Oral & Maxillofacial Trauma

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Maxillofacial Trauma Facts

- Maxillofacial fractures result from blunt or penetrating trauma. Blunt injuries are far more common

- Simple Nasal fractures are the most common of all facial fractures and must be distinguished from the more serious NOE fractures.

- Mandible fractures are the second most common maxillofacial fracture.

Treatment Pearl

"Occlusion"

Teeth and occlusion are the key to reconstruction. It provides the foundation upon which other facial structures are built.

Initial Management

- Primary Survey based on ABC'S & D,E.
- Airway maintenance with cervical spine control
- Breathing and adequate ventilation
- Circulation with control of Hemorrhage
- "D" Degree of consciousness
- "E" Exposure - complete undressing to avoid overlooking injuries

Diagnosis of Oral & Maxillofacial Injuries

- History
- Physical Exam (Extra-oral and Intra-oral)
- Radiological Exam

History

- Obtain history from patient, witness and/or EMT
- AMPLE history

  Mechanism of injury

- Specific Questions

  Was there LOC? If so, how long?

  Hearing problems?

  How is your vision?

  Is there pain with eye movement?

  Are there areas of numbness or tingling on your face?

  Is the patient able to bite down without any pain?

  Is there any pain when moving the jaw?

Mechanism of Injury

1. Type of traumatic force

   Vehicle accidents can result in multiple compound fractures.

   A blow from a broad blunt object can result in a comminuted fracture as the force is distributed throughout the bone.

2. Direction of the force

   A blow to the chin causing a symphysis fracture can distribute the force to the condylar region possibly resulting in unilateral or bilateral condylar fracture.

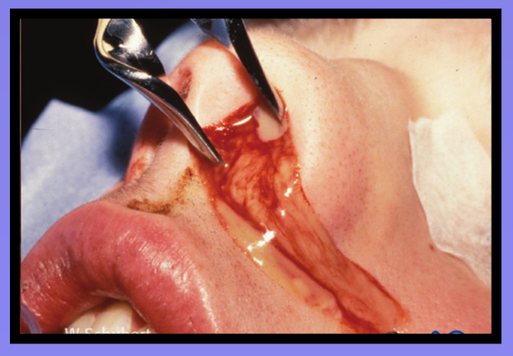
It is important to note any pre-trauma TMJ dysfunction

Physical Examination of the Face

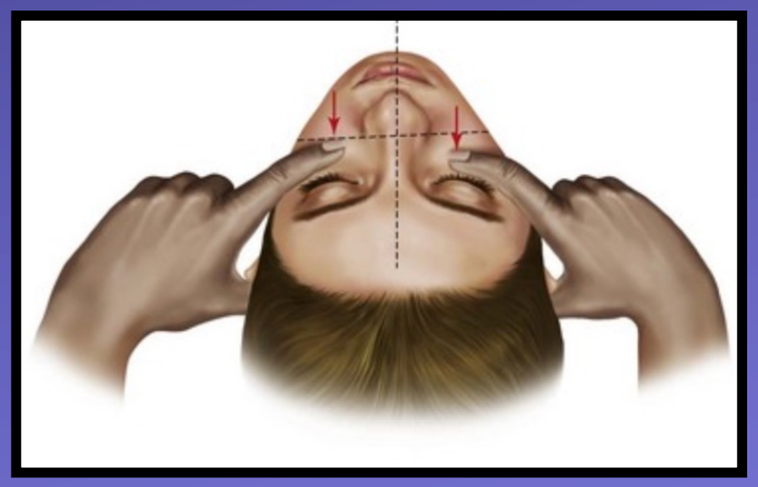
Extra-Oral

- Inspection of the face for asymmetry.
- Inspect open wounds for foreign bodies.
- Palpate nose for crepitus and subcutaneous air.
- Inspect the nose for asymmetry, telecanthus, widening of the nasal bridge.

- Inspect the nasal septum for septal hematoma, CSF or blood.



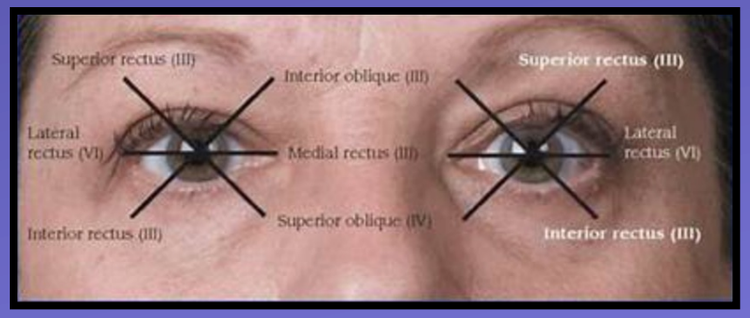
- Palpate the entire face.
  - Supraorbital and Infraorbital rim
  - Zygomatic - frontal suture
  - Zygomatic arches

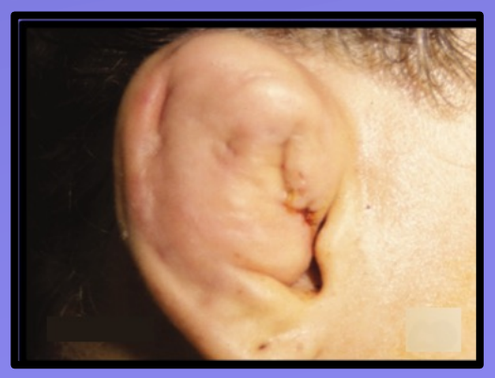


- Check facial stability by gently grasping teeth and pushing back and forth up and down feeling for movement.

- Palpate the mandible for tenderness, swelling, crepitus and step deformity.

- Check visual acuity.
- Check pupils for roundness and reactivity.
- Examine eyelids for lacerations.
- Test extraocular muscles.
- Palpate around the entire orbit.
- Examine the cornea for abrasions and lacerations.
- Examine the anterior chamber for blood or hyphema.
- Perform fundoscopic exam and examine the posterior chamber and retina.
- Examine and palpate the external ears
- Examine the exterior Auditory Meatus



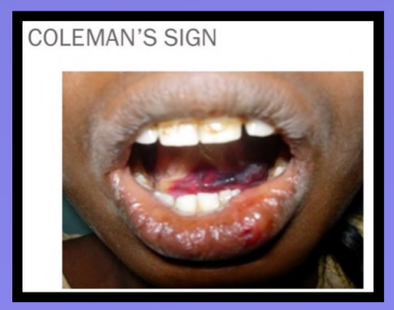


- Check the nerve distributions of the supraorbital, infraorbital, inferior alveolar and mental nerves.

Intra-Oral

- Check the teeth for malocclusions, bleeding and step deformity.

- Manipulation of the teeth. Avulsed, fractured, displaced teeth.
- Check for mucosal and gingival lacerations and ecchymosis.

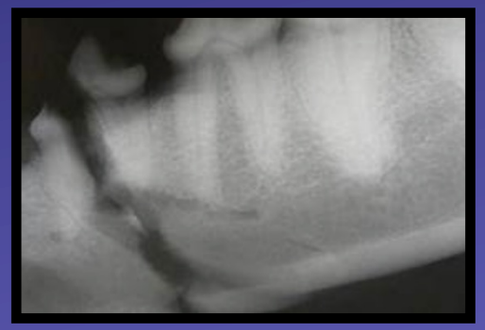


- Stress the mandible.
- Tongue blade test.

Radiographic Examination

- Panoramic (Panorex, OPG)
- PA (Posterior-Anterior)
- Paranasal Sinuses (PNS)
- Lateral Oblique
- Water's View
- Submental Vertex (Jug Handle)
- Occlusal
- Periapical
- CT Scan (Axial, Coronal and Sagittal Views)
- 3D image reconstruction from CT

Panorex

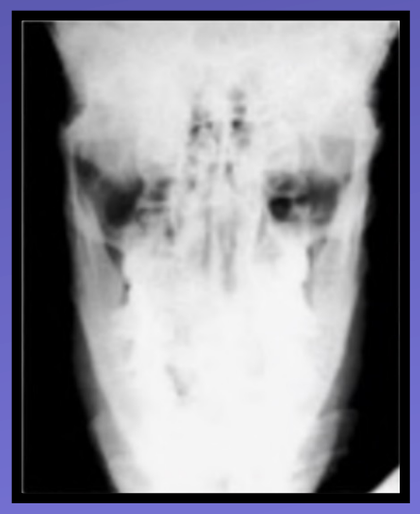


Peri apical

Submental Vertex

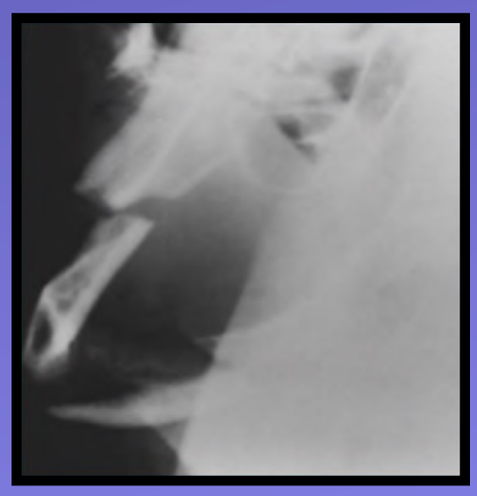
Water's View

PA



Reverse Townes

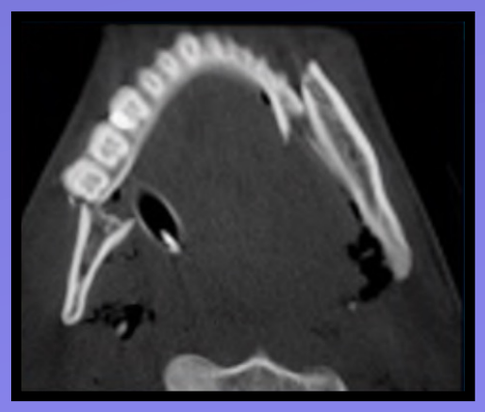
Occlusal



Lateral Oblique

CT Coronal View

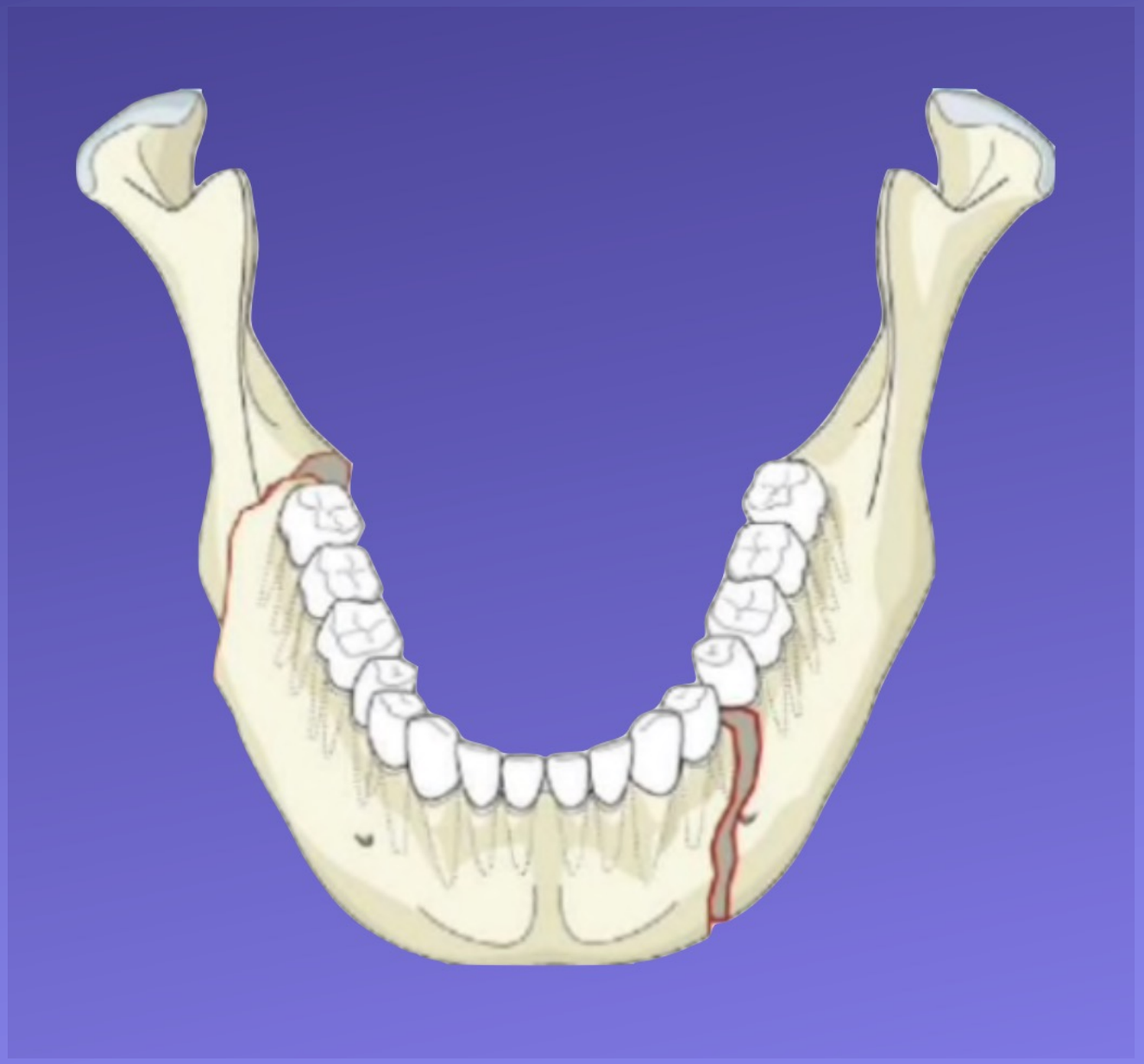
CT Sagittal View



CT Axial View

3D Reconstructioin

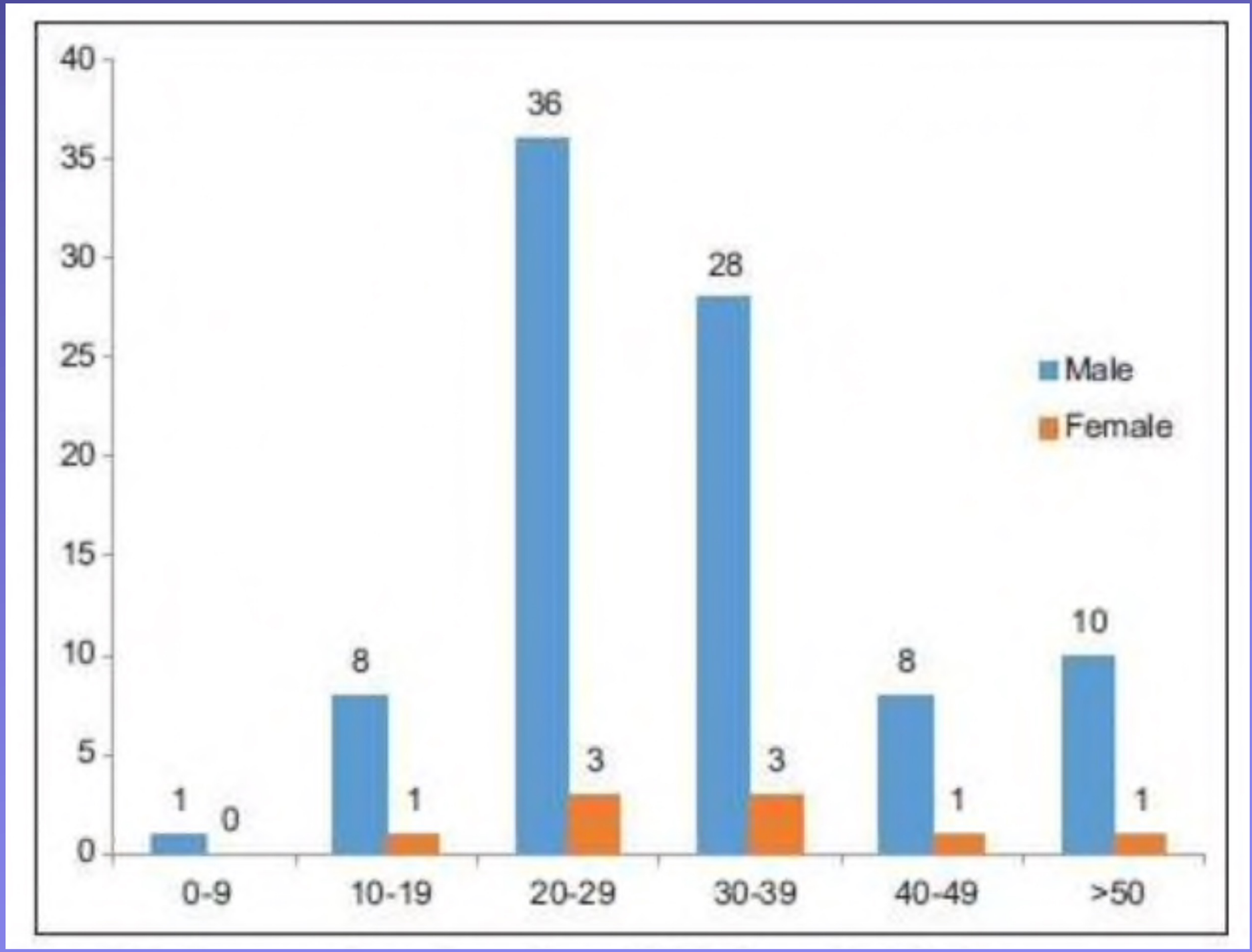
Mandible Fractures



Etiology of Mandible Fractures

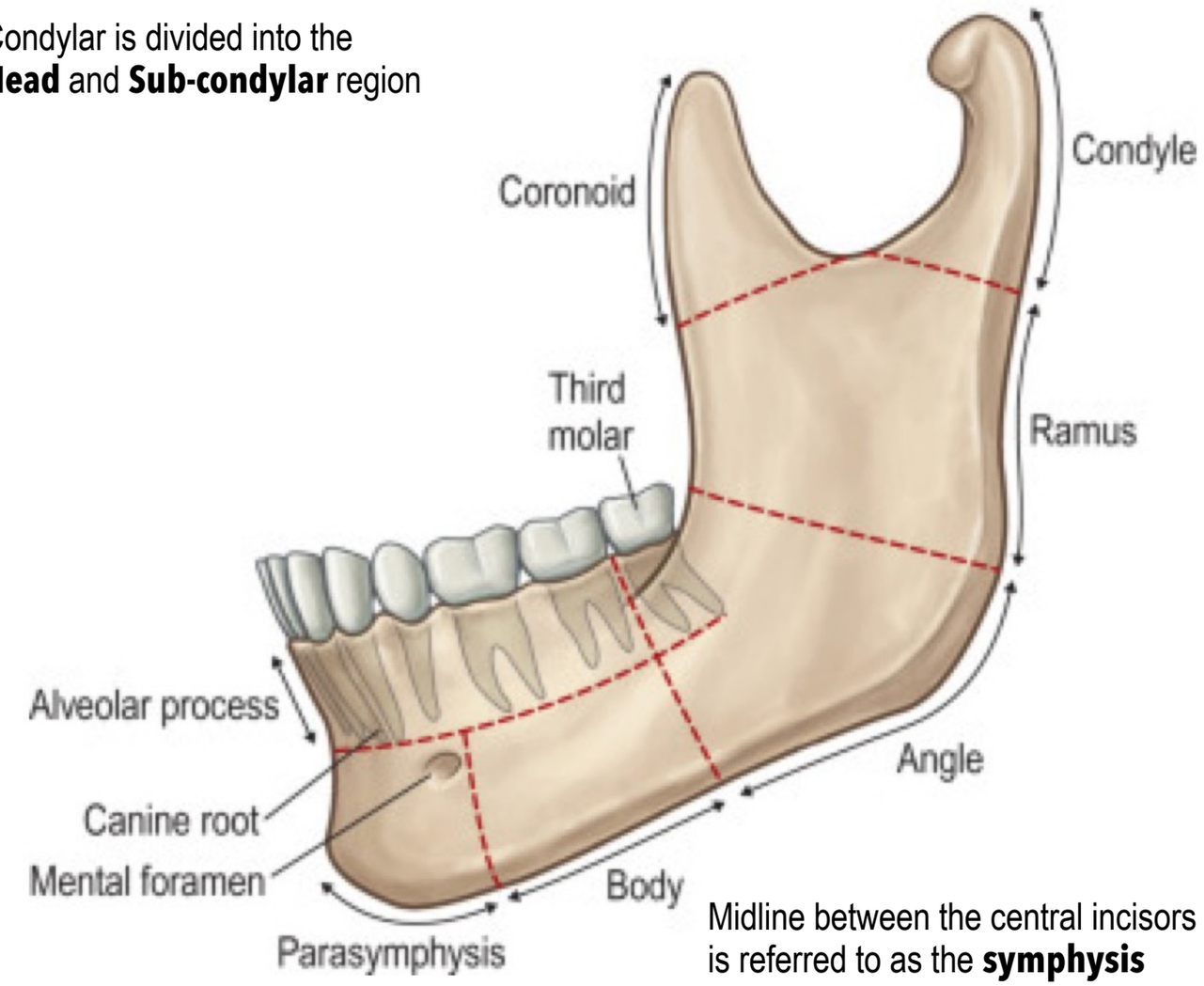
Cause	(n)	(%)
Motorcycle Accident	87	44.8%
Interpersonal Violence	36	18.6%
Fall	17	8.8%
Car Accident	13	6.7%
Hit by Car	11	5.7%
Firearm	8	4.1%
Bicycle	6	3.1%
Sport	4	2.1%
Work Accident	1	0.5%
Others	11	5.7%
Total	194	100.0%

Distribution by Age and Gender (100 Mandible Fractures)



