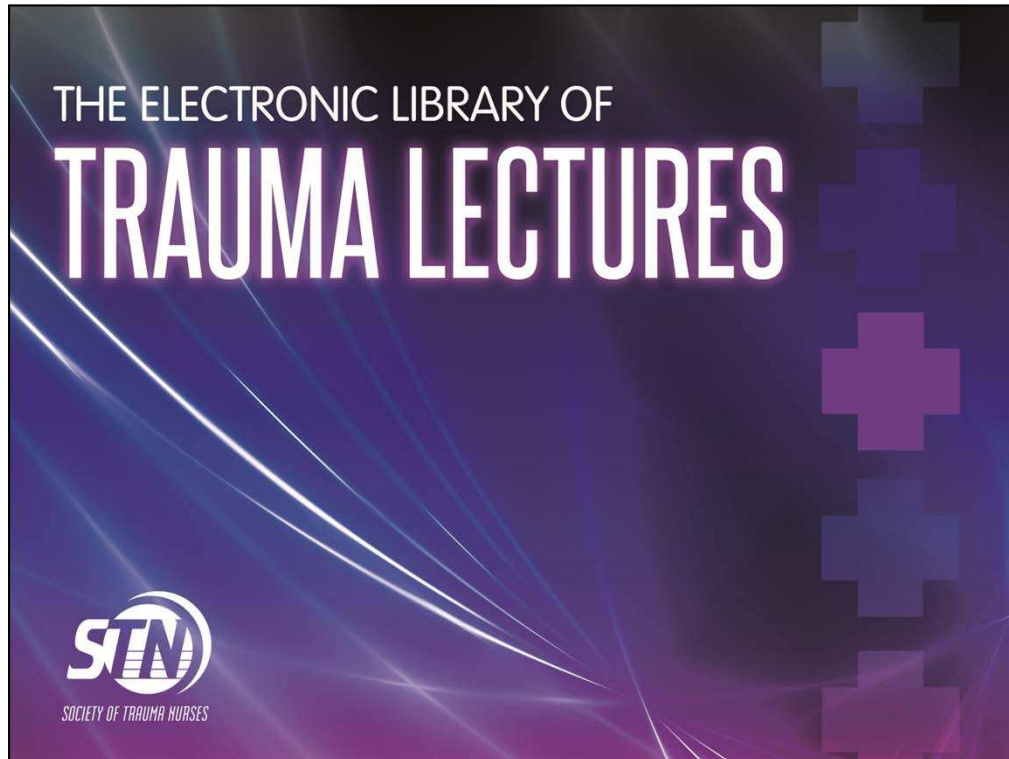
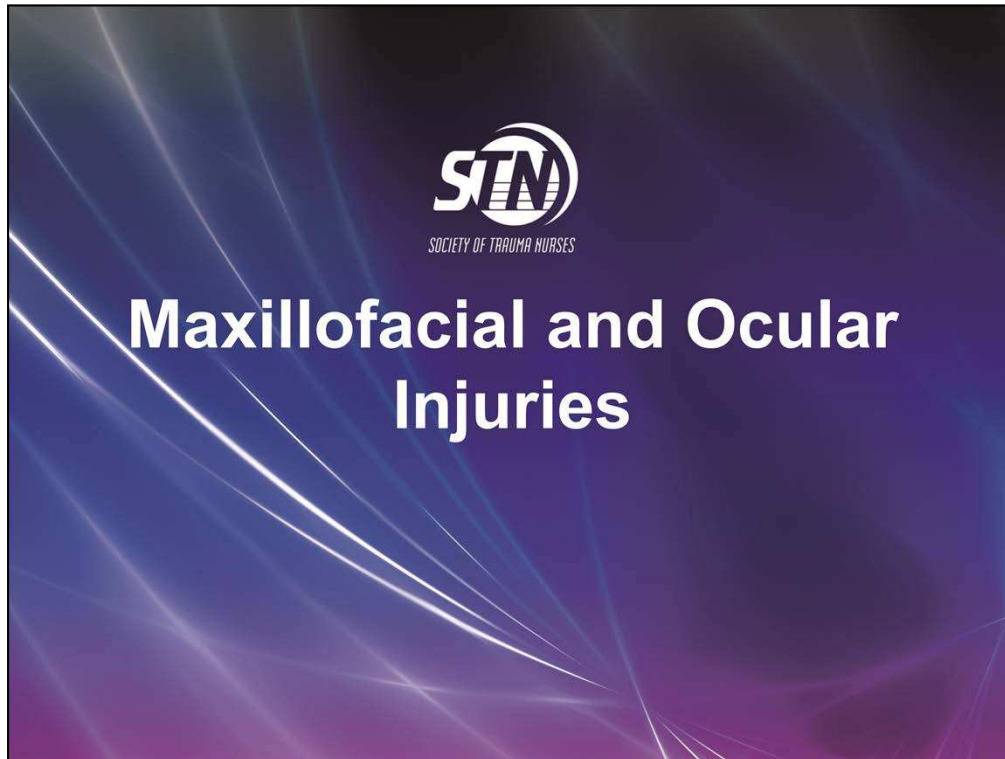






Objectives

**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





Magnitude of maxillofacial injury is directly proportionate to the velocity at impact when the face makes contact with an object.

Low velocity

- Soft tissue
- Contusions, abrasions, lacerations

High velocity

- Extensive soft tissue
- Bony disruption of facial structures
- Common predictable fault lines

Pathophysiology

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



Maxillofacial fractures result from either blunt or penetrating trauma.
Penetrating injuries are more common in city hospitals.
-----Midfacial and zygomatic injuries.
Blunt injuries are more frequently seen in community hospitals.
-----Nose and mandibular injuries.

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



The amount of force to fracture different facial bones have been studied and have been divided into High impact (greater than 50 times gravity) and Low Impact (less than 50 times gravity).

High Impact:

- Supraorbital rim – 200 G
- Symphysis of the Mandible – 100 G
- Frontal – 100 G
- Angle of the mandible – 70 G

Low Impact:

- Zygoma – 50 G
- Nasal bone – 30 G

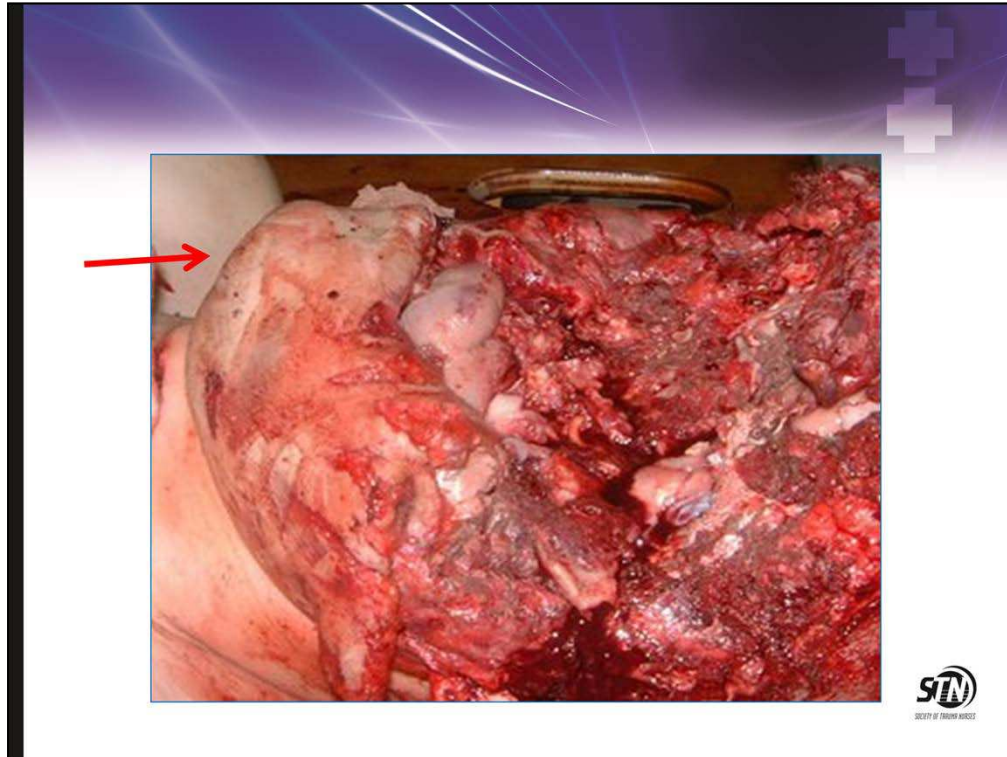
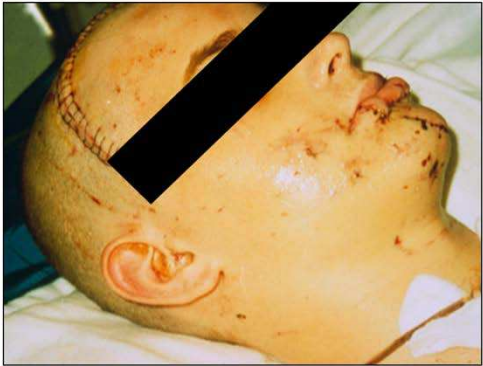


Image is of high impact to face. Arrow pointing to chin.

Etiology

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



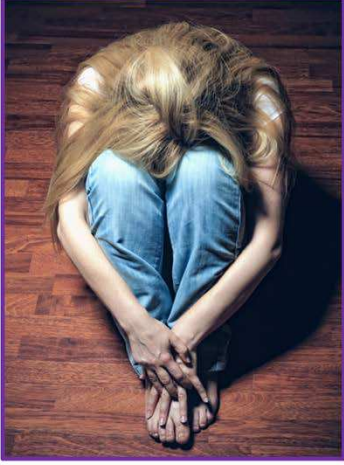
60% of patients with severe facial trauma have multisystem trauma and the potential for airway compromise.

As many as 20-50% of the patients with facial trauma sustain concurrent brain injury, especially those with upper face and midface fractures.

1-4% of these patients have cervical spine injuries. Remember to always r/o cervical spine injuries clinically and radiographically in such patients.

Blindness can occur in .5-3% of these trauma pts and are mostly seen in patients with LeFort 3 (2.2%) and LeFort 2 (.64%).

