



SOCIETY OF TRAUMA NURSES

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Maxillofacial and Ocular Injuries

Objectives

**At the conclusion of this presentation
the participant will be able to:**

- Identify the key anatomical structures of the face and eye and the impact of force on those structures.
- Discuss assessment priorities for a patient with maxillofacial and ocular injuries.
- Prioritize the care of a patient with facial and ocular injuries.
- Discuss psychosocial support for a patient with maxillofacial and ocular injuries.

Mechanism of Injury

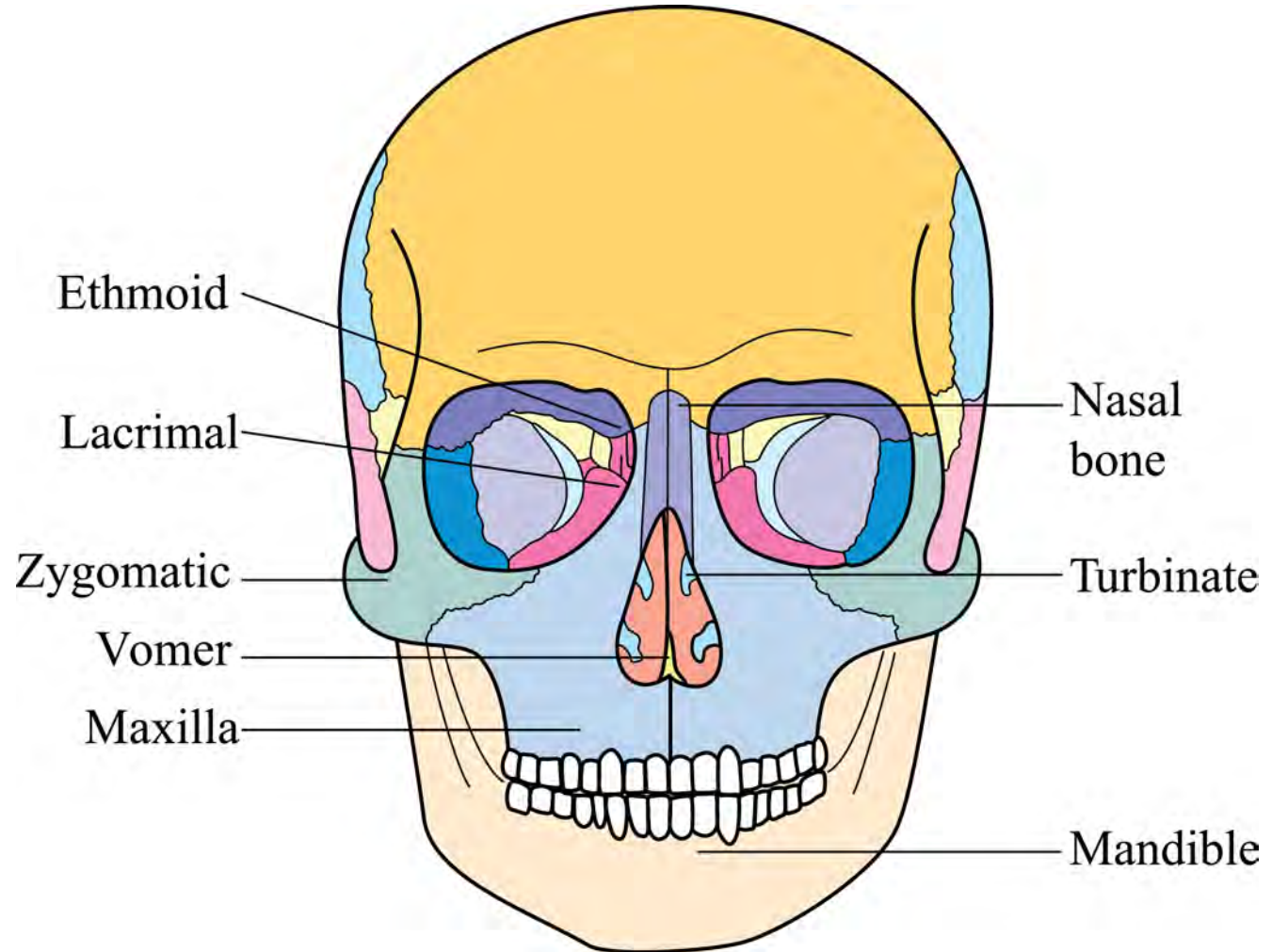
Low
velocity

High
velocity



Pathophysiology

- Bones of face make up the most complex skeletal area of the body.
- Maxillofacial fractures result from either blunt or penetrating trauma.



Pathophysiology

- 'G' force is a measure of acceleration not produced by gravity
- **High Impact:**
 - Supraorbital rim – 200 G
 - Symphysis Mandible – 100 G
 - Frontal – 100 G
 - Angle mandible – 70 G
- **Low Impact:**
 - Zygoma – 50 G
 - Nasal bone – 30 G





Etiology

60% of patients with severe facial trauma have multisystem trauma and the potential for airway compromise.



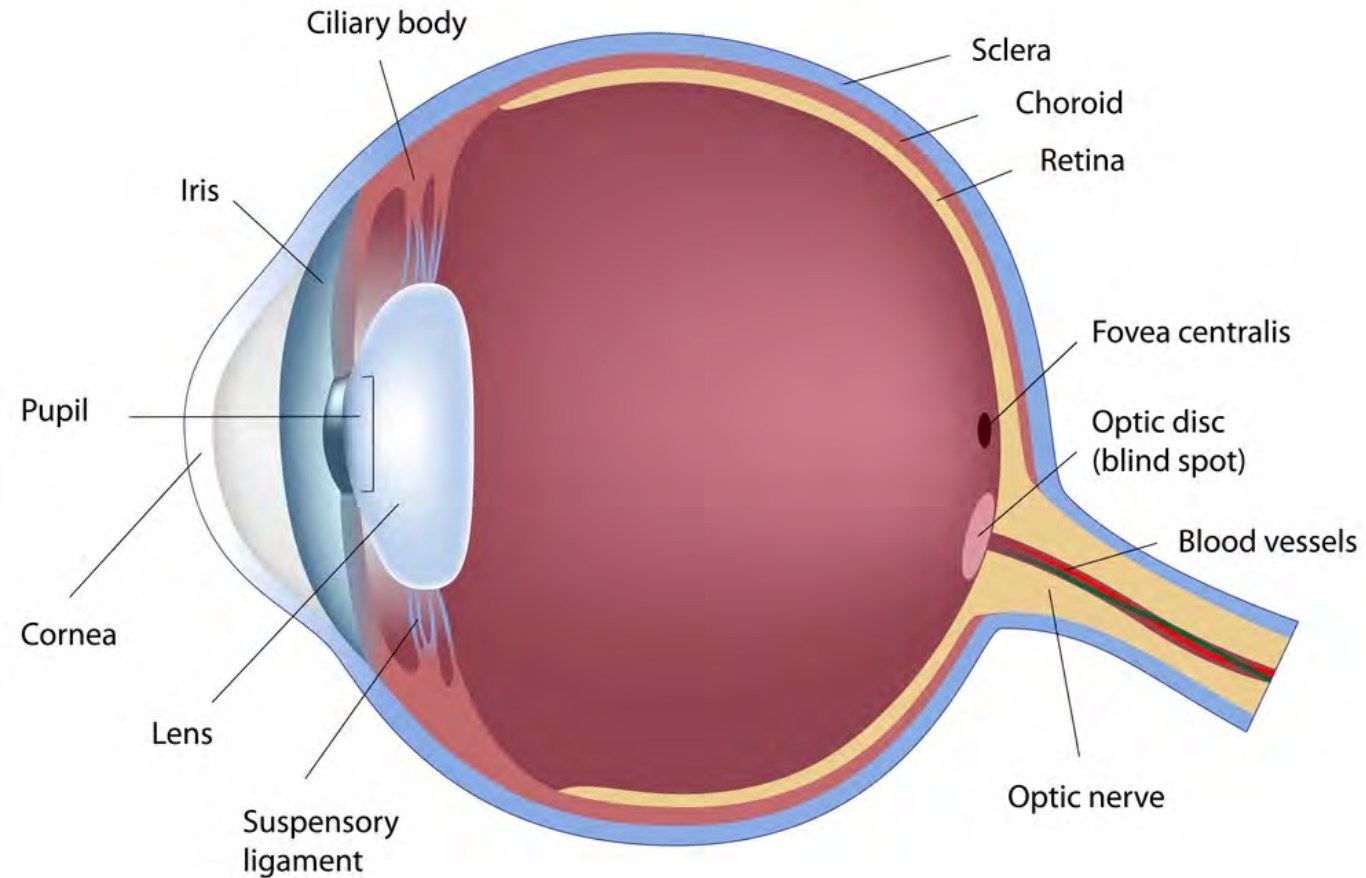
Etiology



- Approximately one quarter of women with facial trauma are victims of domestic violence.
 - Index of suspicion increases if an orbital wall fx is present.
- Approximately one quarter of patients with severe facial trauma will develop Post Traumatic Stress Disorder.

