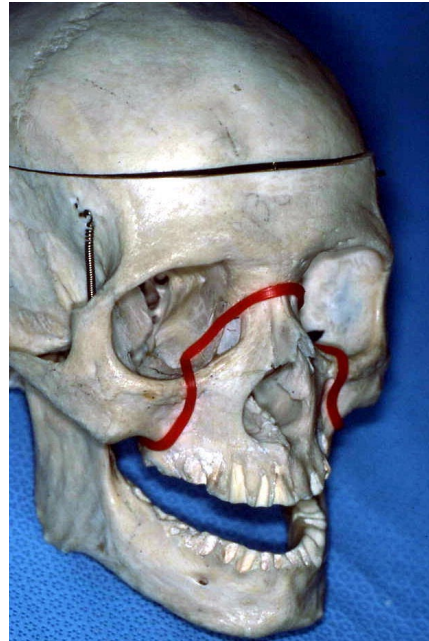
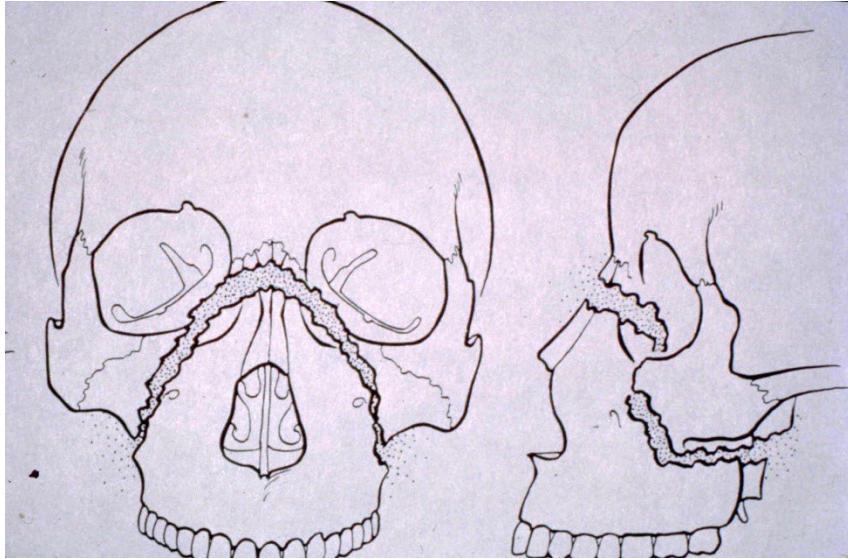