Etiology

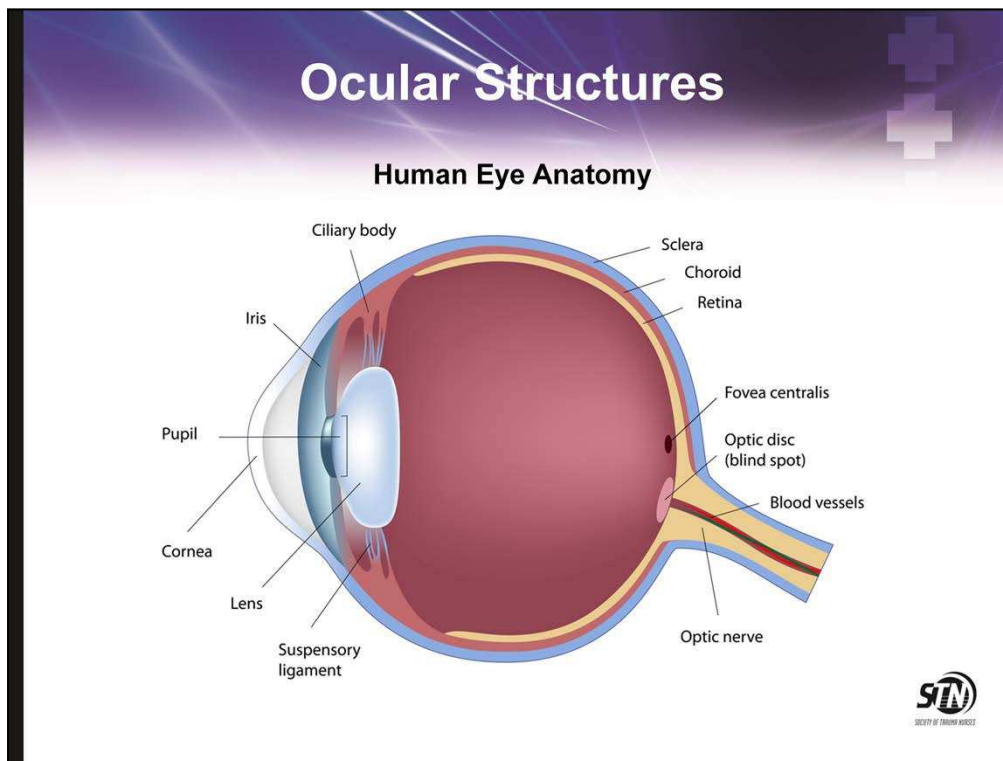


- 25% of women with facial trauma are victims of domestic violence
 - Increases to 30% if an orbital wall fx is present
- 25% of patients with severe facial trauma will develop Post Traumatic Stress Disorder



As many as one fourth of women with facial trauma are victims of domestic violence. If a women has an orbital fracture, the likelihood of sexual assault or domestic violence increases to more then 30%.

In addition to physical consequences of facial trauma, there are psychological costs as well. More then a one quarter of patients with severe facial trauma will develop Post Traumatic Stress Disorder.



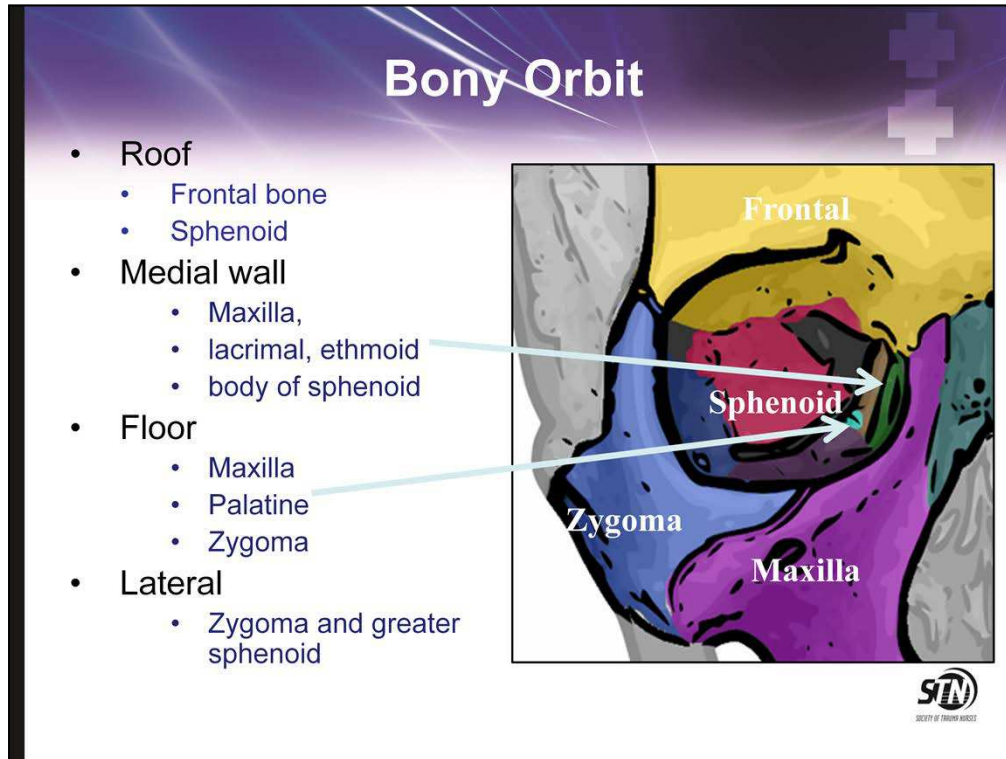
Light enters the eye through the cornea, pupil and lens then falls on the retina activating rods and cones. Rods and cones transmit light messages through retinal ganglia to the optic nerve which connects which extends to the optic chiasm in the brain.

The sclera is a tough connective tissue layer that acts as the structural skeleton for the globe and protects internal ocular structures.

The lens lies anterior to the vitreous and is suspended behind the iris by fibers connected to the ciliary body. The ciliary body is responsible for changing the shape of the lens from biconvex for near vision and for distance vision, the lens flattens

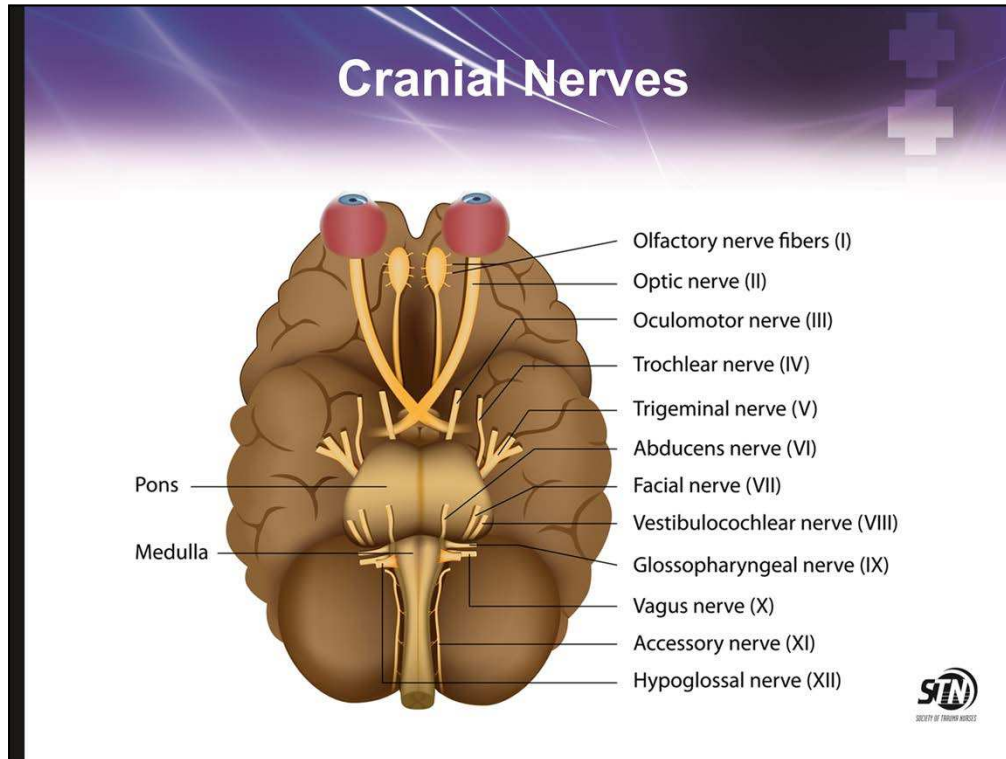
The anterior chamber lies in front of the iris and contains aqueous humor which is produced by the ciliary body. Aqueous humor is continually produced and drains through Schlemm's canal.

The cornea is an avascular structure that blends with the sclera. It becomes contiguous with the conjunctiva.



The bony orbit is pyramid in shape with the apex positioned posterior.

The orbits protect the globe and contain the extraocular muscles.



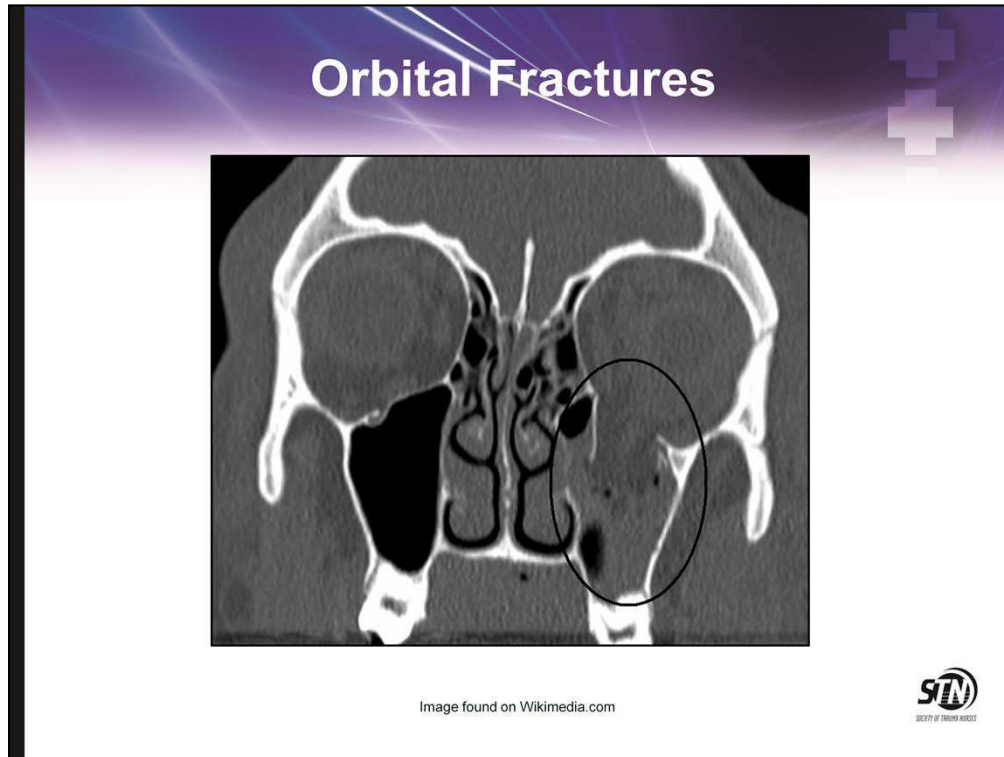
Eyelids protect the globe and facilitate distribution of tear film across the cornea

Lid opening and elevation occurs from sympathetic stimulation of Muller's muscle, and CN III innervation of the levator muscle.