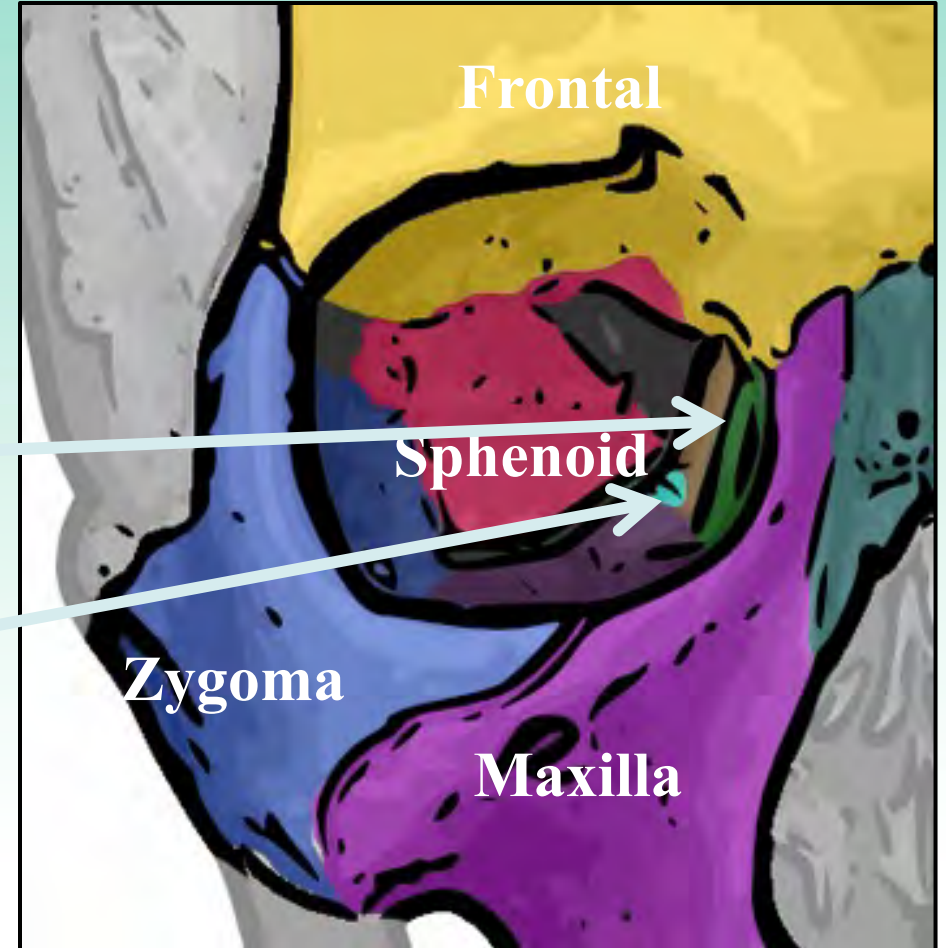
Ocular Structures

Human Eye Anatomy



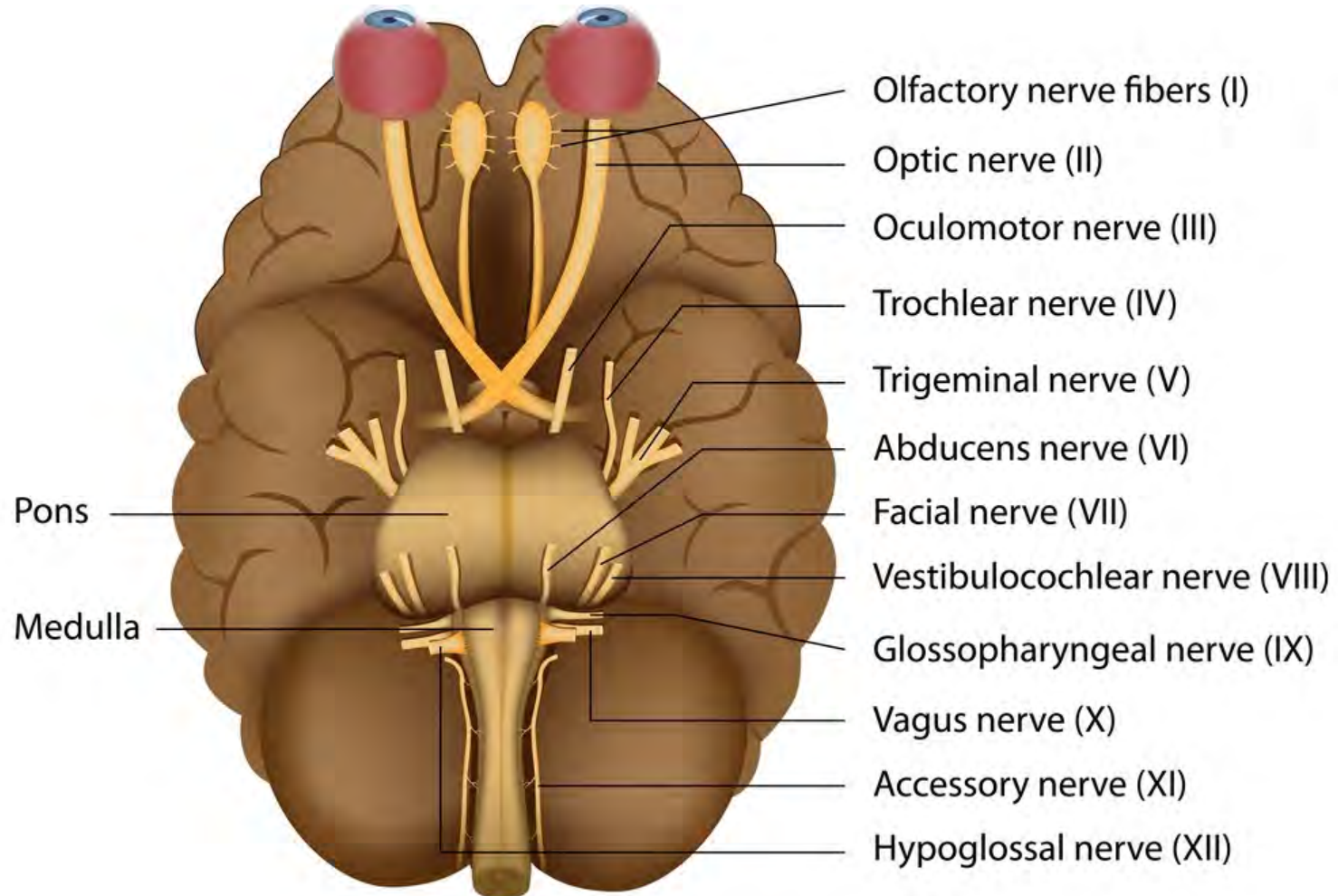
Bony Orbit

- Roof
 - Frontal bone
 - Sphenoid
- Medial wall
 - Maxilla
 - Lacrimal, ethmoid
 - Body of sphenoid
- Floor
 - Maxilla
 - Palatine
 - Zygoma
- Lateral
 - Zygoma and greater sphenoid

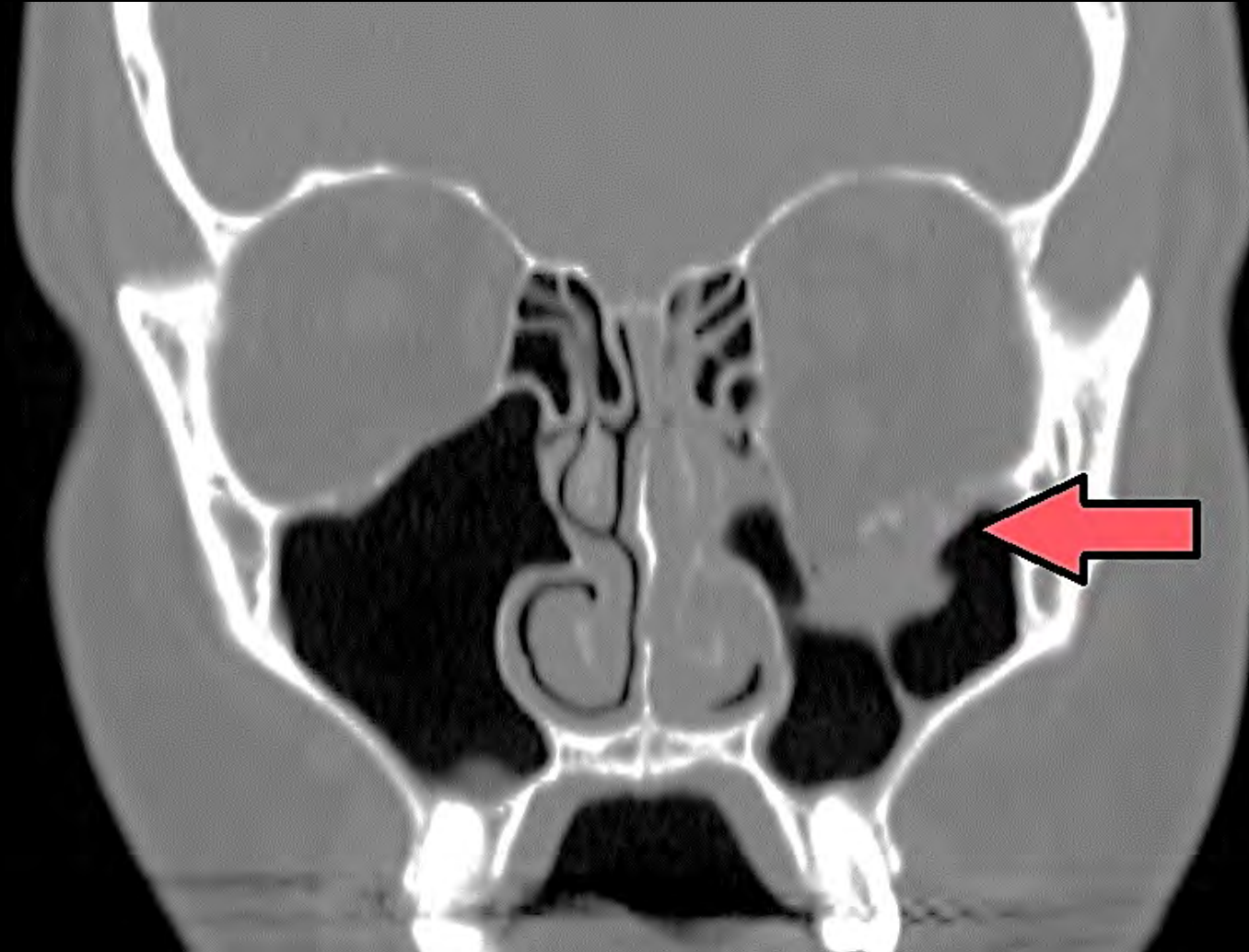


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Cranial Nerves

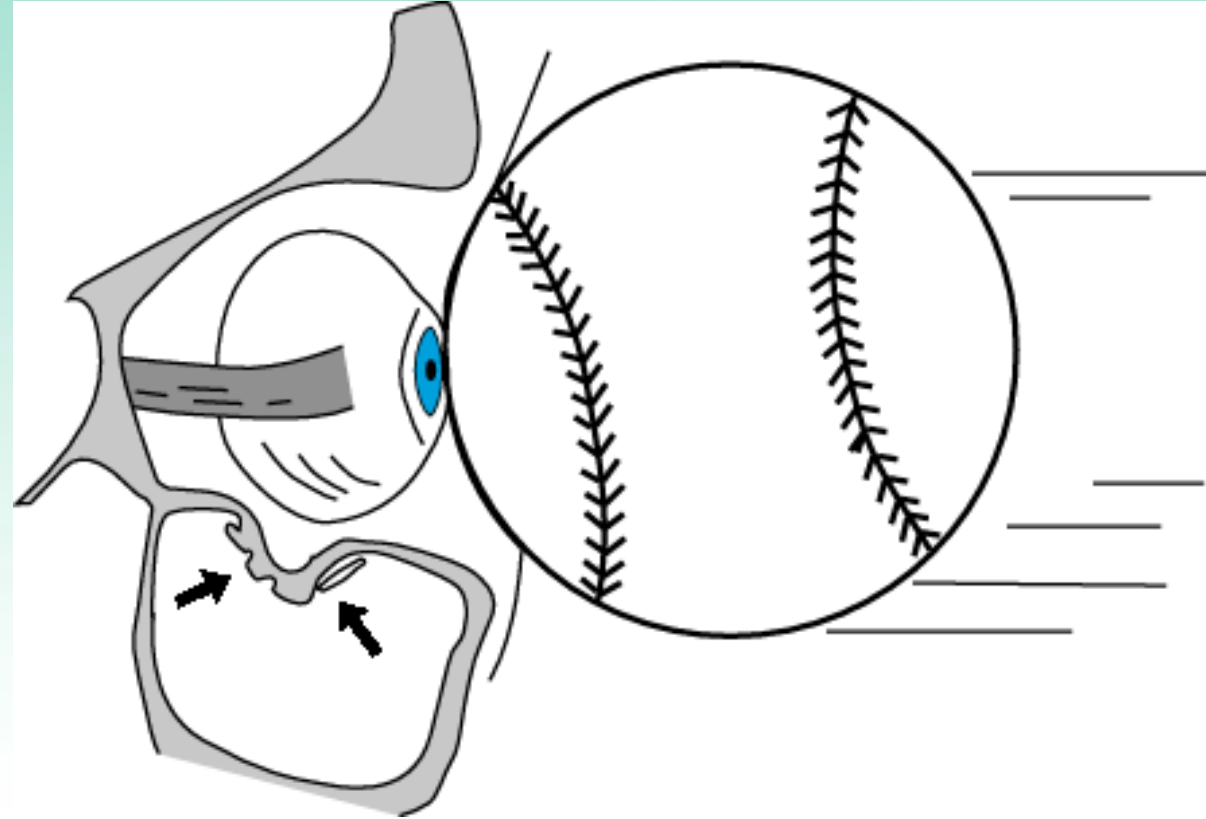


Orbital Fractures



Orbital Fractures

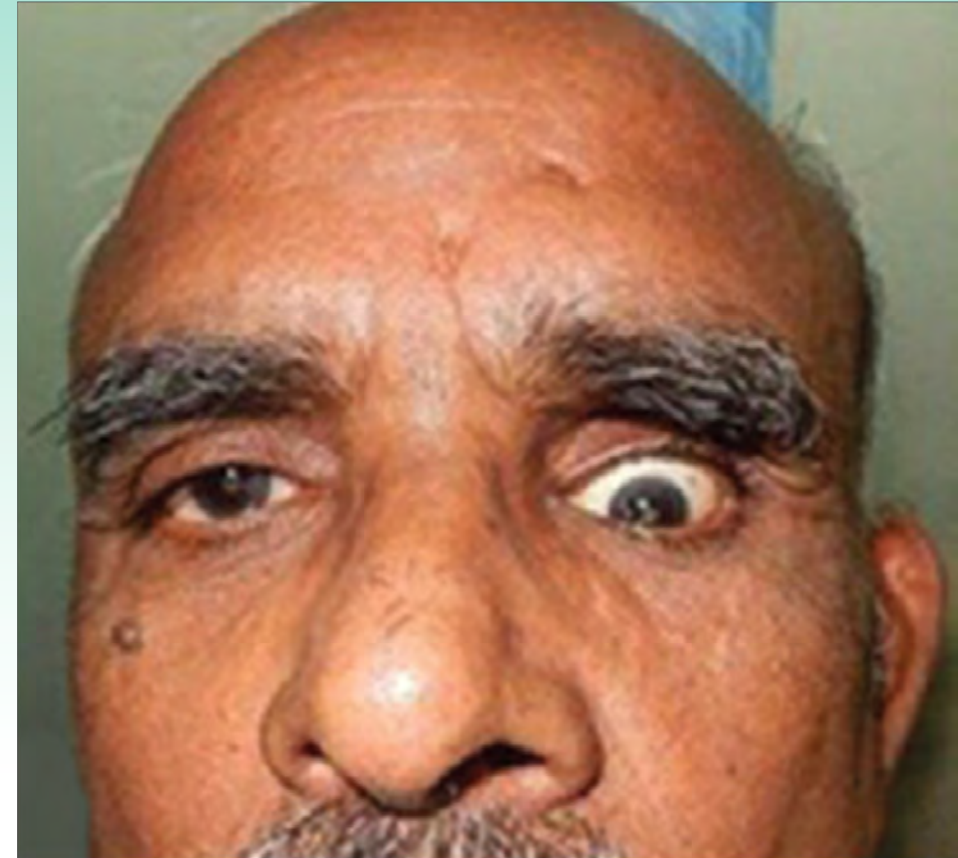
- Usually through floor or medial wall
- Enophthalmos
- Anesthesia
- Diplopia
- Infraorbital stepoff deformity
- Subcutaneous emphysema



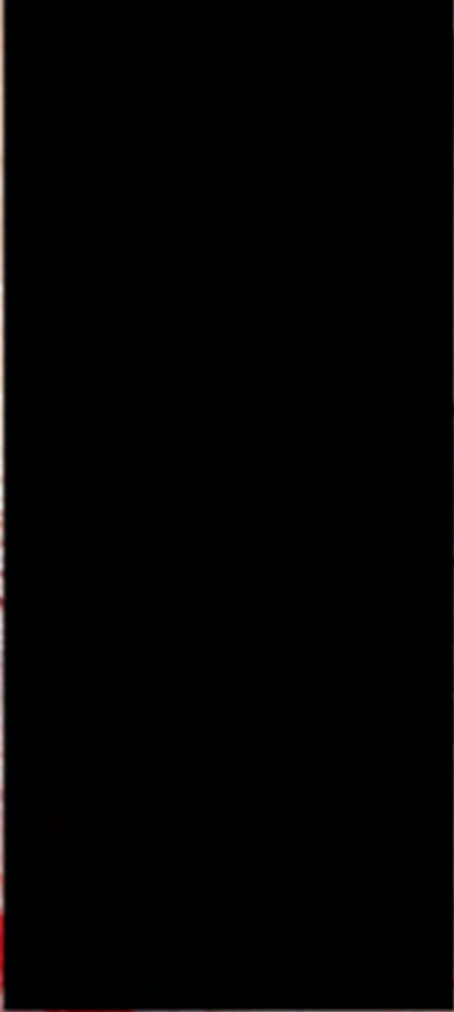
Lipa, et al. (2015)