LeFort I



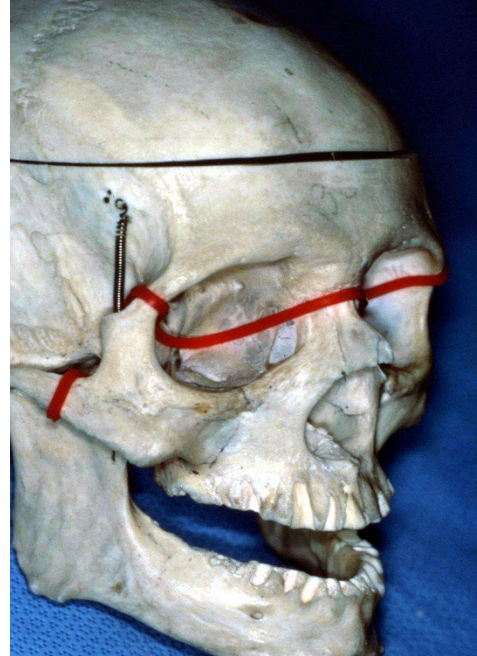
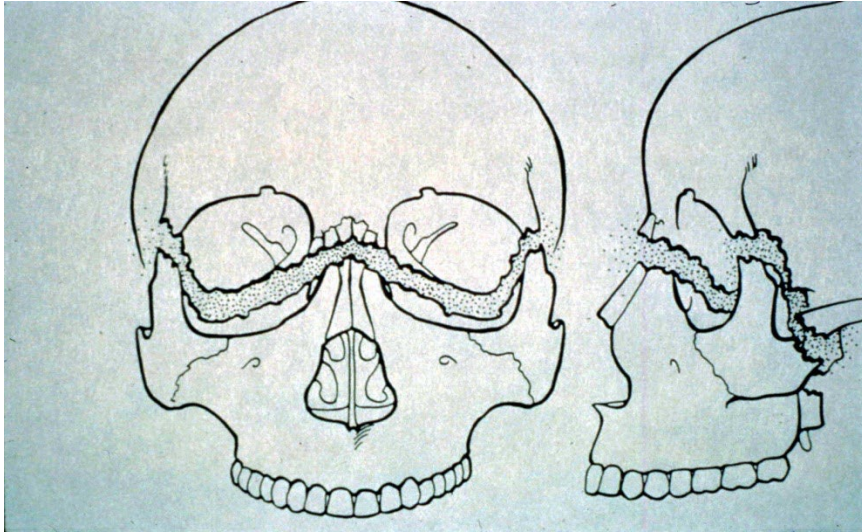
- High energy injury with periorbital ecchymosis, edema, malocclusion
- Transverse Maxillary Fracture - detaches tooth bearing segment of maxilla
 - Sinus precautions
- Airway generally intact
- Treatment – within 7-10 days
- Change in Occlusion (bite)
- V2 paresthesia, numb teeth

LeFort II Fracture



- High energy injury with periorbital ecchymosis, edema, malocclusion
 - Pyramidal dysjunction – floating midface
- May involve cribriform plate, CSF leak, Olfactory Nerve(CN I), Head injury
 - Sinus precautions
- Airway needs to be evaluated closely
- V2 paresthesia, numb teeth
- Treatment – within 7-10 days

LeFort III + NOE Fractures



- High energy injury with periorbital ecchymosis, edema, malocclusion
 - Craniofacial dysjunction – floating midface
 - Increased inter-canthal distance
 - Saddle nose deformity
- May involve cribriform plate, CSF leak, Olfactory Nerve(CN I), Head injury
 - Sinus precautions
- Airway needs to be evaluated closely
- Treatment – within 7-10 days

Nasal Bone/Septum Fracture

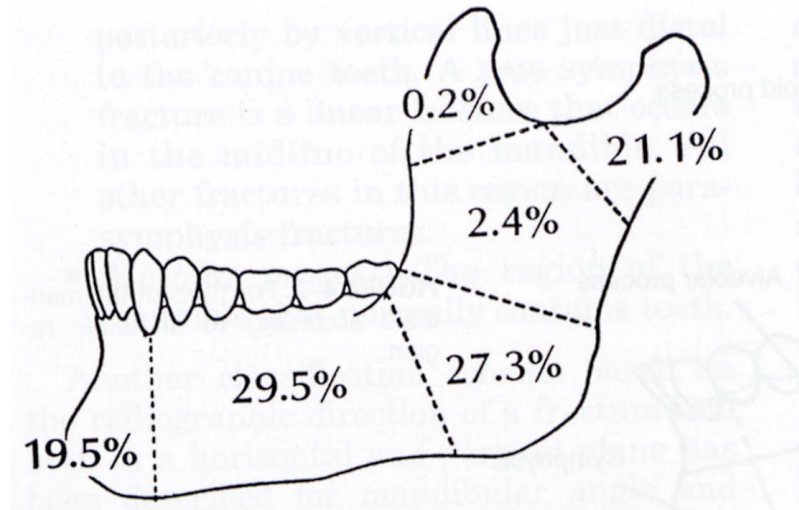
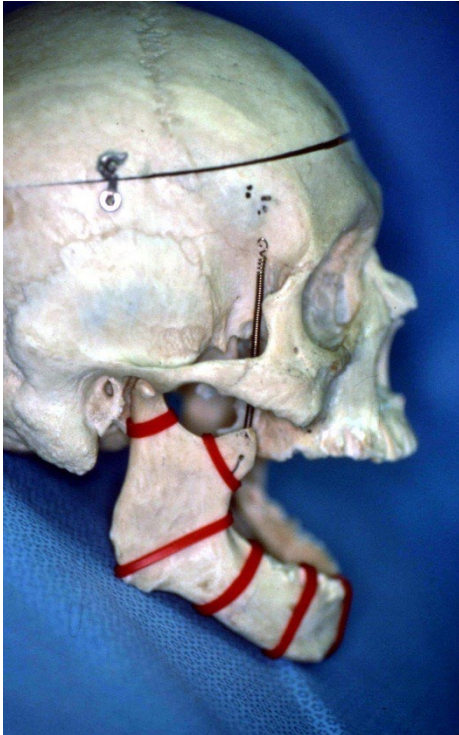
Acute Nasal Fractures