The orbicularis muscle is responsible for eyelid closure. This muscle is innervated by CN VII.

Extraocular muscles are innervated by CN III, IV, and VI.

Sensory innervation to the ocular structures is provided by CN V.

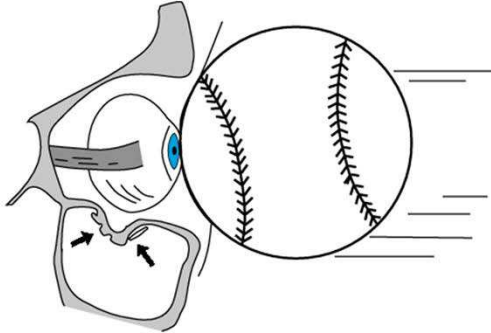


Orbital fractures frequently occur in the floor of the orbit due to the thinness of the bone and underlying maxillary sinus.

Blowout fractures result from blunt force to the globe itself or to the inferior orbital rim causing compression and buckling of the orbital floor.

Orbital Fractures

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



The diagram illustrates a cross-section of the human head, focusing on the orbital region. A baseball is shown striking the right eye, with lines indicating the point of impact and the direction of force. The force is directed towards the floor of the orbit. Below the eye, the infraorbital region is shown with two arrows pointing to a step-off deformity, indicating a fracture of the orbital floor. The diagram is labeled 'Image found on Rad.washington.edu'.

Image found on Rad.washington.edu



STN
SOCIETY OF TRAUMA NURSES

Image can be found at <http://www.rad.washington.edu/academics/academic-sections/msk/teaching-materials/online-musculoskeletal-radiology-book/facial-and-mandibular-fractures?searchterm=orbital+fracture>

Orbital Fractures

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



Symptoms include periorbital swelling, crepitus around the orbital rim, proptosis, ophthalmoplegia (decrease movement of the globe) and possibly enophthalmos if the orbital contents have herniated through the bony defect.

Optic nerve injury or globe rupture is an associated finding and requires urgent intervention to prevent vision loss.

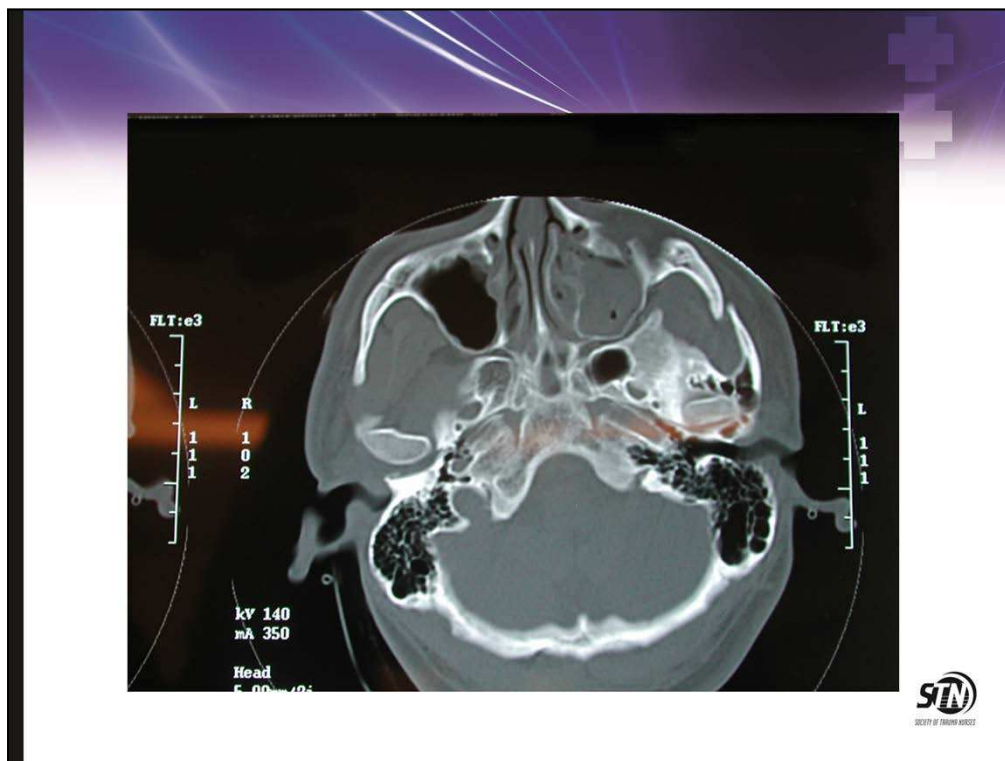
Extraocular muscles must be evaluated for entrapment.

Teach patient to avoid nose blowing to prevent intraorbital air and proptosis.

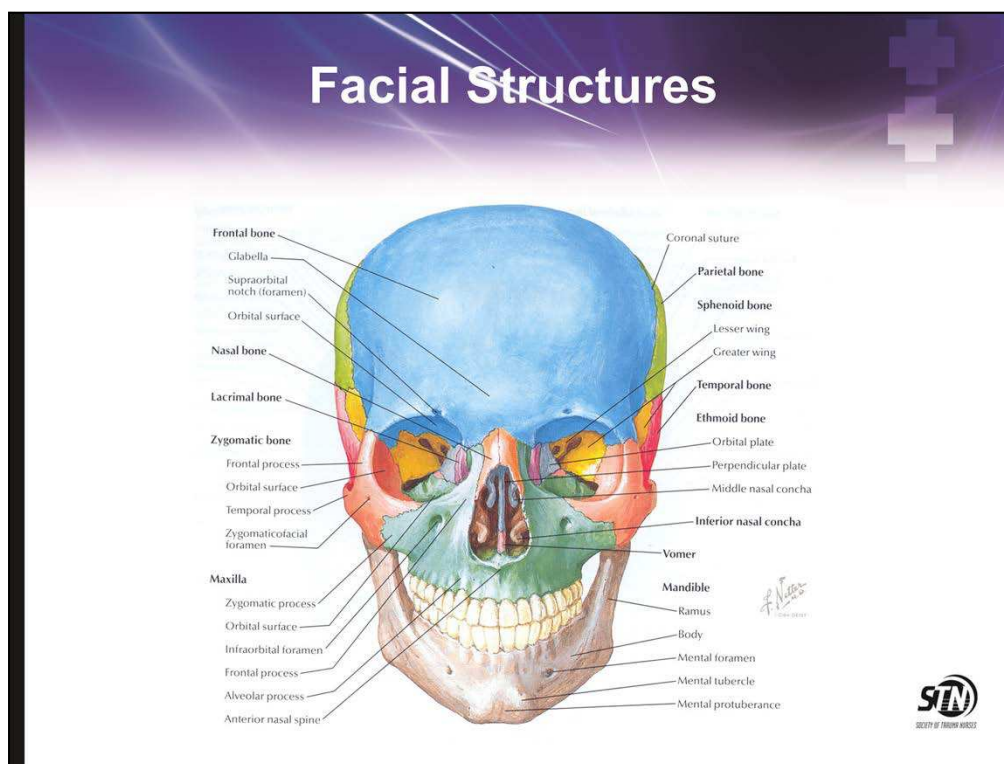
Image is a 28 year old male involved in an MVC with left orbit fracture and globe injury.



This 73 yr old female fell down the stairs sustaining this large laceration of her forehead but also sustained orbital wall fractures.



CT scan of orbit fracture



The face can be divided into thirds

Upper third

Injury to the upper third of the face includes frontal bone fractures, frontal sinus fractures, and upper nasal fractures.

Injuries may result in epistaxis, CSF rhinorrhea, injury to the upper branch of the Trigeminal nerve and facial paresthesias.

Fractures of the orbital roof may communicate with the supraorbital fissure through which branches of CN III, IV, VI pass through the orbit and a resultant Superior Orbital Fissure Syndrome (absent V1 sensation, pupillary fixation and dilation, loss of extraocular movement, down and out positioning of the eye, & ptosis).

Intracranial injuries are common.