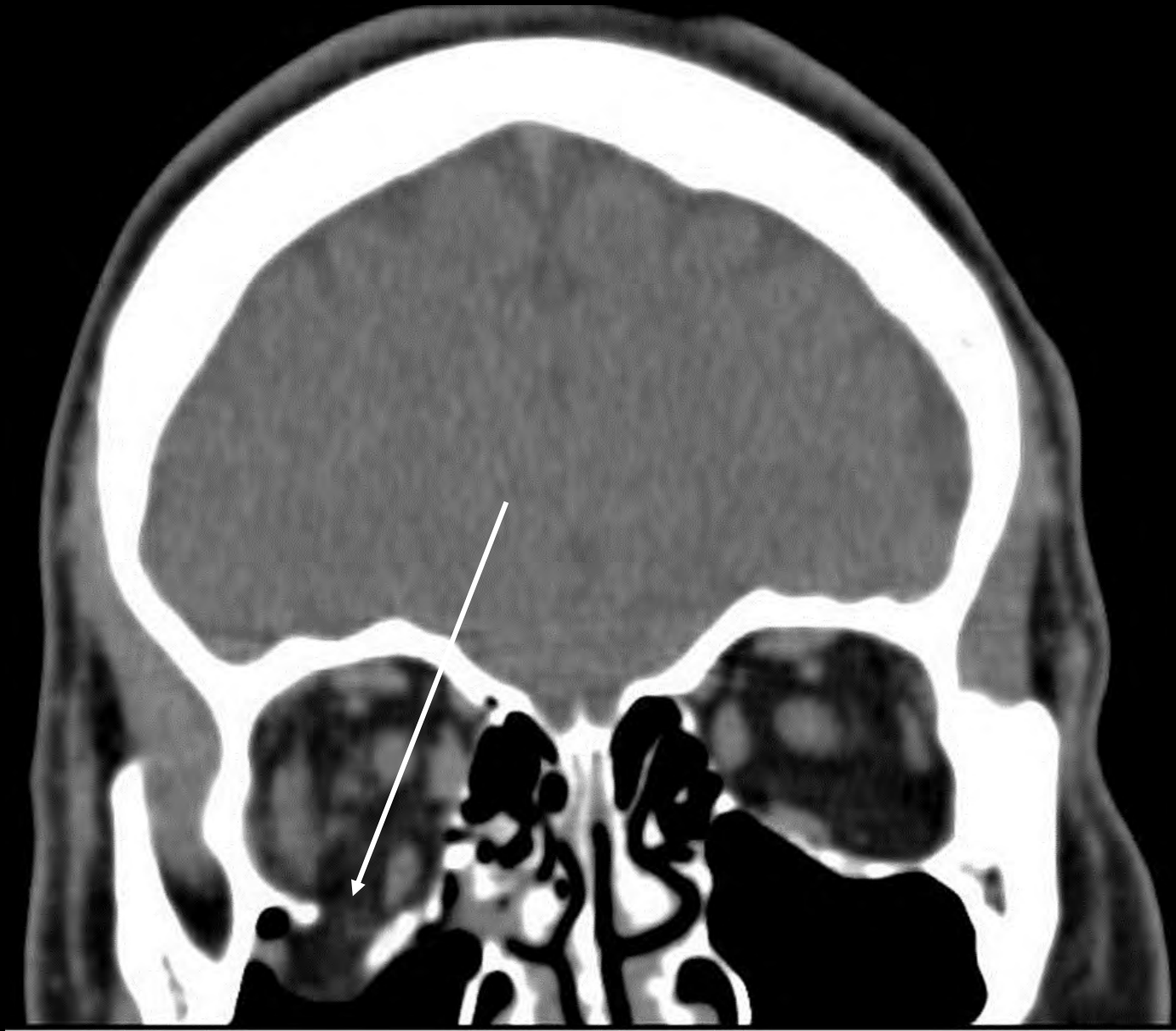
Orbital Fractures

- Symptoms
 - Periorbital swelling
 - Crepitus
 - Proptosis
 - Ophthalmoplegia
 - Enophthalmos
 - Palpable defects
- Assess for globe injury
- Avoid nose blowing
- Assess for entrapment

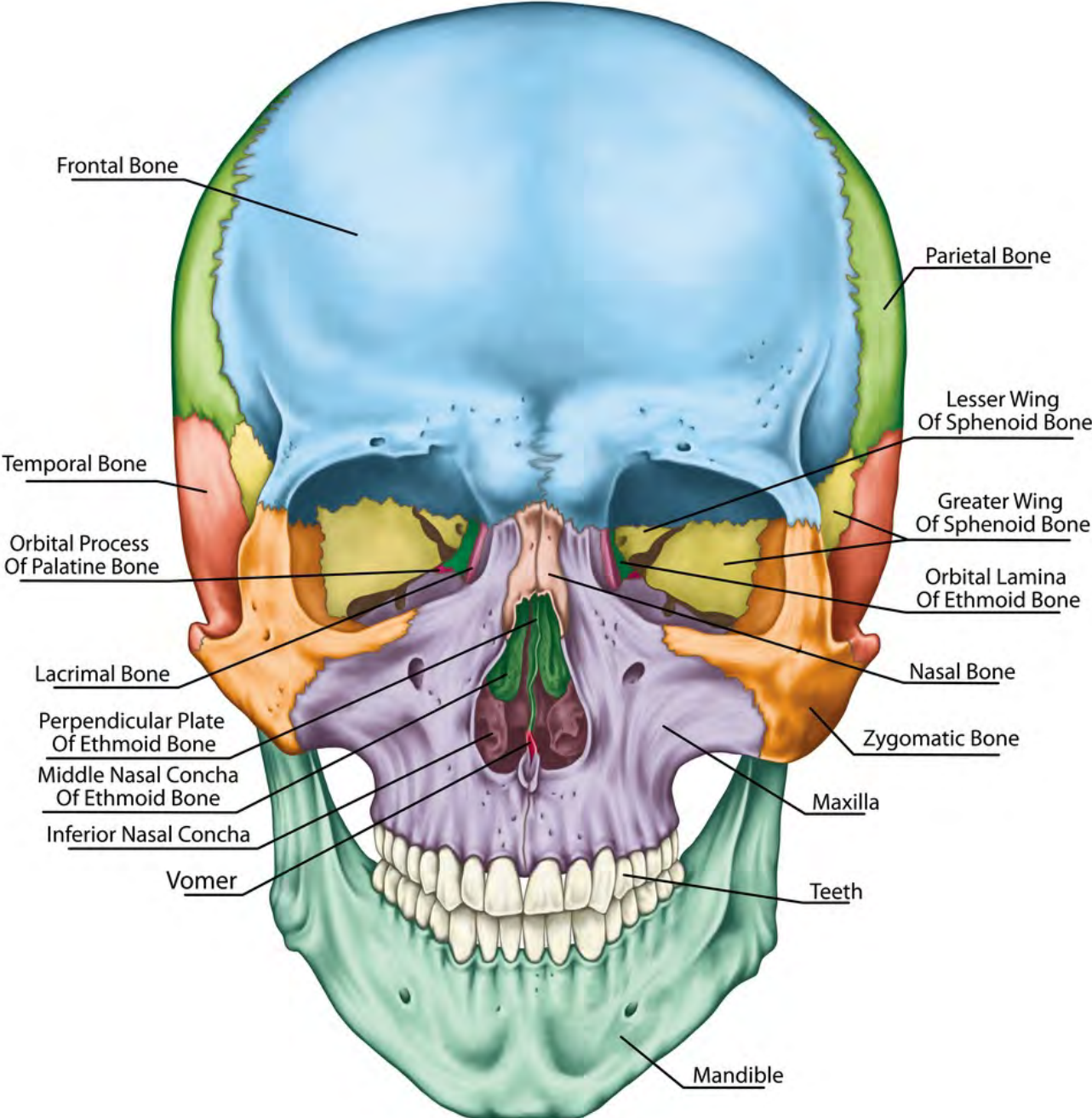


Jha, 2018

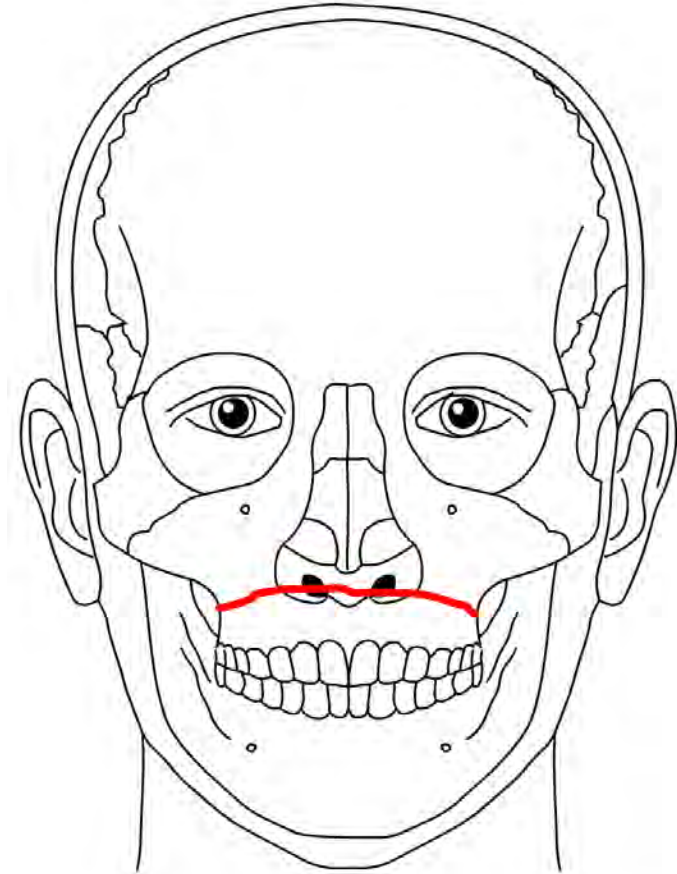
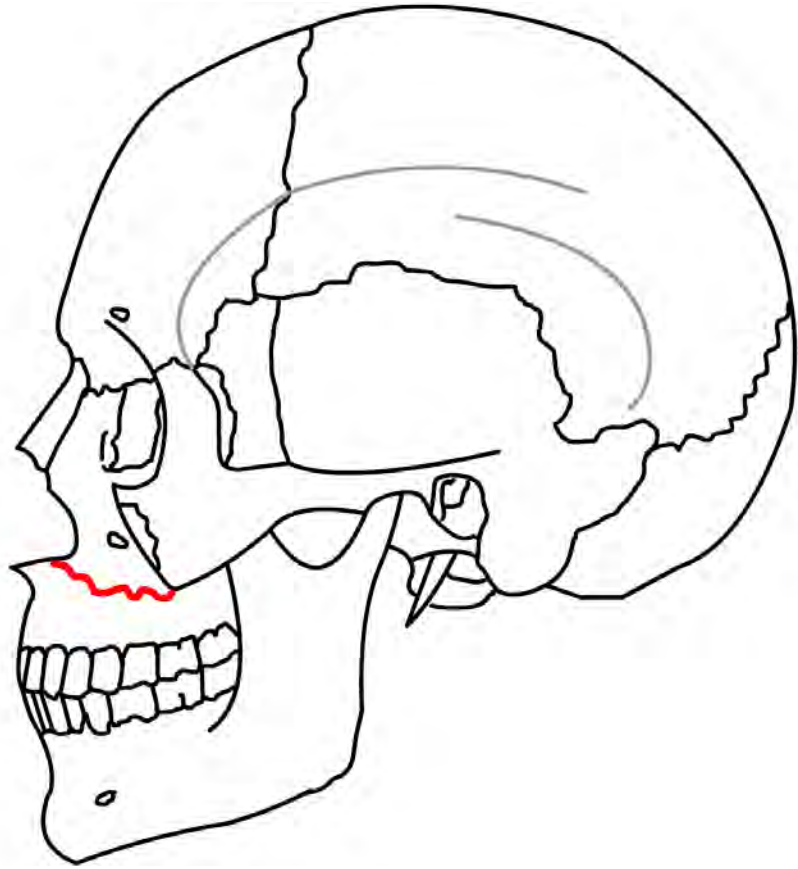