Anatomy of the Mandible

Condylar is divided into the **Head** and **Sub-condylar** region



Midline between the central incisors is referred to as the **symphysis**

Classifying Mandible Fractures

- According to the degree of displacement
- According to type of fracture
- According to the site of the fracture

Degree of displacement

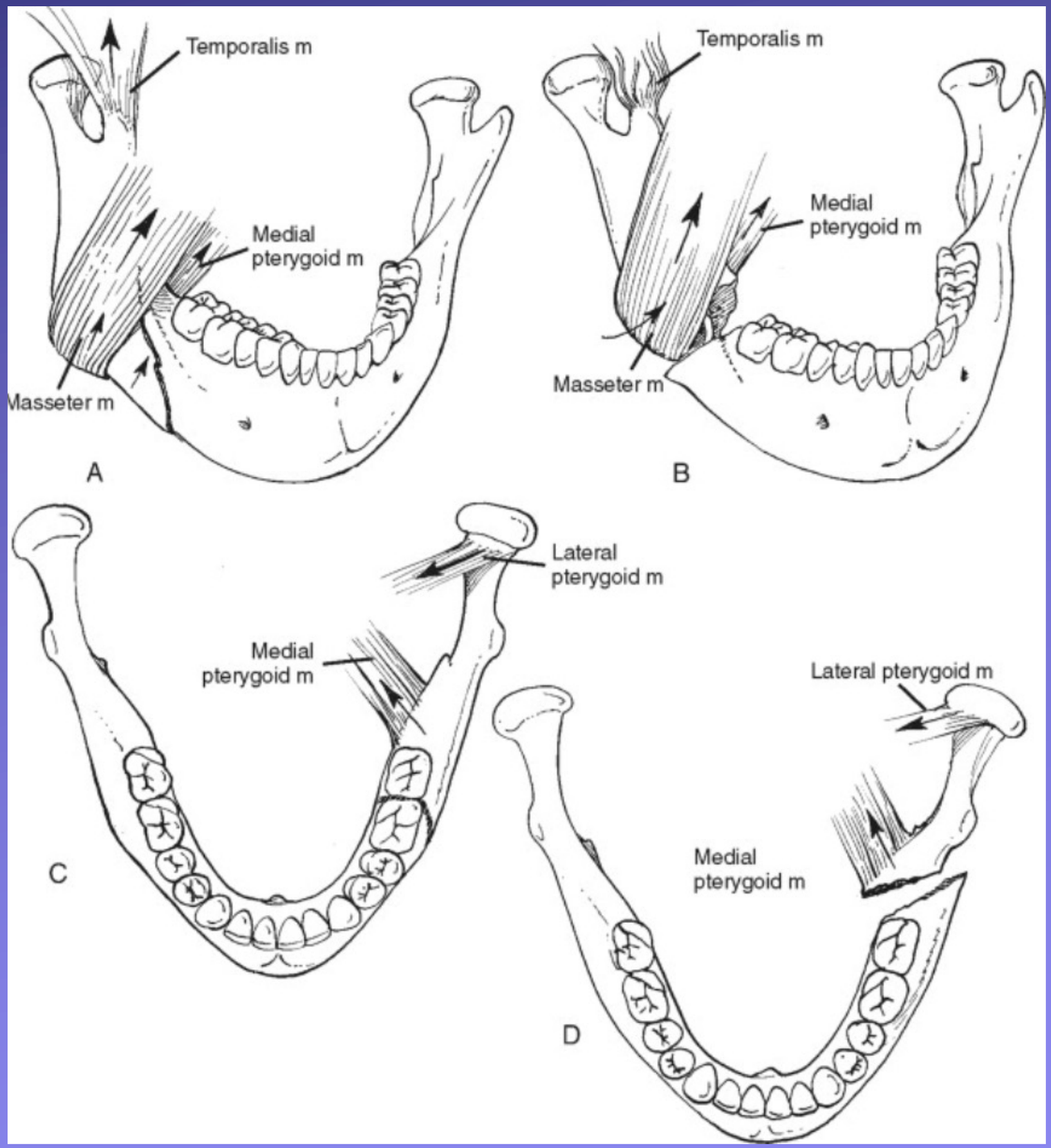
- Non displaced
- Mildly displaced
- Moderately displaced
- Grossly displaced

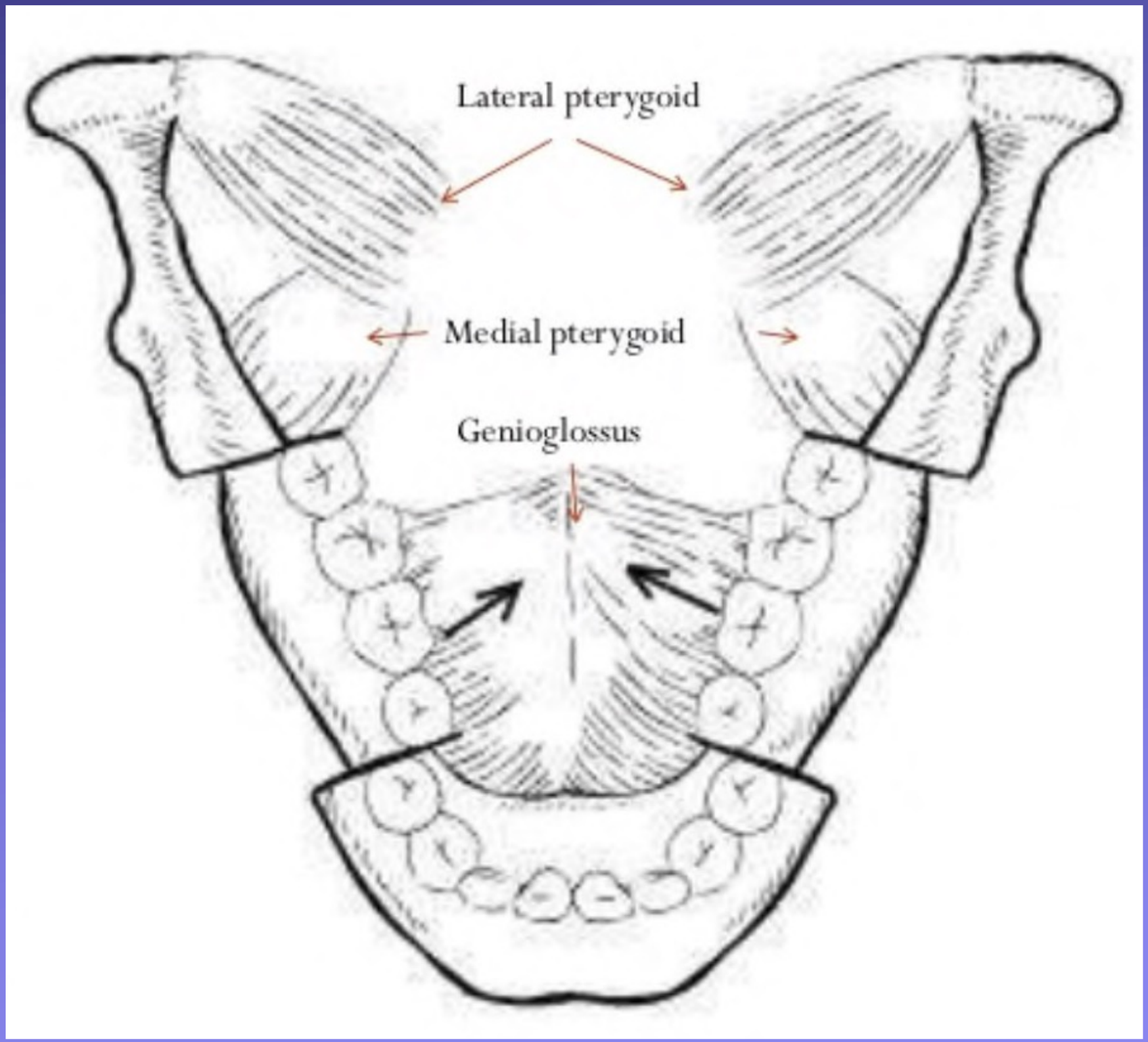
Favorable

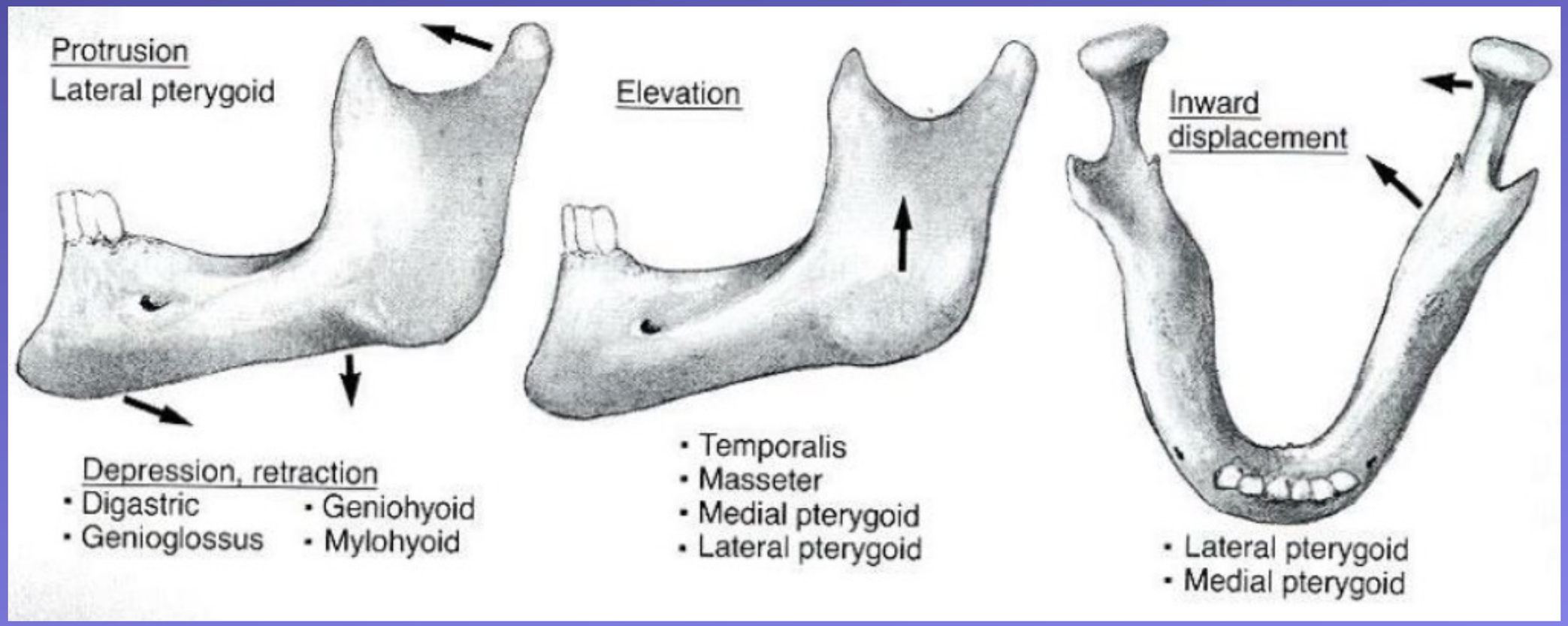
Unfavorable

Favorable

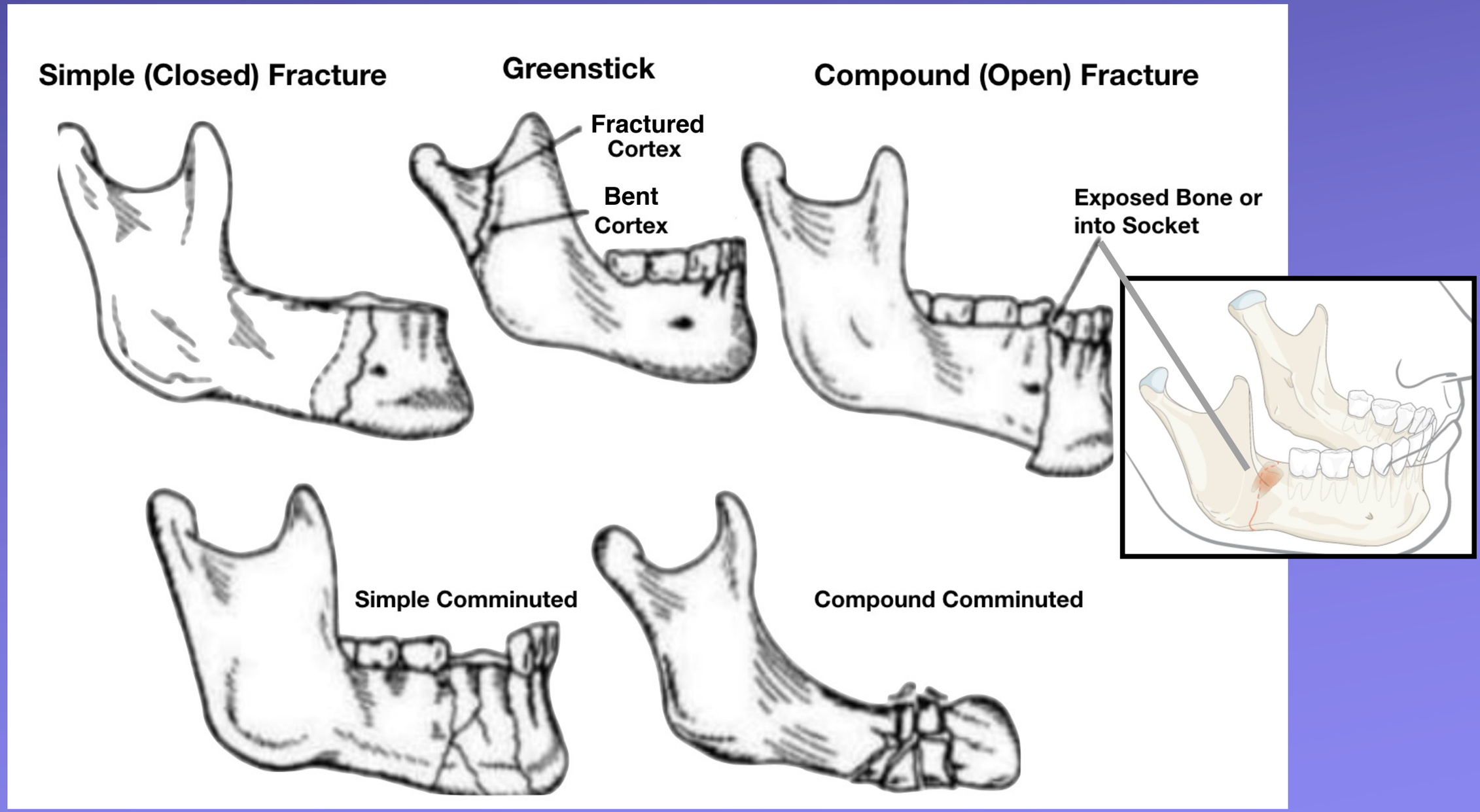
Unfavorable


Temporalis m
Medial pterygoid m
Masseter m
A
Temporalis m
Medial pterygoid m
Masseter m
B
Lateral pterygoid m
Medial pterygoid m
C
Lateral pterygoid m
Medial pterygoid m
D

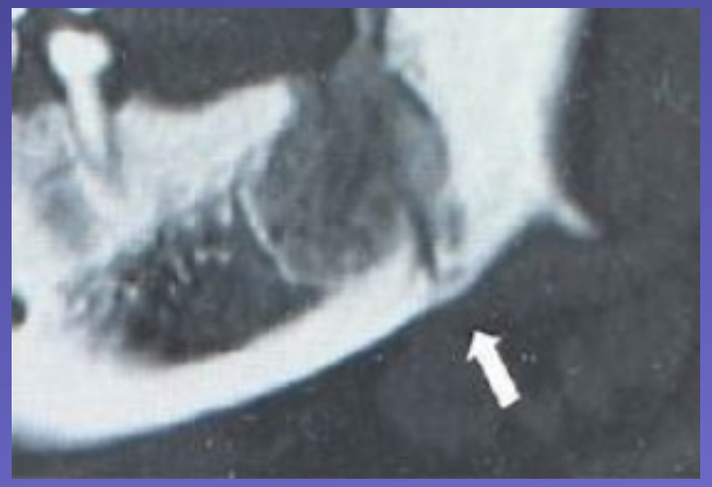

Lateral pterygoid
Medial pterygoid
Genioglossus


Protrusion
Lateral pterygoid
Depression, retraction
• Digastric
• Geniohyoid
• Genioglossus
• Mylohyoid
Elevation
• Temporalis
• Masseter
• Medial pterygoid
• Lateral pterygoid
Inward displacement
• Lateral pterygoid
• Medial pterygoid