- **Management**
 - Closed reduction at 5-10 days
 - Anesth. deep MAC or General
 - reduction and elevation



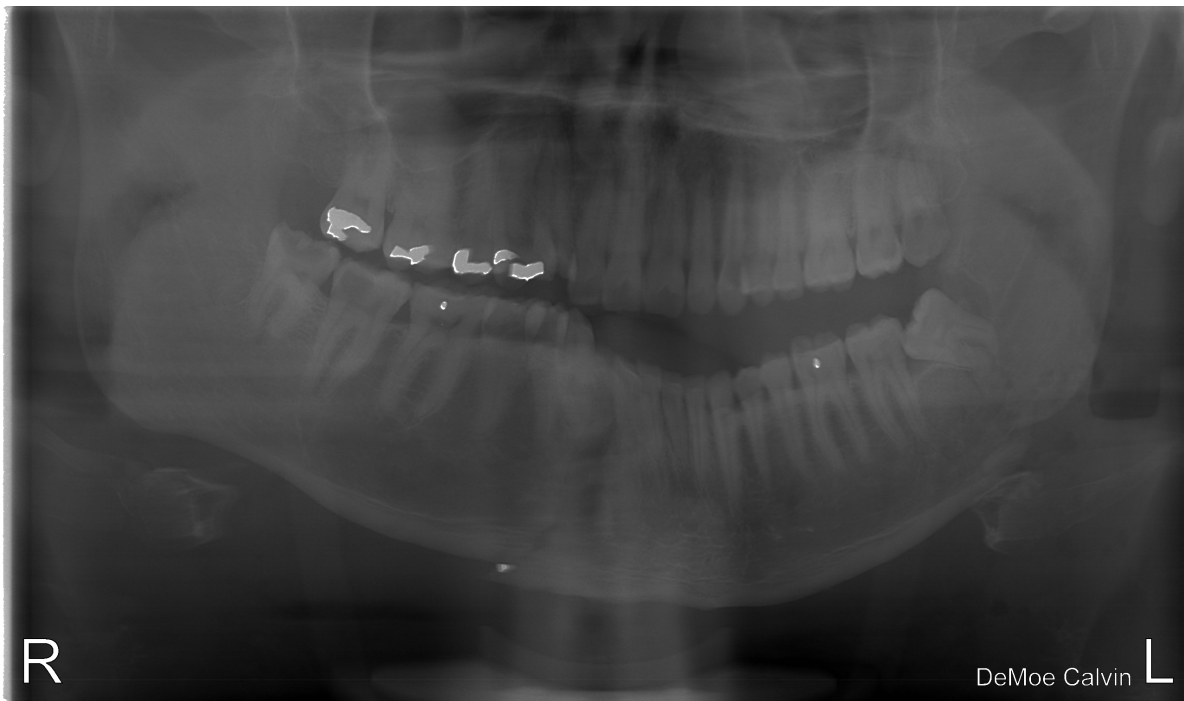


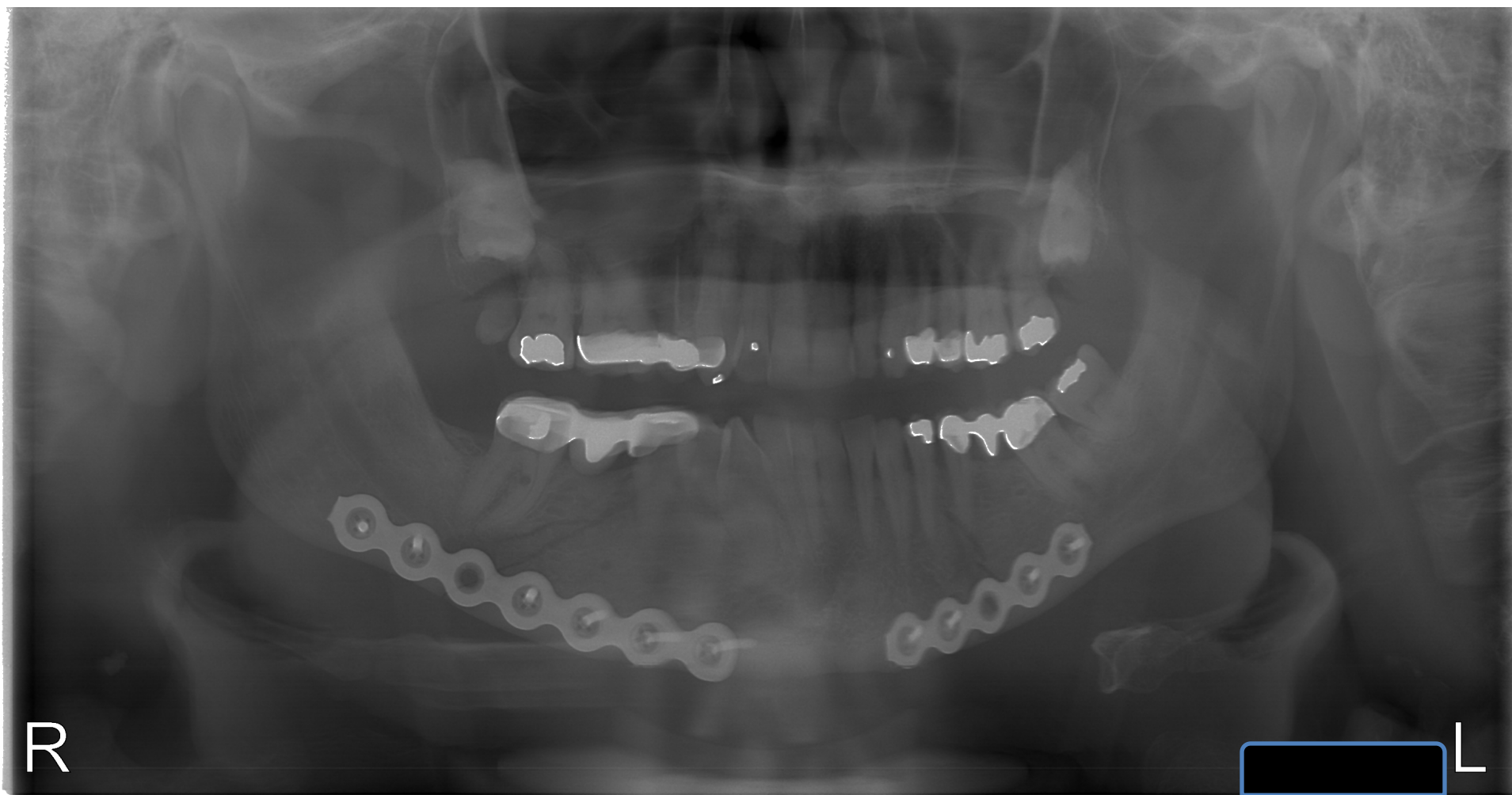
Mandibular Fractures



- Usually present with malocclusion, paresthesia(CN V)
 - Evaluate for hematoma floor of mouth, if flail mandible – evaluate airway patency
 - Missing teeth or displaced fracture segments
- High energy injuries – evaluate for other fractures
- Treatment – within 1-5 days(unless temporarily stabilized)