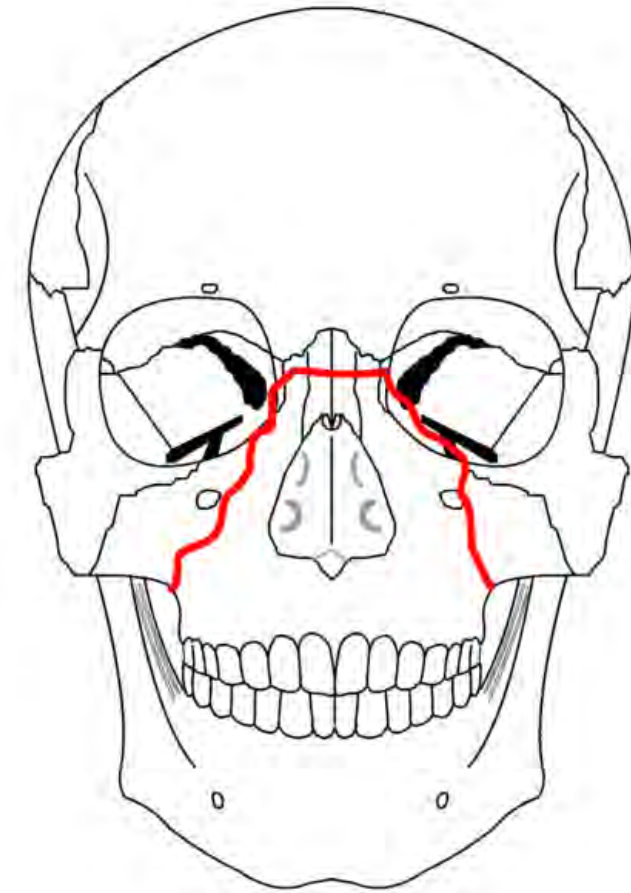
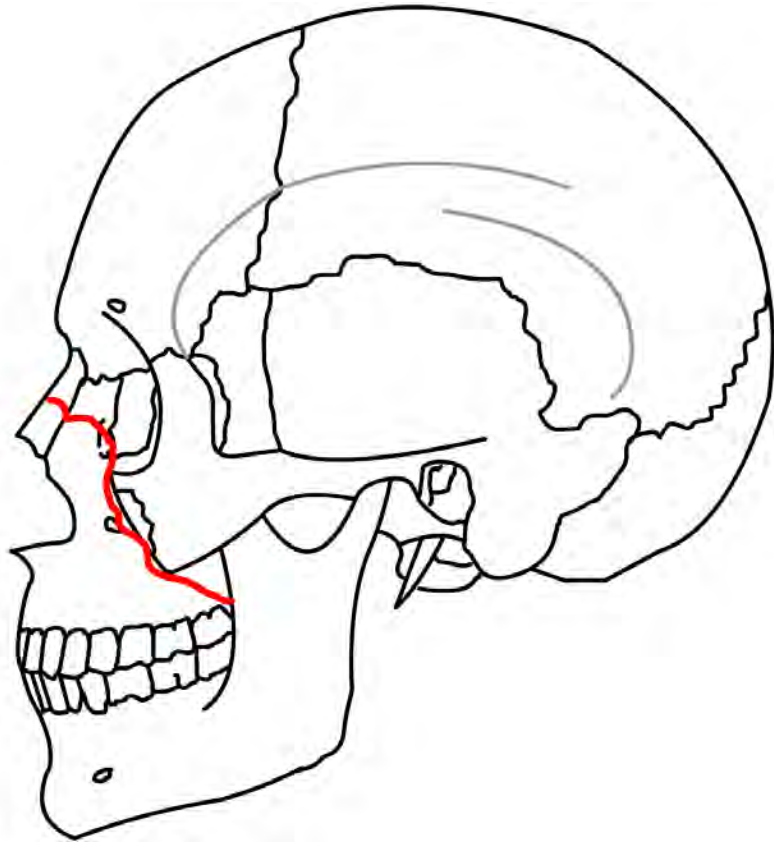
Facial Structures



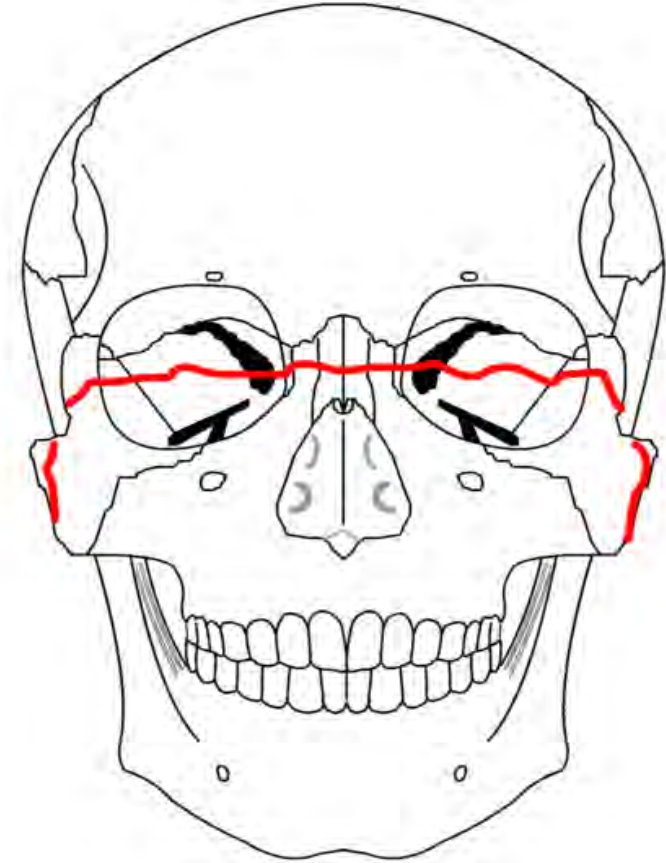
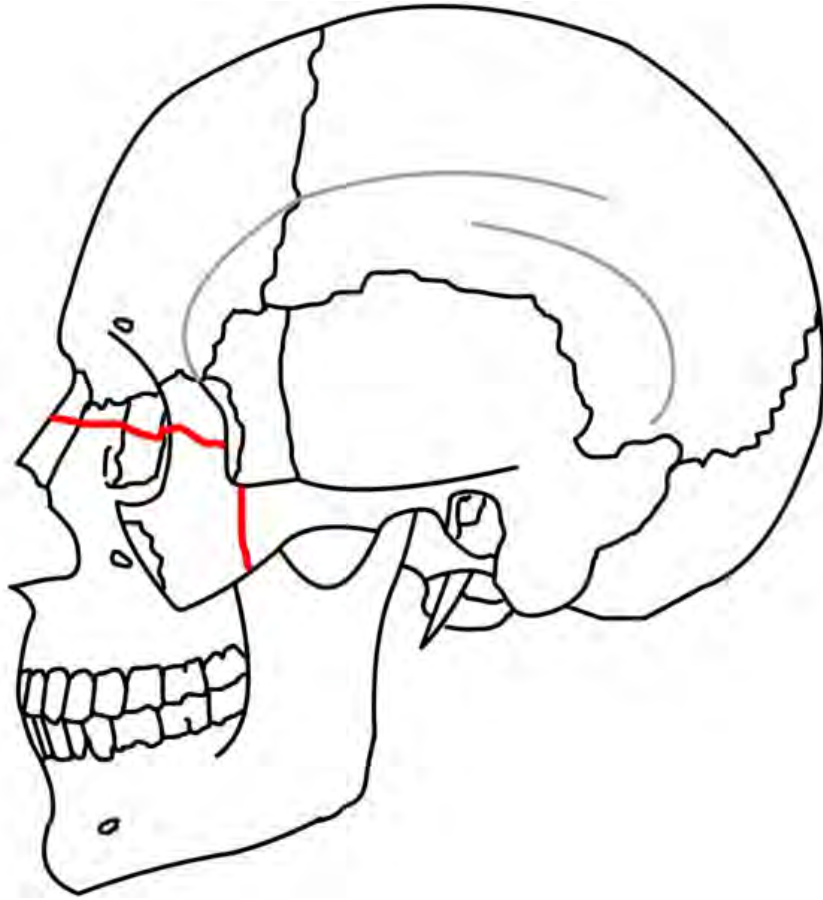
LeFort I Fracture



LeFort II Fracture



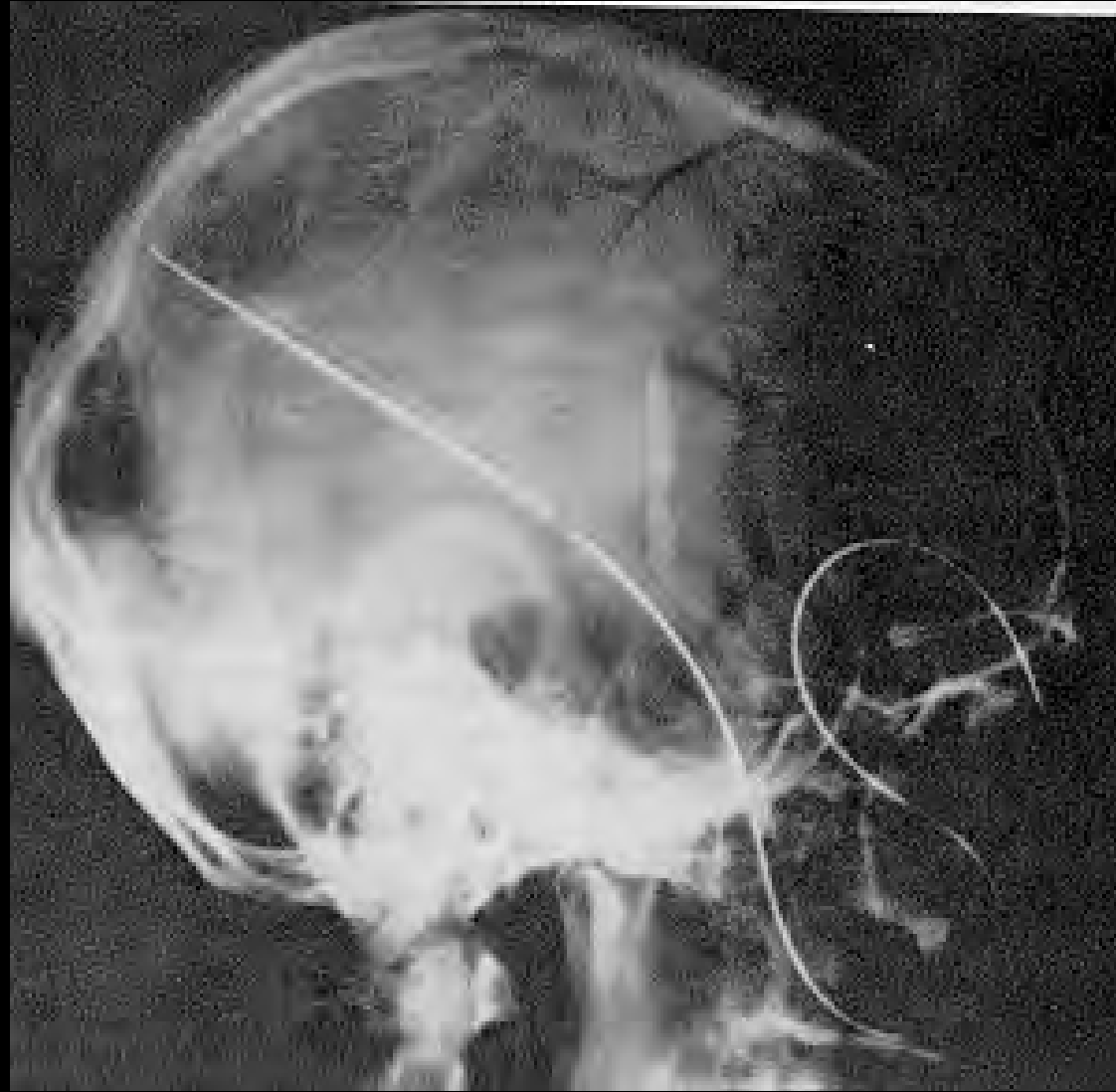
LeFort III Fracture



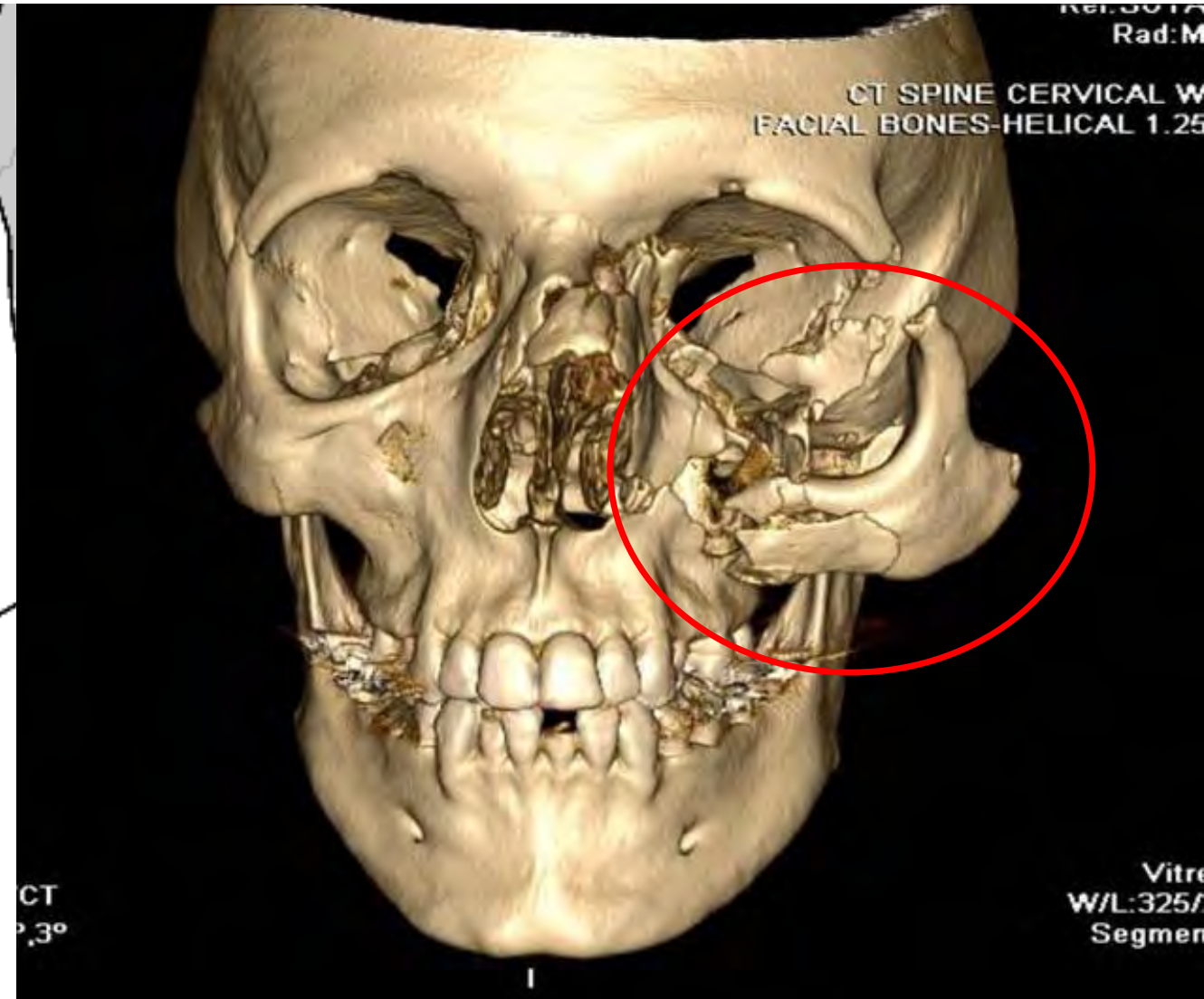
Le Fort III Fracture

- Periorbital hematoma
- Racoon eyes suggestive of basal skull fracture.
- Inappropriate placement of nasogastric tube.