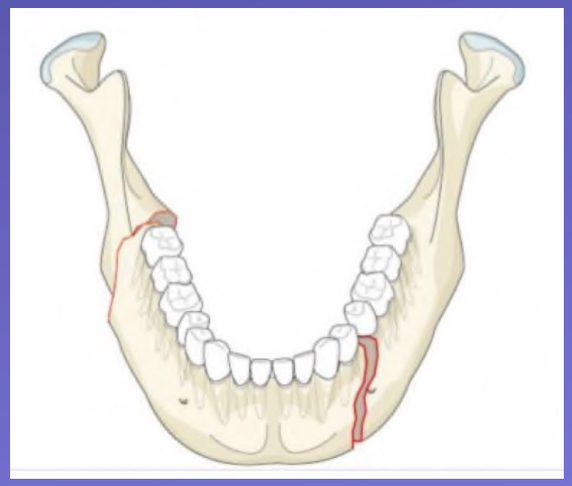
Type of Fracture



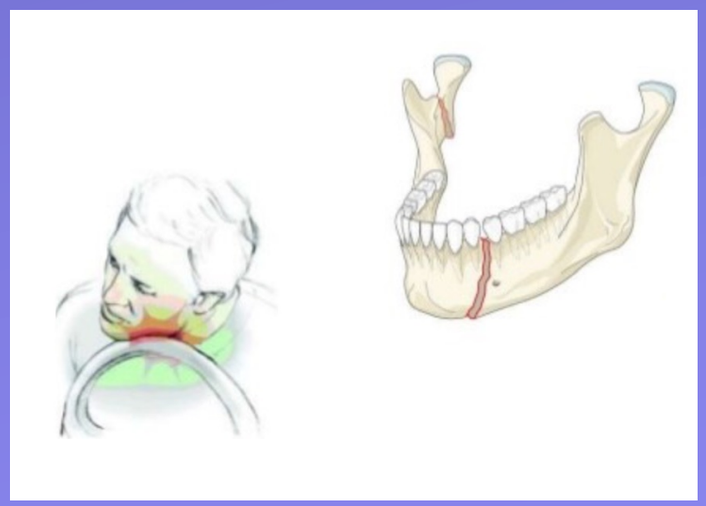
Pathologic Fracture



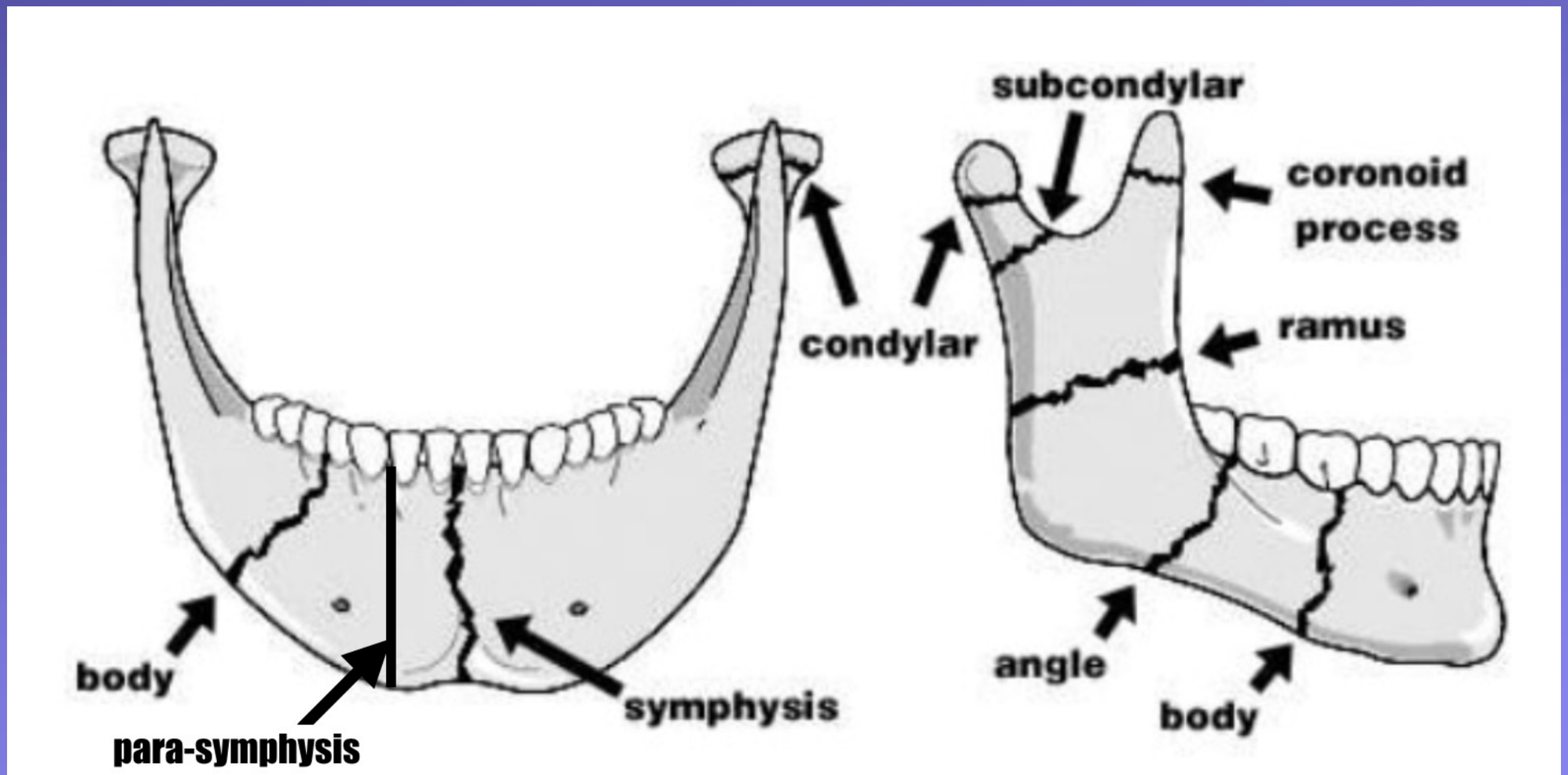
Multiple Fractures

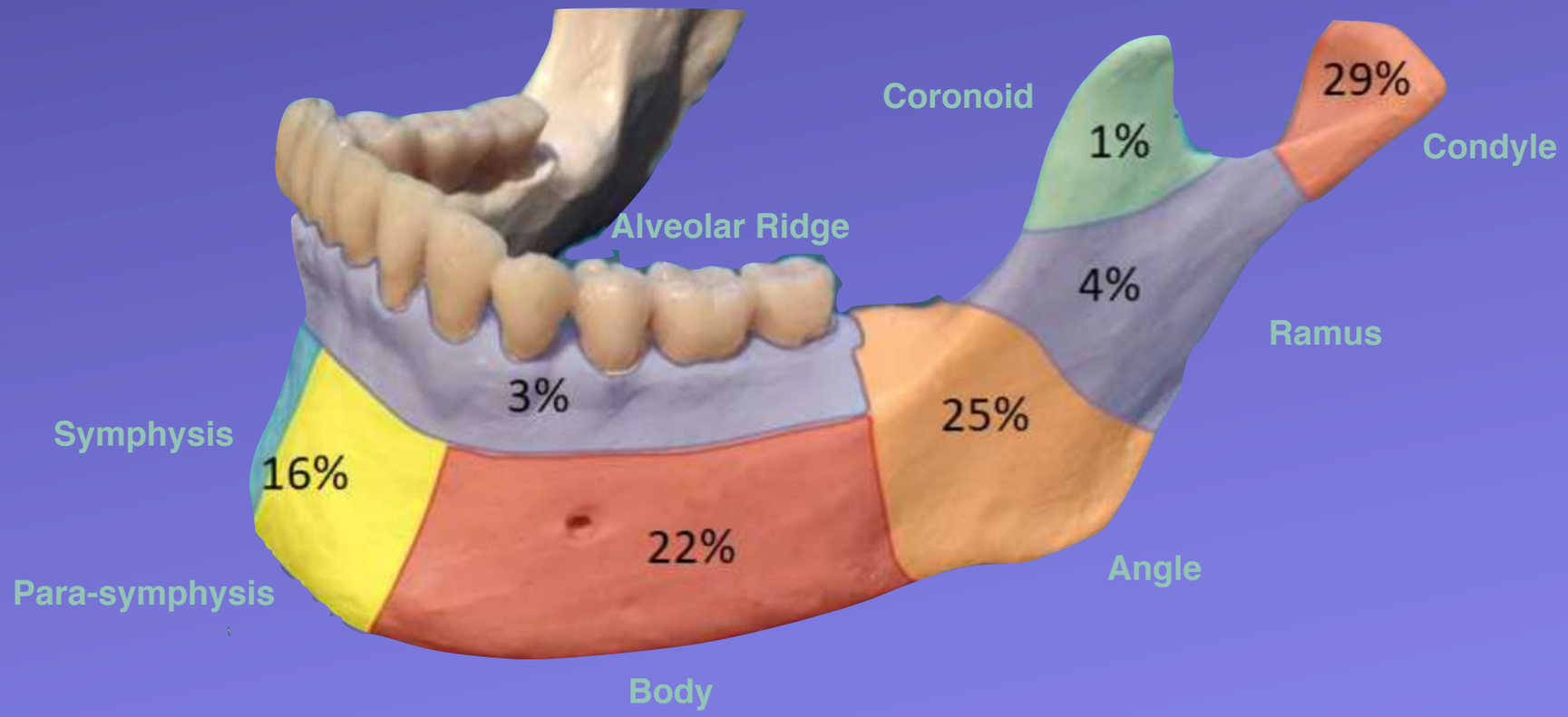


Indirect/Direct Fractures



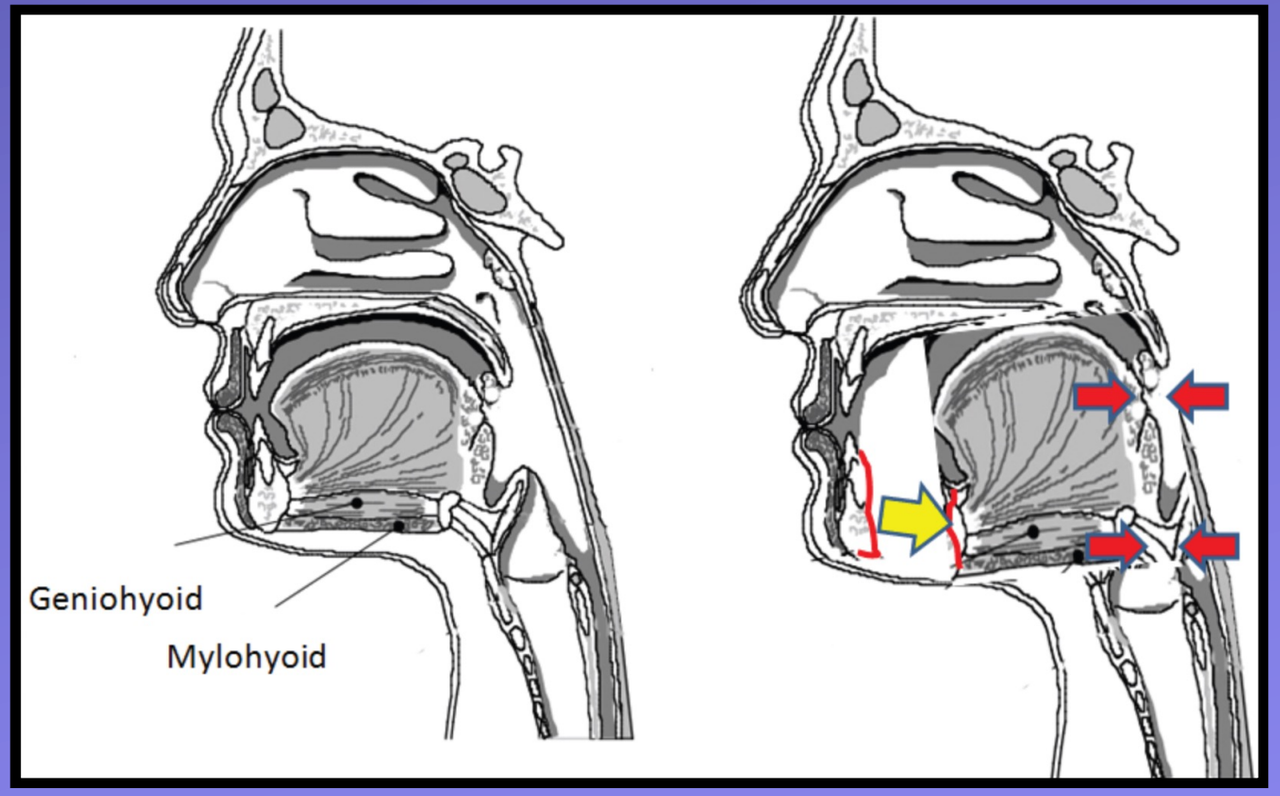
Site of Fracture




Coronoid
1%
29%
Condyle
Alveolar Ridge
4%
Ramus
3%
25%
Symphysis
16%
22%
Angle
Para-symphysis
Body

Bilateral Mandibular Fractures and Airway Obstruction

This is typically described as an immediate or acute process. After trauma, the production of a “flail Mandible” with concomitant loss of support of the tongue muscles is thought to result in obstruction of the upper airway.



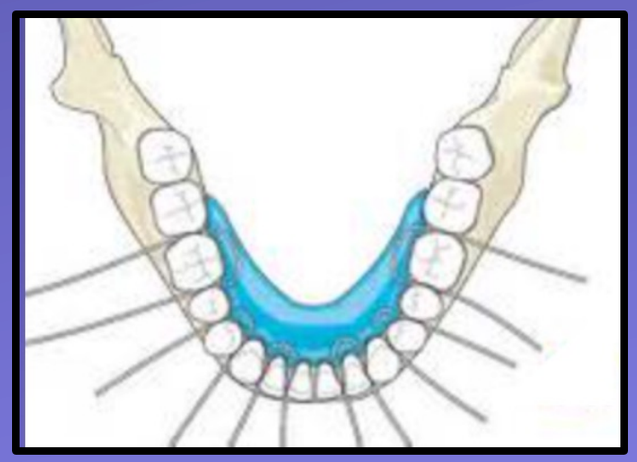
Principles of Fracture Management

- Reduction
- Fixation
- Immobilzation

Mandible Fx - Treatment Options

- Observation
- Closed Reduction via MMF (maxillary mandibular fixation) with or without lingual splint.

Arch Bars with Elastics



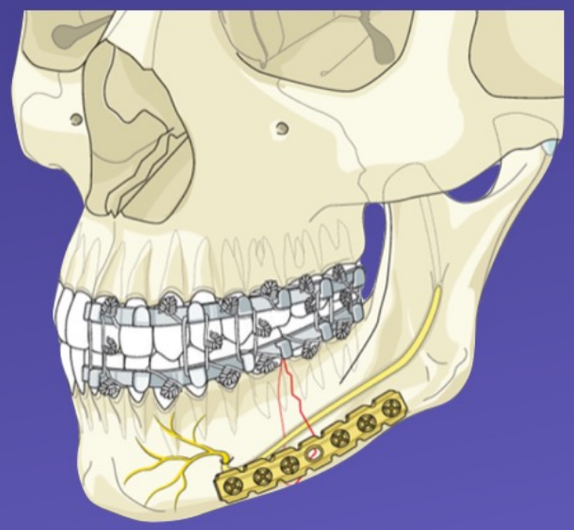
Lingual Splint

MMF Screws with Wires

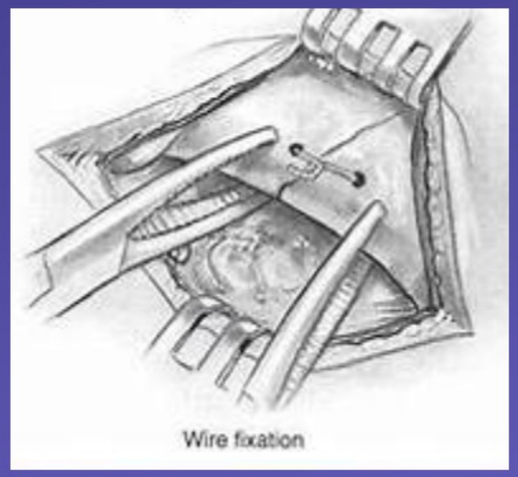
External Pin Fixation

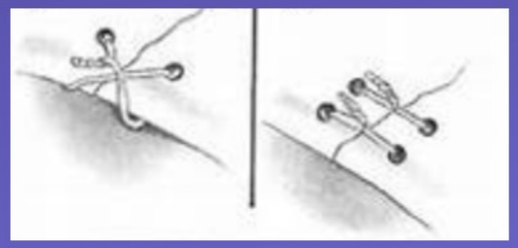
Edentulous Mandible Splint with Circummandibular Wires

- Open Reduction with internal fixation

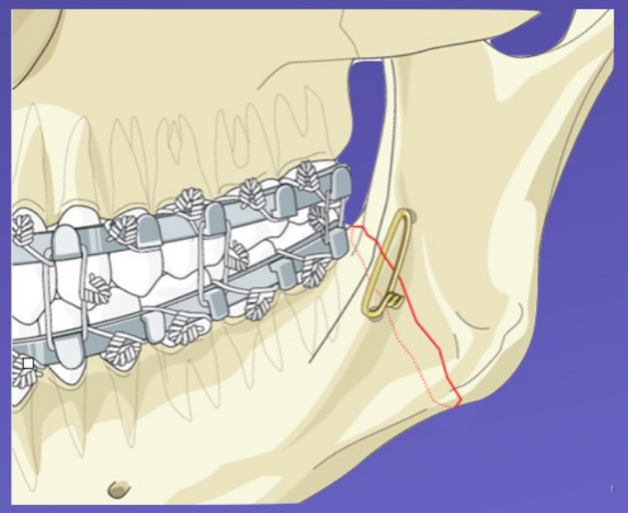


Bone Plate





Wire Fixation

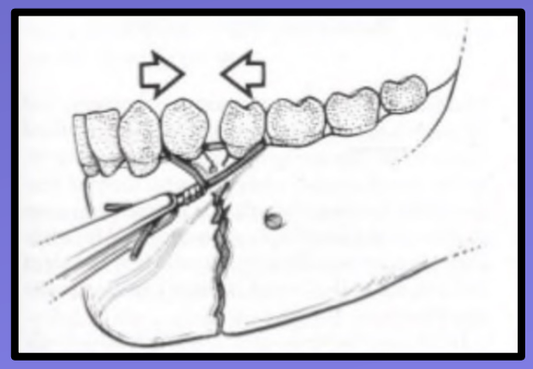


Superior Border Wire

Mandible Fractures

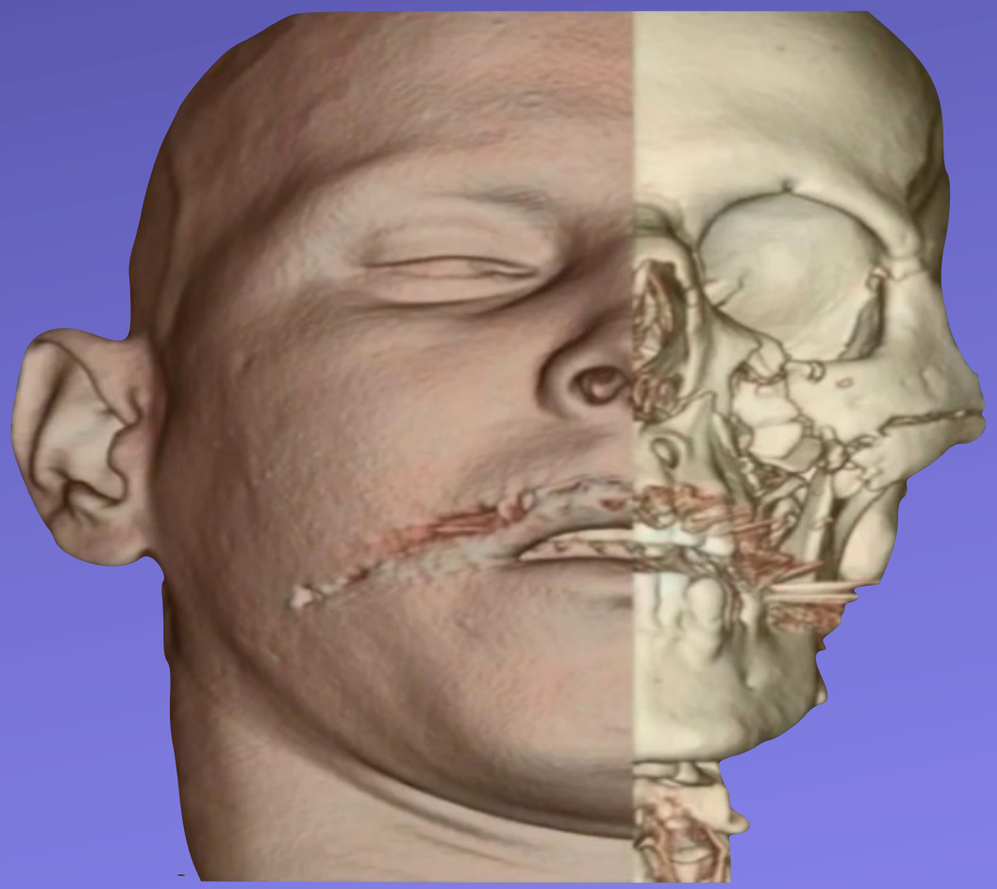
Temporary Stabilization

Barton Bandage

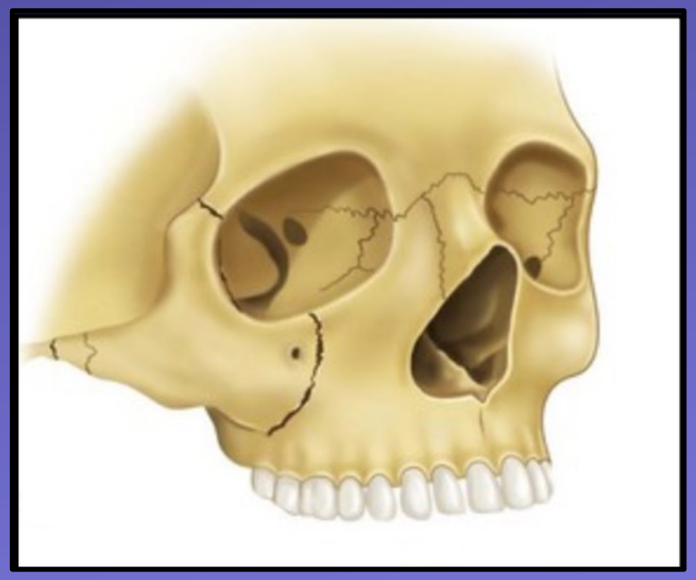


Bridle Wire

Midface Fractures



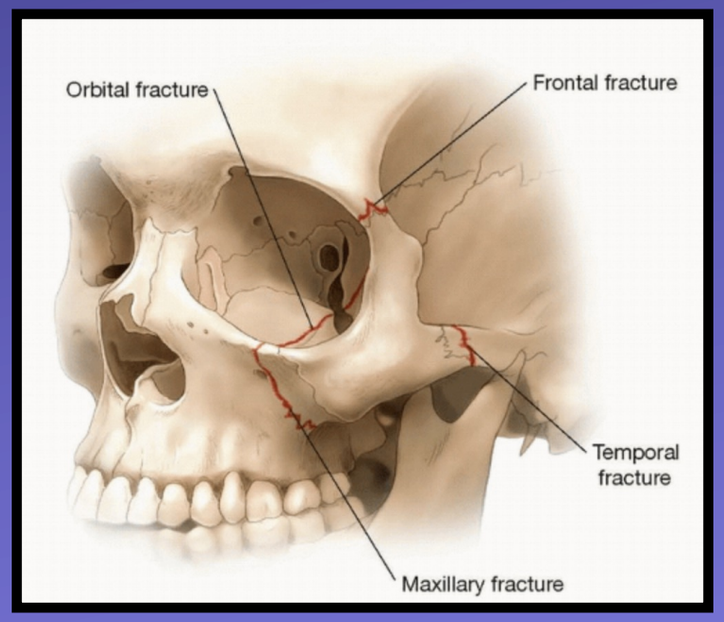
Zygoma Fractures
ZMC - Zygomaticmaxillary Complex

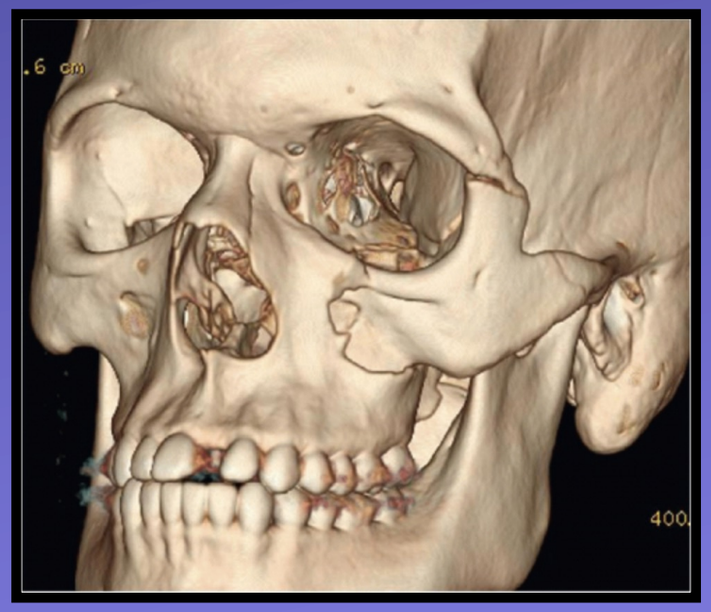


- The Zygoma has two major components
  1. Zygomatic (Tripod) Body
  2. Zygomatic Arch

- Blunt trauma most common cause.