DENTOALVEOLAR TRAUMA

TRAUMA

» CLASSIFICATION (ANDREASEN)

- CROWN INFRACTION
- UNCOMPLICATED CROWN FRACTURE
- COMPLICATED CROWN FRACTURE
- CROWN AND ROOT FRACTURE
- HORIZONTAL ROOT FRACTURE
- CONCUSSION
- SUBLUXATION
- LATERAL LUXATION
- EXTRUSIVE LUXATION
- INTRUSIVE LUXATION
- AVULSION

TRAUMA

» CLASSIFICATION (ELLIS)

- **Type I: Enamel only**
- **Type II: Enamel and dentin**
- **Type III: Pulp**
- **Type IV: Root fracture**
- **Type V: Luxation**
- **Type VI: Avulsion**

HORIZONTAL ROOT FRACTURE



CONCUSSION

- » Tooth is tender to percussion but no mobility.
- » Baseline pulp test (3% nonvital).
- » Look for root fracture.
- » Soft diet, rinse with chlorhexidine every 12 hrs for 1 week.
- » No treatment required, monitor for 2-3 wks and then regular follow-ups.



SUBLUXATION

- » Some mobility but no displacement.
- » Baseline pulp test (6% nonvital).
- » Look for root fracture.
- » Soft diet, rinse with chlorhexidine every 12 hrs for 1 week.
- » No treatment required, monitor for 2-3 wks and then regular follow-ups.



EXTRUSIVE AND LATERAL LUXATION



LATERAL AND EXTRUSIVE LUXATION

- » **Tooth is displaced laterally or coronally.**
- » **Baseline pulp test:**
 - **Lateral Luxation: 58% nonvital.**
 - **Extrusive Luxation: 26% nonvital.**
- » **Treatment:**
 - **Flexible splint up to 3 weeks.**
 - **Soft diet, rinse with chlorhexidine every 12 hrs for 1 week.**
 - **If no response at 2-3 weeks perform RCT.**
 - **Follow-up at 3, 6, 12 months.**

INTRUSIVE LUXATION

- » Displacement towards the socket.
- » Baseline pulp test (85% nonvital).
- » Treatment:
 - Soft diet, rinse with chlorhexidine every 12 hrs for 1 week.
 - Immature root formation: May re-erupt on its own, if not surgical or orthodontic movement. If no response after 3 wks perform RCT.
 - Mature root formation: Surgical or orthodontic movement, followed by RCT.



AVULSION

- » Tooth is displaced from the socket.
- » Treatment is based on:
 - Stage of root formation
 - Dry time
- » Transport medium:
 - HBSS
 - Skim Milk
- » Antibiotics:
 - Pen VK
 - Doxycycline



AVULSION

» TREATMENT (Trope and Andreasen)

- Dry Time less than 1 hour (OPEN APICES)
 - Revascularization of the pulp is good.
 - Place tooth in transport medium.
 - Clean foramen with saline and soak tooth in 100mg doxycycline/20mg saline.
 - Flexible splint 7 to 10 days.
 - Soft diet, rinse with chlorhexidine every 12 hrs for 1 week.
 - Monitor pulp status, may take up to 3 months for the pulp to respond to cold.