Tripod Fracture



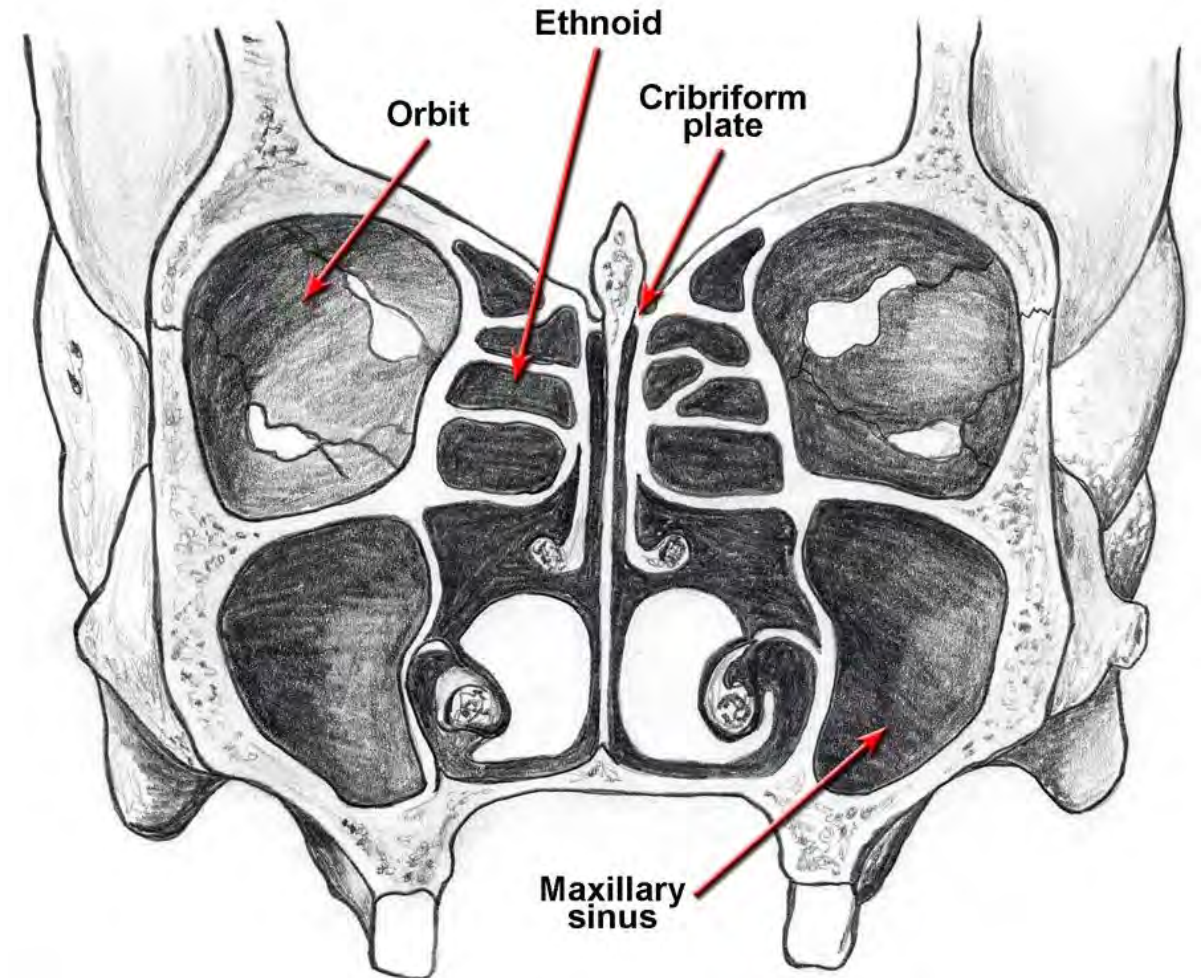
Orbitozygomatic Fractures



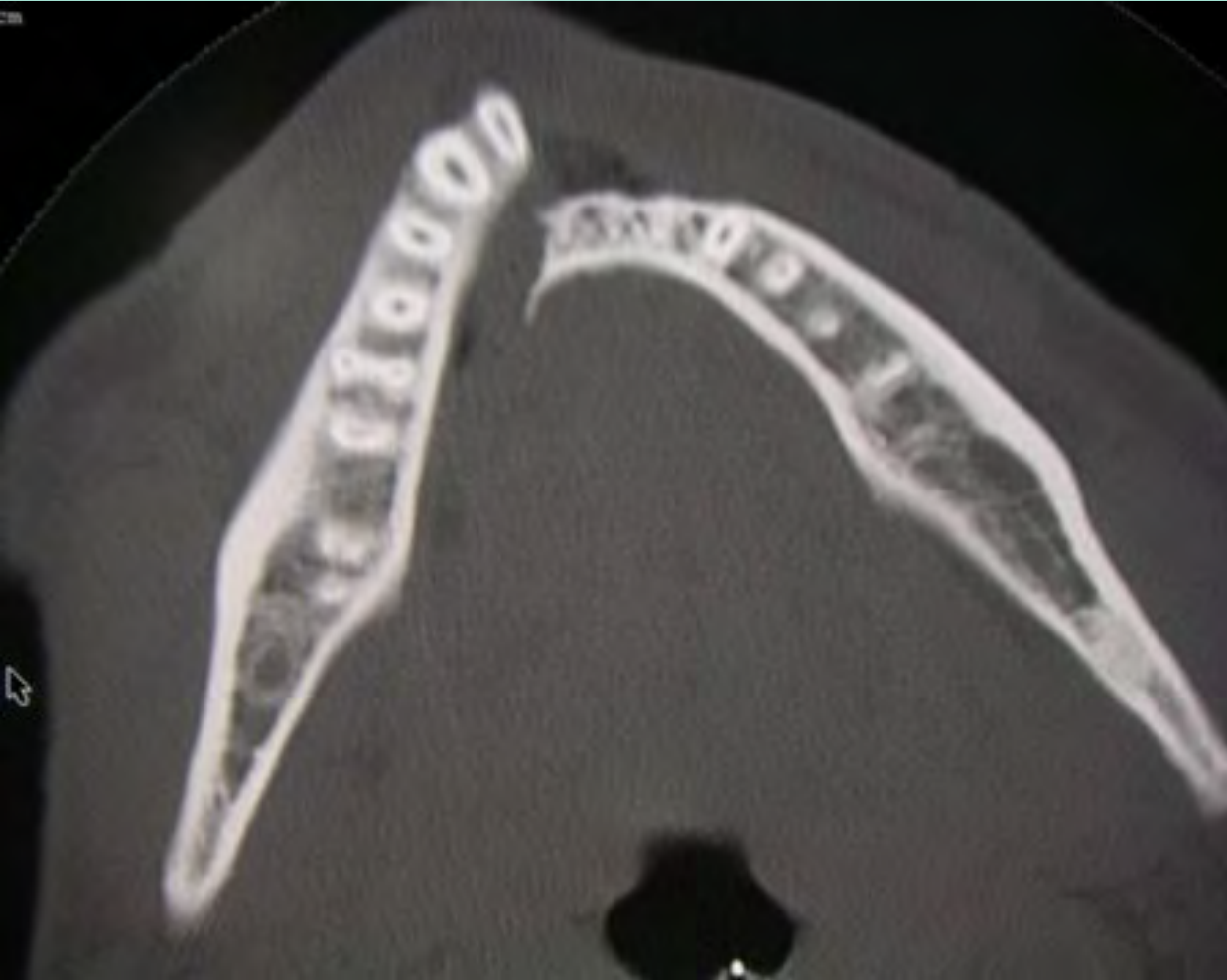
- Complex fractures of the zygoma and orbital floor.
- May have double vision, ocular proptosis or enophthalmos.
- Must assess for entrapment of extraocular muscles.
- Surgical management directed at decompression of entrapped muscles and anatomic realignment of zygoma.

Naso-Ethmoidal-Orbital 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.

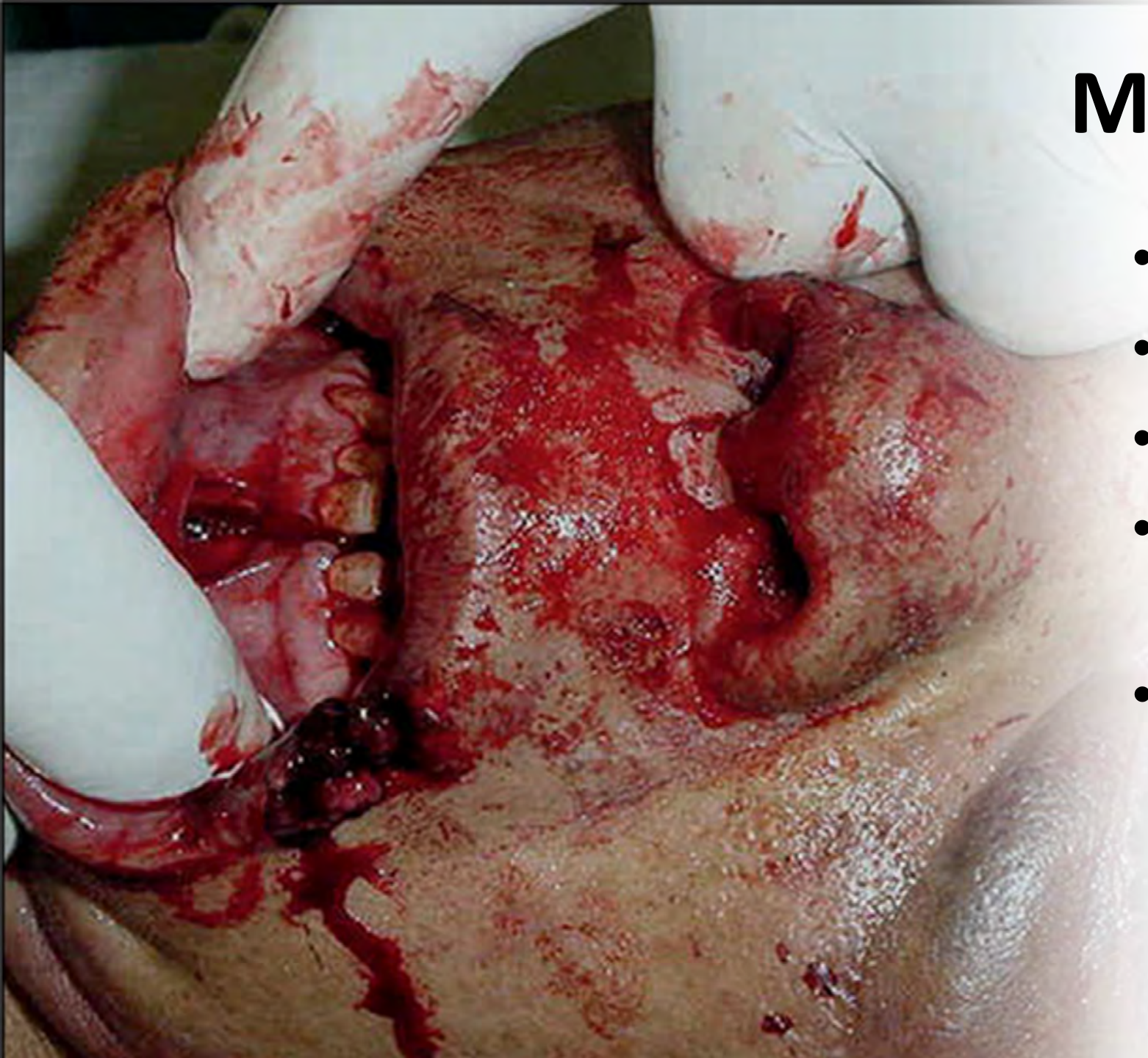


Mandibular Fractures



Mandible Fractures

- Pain
- Malocclusion
- Separation
- Inability to open mouth
- Tongue blade test



Tongue Blade Test

- Screening test
- Have patient bite tongue blade
- Rotate blade laterally
- 96% sensitive for mandibular fx



Peterson, 2014

Treatment



Maxillofacial Injuries General Assessment



- ABC's
- Assess for symmetry of facial structures
 - Assess for paresthesias
 - Assess symmetry of facial movements
- Assess the ears, nose and oral cavity for occult lacerations, hematomas
- Palpate for crepitus, tenderness or deformity
- Assess sense of smell

Ocular Assessment

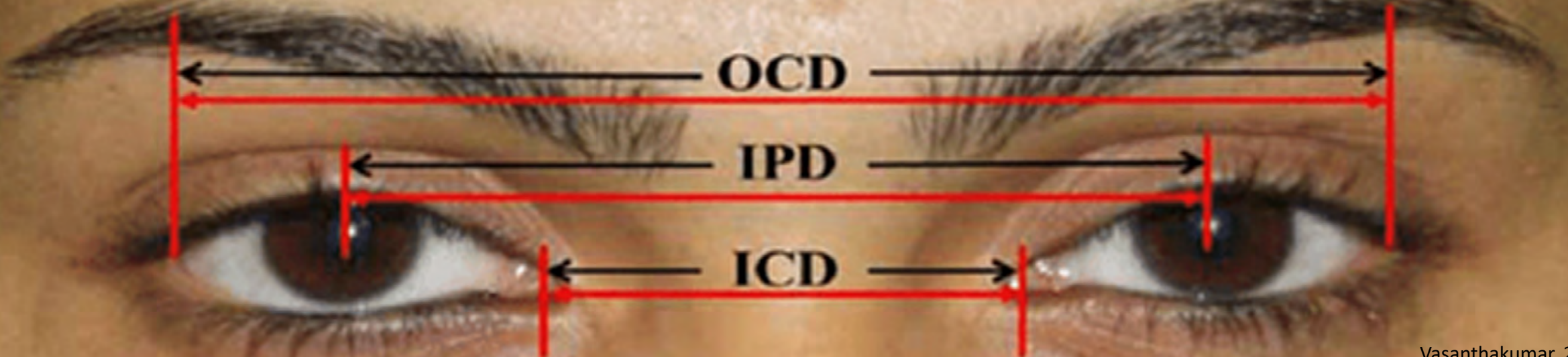
- Visual acuity
- Pupil assessment
- Extraocular movements
- Eye position and movement
- Intraocular pressure



Physical Examination

- Inspect open wounds for foreign bodies.
- Palpate the entire face.
- Inspect the nose.
- Inspect nasal septum for septal hematoma, CSF or blood.
- Palpate nose for crepitus, deformity and subcutaneous air.
- Palpate the zygoma along its arch and its articulations with the maxilla, frontal and temporal bone.