Zygomatic Body (Tripod) Fracture



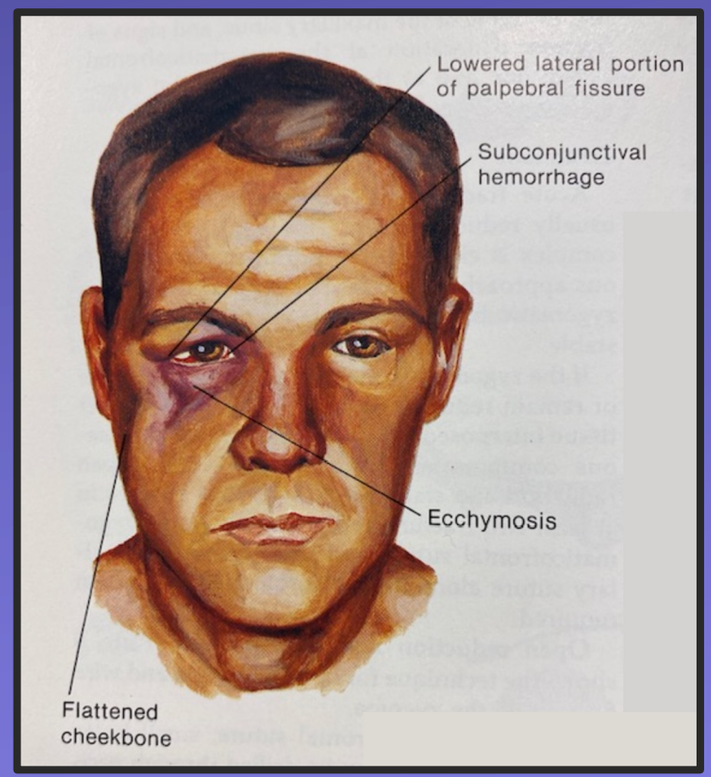


- Consists of fractures through:
  1. Zygomatic arch
  2. Zygomaticofrontal suture
  3. Inferior orbital rim and floor

Zygomatic Body (Tripod) Fracture

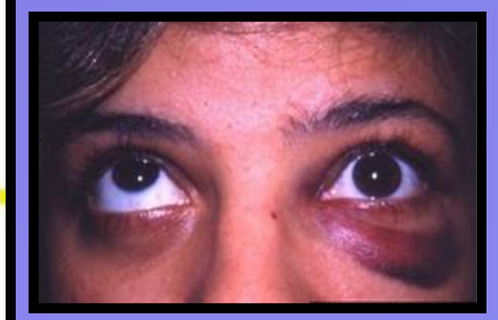
Clinical Features

- Periorbital edema and ecchymosis
- Subconjunctival Hemorrhage
- Flattening of the malar prominence
- Hypesthesia of the infraorbital nerve
- Palpation may reveal a step deformity
- Concomitant globe injuries are common
- Dyplopia with fracture of the orbital floor and resultant downward displacement of the globe.
- Orbital muscle entrapment





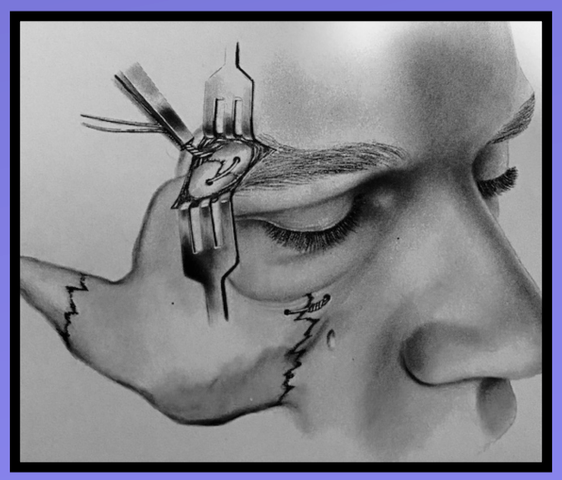




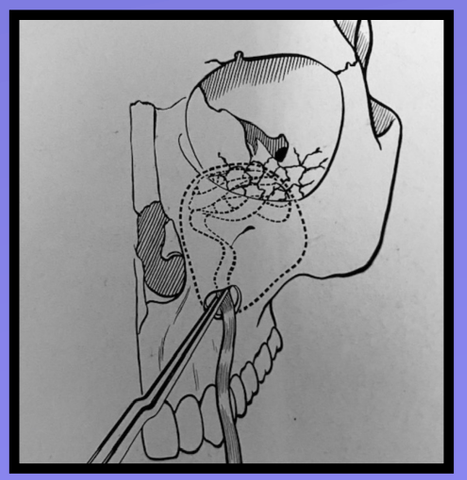
Zygoma Fracture
Treatment Options

- Nondisplaced fractures without eye involvement.
  - Ice and analgesics
  - Delayed operative considerations 5 - 7 days
  - Decongestants
  - Broad spectrum antibiotics
  - Tetnus
- Displaced fractures require ORIF

Elevation

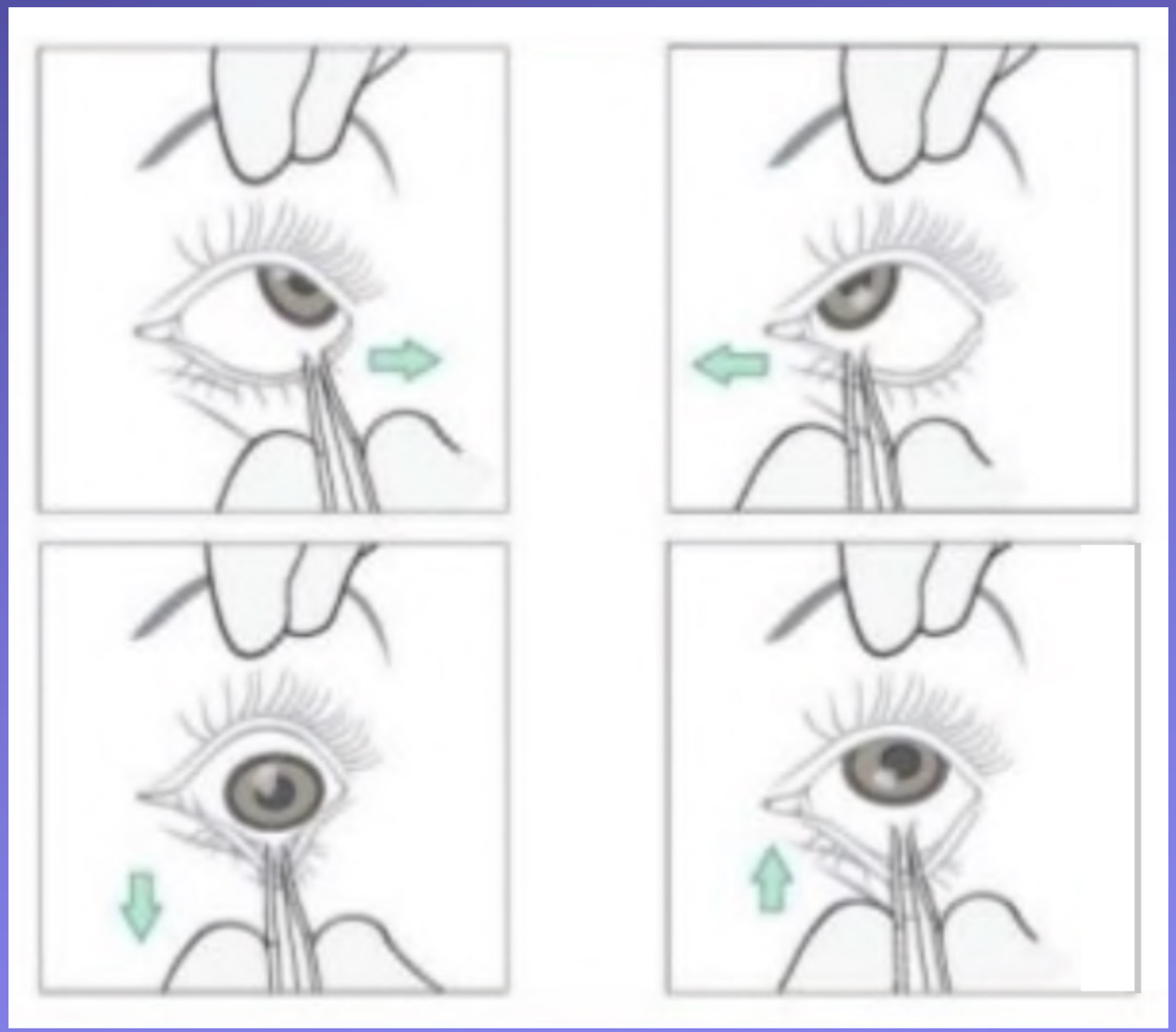


Wires or Plates

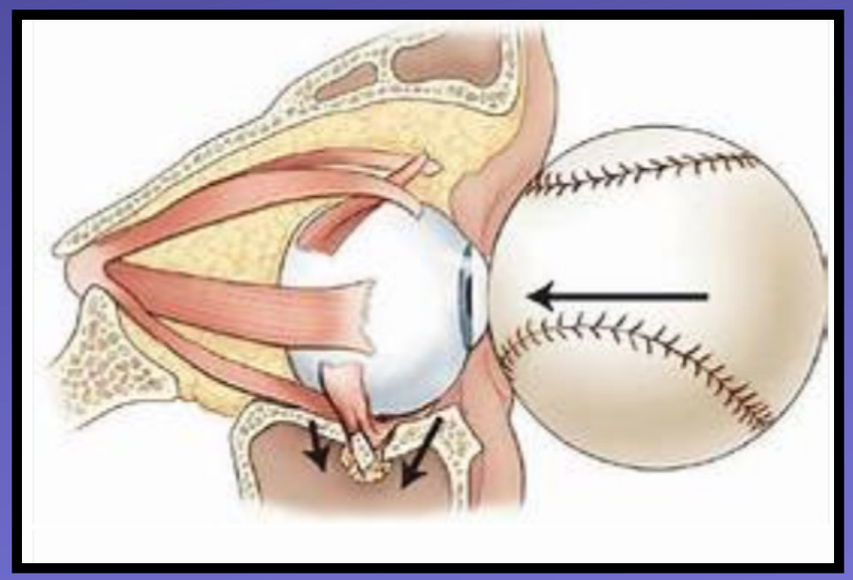


Gauze or Foley Balloon

Forced Duction Test



Orbital Blowout Fracture



- Occur when the globe sustains a direct blunt force.
- 2 mechanisms of injury:
  - Blunt trauma to the globe.
  - Direct blow to the infraorbital rim.

Orbital Blowout Fracture

Clinical Findings / Radiographic Findings

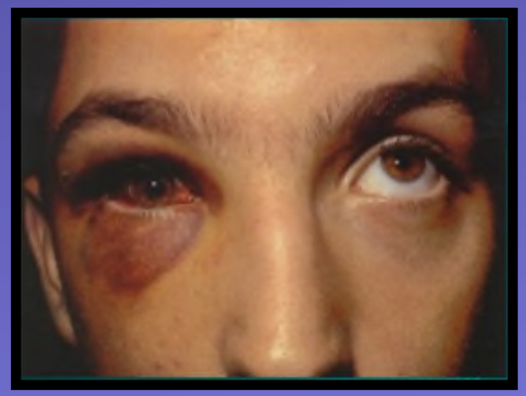
- Periorbital tenderness, swelling, ecchymosis.
- Enophthalmus, or sunken eye.
- Impaired ocular motility
- Infraorbital anesthesia
- Step deformity

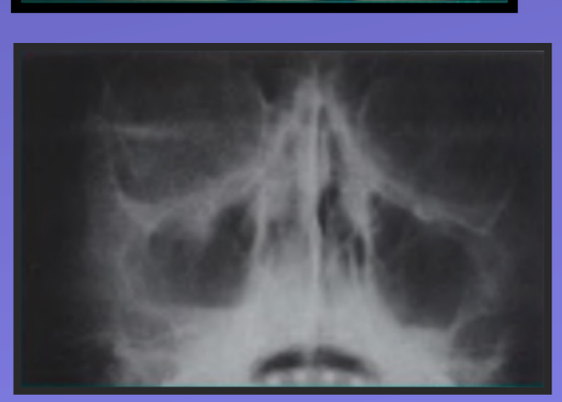
Radiographs

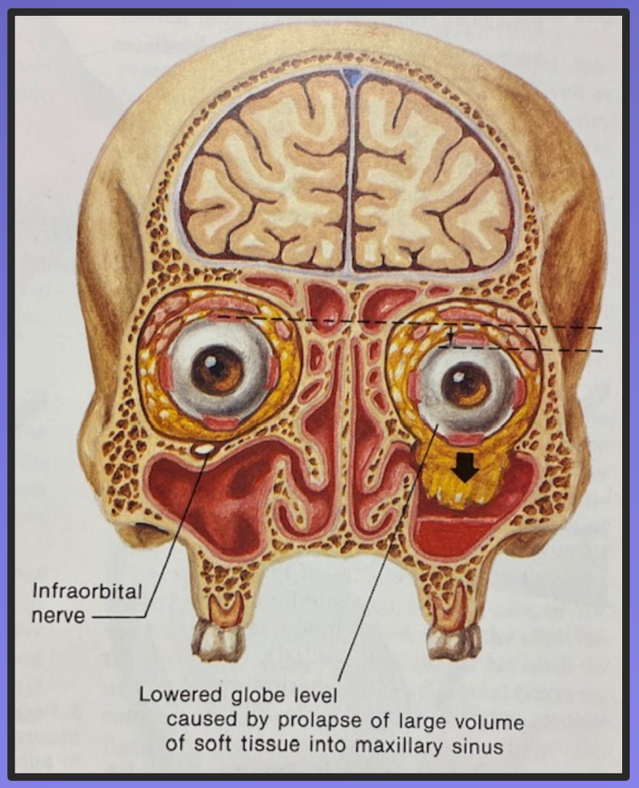
- Hanging tear drop sign
- Open bomb bay door
- Air fluid levels
- Orbital emphysema

CT of orbits

- Details the orbital fracture
- Excludes retrobulbar hemorrhage

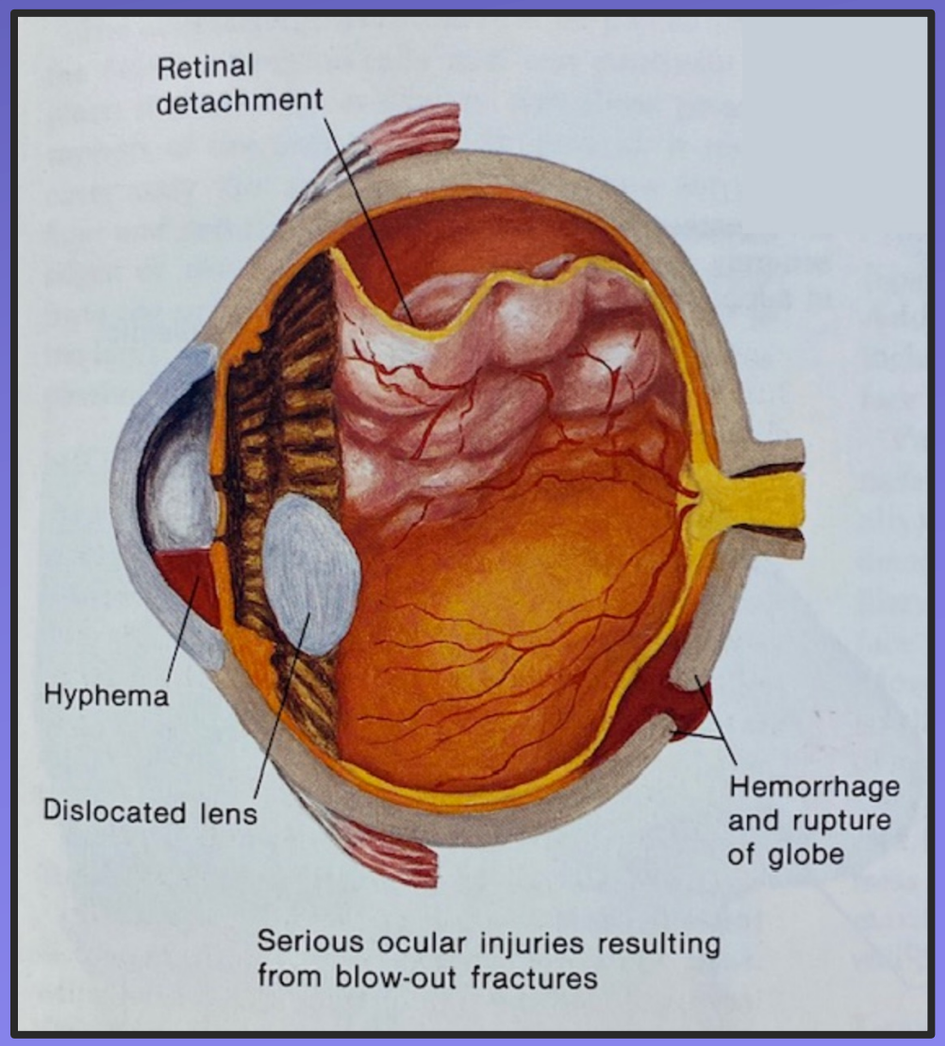






Orbital Blowout Fractures

Due to the possibility of ocular injury with these fractures they are best treated where ophthalmology support exists.

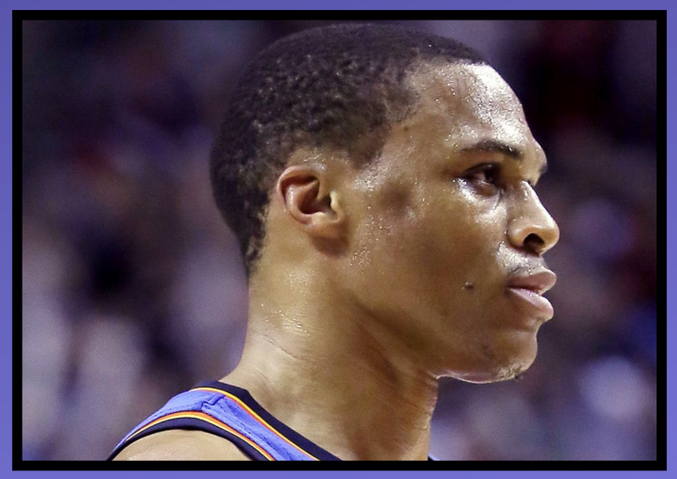


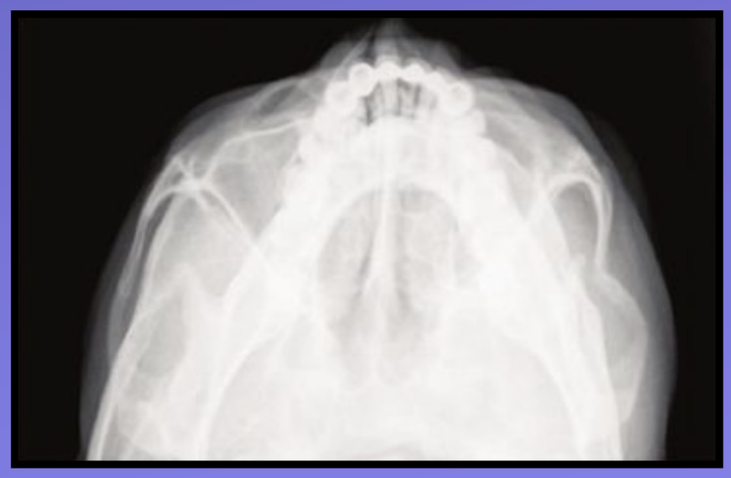
Serious ocular injuries resulting from blow-out fractures

Zygomatic Arch Fracture

Clinical findings:

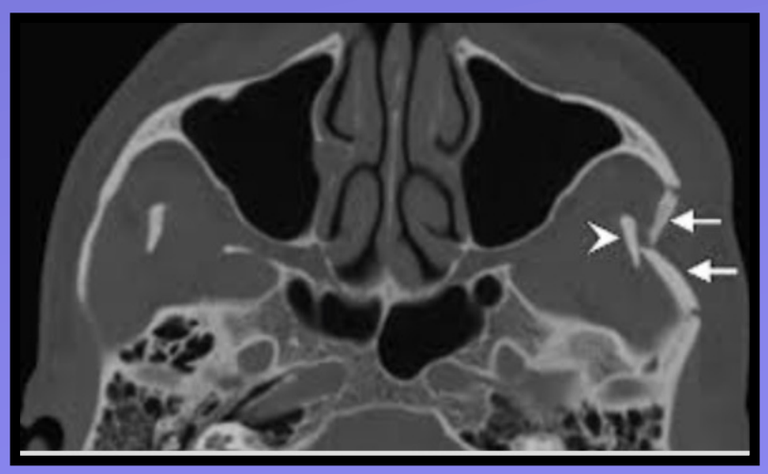
- Palpable bone defect on the arch
- Pain in cheek with jaw movement
- May have limited opening or closing





Imaging:

- Submental Vertex view
- CT
- 3D CT reconstruction

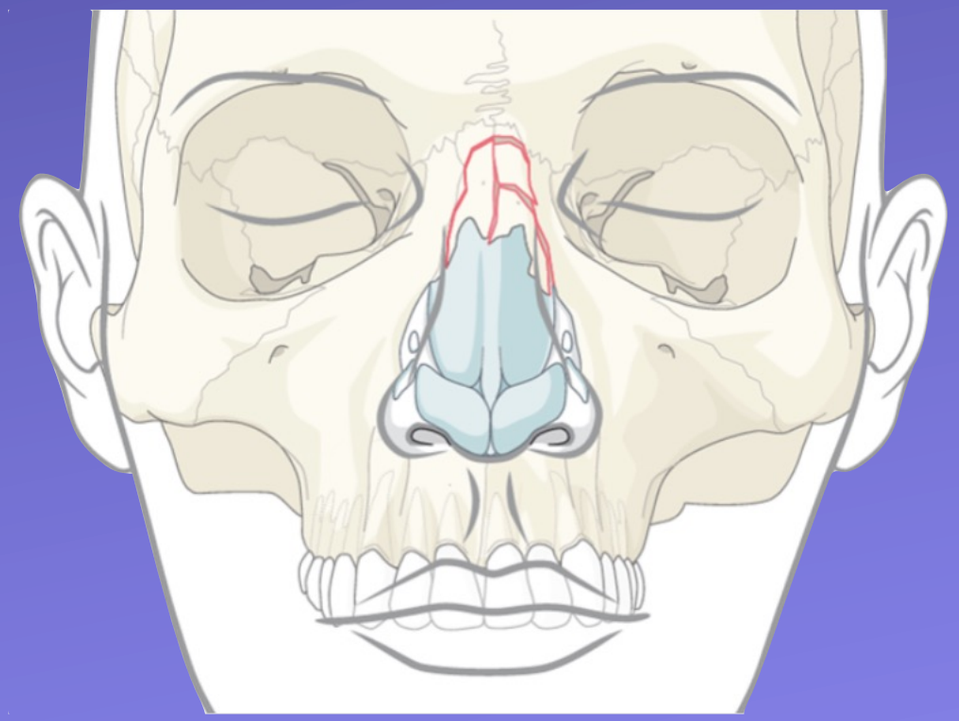


Zygomatic Arch Fracture

Treatment:

- If relatively non displaced, observation, treat with ice and analgesia
- If displaced or impinging on the opening or closing of the mandible, open reduction via elevation through brow incision (or incision of choice)

Nasal Fracture

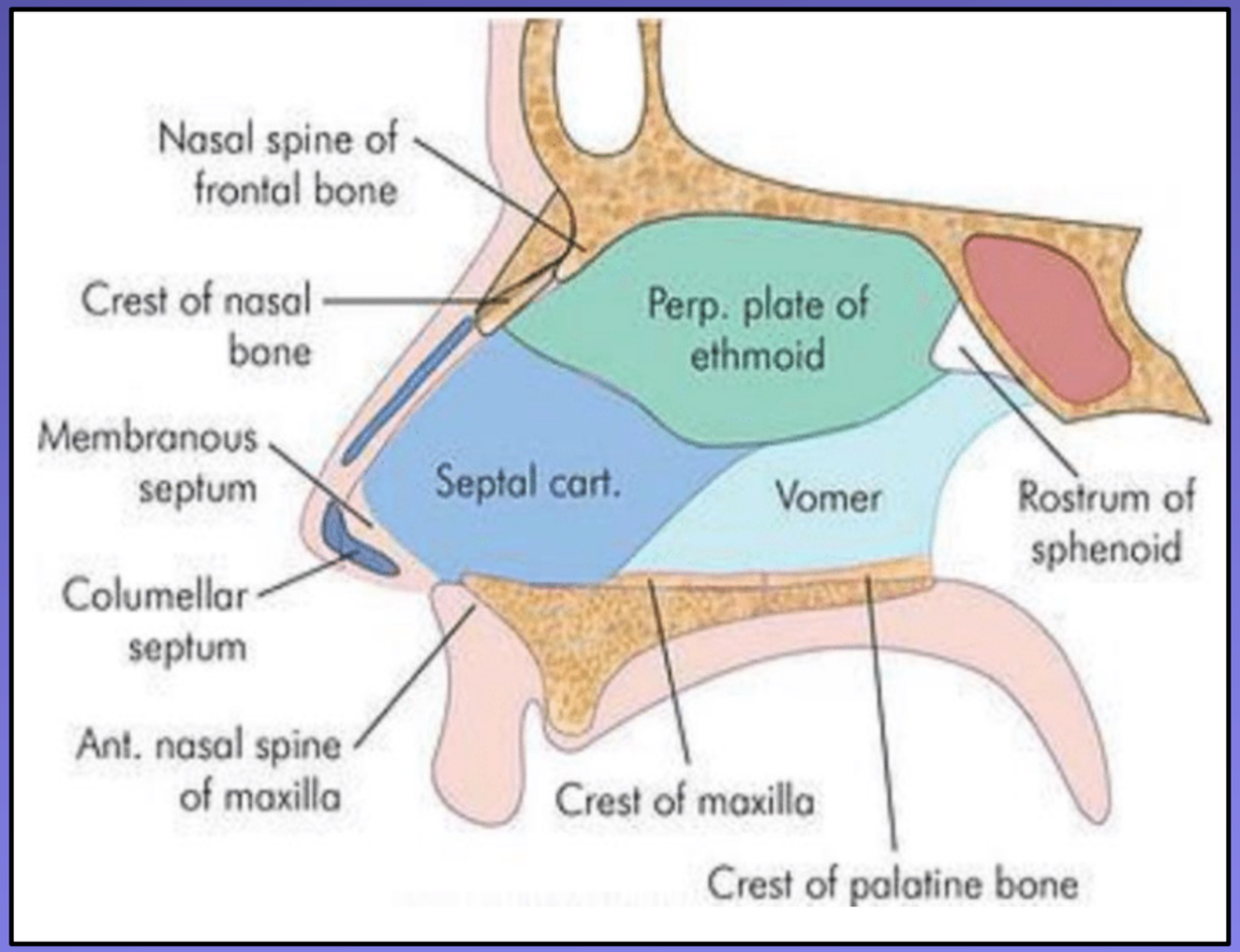


Nasal Fracture

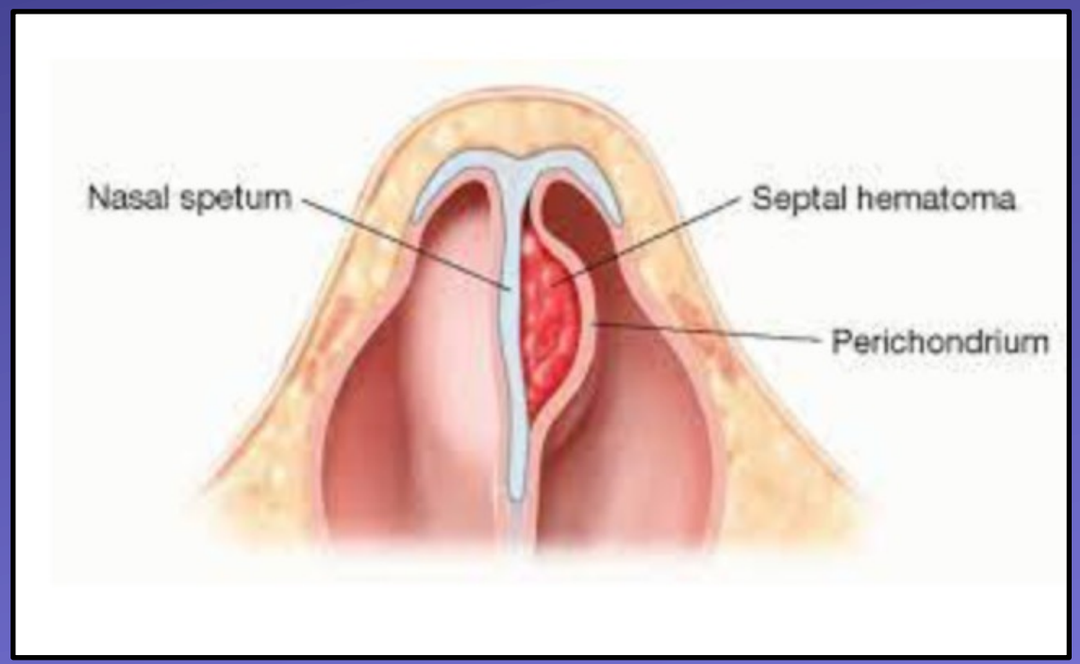
Clinical findings:

- Nasal deformity
- Edema, tenderness
- Epistaxis
- Crepitus and mobility

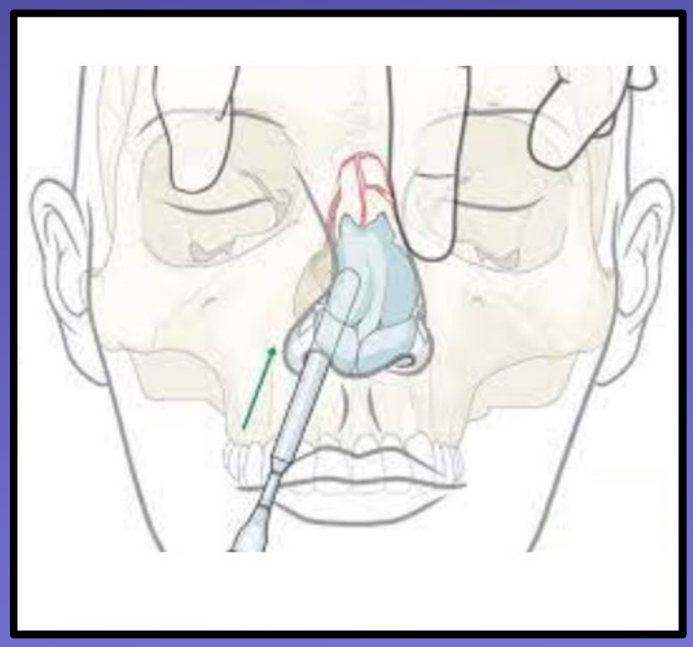
Nasal Fracture

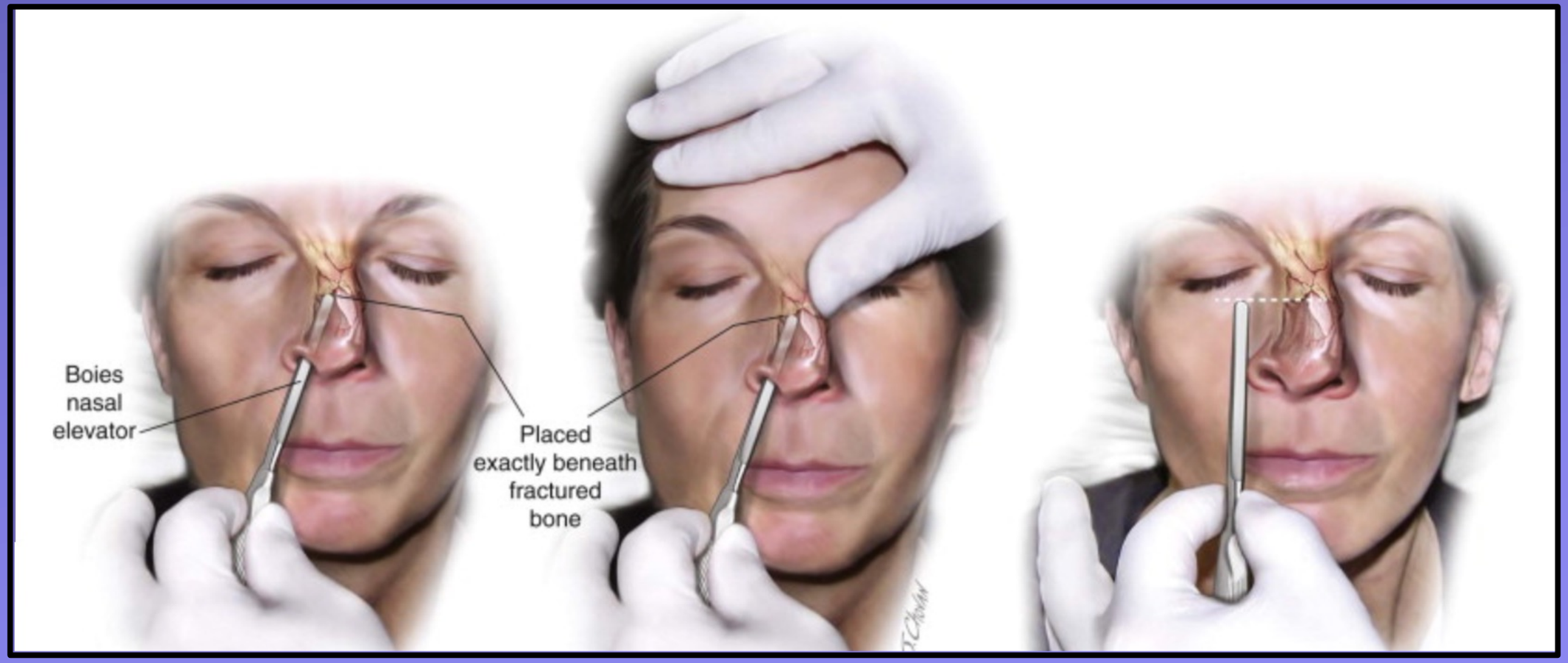


Nasal Fracture

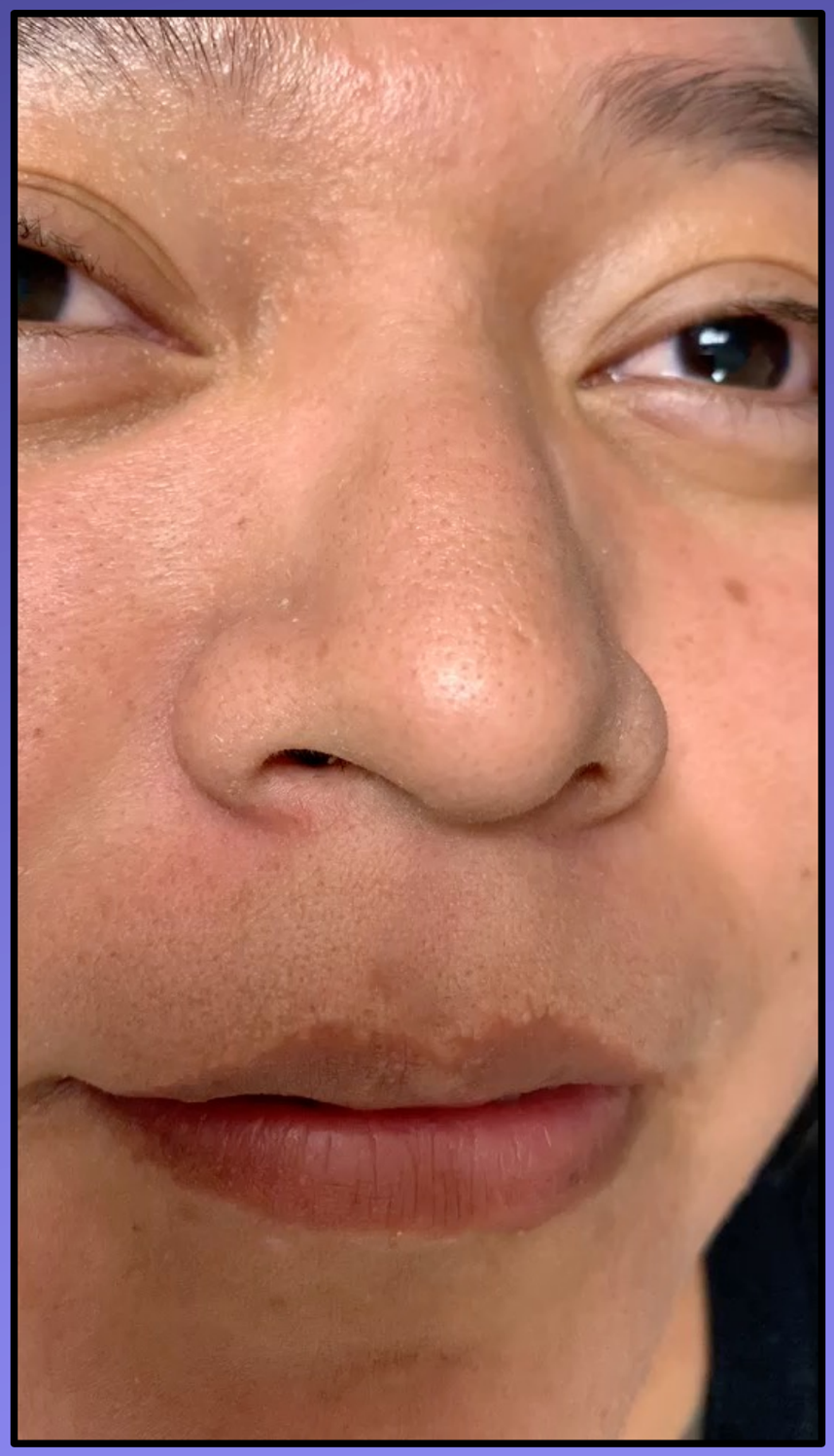


Nasal Fracture



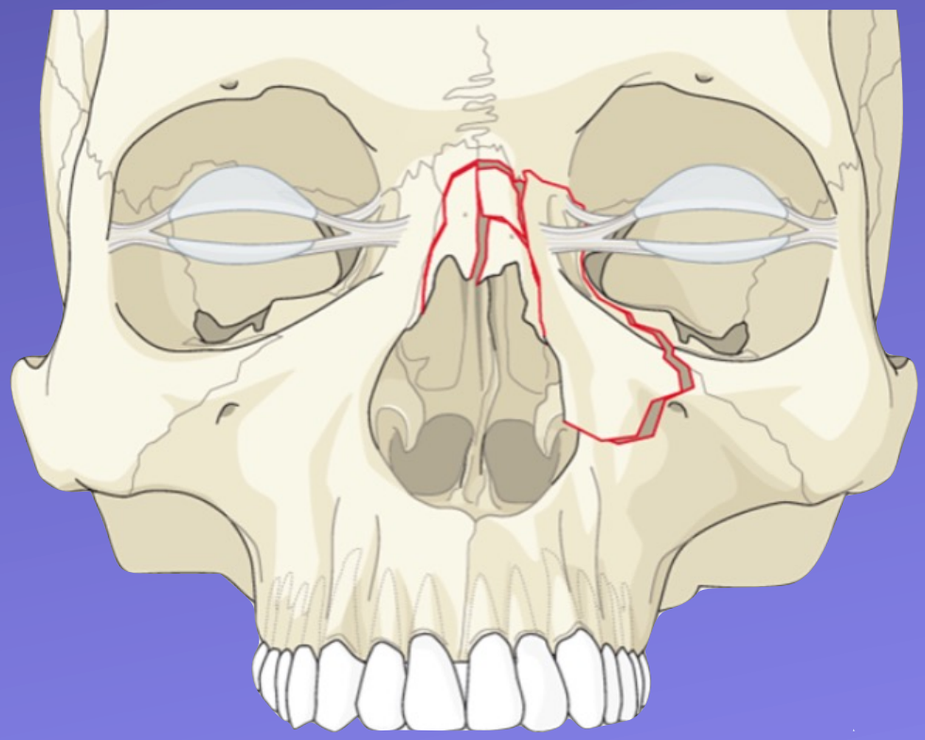


Nasal Fracture



Nasal Fracture

NOE (naso-orbital-ethmoid) Fracture

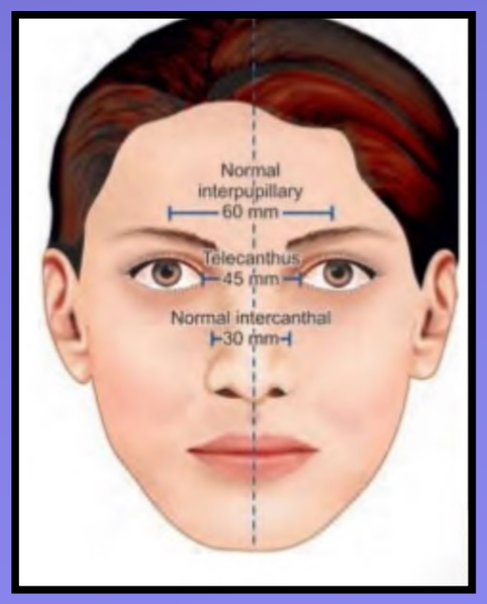


NOE (naso-orbital-ethmoid) Fracture

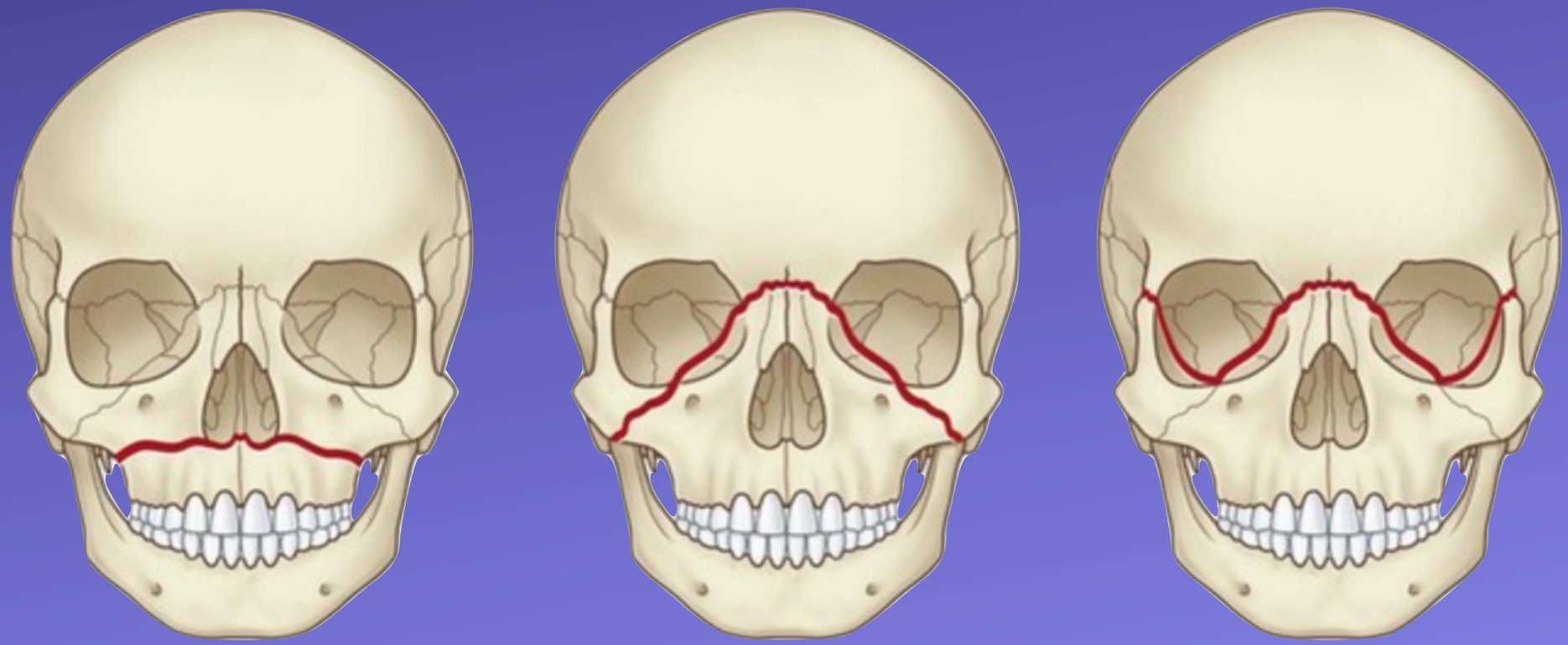
- Fractures that extend into the nose through the ethmoid bones.
- Associated with lacrimal disruption and dural tears.
- Suspect if there is trauma to the nose or medial orbit.
- Patients complain of pain on eye movement.