Middle third

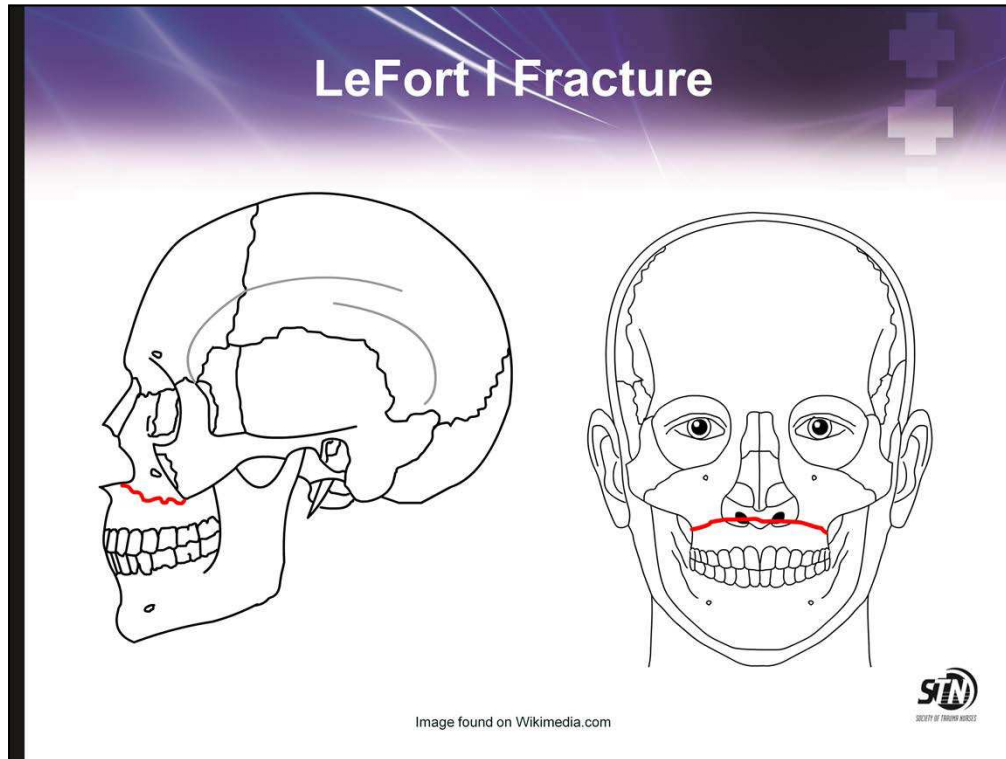
Common injuries include nasal and orbit fractures. Severe fractures may cause loss of sense of smell. LeFort fractures (will be discussed later).

Most midface fractures communicate with the orbit and require a complete ocular assessment including vision, visual acuity and extraocular muscle movement.

Lower third

Injuries to the lower third of the face include maxilla and mandible fractures.

Injuries frequently result in malocclusion and or inability to completely open the mouth, injury to the V3 branch of the trigeminal nerve and paresthesias as well as injury to CN VII result in abnormal facial expression.



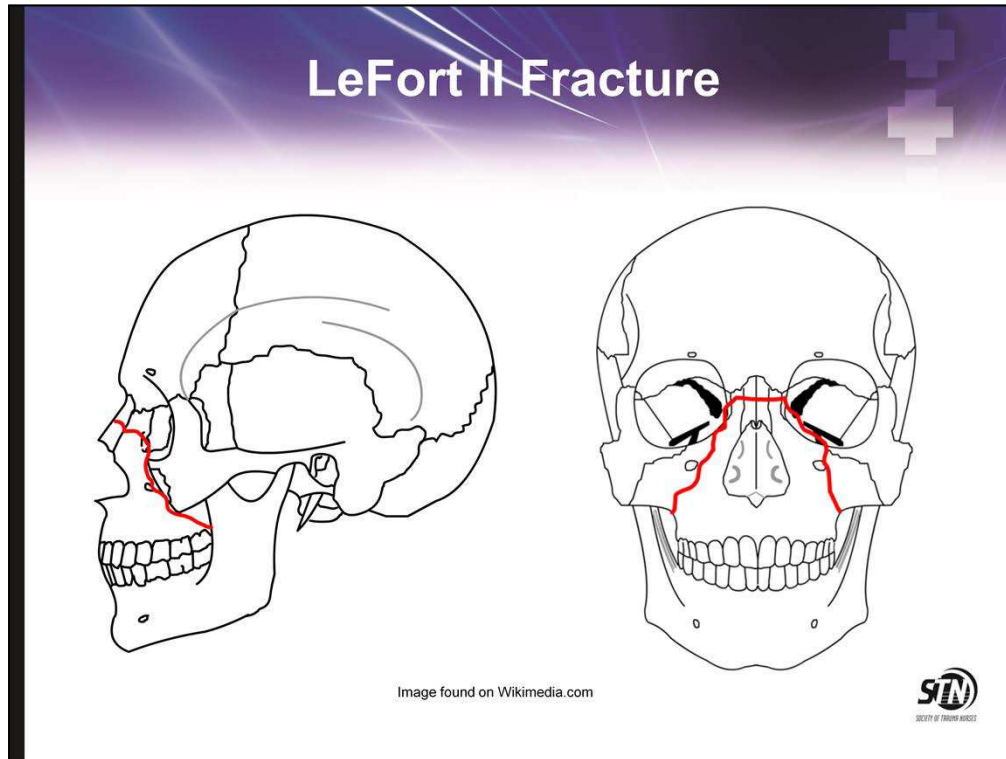
LeFort I fracture is a transverse fracture that runs between the maxillary floor and orbital floor just below the nasal septum. It may involve the medial and lateral walls of the maxillary sinuses.

Results from forces of injury directed on the lower maxillary alveolar rim in a downward direction.

Clinically, the lower maxilla and teeth are mobile or floating but the nose and remaining midface are stable.

Patient will likely have malocclusion, may have trismus.

Assess the patient for a mandible fracture as well.



LeFort II or middle third fracture involves the pyramidal area including the central maxilla, nasal area, and ethmoid bones. This portion of the face is a tripod shape with the apex at the nose. Grasping the front teeth and palate causes movement of the nose and upper lip with no movement of the orbital complex.

Significant force is required to fracture this area so the patient should be carefully evaluated for other injuries.

Patients may have a “caved-in” appearance of face.

May appear to have widening between the eyes (telecanthus).

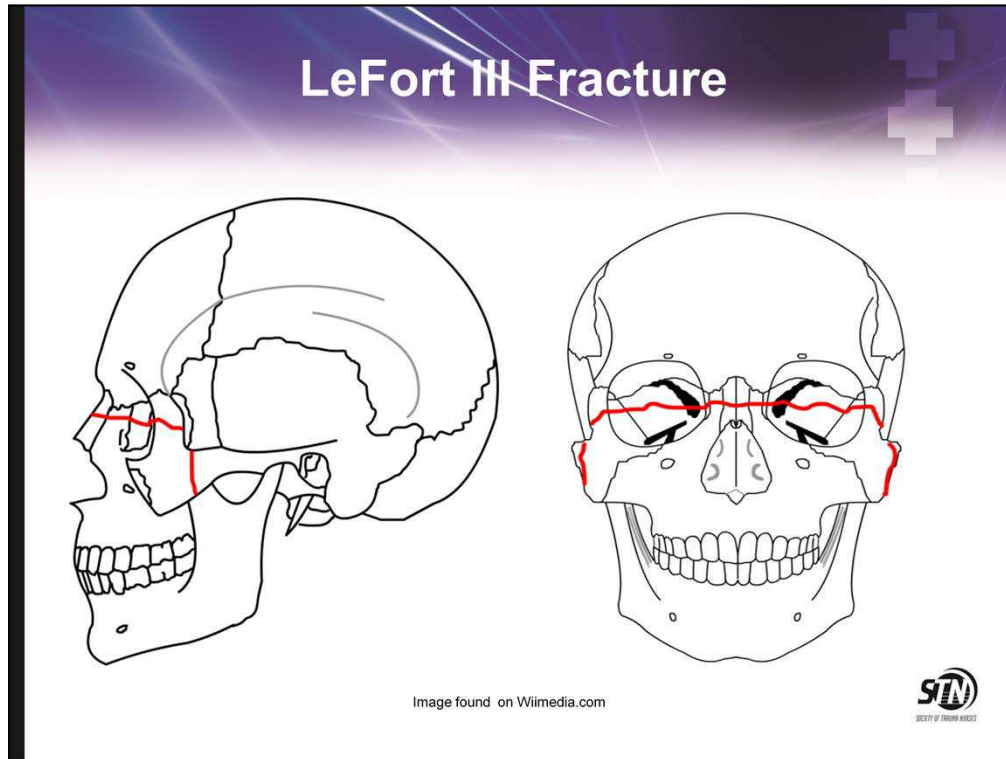
May have paresthesias of the V2 branch of the trigeminal nerve.

Will complain of malocclusion.

The nose, lips and eyes are usually edematous with subconjunctival hemorrhage and epistaxis.

Anticipate need for early intubation to protect airway due to facial edema.

The presence of CSF rhinorrhea suggests an open skull fracture.



Characterized by complete craniofacial dysjunction (can be hemi-LeFort III).

Severe injury often associated with massive soft tissue injury, ocular injuries, traumatic brain injury and other skull injuries.

Because the nasoethmoid complex is fractured, there is a high incidence of cribriform plate fractures and dural tears.

Rocking the maxilla moves the entire face.