ICD is the inner (medial) canthus measurement



Physical Examination

- Inspect the teeth
- Intraoral examination:
 - Check for lacerations
 - Stress the mandible
 - Tongue blade test
- Palpate the mandible for tenderness, swelling and step-off



Physical Examination

- Check visual acuity
- Check pupils for roundness and reactivity
- Examine the eyelids for lacerations
- Test extra ocular muscles
- Palpate around the entire orbits

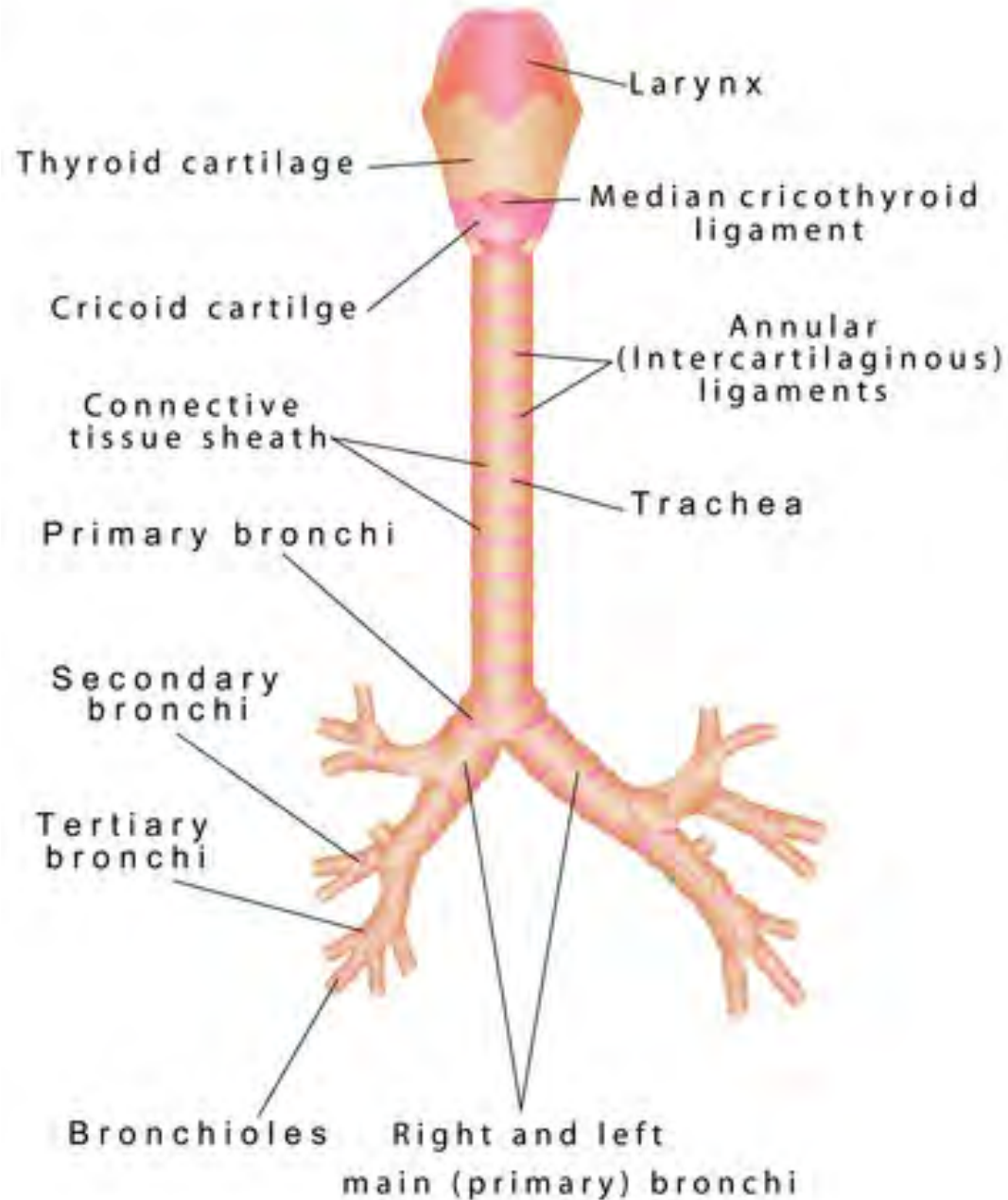




Physical Examination

- Examine the cornea for abrasions and lacerations.
- Examine the anterior chamber for blood or hyphema.

Airway Management

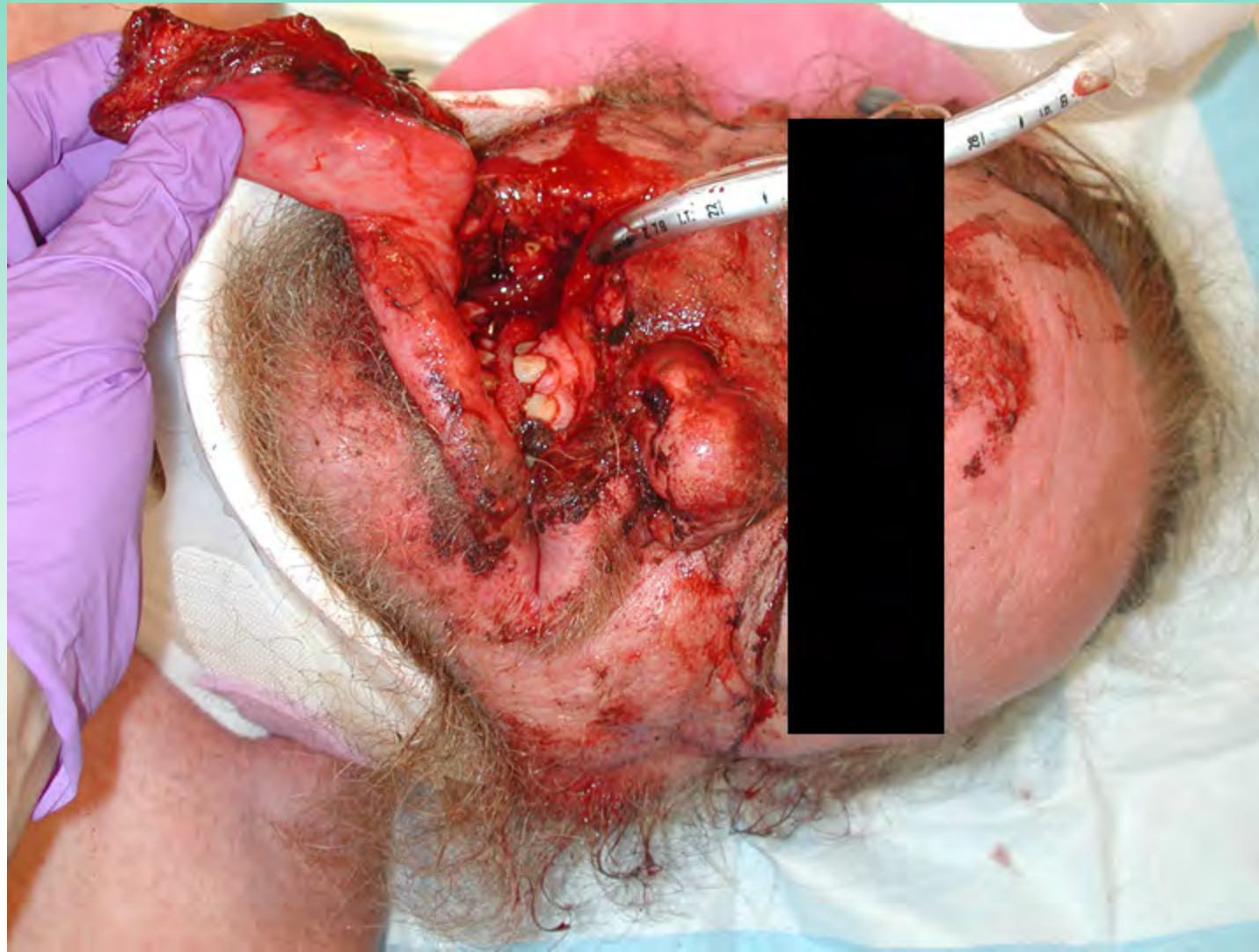


- Protect and maintain airway
 - Pull tongue forward with padded forceps or sutures
 - Endotracheal intubation
 - Anticipate need for cricothyroidotomy
- Prevent aspiration
- Ensure adequate oxygenation and ventilation

Airway Management

- Protection of airway
- Keep HOB elevated
- Aggressive pulmonary toilet
- Frequent suctioning







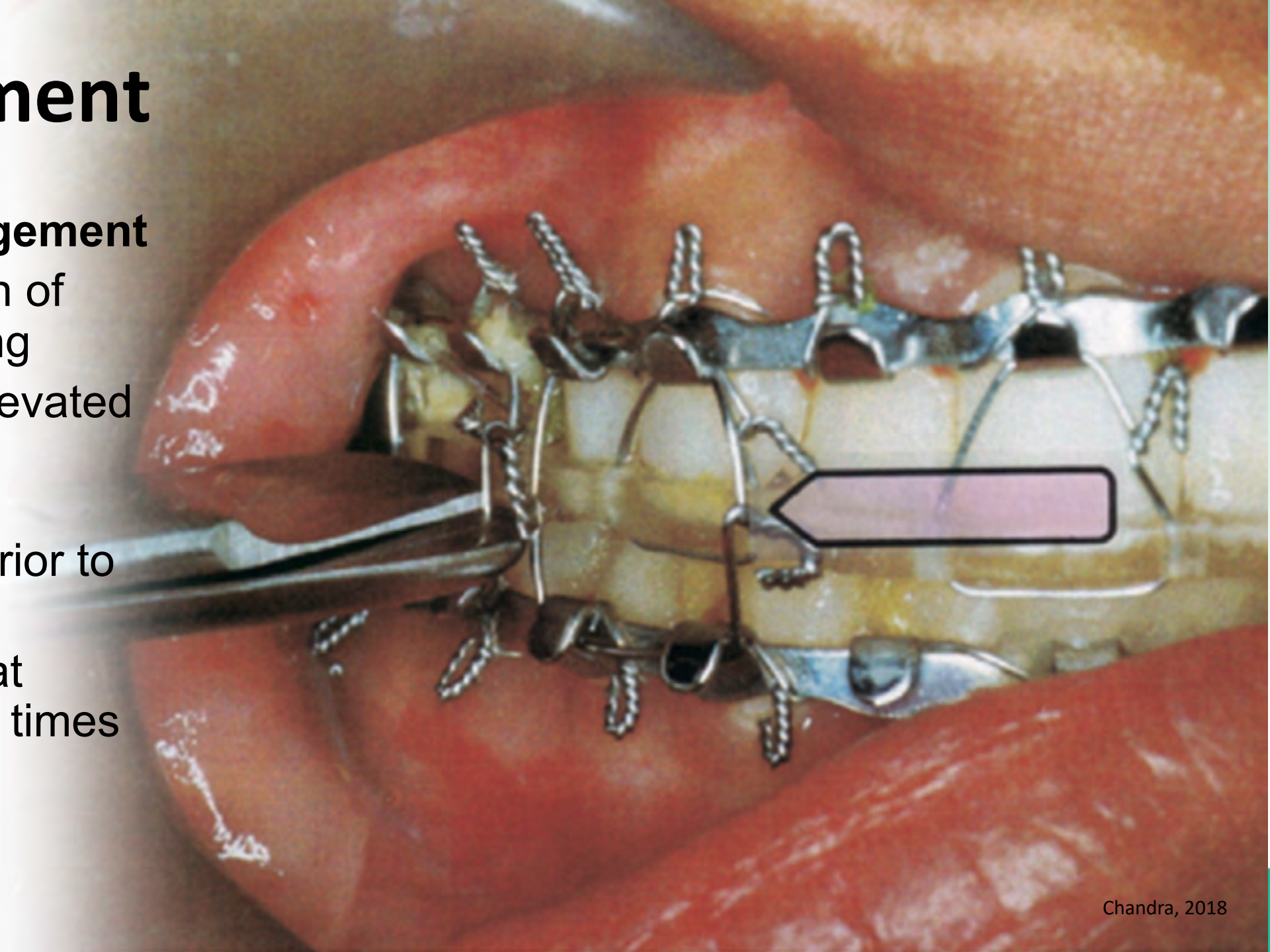
Management

- Control hemorrhage
 - Direct pressure
 - Nasal and oral packing
 - Reduce fractures
- Restore intravascular volume
- Anticipate intracranial injury and need for intervention
 - Serial neurologic exams

Management

Nutrition Management

- Early initiation of enteral feeding
- Keep HOB elevated
- Evaluate for swallowing dysfunction prior to oral feeding
- Wire cutters at bedside at all times