NOE (naso-orbital-ethmoid) Fracture

Suspect NOE fracture if the patient has evidence of nasal fracture with telecanthus, widening of the nasal bridge with detached medial canthus, and epistaxis or CSF rhinorrhea.



Le Fort Fractures

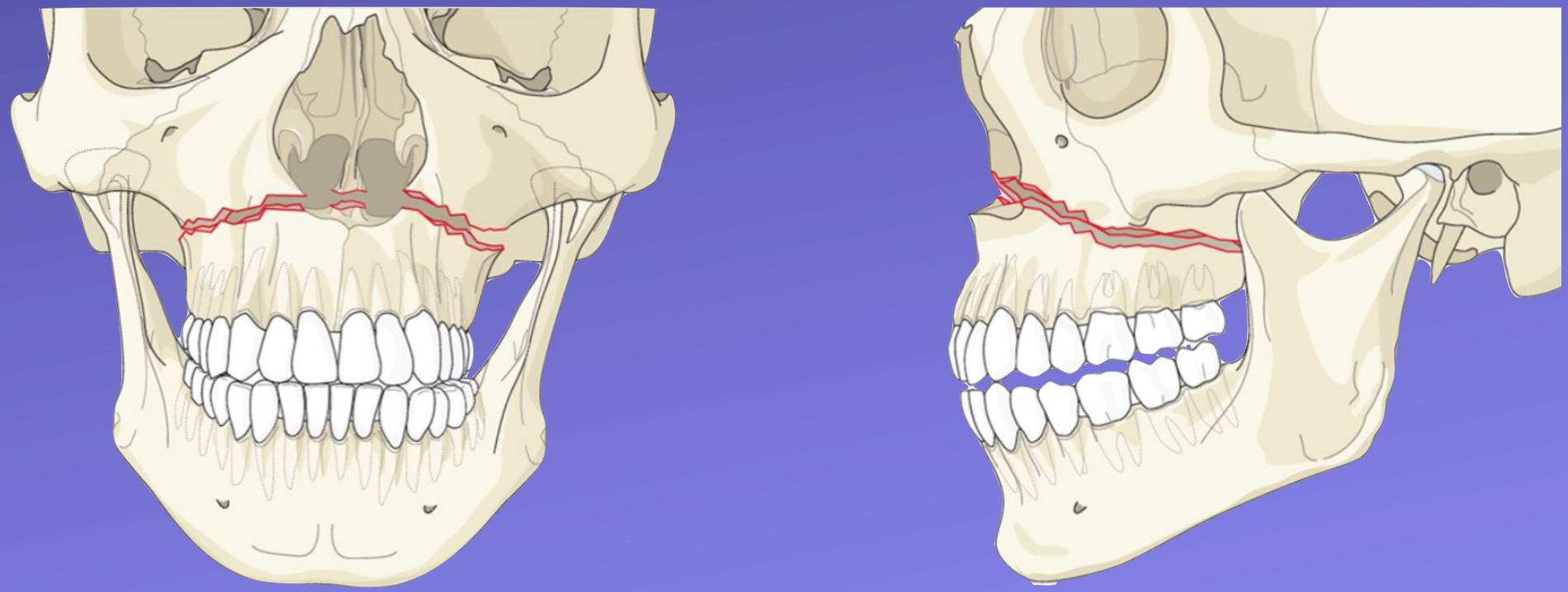


1

2

3

Le Fort 1 Fracture



Le Fort 1 Fracture

Definition:

- Horizontal fracture of the maxilla at at the level of the nasal fossa

- Allows motion of the maxilla while the nasal bridge remains stable.

Subcategories:

- Linear fracture

- Unilateral comminution

- Bilateral comminution

- Endentulous

Le Fort 1 Fracture

Signs and Symptoms

Extraoral

- Facial edema
- Malocclusion
- Maxilla mobility while nasal bridge remains stable

Intraoral

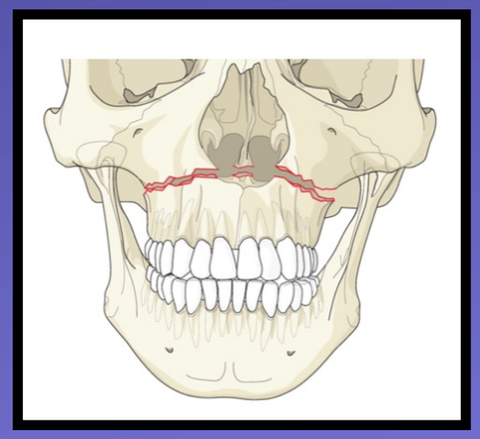
- Floating maxilla
- Impacted or telescoping fracture
- Anterior open bite
- Malocclusion
- Ecchymosis
- May have a mid palatal split
- May have damaged or subluxed teeth
- Guerin's sign

Le Fort 1 Fracture

Treatment Options

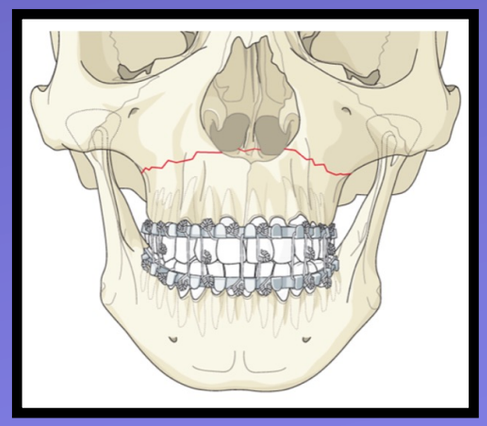
Observation

Good Occlusion
Non or minimal mobility



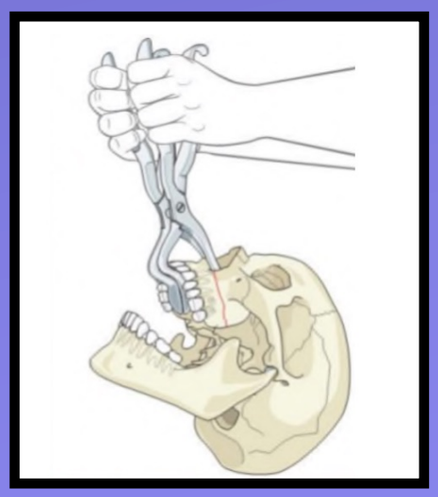
Maxillary Mandibular Fixation

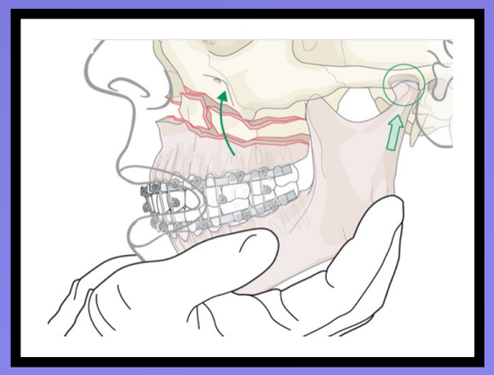
Minor malocclusion
Non or minimal mobility

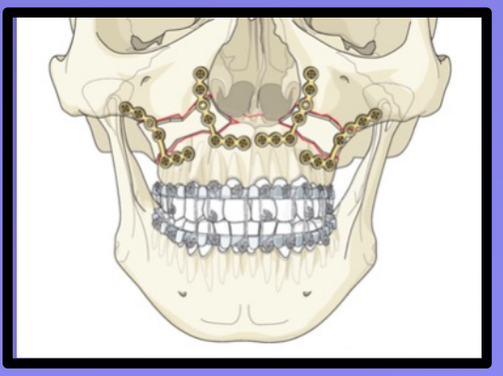


Open Reduction

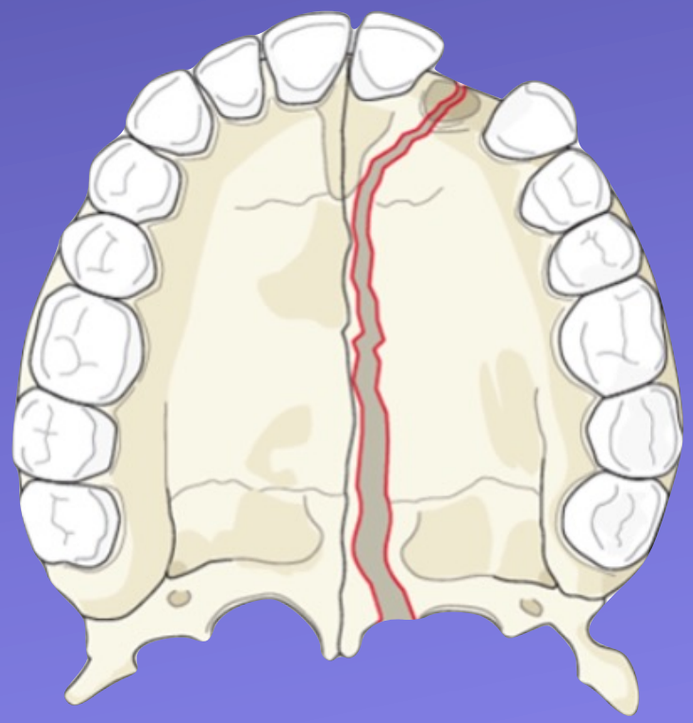
Mobile maxilla resulting in malocclusion

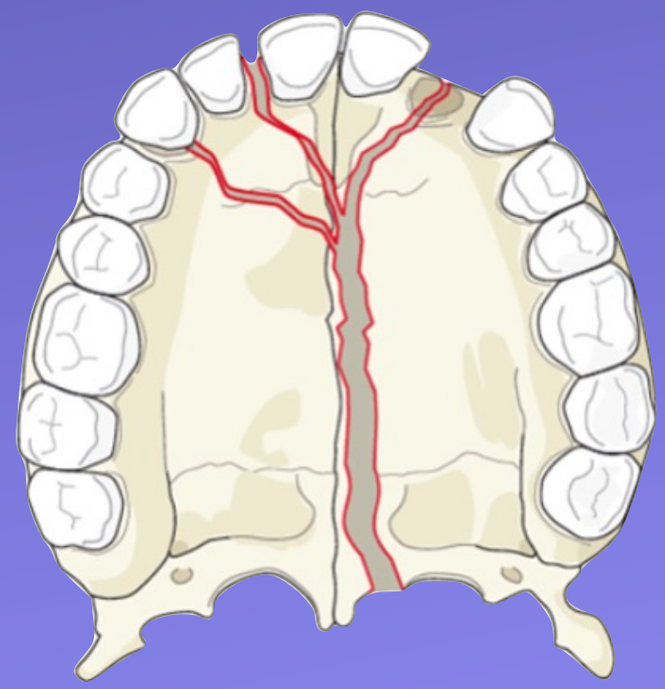




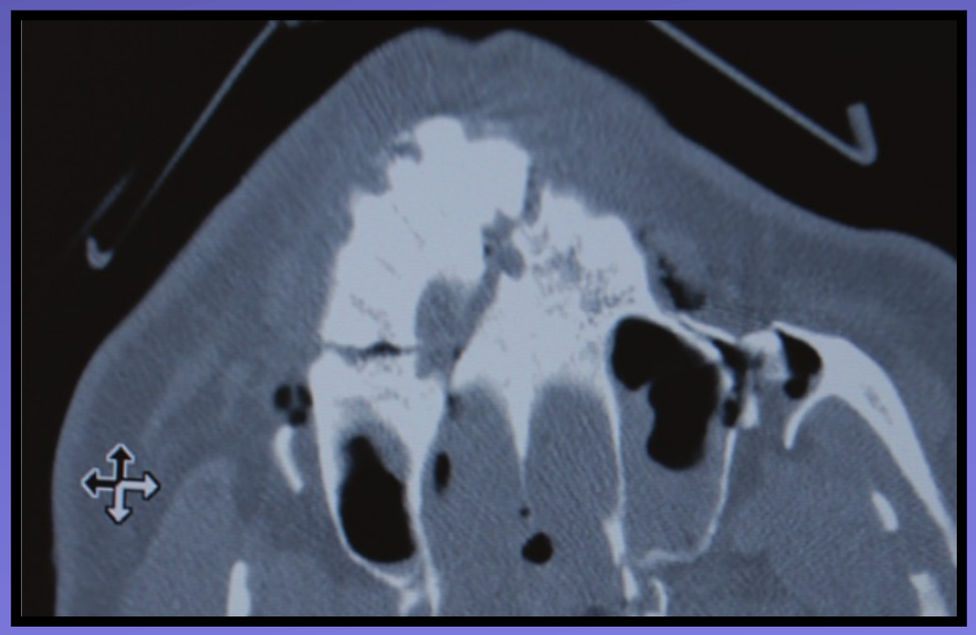


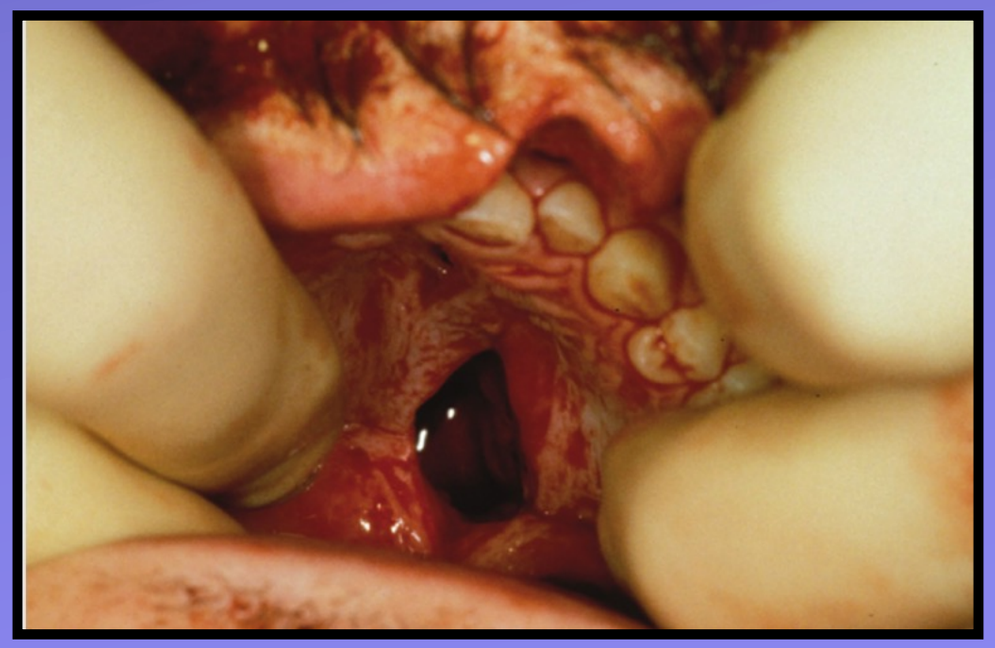
Palatoalveolar Fracture
(Hemi Le Fort 1)



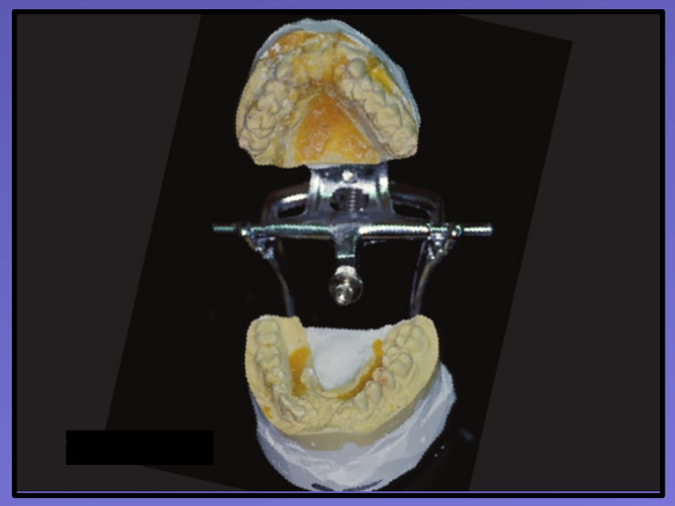


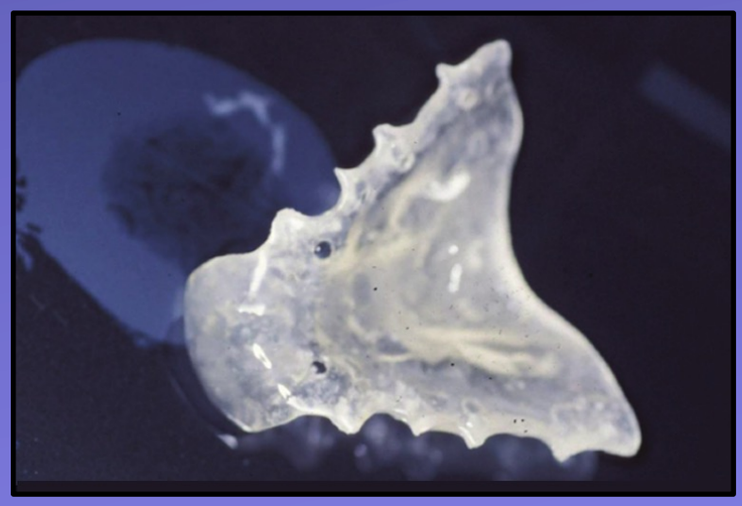
Palatoalveolar Fracture
(Hemi Le Fort 1)

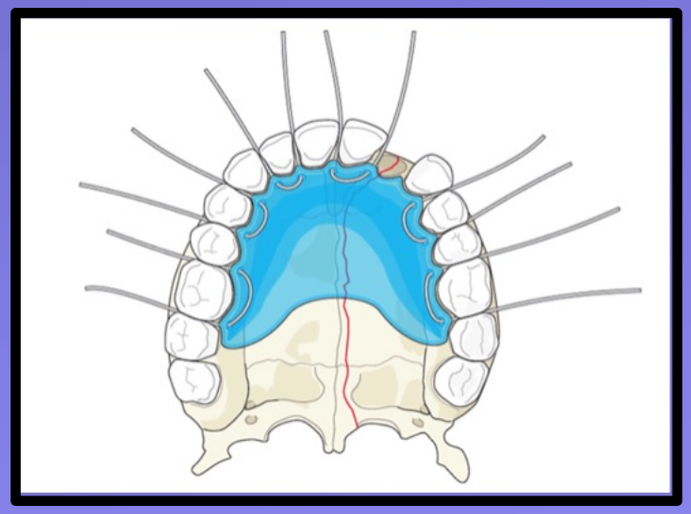




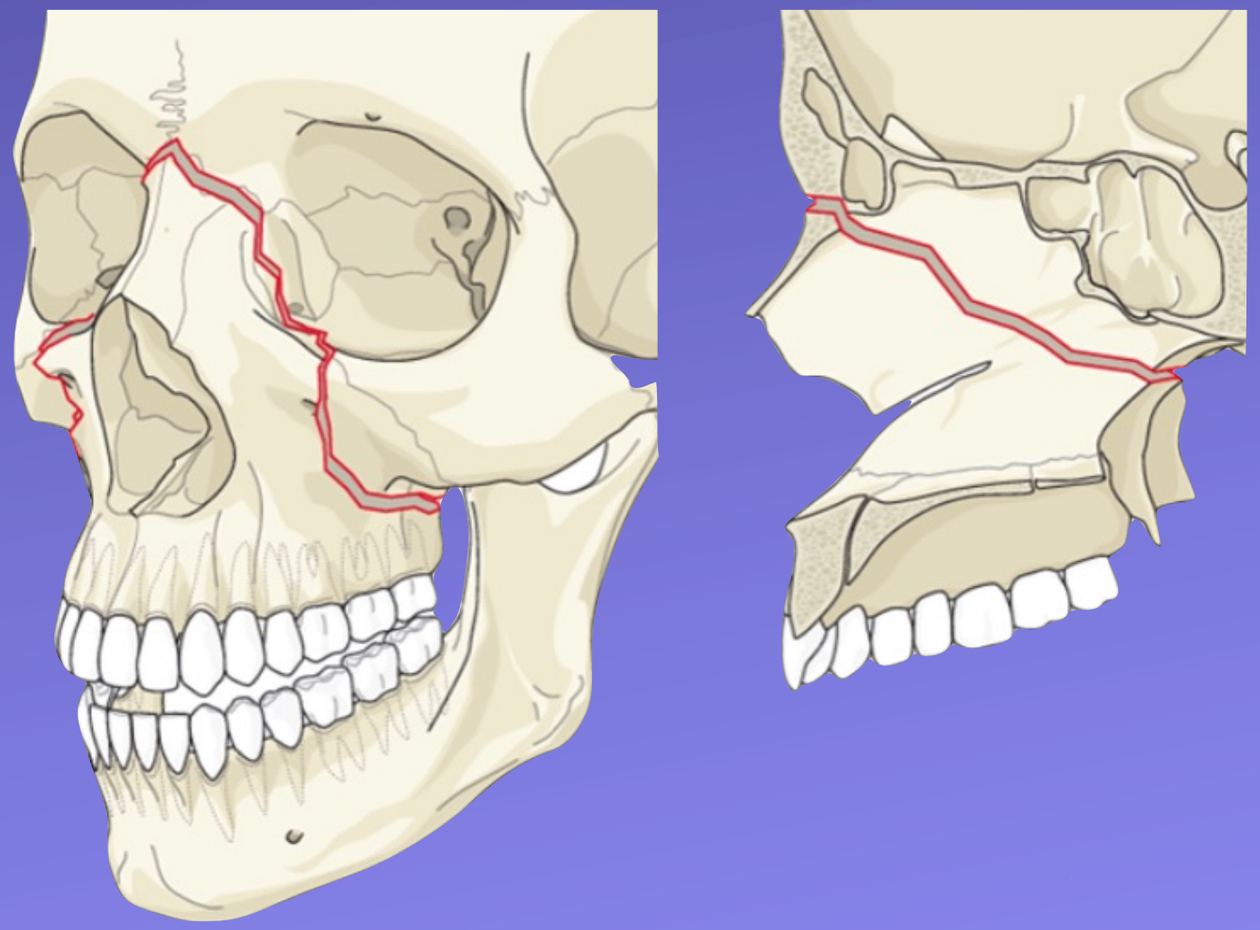
Palatoalveolar Fracture
(Hemi Le Fort 1)
Closed Treatment