AVULSION

» TREATMENT

- Dry Time of less than 1 hour (CLOSED APICES)
 - Place tooth in transport medium.
 - No chance for revascularization.
 - Rinse socket and remove coagulum and gently replace tooth.
 - Flexible splint for 7 to 10 days.
 - Soft diet, rinse with chlorhexidine every 12 hrs for 1 week.
 - RCT in 7 to 10 days with CaOH to decrease resorption.

AVULSION

» TREATMENT

- Dry Time of greater than 1 hour (OPEN APICES)
 - No chance of revascularization.
 - Resorption will occur.
 - Replantation is not recommended.

AVULSION

» TREATMENT

- Dry Time of greater than 1 hour (CLOSED APICES)
 - All PDL cells are dead, no reason to soak in HBSS or Viaspan.
 - To decrease resorption soak tooth in available fluoride solution for at least 5 min.
 - Flexible splint for 7 to 10 days.
 - Soft diet, rinse with chlorhexidine every 12 hrs for 1 week.
 - RCT in 7 to 10 days with CaOH to decrease resorption.
 - Prognosis: guarded

ALVEOLAR FRACTURES

» Alveolar fractures:

- Entire segment moves.
- X-ray.
- Reposition segment and place rigid or semi-rigid splint for 4 weeks.
- Placing a rigid splint increases the chance of resorption and should only be placed when an alveolar fracture is present.



Alveolar Process Injuries

Fractured teeth

Fractured roots

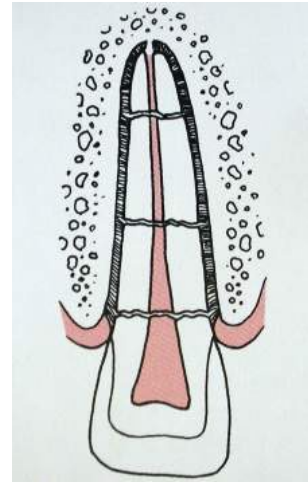
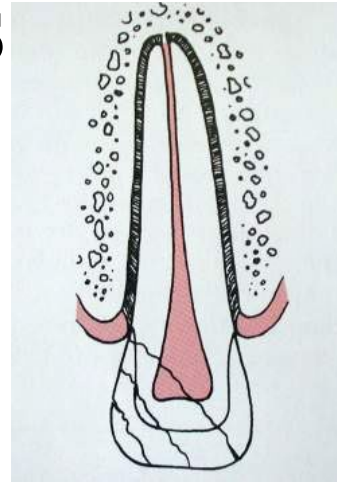
Avulsed teeth