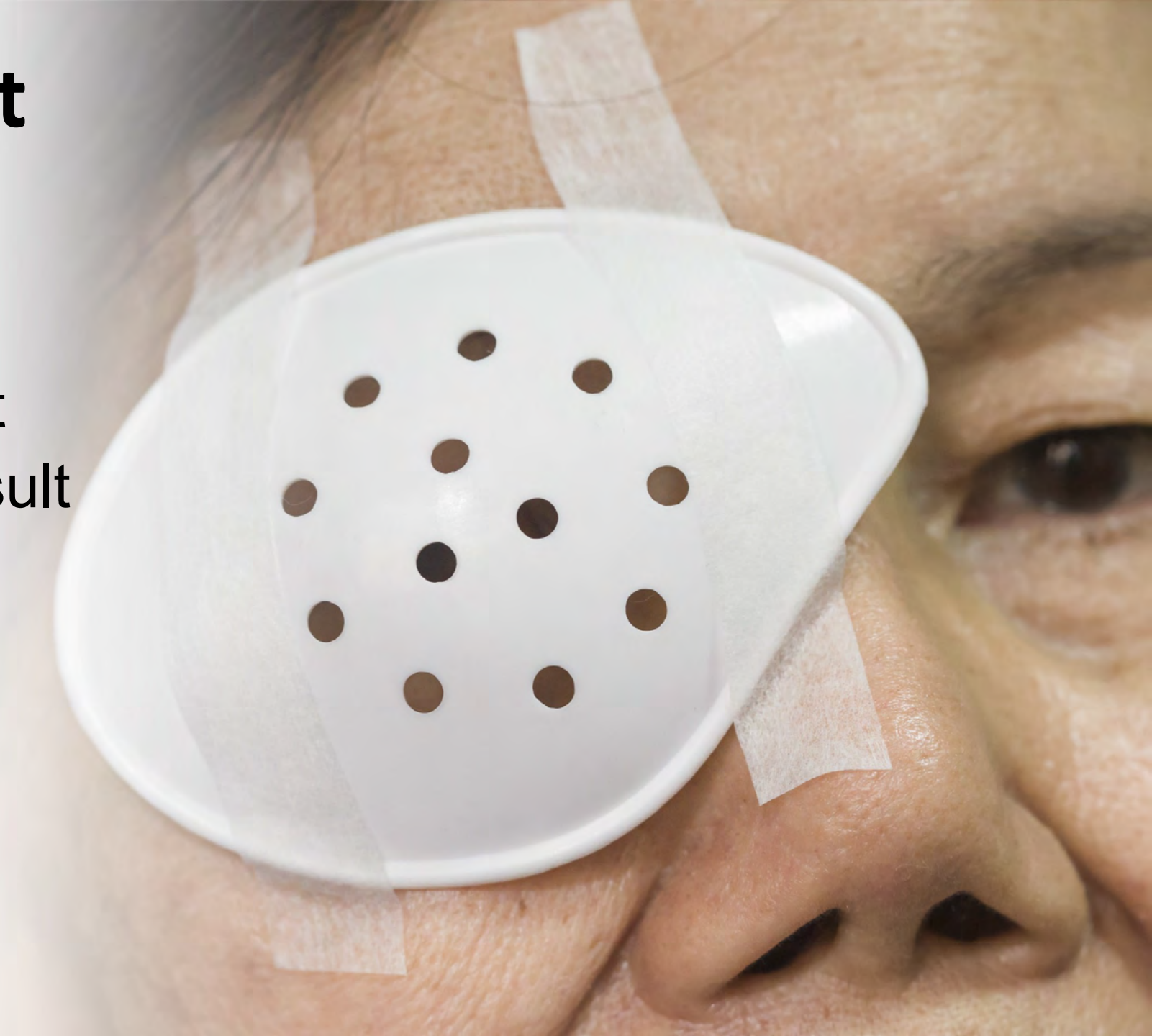
Management

Prevention of infection

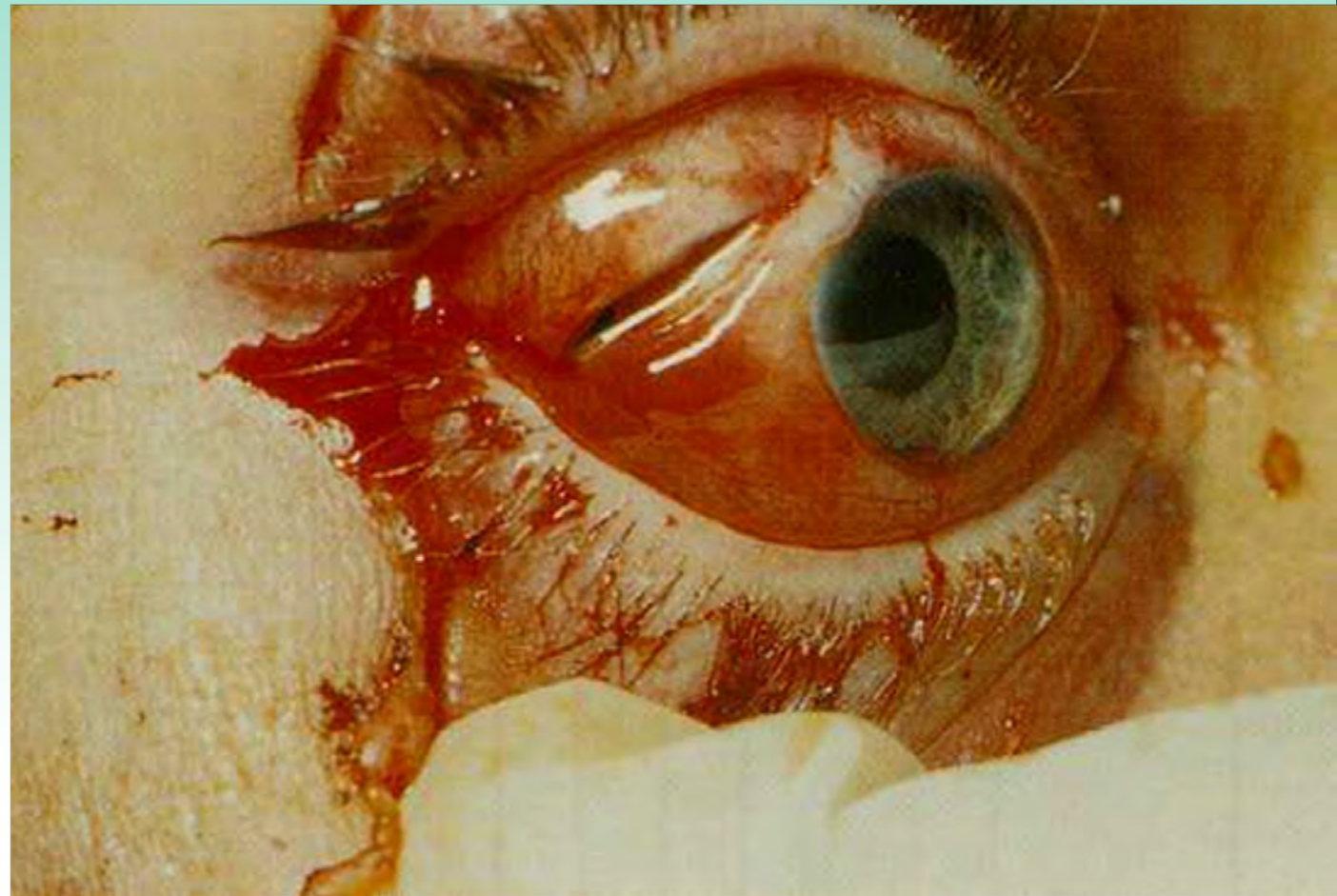
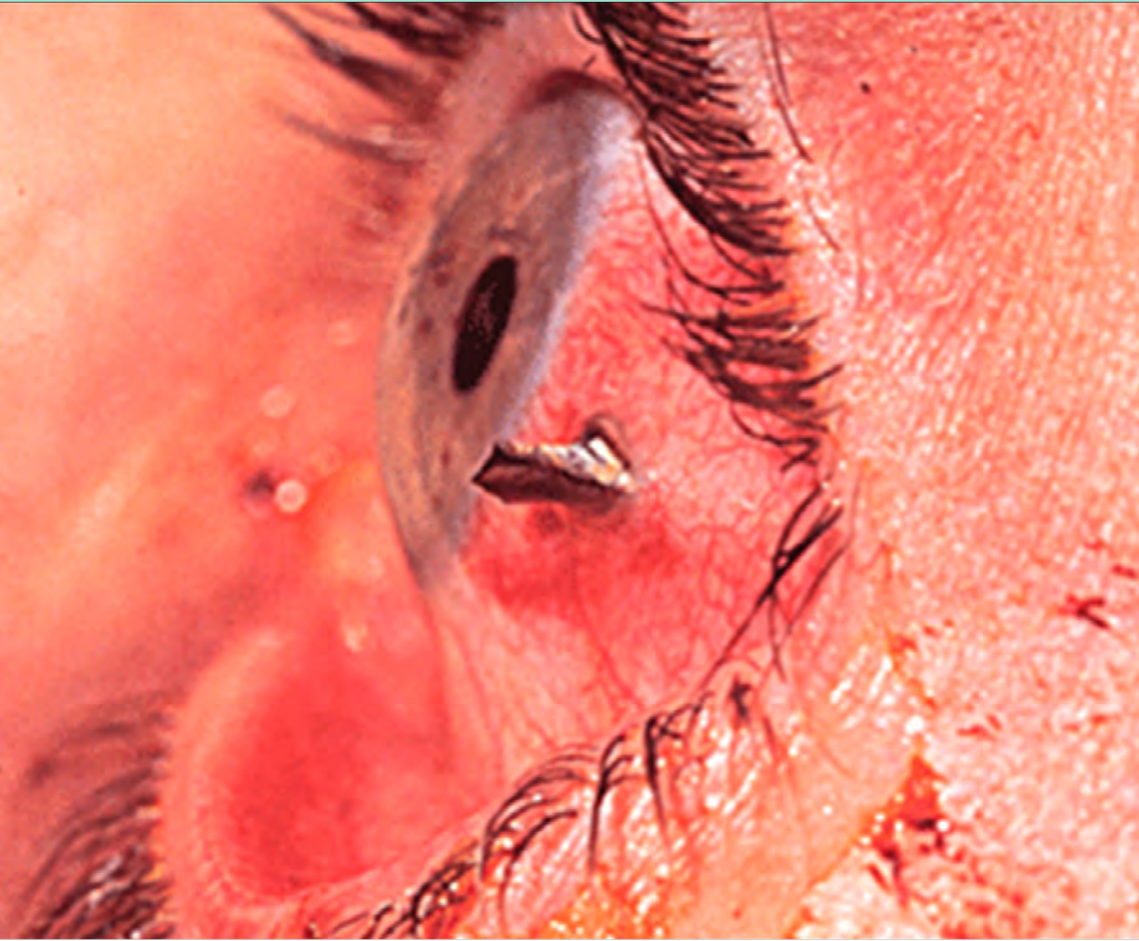
- Perioperative antibiotics
- Frequent oral lavage
- Minimize nasal packing and tubes
- Decongestants
- Avoid blowing nose
- Avoid foreign bodies or instrumentation in nares or ear canal

Management

- Protect eyes from further injury
- Pain management
- Early Rehab Consult



Direct Eye Trauma



Blast Injury: Thermal Injury



Thermal Injury

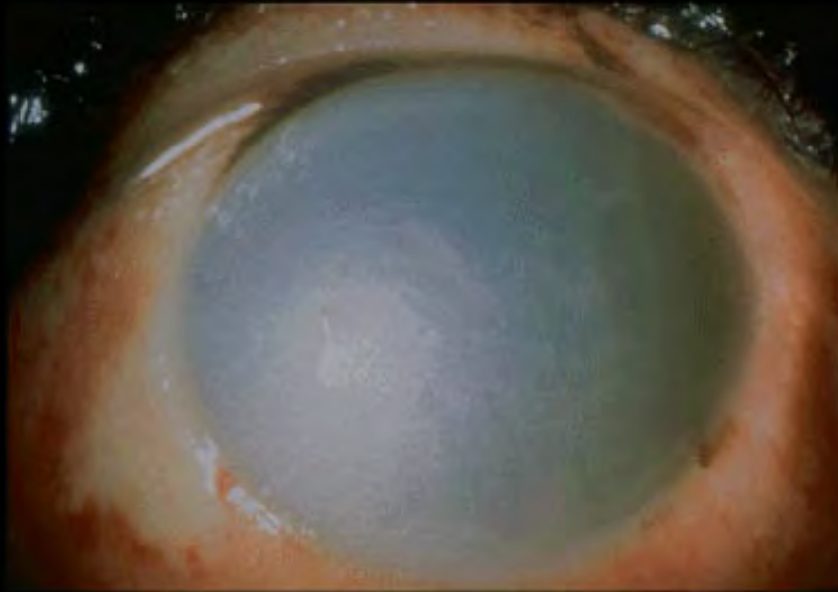
- Eye is usually spared
- Corneal exposure may occur as burn heals and skin contracts