Le Fort Fractures

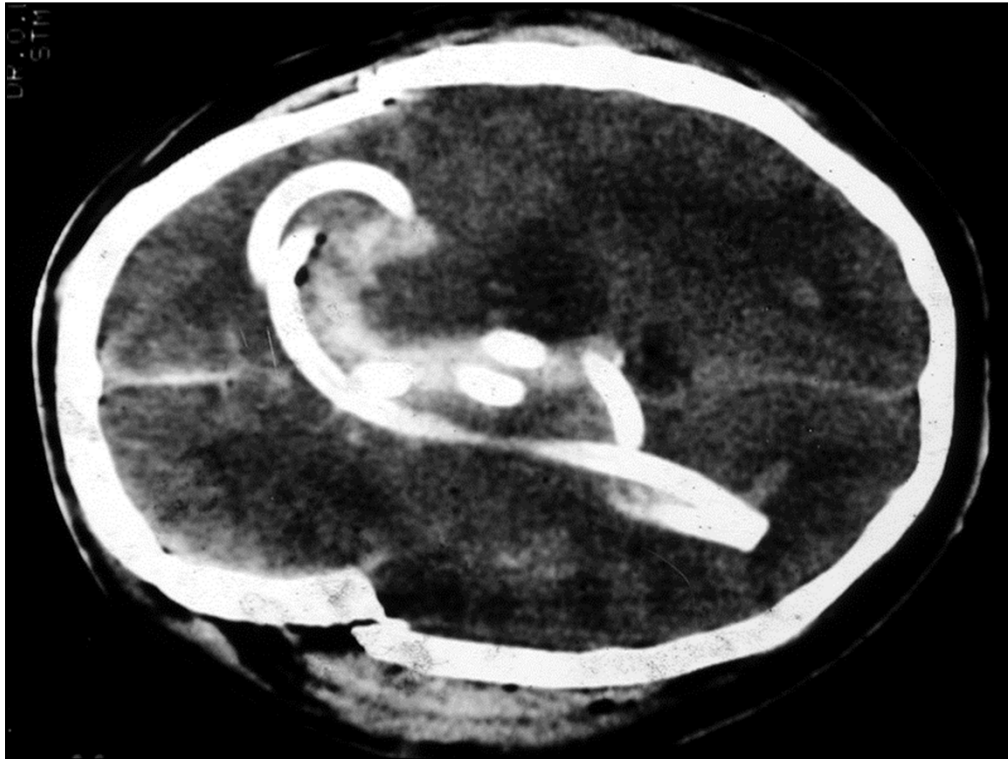


Le Fort III Fracture

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



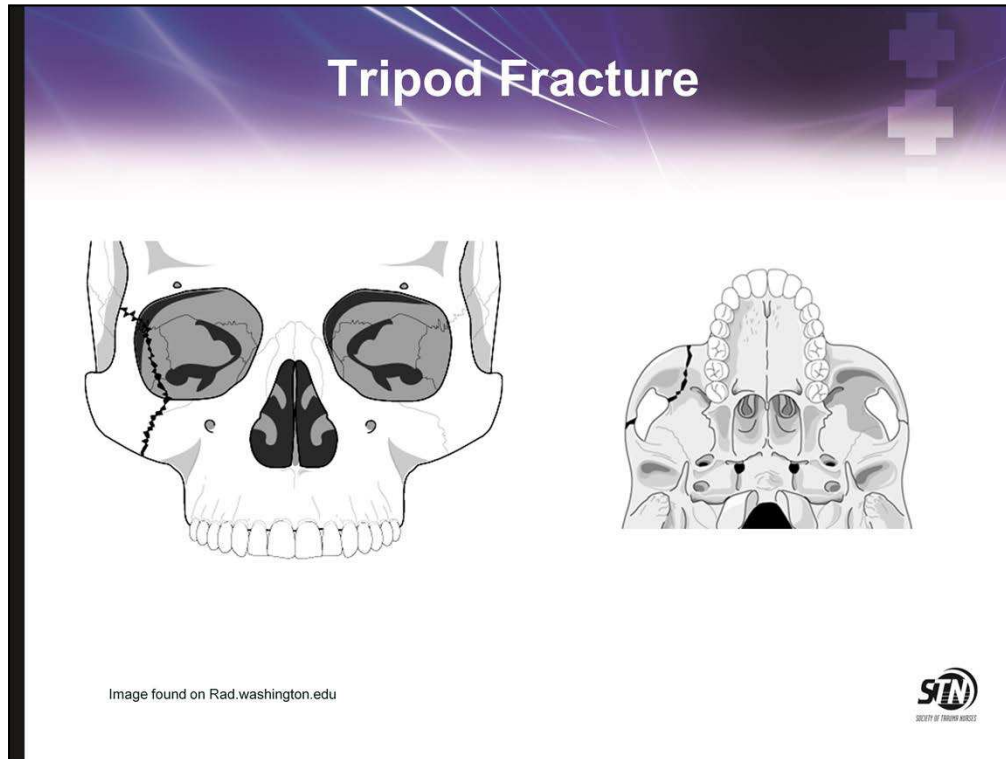
Ask the question why the NG tube is inappropriately placed



Classic image of NG in Brain



Another classic image.



Probably the most common facial fracture is the tripod or zygomaticomaxillary complex fracture, so called because it involves separation of all three major attachments of the zygoma to the rest of the face.

Image found at <http://www.rad.washington.edu/academics/academic-sections/msk/teaching-materials/online-musculoskeletal-radiology-book/facial-and-mandibular-fractures?searchterm=tripod>

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



Orbitozygomatic fractures are extensive fracture of the zygomatic process. It consists of a fracture through the frontozygomatic suture and the maxillary process of the zygoma. Fracture lines pass through the inferior orbital floor, the inferior orbital rim and the lateral wall of the maxillary sinus, and the zygomatic arch.

Symptoms include pain, trismus, diplopia, numb upper lip, lower lid and bilateral nasal area. Swelling ecchymosis of malar and periorbital areas, palpable infraorbital rim “step-off” entrapment of extraocular muscles with disconjugate gaze.

Surgical management is directed at decompressing the entrapped tissues and restoring the orbital structure to prevent diplopia and enophthalmos.

The zygomatic arch is repositioned to give proper midface alignment and symmetrical midface projection.

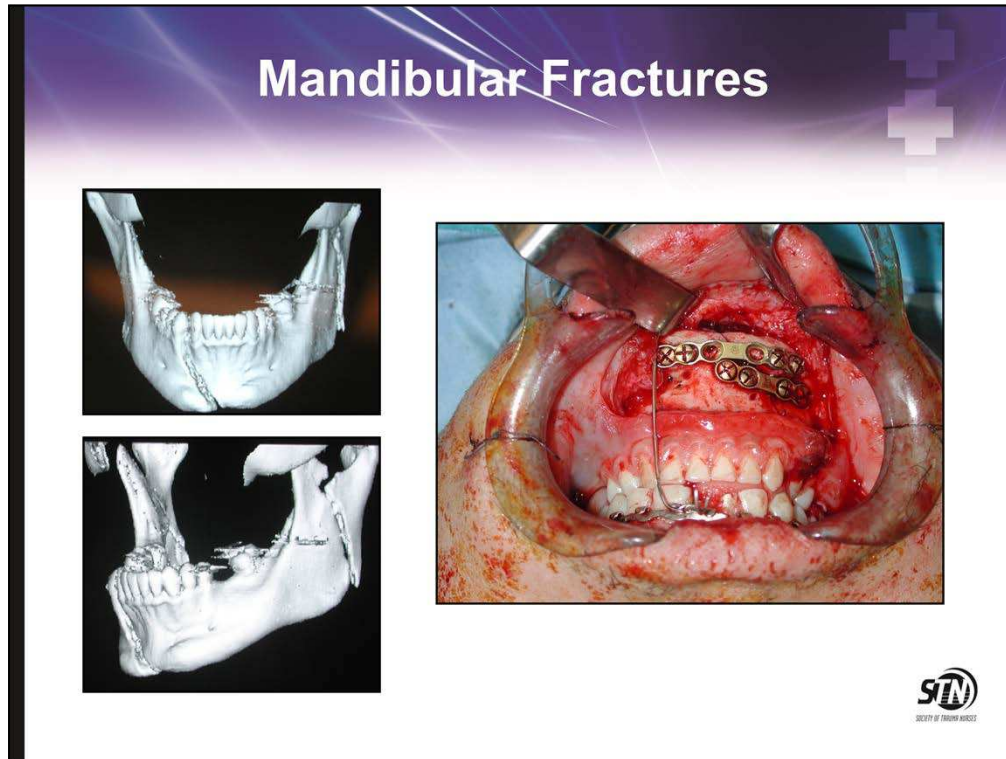
Naso-Ethmoidal-Orbital Fracture

- 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.



NEO fracture is defined as a fracture that extends into the nose through the ethmoid bones. These fractures are associated with lacrimal disruption and dural tears.

Suspect this type of a fracture if there is trauma to the nose or medial orbit. Patients typically complain of pain on eye movement.



Mandible is a commonly fractured bone both as an isolated fracture due to direct blows as well as in combination with other fractures as seen with MVC's.

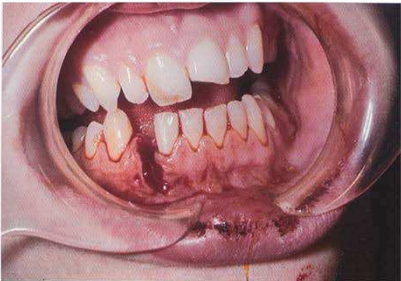
Common sites of mandibular fractures are body (~ 30-40%), angle(~25-30%), and condyles (~ 15%).

Double fractures are common and usually occur on contralateral sides.

The mandible may also be dislocated without fracture as may occur with a large yawn.

Mandible Fractures

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





These fractures manifest clinically with

- Mandibular pain.
- Malocclusion of the teeth
- Separation of teeth with intraoral bleeding
- Inability to fully open mouth.
- Preauricular pain with biting.

Tongue blade test.

A screening maneuver for mandibular fractures is the “tongue blade test.” Most patients with mandibular fractures will not be able to exert much bite force because of pain. The masseters are considered the strongest muscles in the body, and normal adults can usually easily bend and break a tongue blade, which is clenched between their teeth. Patients with mandible fractures are unable to perform this task without extreme discomfort, and difficulty performing this task should be considered at high risk for a mandible fracture.

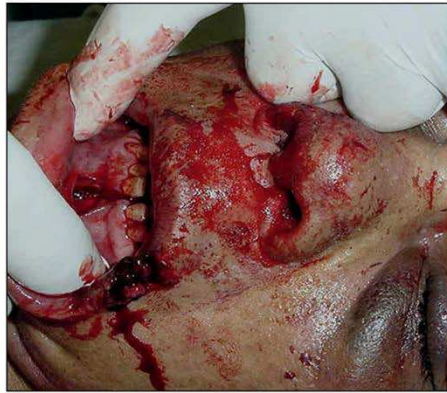
A step off in the dental line or ecchymosis to the floor of the mouth are often present and is highly suggested of a mandibular fracture. Patients are unable to fully open their mouth.

Patients may have preauricular pain with biting when there is a fracture of the condyle.

The open fracture line is evident clinically. There is slight mal-alignment of the teeth.

Mandibular Fracture

- Direct frontal trauma with jaw fracture



Mandibular Fractures Treatment

- Nondisplaced fractures:
 - Analgesics
 - Soft diet
 - oral surgery referral in 1-2 days
- Displaced fractures, open fractures and fractures with associated dental trauma
 - Urgent oral surgery consultation
- All fractures should be treated with antibiotics and tetanus prophylaxis.



Nondisplaced fractures:

- Analgesics
- Soft diet
- Oral surgery referral in 1-2 days

Displaced fractures, open fractures and fractures with associated dental trauma

- Urgent oral surgery consultation, these patients are usually admitted.
- These patients either need closed reduction with occlusion fixation or open reduction.