Le Fort 2 Fracture

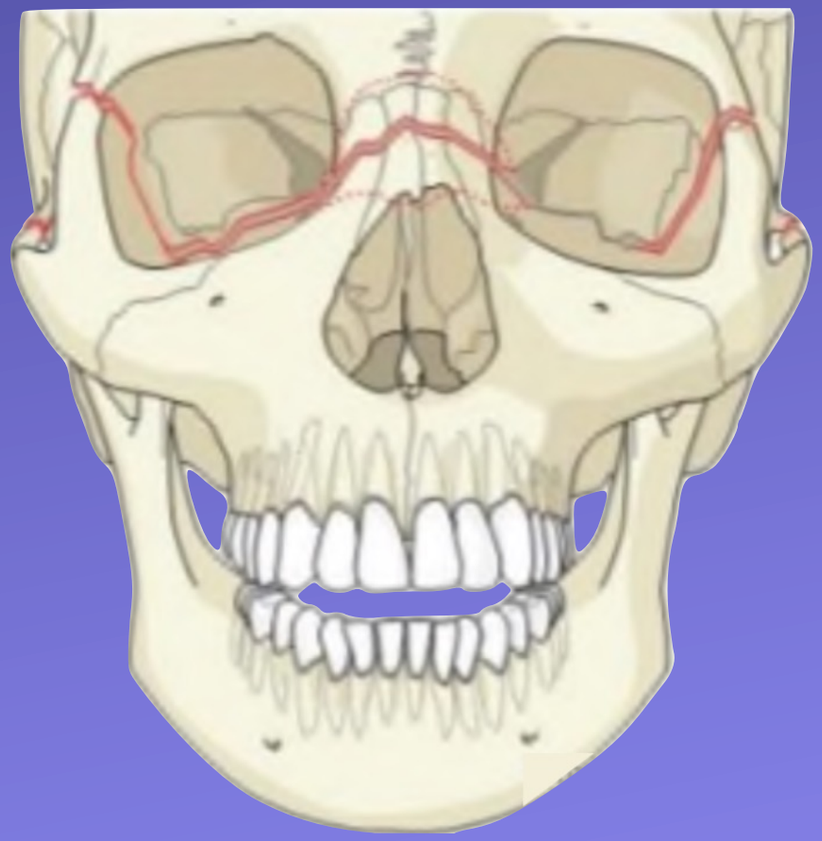


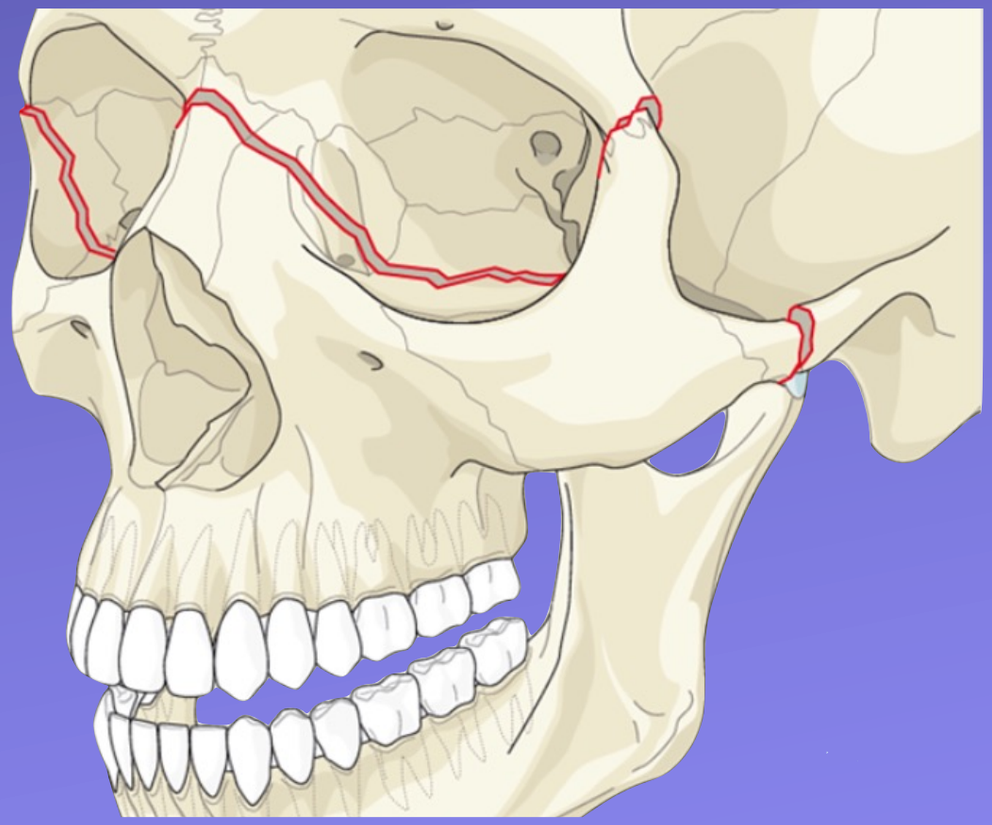
Le Fort 2 Fracture

Definition:

Pyramidal fracture starts at the nasal bone, extends through the lacrimal bone, and courses downward through the zygomaticomaxillary suture. It courses posteriorly through the maxilla and below the zygoma into the upper pterygoid plates. The inner canthus of the nasal bridge is widened. Infraorbital hypesthesia often exists as well as bilateral subcutaneous hematoma.

Le Forte 3 Fracture





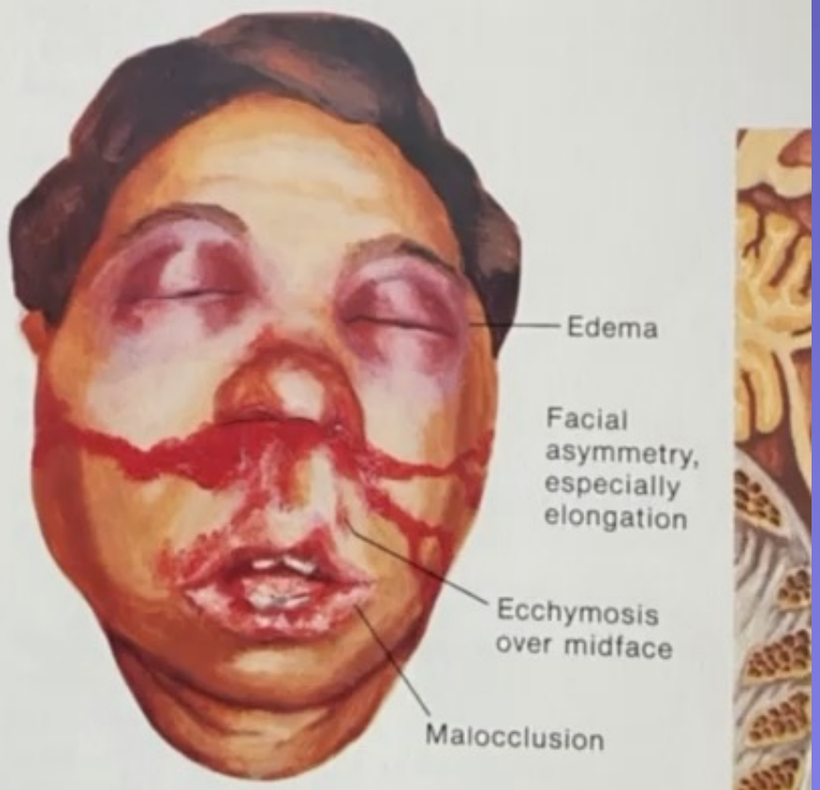
Le Forte 3 Fracture

Definition:

Craniofacial dysjunction also starts at the nasal bridge. It extends posteriorly through the ethmoid cones and laterally through the orbits below the optic foramen, through the pterygomaxillary suture into the sphenopalatine fossa. The fracture separates the facial bones from the cranium causing the face to appear long and flat.

Plate 12

Clinical Findings in Midface F



Craniofacial dysjunction in Le Fort III fracture distorts facial symmetry

Le Fort 2 and 3 Fractures

"To transfer or not to transfer"

Due to the multidisciplinary nature of these fractures involving Neurosurgery, Ophthamology and Oral and Maxillofacial Surgery these patients are best transferred to a level 1 trauma center for definitive care with a team approach.

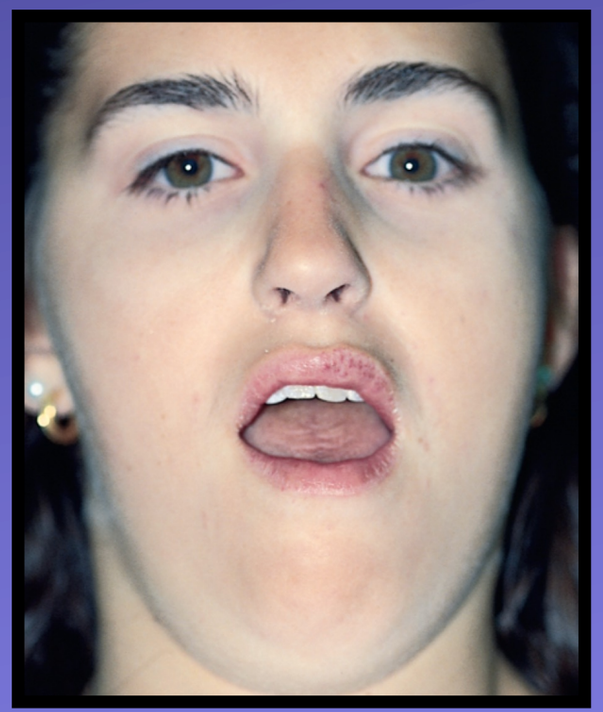
Mandibular Dislocation

Causes:

- Blunt trauma
- Excessive opening of the mouth

Risk factors:

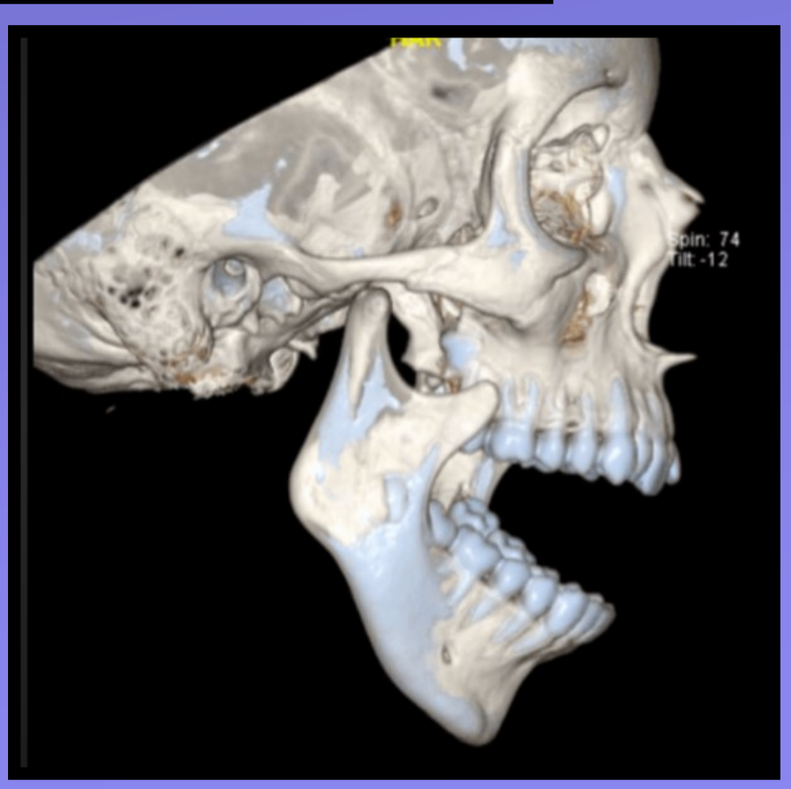
- Weakness of the temporal mandibular ligament
- Over stretched joint capsule
- Shallow articular eminence
- Neurologic disease



Mandibular Dislocation

Diagnosis:

- History and physical
- X-rays
- CT
- CT 3D reconstruction



Mandibular Dislocation

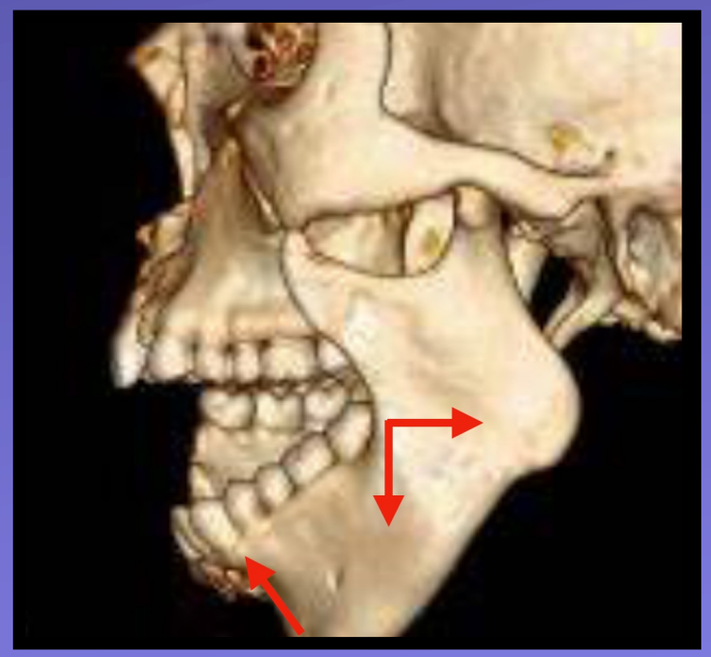
Clinical features:

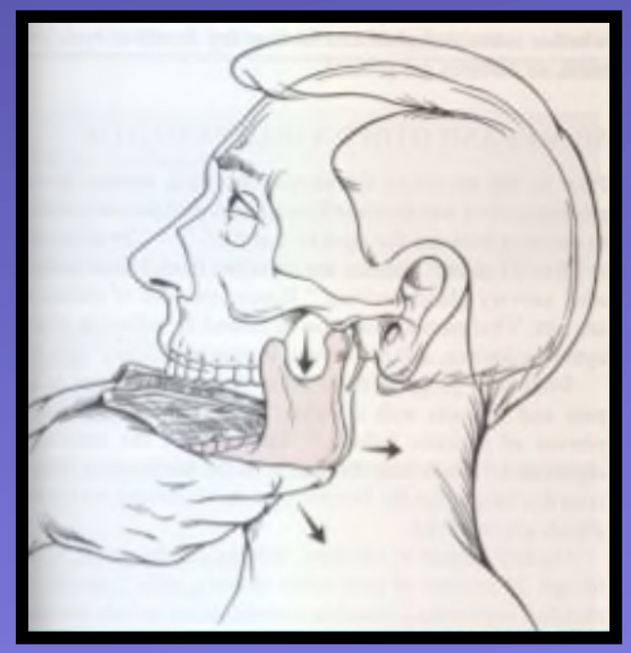
- Inability to close mouth
- Pain
- facial swelling

Physical exam:

- Palpable depression
- Jaw will deviate away
- Jaw displaced anterior

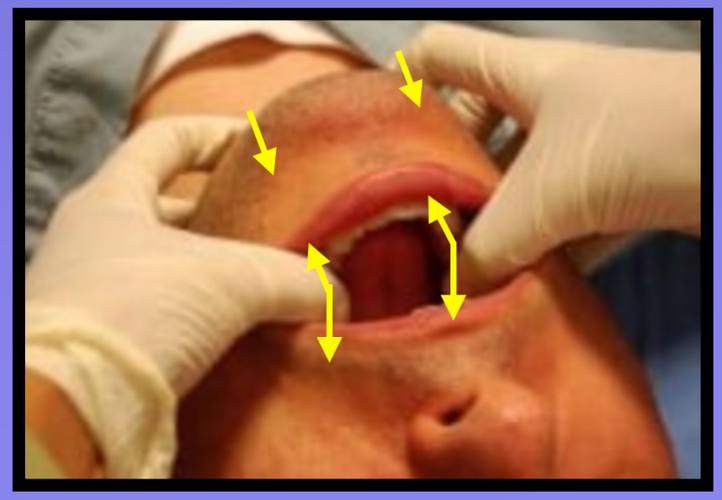
Mandibular Dislocation





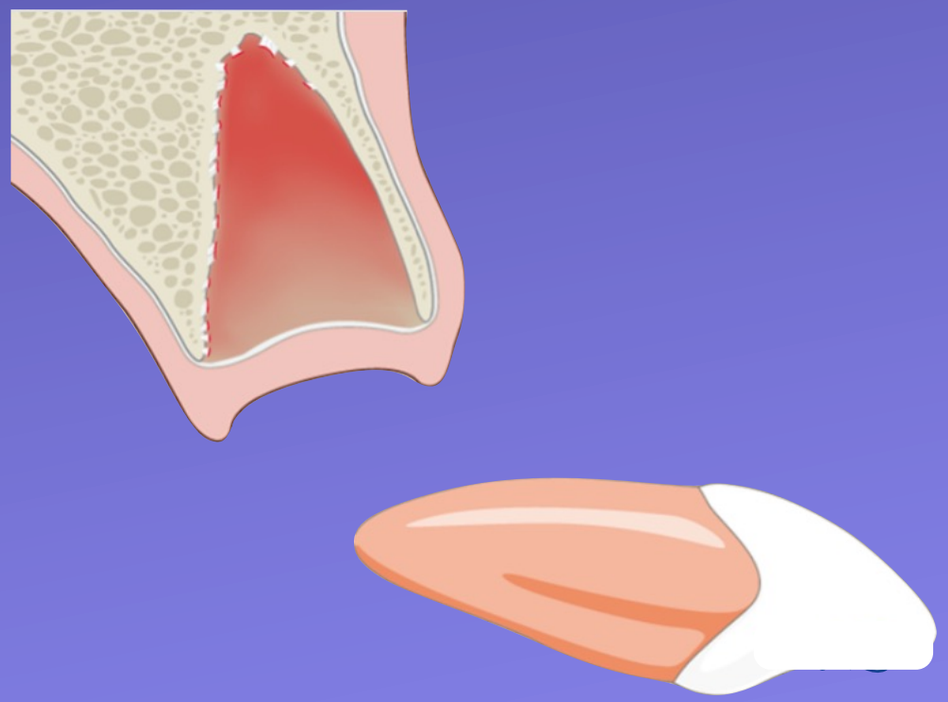
Treatment:

- Muscle relaxant
- Analgesic
- Closed reductions in the ED



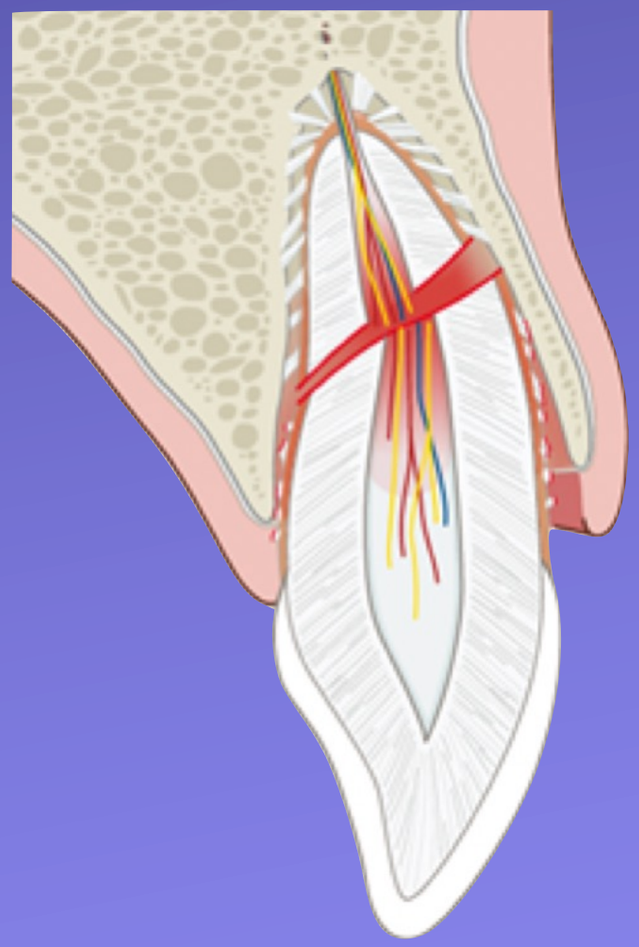
Dento-alveolar Trauma

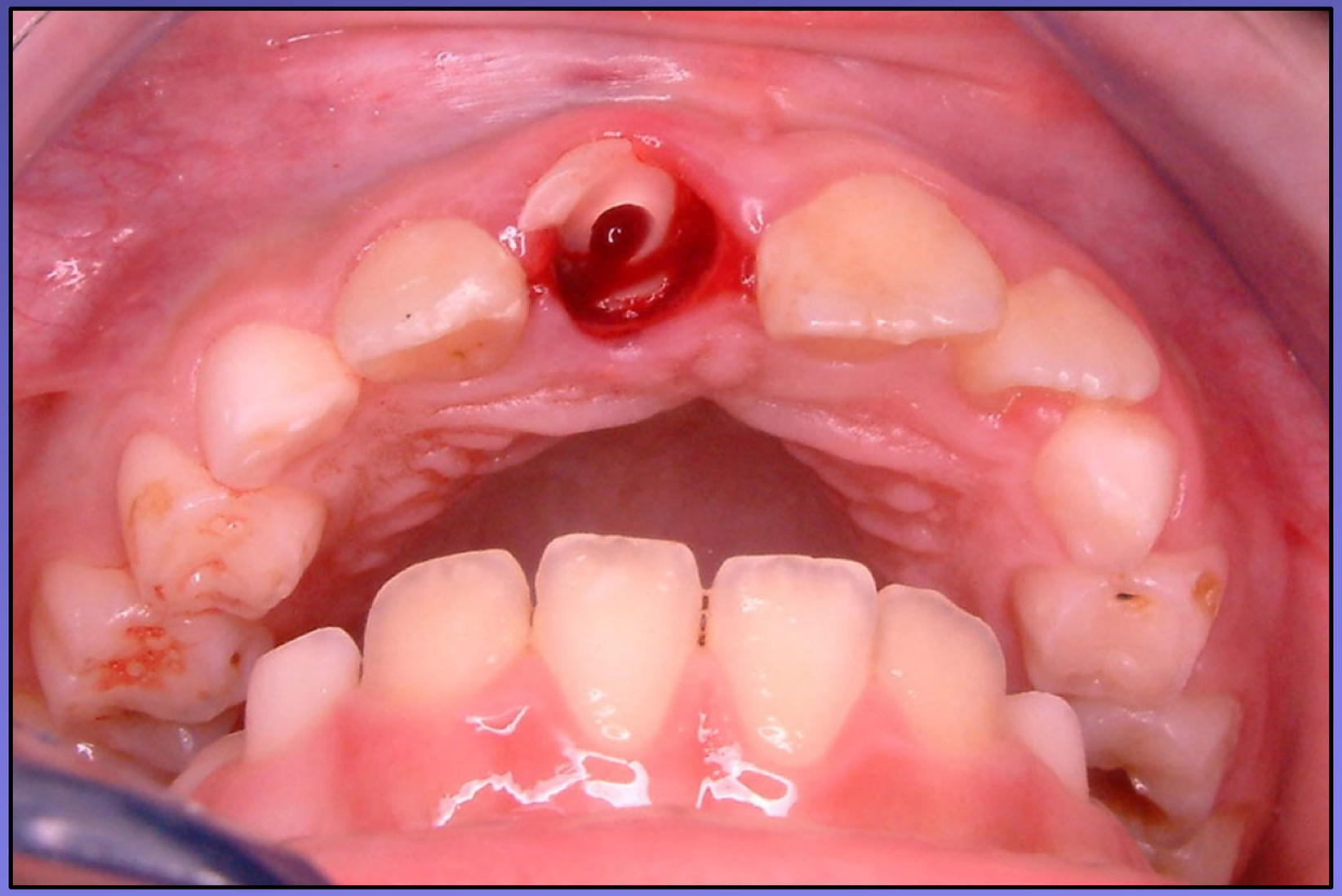
Dental Injuries (Crown/Root/Alveolar) Fractures
Avulsion