Corneal Abrasion



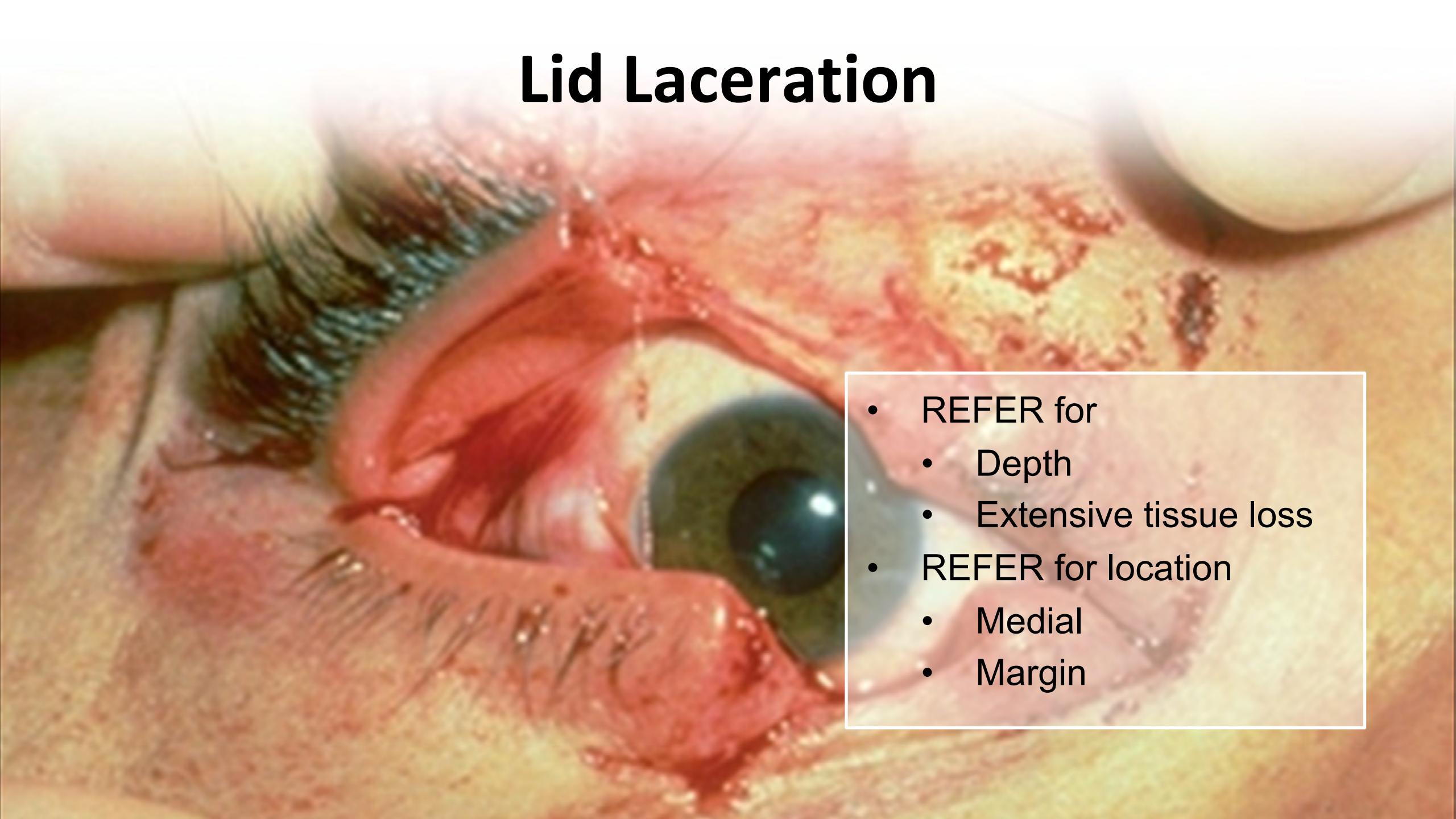
Chemical Burns

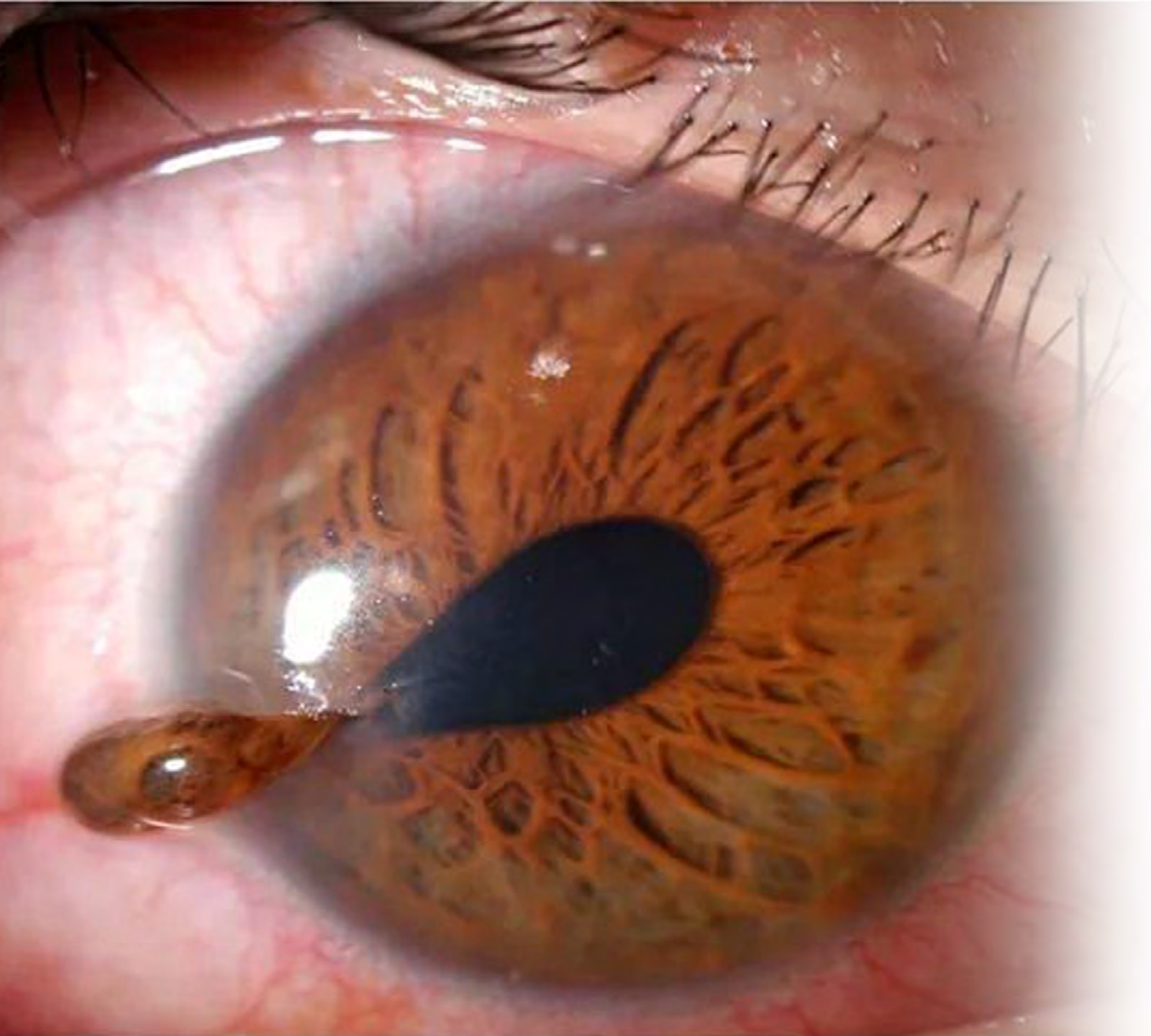


Traumatic Hyphema

- Limit activity
- Keep HOB elevated
- Protect the eye
- Monitor intraocular pressure
- Cycloplegic agents
- Monitor for re-bleeding
- Avoid NSAIDs and anticoagulants
- Topical aminocaproic acid

Lid Laceration

- 
- REFER for
 - Depth
 - Extensive tissue loss
 - REFER for location
 - Medial
 - Margin



Ruptured Globe

- Penetrating
- Blunt
- Urgent ophthalmology consult
- NPO

Open Globe

- Tetanus
- Antibiotics
- Minimize additional damage
- Avoid increasing intraocular pressure



Sympathetic Ophthalmia

- Inflammatory condition
- Common after penetrating injury or ruptured globe
- Occurs 5 days to many years after injury
- Results in loss of vision of uninjured eye
- Prevented by early enucleation of injured eye

Psychosocial Support

- Provide communication aids
- Frequent positive reinforcement
- Early referrals to psychiatric liaisons or counselors
- Early referrals to community agencies for the blind
- Referrals for home safety evaluations
- Referrals to local and state agencies for financial assistance

Patient and Family Education

- Reinforce surgical plan of care
- Medications
- Nutrition management
- Wound care
- Tracheostomy care
- Avoid direct sunlight for 6-12 months
- Use of cosmetics

Summary

- Facial and ocular trauma requires a comprehensive multidisciplinary team to maximize outcomes.
- Early incorporation of rehabilitation services is necessary for functional recovery.
- Overall prognosis of reconstruction may take months or years.

Maxillofacial and Ocular Injuries

1. A common complication of nasal fractures that must be urgently treated is:
 - a. Loss of sense of smell
 - b. Septal hematoma
 - c. Periorbital edema
 - d. Subcutaneous edema

2. A patient presents to the emergency department after being assaulted in the face. He has periorbital edema of the right eye and enophthalmos. Patient teaching for this patient would include:
 - a. Avoid blowing the nose
 - b. An eye patch should be worn for at least 1 week
 - c. Cycloplegic drops will be necessary to prevent glaucoma
 - d. Surgical management will be required

3. Cribriform plate fractures are commonly associated with:
 - a. LeFort I fractures
 - b. LeFort II fractures
 - c. LeFort III fractures
 - d. Mandible fractures

4. A patient presents to the emergency department after having lye splashed in his eyes. Irrigation of the eye should continue until:
 - a. Two liters have been instilled
 - b. The pH reaches 6.8
 - c. All evidence of burned tissue has been washed away
 - d. The pH reaches 7.3

5. The normal intraocular pressure is:
 - a. 30 mmHg
 - b. 25 mmHg
 - c. 5 mmHg
 - d. 20 mmHg

6. A 24-yr-old male is brought to the trauma room after a high-speed motor vehicle collision with obvious trauma to the left side of his face. He has ptosis of the left eye and a palpable deformity of the left zygoma. His airway is patent and he is receiving supplemental oxygen. Upon further examination, you note the left side of his face appears to have a "droop." Based on this assessment finding, you anticipate:
 - a. An injury to cranial nerve V
 - b. An injury to cranial nerve VII
 - c. An injury to cranial nerve III
 - d. An injury to cranial nerve IV

7. A 32-year-old female presents to the trauma room after being shot in the face with a small caliber handgun. There is a wound inferior to the right zygomatic arch. She is complaining of diminished vision in the right eye. A ruptured globe is suspected. Anticipated assessment findings include:

- a. Complete blindness, bleeding from the eye and inability to open the eye
- b. Bleeding into the anterior chamber and proptosis
- c. Asymmetry of the globes, teardrop shaped pupil and diminished vision
- d. Elevated intraocular pressure, diminished vision and extreme pain

8. A patient with a mandible fracture will likely complain of:

- a. Inability to swallow and abnormal taste
- b. Paresthesia of the tongue and upper lips
- c. Malocclusion and paresthesia of the lower lip and chin
- d. Trismus

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References

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5th edition

- Blair K, Alhadi SA, Czyz CN. Globe Rupture. [Updated 2022 Jan 2]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK551637/>
- Chandra, K., Wired shut: cutting jaw wires in an emergency. (2018). Resident Clinical Pearl. Retrieved <https://sjrhem.ca/wiredjaw/>
- Gaillard, F., Murphy, A. Orbital blowout fracture. Reference article, Radiopaedia.org. (accessed on 08 Dec 2021) <https://doi.org/10.53347/rID-1000>
- Ha, Y. I., Kim, S. H., Park, E. S., & Kim, Y. B. (2019). Approach for naso-orbito-ethmoidal fracture. Archives of craniofacial surgery, 20(4), 219–222. <https://doi.org/10.7181/acfs.2019.00255>
- Jha KN, Rajalakshmi A R. Evaluation and management of orbital trauma. J Clin Ophthalmol Res 2018;6:77-82. <https://www.jcor.in/article.asp?issn=2320-3897;year=2018;volume=6;issue=2;spage=77;epage=82;aulast=Jha;type=0>
- Lipa, Sebastian & Mrozowski, J. & Awrejcewicz, Jan. (2015). Analysis of orbital strain and stress caused by multidirectional forces generated during a ball impact. <https://www.researchgate.net/publication/288670499>
- Mohseni M, Blair K, Bragg BN. Blunt Eye Trauma. [Updated 2022 Jan 2]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. [Figure, Teardrop pupil with vitreous extrusion...] Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470379/figure/article-21506.image.f3/>
- Nash, D., (2019). Hyphema, Retrieved from <https://emedicine.medscape.com/article/1190165-overview>.
- Peterson, T. (2014). Mandibular fractures. Retrieved from <https://www.slideshare.net/Toddr56/mandibular-fracture-31280157>
- Pickrell, B. B., Serebrakian, A. T., & Maricevich, R. S. (2017). Mandible Fractures. Seminars in Plastic Surgery, 31(2), 100–107. <http://doi.org/10.1055/s-0037-1601374>
- Shaffer, S. M., Brismée, J.-M., Sizer, P. S., & Courtney, C. A. (2014). Temporomandibular disorders. Part 1: anatomy and examination/diagnosis. The Journal of Manual & Manipulative Therapy, 22(1), 2–12. <http://doi.org/10.1179/2042618613Y.0000000060>

Siddiqui, N., Shivananda, A. Zygomaticomaxillary complex fracture. Reference article, Radiopaedia.org. (accessed on 08 Dec 2021) <https://doi.org/10.53347/rID-11114>

Tollefson, TT. (2021). Nasoorbitoethmoid fractures. Retrieved from <https://emedicine.medscape.com/article/869330>

Vasanthakumar, P & Kumar, Pramod & Rao, Mohandas. (2013). Anthropometric Analysis of Palpebral Fissure Dimensions and its Position in South Indian Ethnic Adults. Oman medical journal. 28. 26-32. 10.5001/omj.2013.06.
https://www.researchgate.net/publication/235406673_Anthropometric_Analysis_of_Palpebral_Fissure_Dimensions_and_its_Position_in_South_Indian_Ethnic_Adults/citation/download

Yuen HW, Hohman MH, Mazzoni T. Mandible Fracture. [Updated 2021 Aug 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK507705/>