All patients with mandibular fractures should be treated with antibiotics and tetanus prophylaxis.

Antibiotics of choice are PCN, clindamycin or a 1st generation cephalisporin.

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



Initial assessment and stabilization of the patient's airway, breathing and circulation should be highest priority. High velocity blunt forces frequently cause concomitant intracranial, thoracic and abdominal injuries.

Patients with maxillofacial trauma have a greater risk for airway compromise from edema, bleeding and disruption of the bony structures.

Assess for symmetry of facial structures from a frontal view and a profile view.

Assess for paresthesia along the three branches of cranial nerve V.

Assess for symmetry of facial movements (cranial nerve VII) by having the patient puff out cheeks, smile, show teeth, frown, raise eyebrows and close eyes tightly.

In the unconscious patient, testing corneal reflex will assess the integrity of CN V and CN VII.

Inspect the ears, nose, oral cavity and oropharynx for laceration, contusions, hematomas or other soft tissue defects.

Septal hematoma should be drained urgently to avoid necrosis of the septum.

Assess any drainage for CSF.

Loosely apply gauze at the base of the nose to absorb drainage.

Battle's sign or raccoon's eyes.

Assess sense of smell--Tests cranial nerve I; have the patient identify a familiar odor.

Ocular Assessment

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



Visual acuity

Assess each eye separately.

If the patient cannot see any letters or symbols on Snellen or Allen chart, assess the patient's ability to perceive light and the direction of the light.

Pupil assessment

Assesses cranial nerves II and III.

CN II—direct pupillary response to light and CN III the consensual response to light.

Swinging light test for Marcus Gunn pupil.

Marcus Gunn pupil— the pupil will constrict when a light is shone in the opposite eye. When the light is quickly moved to the diseased eye, the pupil dilates.

Extraocular movements

Assesses cranial nerves III, IV and VI.

Abnormal findings may be caused by orbital edema, entrapment or direct injury to one or more cranial nerves.

Eye position and movement

Exophthalmos (globe pushed out) may be seen in orbital edema, retrobulbar hemorrhage, orbital abscess.

Enophthalmos (sunken globe) is common with orbital fractures.

Eyes lying in different horizontal planes should consider an orbital floor fracture.

Intraocular pressure: Normal pressure is 10-22mmHg.

Physical Examination



- Inspect open wounds for foreign bodies
- Palpate the entire face
 - Supraorbital and Infraorbital rim
 - Zygomatic-frontal suture
 - Zygomatic arches



Inspection of the face for asymmetry. Best done at the head of the bed.

Ask the patient to smile, frown, whistle, raise their eyebrows, close their eyes. Inspect open wounds for foreign bodies.

Palpate the entire face.

Supraorbital and Infraorbital rim

Zygomatic-frontal suture

Zygomatic arches

Note ecchymosis (Battle's sign, Raccoon eyes)

Physical Examination

- Inspect the nose for asymmetry, telecanthus, widening of the nasal bridge
- 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



Inspect the nose for asymmetry, telecanthus, widening of the nasal bridge. Measure the distance between the medial canthi. In normal patients the distance is 35-40mm. If its greater then 40 mm you should suspect nasoethmoid-orbital trauma.

Inspect nasal septum for septal hematoma, CSF or blood. (place a drop of blood on a paper towel and look for a halo sign, nonspecific).

Palpate nose for crepitus, deformity and subcutaneous air.

Palpate the zygoma along its arch and its articulations with the maxilla, frontal and temporal bone.

Physical Examination

- Check facial stability
- Inspect the teeth
- Intraoral examination:
 - Manipulation of each tooth
 - Check for lacerations
 - Stress the mandible
 - Tongue blade test
- Palpate the mandible for tenderness, swelling and step-off.



Open pts mouth and grasp the maxilla arch, place the other hand on the forehead. Push back and forth, up and down and check for movement. Inspect the teeth for malocclusions, bleeding and step-off.

If teeth are missing, account for to be sure they have not been aspirated.

Intraoral exam: Manipulate each tooth, check for lacerations, stress the mandible, tongue blade test. (Bite down on the tongue blade, Twist the blade to try to break it. Patients with broken jaw will reflexively open their mouth.) 95% sensitive and 65% specific.

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



Check visual acuity. Snell chart, finger counting or presence or absence of light perception.

Check pupils for roundness and reactivity. Tear drop pupil – ruptured or penetrated globe injury. Examine for exophthalmos or enophthalmos

Examine the lids for lacerations. Check for injuries to the medial 3rd of the eyelids for damage to the lacrimal apparatus. Check for disruption of the levator palpebral muscles.

Test extra ocular muscles. Testing for restriction. Restriction of upward gaze can be seen with zygomatic or infra orbital wall fx's.

Palpate around the entire orbits. Tenderness, subcutaneous air and deformity. Palpate the medial orbit area to r/o naso ethmoidal orbital fx. (place a Q tip inside the nose to the medial canthus, place your finger outside the medial canthus. If the bone moves NEO fx.)

Physical Examination



- Examine the cornea for abrasions and lacerations
- Examine the anterior chamber for blood or hyphema
- Perform fundoscopic exam and examine the posterior chamber and the retina



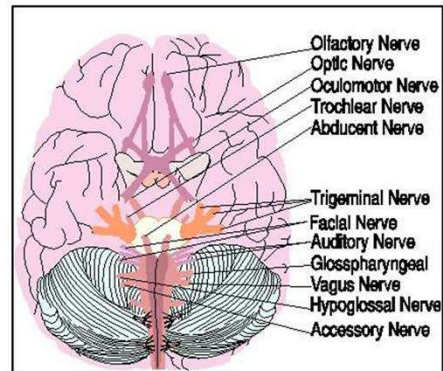
Examine the cornea for abrasions and lacerations. Fluorescein if needed.

Examine the anterior chamber for blood or hyphema. When the patient is stable try to do a slit lamp examination.

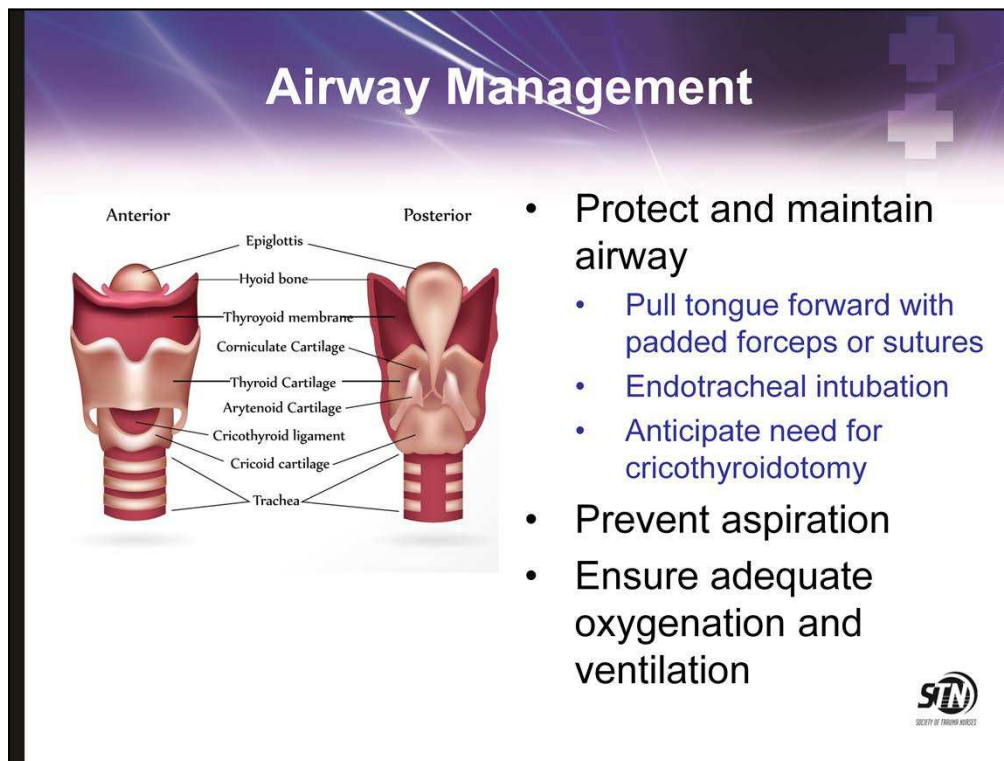
Perform fundoscopic exam and examine the posterior chamber and the retina. Looking for retinal detachment.

Cranial Nerve Hints

- Cranial nerve I - loss of smell, taste (basilar skull fracture hallmark)
- Cranial nerve II - blindness, visual defects
- Cranial nerve III - Ipsilateral, dilated fixed pupil
- Cranial nerve VII - immediate or delayed facial paralysis (basilar skull or LeFort)
- Cranial nerve VIII - deafness (basilar skull fx)



May not be helpful in obtunded patients



Airway is easily obstructed from edema, secretions, blood, vomitus, avulsed teeth. Tongue may obstruct the airway with mandible fractures and loss of bony support. Oral intubation is preferred particularly in mid face fractures.

Cribiform plate fractures are frequently associated with LeFort III fractures.

Avoid inserting ETT, NP airways or gastric tubes into the nares.

Surgical airways may be necessary in patients with massive facial injuries and distortion of landmarks.

Prevent Aspiration

Frequent suctioning of the mouth and oropharynx and endotracheal suctioning.

Gastric decompression via orogastric tube.