Alveolar fractures

Intruded

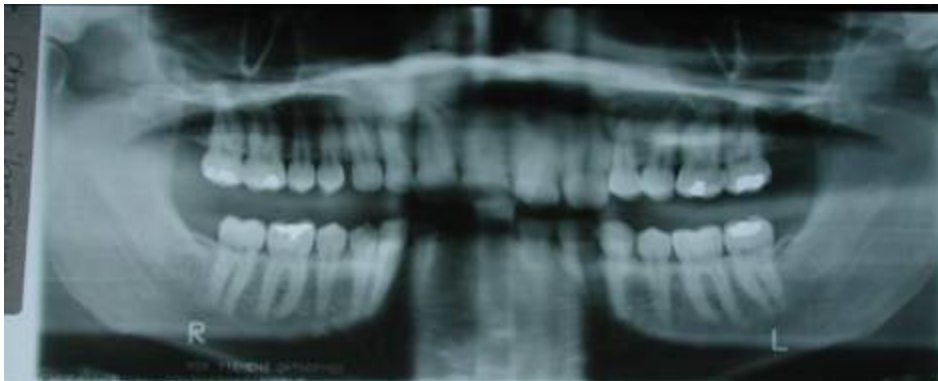
Extruded

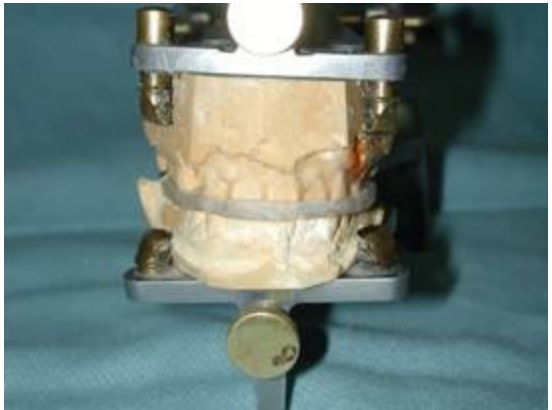
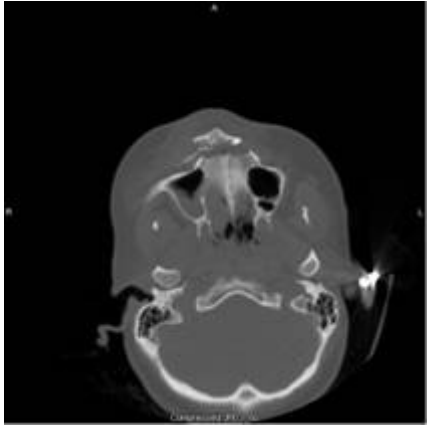
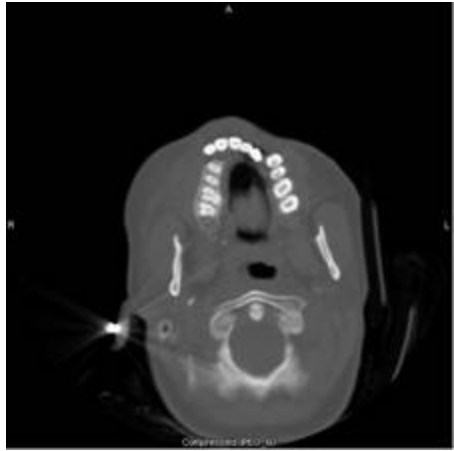
Displaced

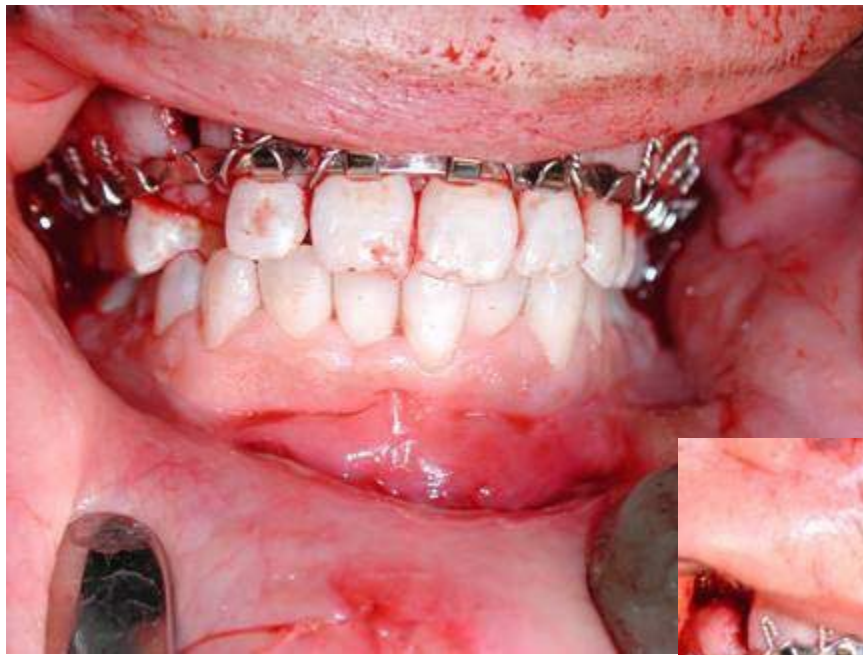




Composite bonding an arch wire to stabilize avulsed teeth and / or alveolar fractures







Dento-alveolar Case