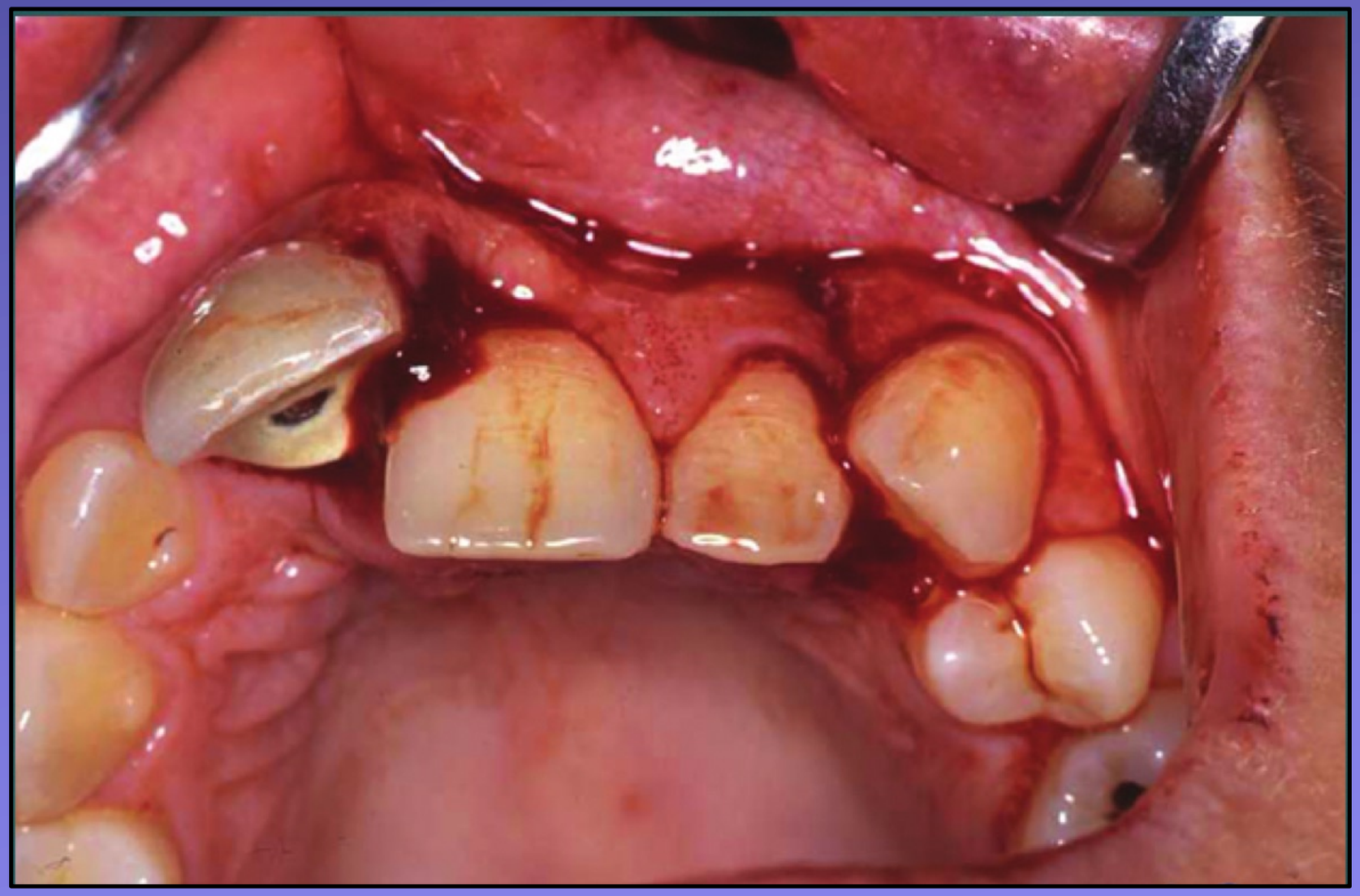
Crown Fracture

Root Fracture





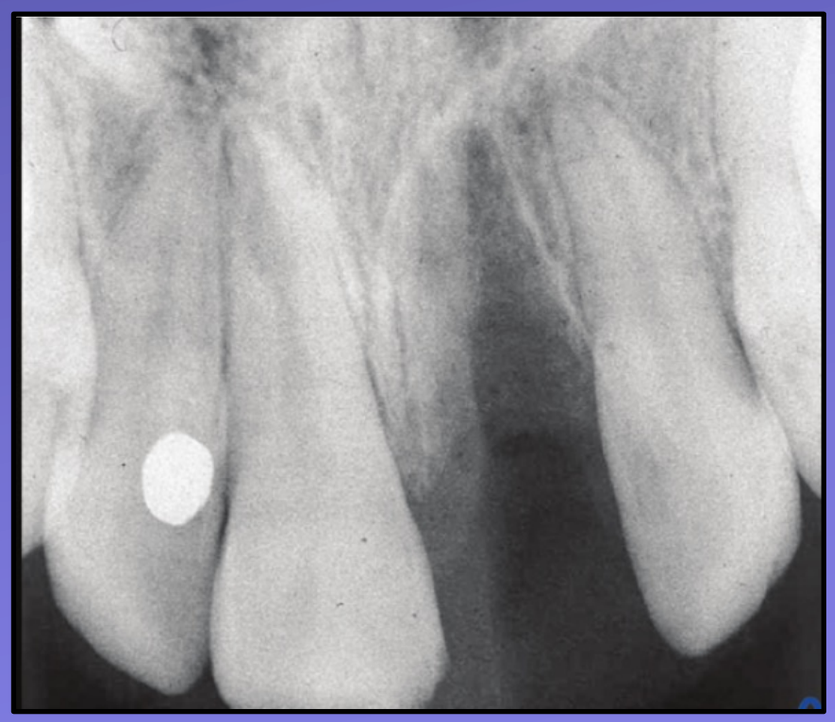
Alveolar Fracture



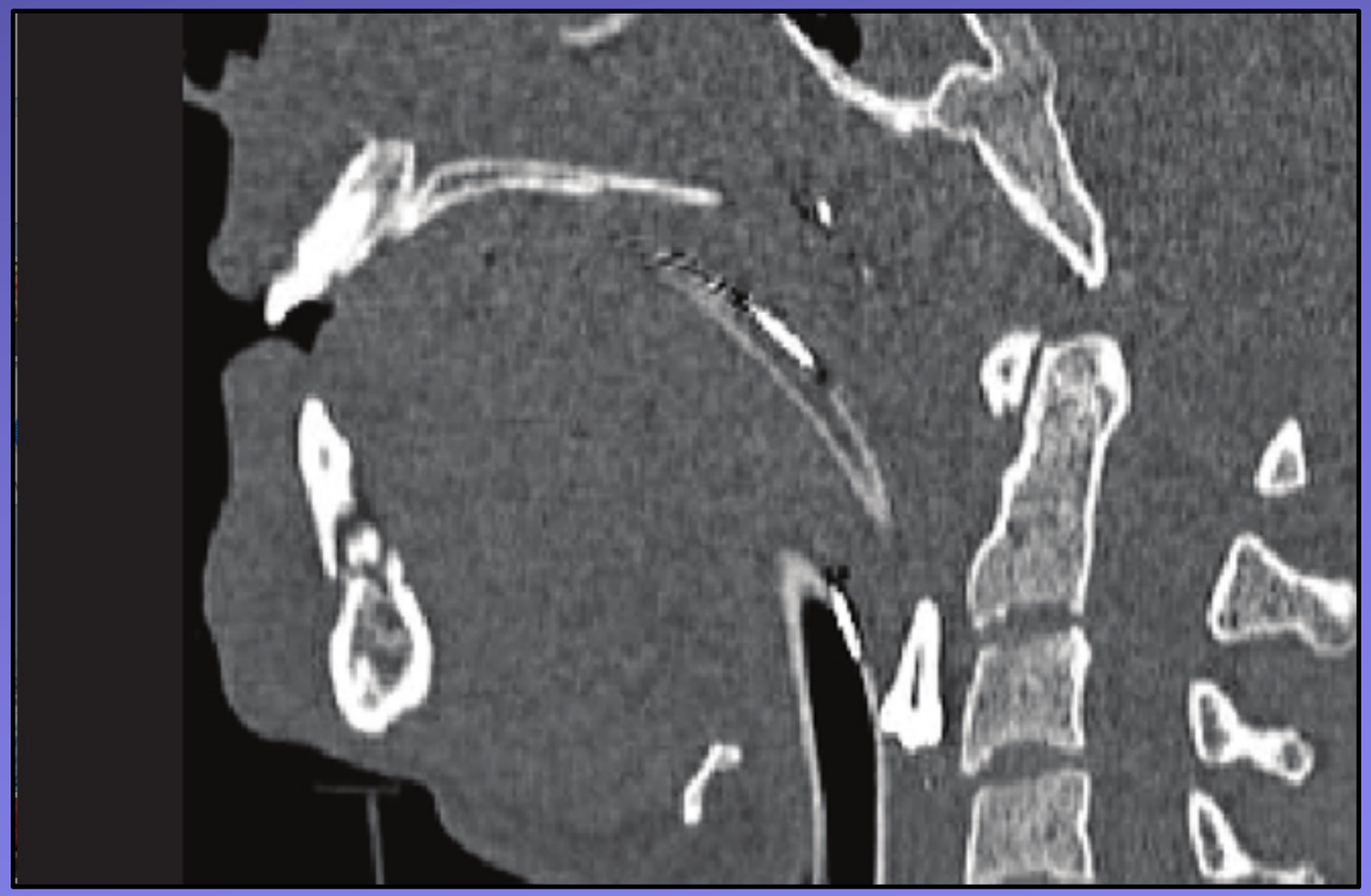
Treatment of Dental/Dentoalveolar Fractures

- See Dentist the next day (Best treated in dental setting)
- Pain Medication/Antibiotics/Steroid
- Full Liquid Diet
- May require root canal treatment with extensive restoration or extraction

Tooth Avulsion



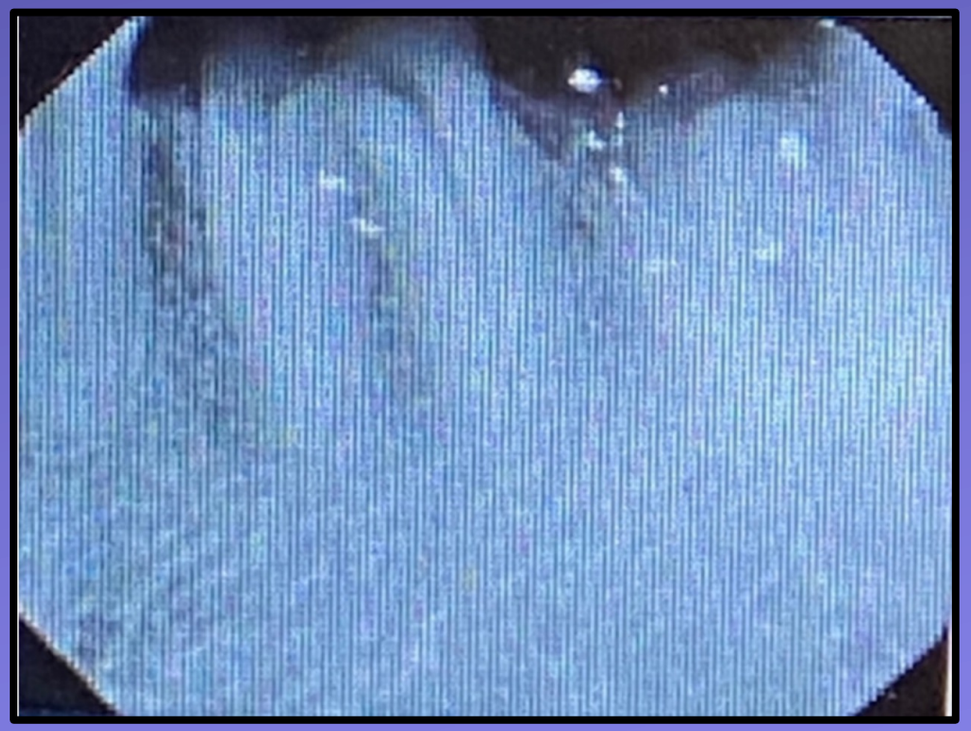
Where is the tooth?

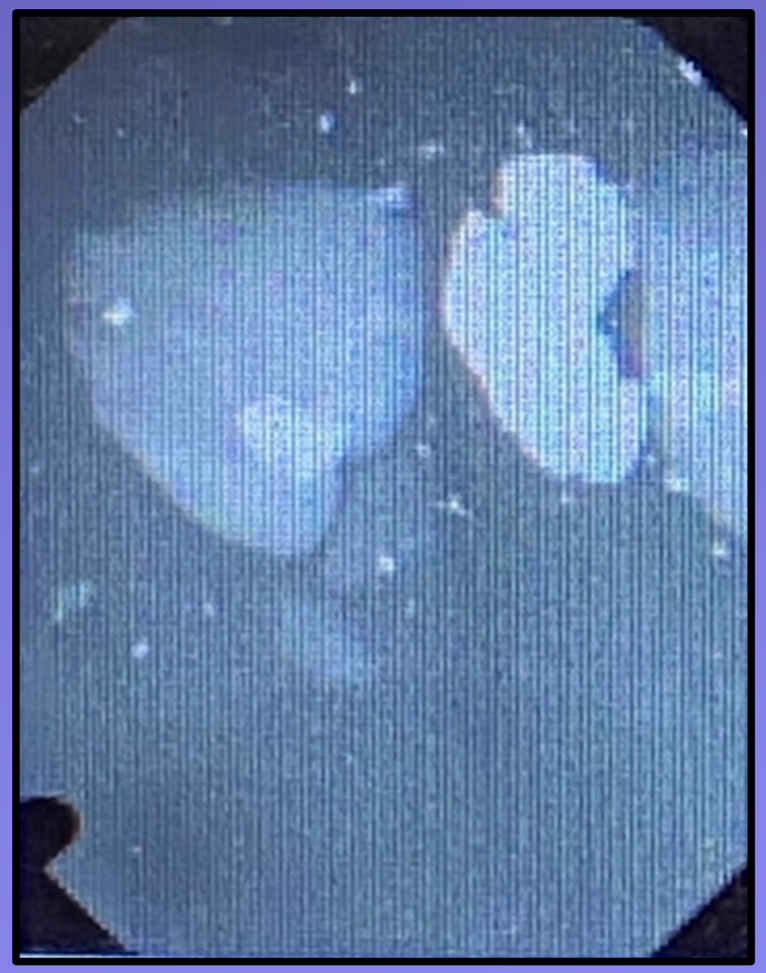


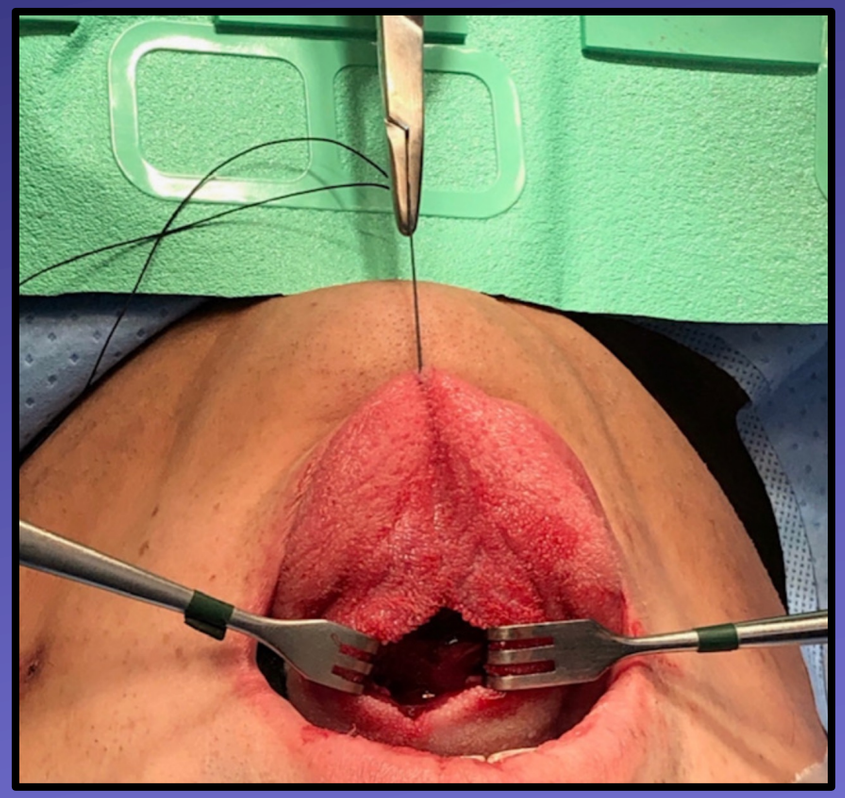
Treatment of Avulsed Tooth

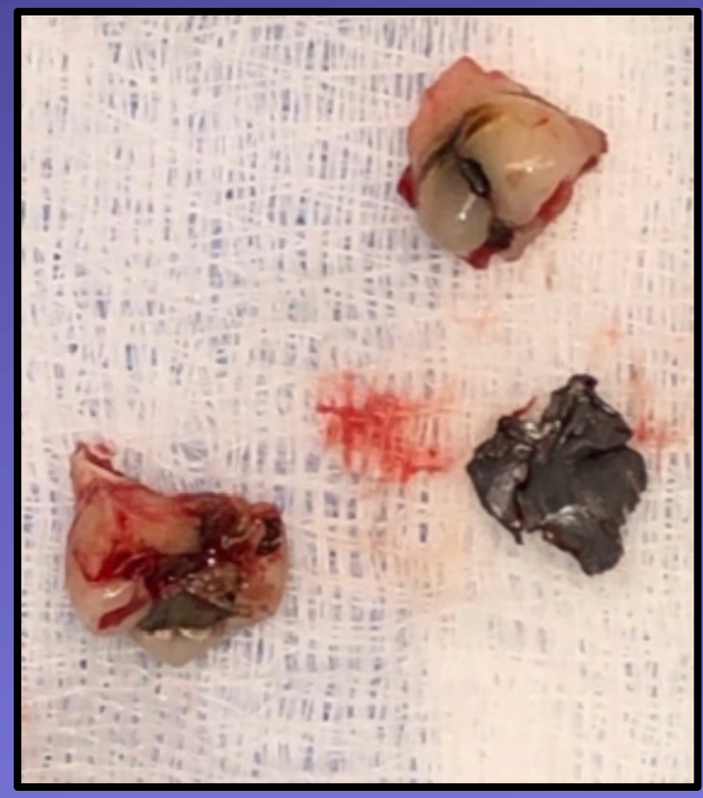
- "Golden Hour" (the quicker the treatment, the greater chance of tooth survival)
- Store tooth in saliva, Milk or HBSS
- Call on call Dentist ASAP
- Tooth may be splinted back into position
- Composite Resin and Wire
- Arch Bars
- Endodontic treatment in 2 - 4 weeks

Unusual Gun Shot Wound









Thank You