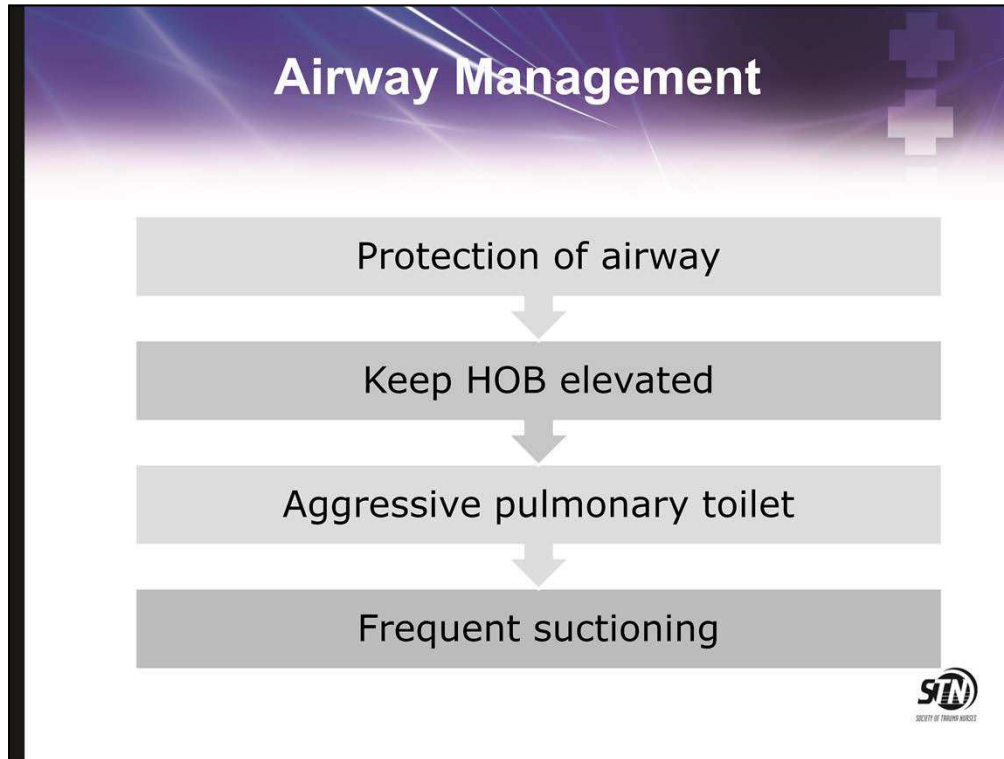
Ensure Adequate Ventilation

Supplemental humidified oxygen.

Assess spontaneous respiratory effort—what other associated injuries will compromise ventilation.

Bag-valve mask ventilation or mechanical ventilation – may be difficult.

Assess for concomitant injuries that compromise oxygenation and ventilation.



Many of these patients will require prolonged endotracheal intubation or tracheostomy due to facial and airway edema, need for multiple trips to the operating room for repeat debridement and phased fixation/reconstruction.

Patients may also have other injuries that necessitate the need for prolonged airway protection or mechanical ventilation.

Once the spine is cleared and there are no other contraindications, keeping the HOB elevated helps to reduce facial swelling.

Intubated and mechanically ventilated patients will require chest physiotherapy.

Non-intubated patients should be encouraged to use an incentive spirometer at frequent intervals.

Suctioning the mouth and oropharynx and teaching the patient to suction the mouth minimizes the risk of aspiration.



This is a 45 year old male struck by a car with significant avulsion injury of the right side of his face.

He sustained a maxilla fracture and right orbit fracture but no mandible fracture.

Prehospital providers were unable to intubate him in the field due to the facial trauma. He was alert but combative on arrival to the ED and was quickly intubated by an anesthesiologist via RSI.



Management

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



Hemorrhage control

Direct pressure to bleeding vessels.

Pack the nares with 30cc balloon or petroleum gauze.

Fracture reduction may reduce bleeding.

Anticipate need for angiography and embolization when bleeding remains uncontrolled.

Restore intravascular volume

Volume replacement is achieved with administration of crystalloids and blood products as needed.

Serial monitoring of hemoglobin and hematocrit.

Blood loss may be from other sources in the multiply injured patient.

Continuous monitoring of Base Deficit, Lactate levels, blood pressure, heart rate, level of consciousness and urine output help guide resuscitation.

Ongoing neurologic status

Traumatic brain injury is a common associated injury. Serial assessment of level of consciousness, motor function, pupil reaction and cranial nerve function.

Interventions to minimize increases in intracranial pressure i.e. mannitol, maximize oxygenation, ensure adequate cerebral perfusion.

Ongoing monitoring if intracranial pressure and cerebral perfusion pressure in the patient with a concomitant traumatic brain injury.

In patients who can cooperate with an exam but are unable to open eyes or speak, develop signals for yes and no (i.e. thumbs up for yes, thumbs down for no).

Watch for ECF leaks.



Protect eyes from further injury

Shield the eye from further injury as patients frequently have more life threatening injuries that take priority in management.

Anticipate need for early/immediate ophthalmologic examination.

Avoid manipulation of the orbit, eyelids or facial structures if there is suspicion of globe perforation.

Pain Management

In the first 24 hours after injury and operative management, ice compress to the eyes and face may reduce swelling and pain.

Intubated patients may require scheduled boluses of narcotic analgesics and benzodiazepines for sedation.

Important to assess for signs of pain (hypertension, tachycardia, agitation) in the patient who is intubated and unable to speak or in patients with significant facial swelling who may be unable to see visual analog scales used for pain assessment.

Liquid forms of analgesic agents may be given orally in the patient with intermaxillary fixation or with gastric tubes or small bore feeding tubes.

Physical Medicine and rehabilitation consults should be made early in the acute phase of care to assist the patient who will require adaptations to ADL's due to vision loss, abnormal speech mechanisms, and associated brain injuries. Cognitive evaluations should be performed on any patient with a traumatic brain injury.



This is the 45 year old male struck by a car with the facial avulsion after closure of the soft tissue injury.

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



Nutrition management

Nutrition consult for “wired-jaw”/blenderized diet

Consultation with dietitians can help determine the patient’s total caloric requirements.

They can also provide patient and family education related to blenderized foods for patients in intermaxillary fixation.

Patient who have been intubated for a prolonged period, patients with tracheostomies or those with significant oral/facial trauma should undergo evaluation for swallowing dysfunction with a speech therapist prior to initiating and oral diet.

Patients receiving enteral feedings should have the HOB elevated at least 30° to prevent aspiration, promote gastric emptying.

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



Prevention of infection

Antibiotic ointments over incision sites when prescribed.

Perioperative antibiotics.

Aggressive dental hygiene with commercially prepared oral rinses (Peridex) or a solution of normal saline and hydrogen peroxide at least 4-6 times a day.



Foreign bodies and lacerations can be caused by

- Blast
- Work related
- Wind storms/leaf blowers
- Air guns
- Paint ball guns
- Heat
- Other varied mechanisms

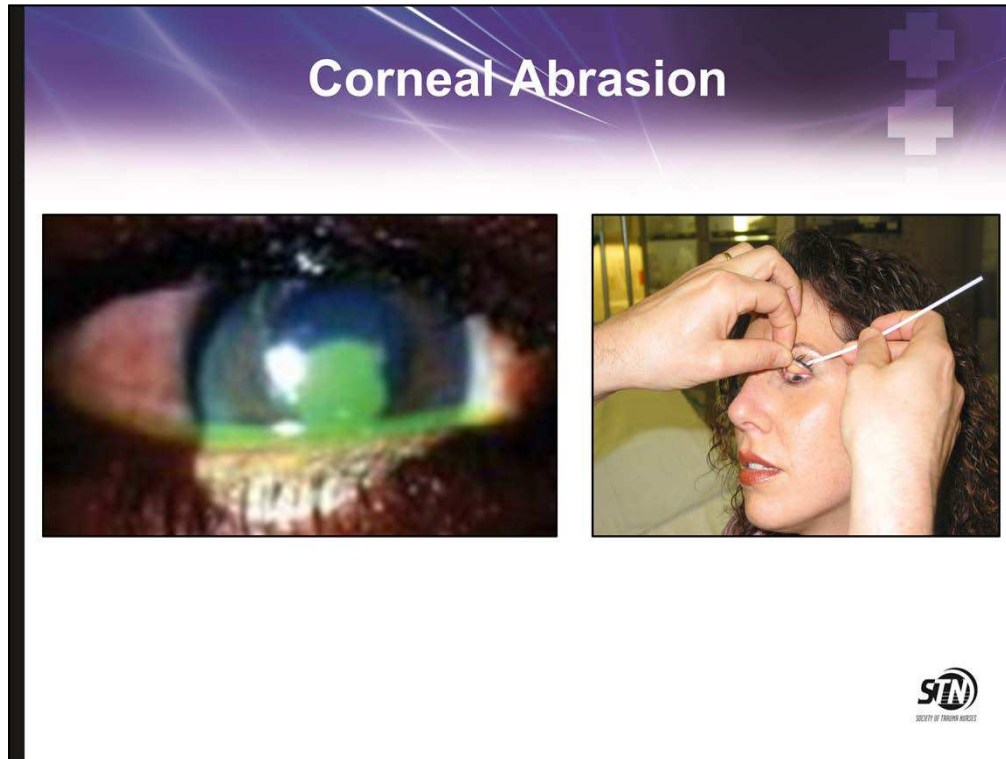


Combination blast and thermal injury

Thermal Injury

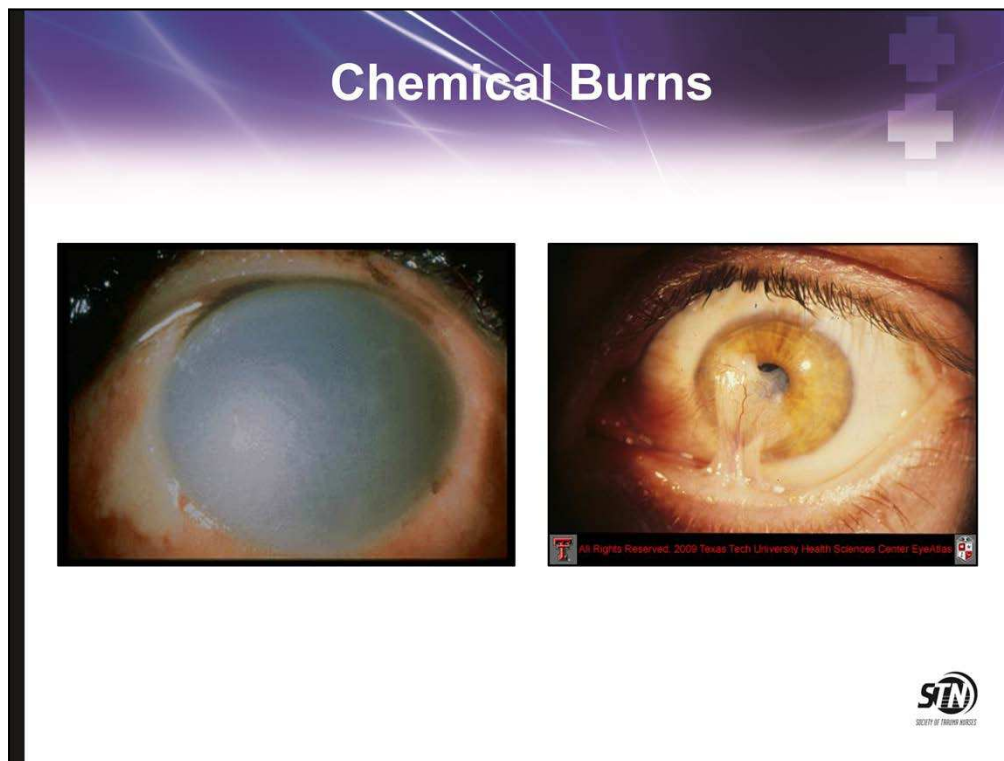
- Eye is usually spared
- Corneal exposure may occur as burn heals and skin contracts





On the left is a corneal abrasion with fluorescein stain

- Corneal abrasions are due to disruption in the integrity of the corneal epithelium, scraping or denudation of the corneal surface as a result of physical external forces. The diagnosis may be confirmed with fluorescein instillation and use of a cobalt blue light, which can be found on some direct ophthalmoscopes or on a slit lamp.
- The eyelids must be everted and checked for the presence of foreign material.
- Topical antibiotics such as polysporin drops can be prescribed to prevent infection. In addition, patching of the eye in contact-lens wearers is contraindicated.
- Although some deep abrasions can lead to scarring and vision loss, prognosis is often excellent with full recovery within 24-48 hours.



Chemical burns are the only exceptions in ocular trauma where treatment begins prior to vision testing. The affected eye must be irrigated with copious amounts of fluid, and a cotton swab used to sweep the fornices of any retained particulate matter. Water or normal saline solutions are preferred, but any nontoxic and unpolluted solutions can be used in an emergency setting. Irrigation should continue until the pH is normalized (pH of 7). This can be monitored with any pH test strips. A thorough ophthalmologic examination is mandatory after irrigation.

Acid (battery fluid, chemistry labs) coagulates protein, limiting depth of injury. **Image on your right is scarring from an acid burn.**

Alkali (household cleaning fluids, fertilizers and pesticides), has severe penetration, causing damage to deep structures within minutes. **Image on your left is an alkali burn.**

Chemical burns are contraindications for patching. The chemical agent may not have been thoroughly lavaged from the eye. Patching will allow extended exposure to the agent under closed lids and is strongly contraindicated.

This is a great link to a PowerPoint on Ocular Trauma

http://home.smh.com/sections/services-procedures/medlib/education/podcasts/documents/okeefe_09-11-09.pdf

Traumatic Hyphema



Image courtesy of EyeMac Development



Traumatic Hyphema

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



Hyphema is blood in the anterior chamber of the eye.

Management directed at prevention of re-bleeding.

Bedrest or limited activity. Non-compliant patients may require hospitalization.

Elevating the HOB encourages settling of blood to the bottom of the anterior chamber.

Cycloplegic agents (such as atropine drops) immobilize the iris and ciliary body thus preventing additional trauma to the damaged blood vessels in the angle is prevented.

Cycloplegic agents also help to stabilize the blood-aqueous barrier, preventing further leakage of inflammatory cells and proteins. Finally, dilation diminishes the risk of pupillary block or synechia (iris adheres to cornea) secondary to hyphema.

Re-bleeding is the most common complication.

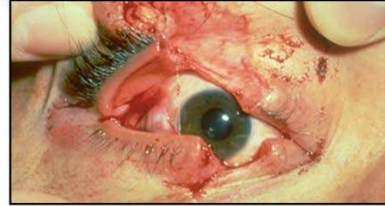
- Rate is from 2%-38%.
- Occurs most commonly 3-5 days after injury when the initial clot begins to lyse and injured vessels rebleed.
- Aminocaproic acid (50mg/kg orally every 4 hours) is an antifibrinolytic agent used to stabilize the clot and prevent rebleeding.
- Paracentesis may be required if the bleeding is significant and intraocular pressure is high.

Controversy: There are studies provide evidence that no statistically significant difference exists in most areas of comparison between patients treated with bed rest, bilateral patches, and sedation and those treated with ambulation, a patch and shield on the injured eye only, and no sedation and recommend ambulation and a patch and shield for the injured eye. Sedation is recommended only in the extremely apprehensive individual. Hospitalization may be warranted in cases of severe trauma and rebleeding



Lid Laceration

- REFER for
 - Depth
 - Extensive tissue loss
- REFER for location
 - medial
 - margin



Lid laceration repair

Conserve tissue

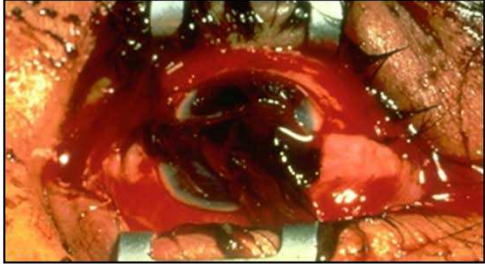
May be delayed up to 72 hrs

6-0 silk or nylon

Sutures out 5 days

Open Globe

- Globe laceration
- Tetanus
- Antibiotics
- REFER
 - 24 hours
 - no altitude restrictions



Administer antiemetics (e.g., ondansetron) to prevent Valsalva maneuvers.
Administer sedation and analgesics as needed.
Avoid any topical eye solutions (e.g., fluorescein, tetracaine, cycloplegics).

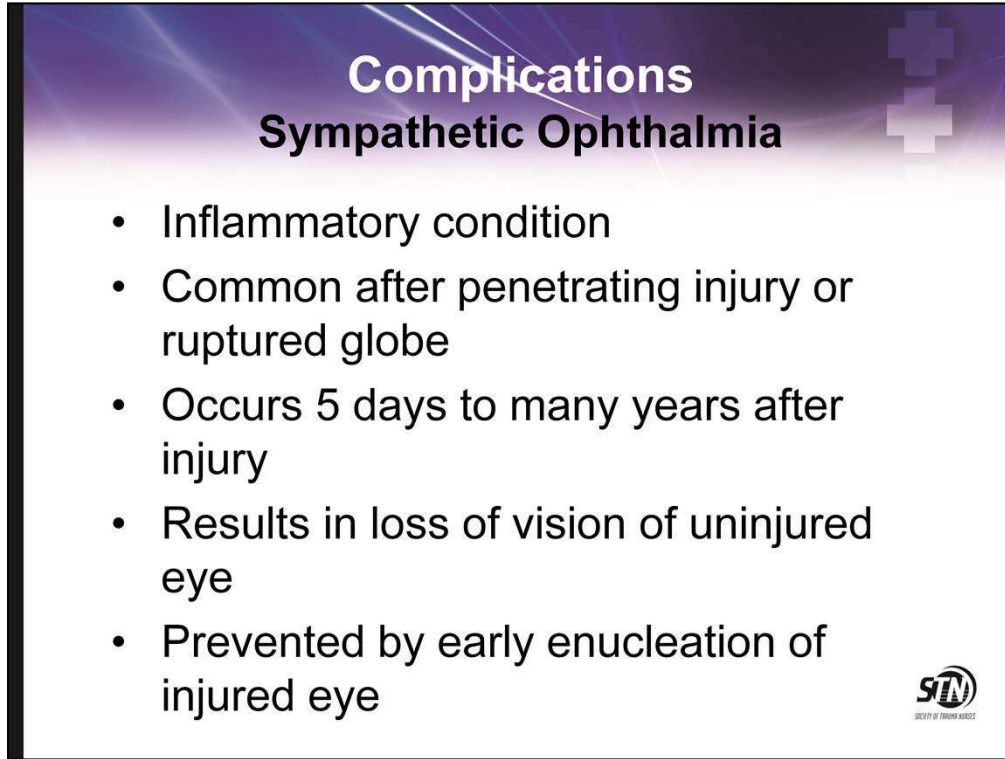
Open Globe

- Minimize additional damage
 - Make sure a shield is used
 - Do not use a patch which applies pressure
 - Avoid bearing down
 - Be prepared for patient to go to the OR
 - NPO



A Fox eye shield or other rigid device (bottom of a polystyrene foam cup) should be placed over the affected eye. Avoid any eye manipulation that may increase intraocular pressure with potential extrusion of intraocular contents.

Eye **patches** are contraindicated.



Complications
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

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Sympathetic Ophthalmia is a rare condition that results from severe penetrating or perforating injury.

This is the primary indication for early enucleation of a nonrepairable globe.

The condition is characterized by diffuse bilateral granulomatous uveitis and loss of the uveal tract or uveal prolapse.

The condition is thought to be autoimmune in nature and occurs from several days to many years after the original injury.

Treatment includes systemic and topical steroids and immunosuppressive agents.

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



Provide communication aids

Blind patients need frequent orientation to time and place.

If patients have lost sight in only one eye or now has limited sight, ensure that the patient can see you when speaking to him.

Describe colors and physical characteristics of the environment to the newly blind patient.

Frequent positive reinforcement

Focus on the positive attributes and accomplishments of patient's progress.

Early referrals to psychiatric liaisons or counselors.

Early referrals to community agencies for the blind and to rehabilitation facilities.

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



Reinforce surgical plan of care

Provide realistic outlook, avoid false reassurances

Surgical sites will appear red and elevated for up to six months

Medications

Correct method of eye drop/ointment instillation

Oral rinses

Nutrition management

Avoid very hot or cold foods, avoid carbonated liquids

Instill small amounts of liquid into buccal pouch

Wound care

Correctly demonstrates use of eye shields

Cleansing of wounds

Use of ointments or OTC creams/lotions

How to remove IMF in an emergency

Tracheostomy care and suctioning

Avoid direct sunlight for 6-12 months

Use strong sunscreens or avoid sunlight to prevent hyperpigmentation

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



Patients with facial trauma may present with life-threatening insults.

Airway compromise is a primary concern and the development of hypovolemic shock due to blood loss cannot be overlooked.

Once the patient is stabilized, early involvement of the multidisciplinary team including plastic surgeons, ENT and/or oral surgeons is required to maximize the patient's outcome.