

Common Facial Injuries

Careful assessment of facial trauma helps the emergency physician determine whether a patient requires supportive measures or more aggressive treatment, including admission for IV antibiotics and surgical intervention.

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An important presenting problem encountered in the ED is facial injury, which includes ear, nose, throat, and ophthalmologic trauma. The emergency physician must be able to perform the initial assessment and treatment of some of the more common injuries. This article reviews traumatic tympanic membrane perforation, nasal fracture, orbital blowout fracture, ruptured globe, and mandible fracture.

TYMPANIC MEMBRANE PERFORATION

The tympanic membrane is a delicate, flexible, and transparent structure that separates the middle ear from the outer ear. It is made up of two distinct

areas, the pars tensa and the pars flaccida. The pars tensa, the larger of the two areas, is an elastic fibrous structure consisting of an inner mucosal layer and an outer squamous layer.¹ The smaller pars flaccida lacks a fibrous layer and is located between the malleus and the tympanic incisura. Damage to this membrane usually occurs in the pars tensa, and infections are the primary cause for tympanic membrane perforations. In addition, blunt, penetrating, and acoustic trauma, as well as barotrauma, can also lead to perforation.^{1,2}

Patients experiencing traumatic tympanic membrane perforation may present with hearing loss, pain, tinnitus, bleeding, otorrhea, and/or vertigo as chief concerns.^{2,3} Patients may also hear whistling sounds while blowing their nose or sneezing. Other concerns include ear infection (as a complication of perforation) with purulent drainage, since the perforation allows bacteria and fungus to enter the usually protected, sterile middle ear.³ The emergency

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physician should perform a thorough otoscopic examination to visualize the ear canal and assess the integrity of the tympanic membrane. If cerumen is blocking the view, it should be removed carefully.^{1,2} When a tympanic membrane perforation is observed on physical exam, it is important to document the location of the perforation by quadrant and percentage of involved membrane.³

Patients diagnosed in the ED with a tympanic membrane perforation should be referred to an otolaryngologist for audiometric testing. It is important to instruct patients to avoid getting water into the ear during the healing process, especially during baths or swimming. A cotton ball coated with petroleum jelly may be placed in the outer ear to help prevent water from entering the ear.³ Most patients with traumatic perforations do not require antibiotics; however, if an infection is suspected (either as the etiology or as a complication of perforation), a topical fluoroquinolone should be used.^{1,4} These agents may be safer and more efficacious than other options in treating otitis media in patients with concurrent tympanic membrane perforation. Due to a possible association with sensorineural hearing loss, eardrops containing gentamicin, neomycin sulfate, or tobramycin should not be used in cases of tympanic membrane perforation.¹ Occasionally, a systemic antibiotic may be necessary to control otorrhea. In this case, an antibiotic typically used to treat upper respiratory infections may be prescribed, such as azithromycin or trimethoprim-sulfisoxazole.

NASAL FRACTURE

The nose consists of the nasal bones and nasal septum, both of which can be easily injured due to their prominent anterior location. Nasal fractures are the most common maxillofacial injury seen in the ED and should be suspected whenever facial trauma has occurred. In general, men are more likely than women to suffer this type of injury, since most facial trauma is secondary to altercations or sporting events.^{5,6}

Most patients will present with an obvious nasal deformity along with a history that supports the diagnosis. It is important to obtain an adequate history regarding the mechanism and type of injury. Most nasal fractures result from minor trauma. The diagnosis is clinical, and in most cases x-rays do not aid in diagnosis or management. However, if significant trauma has occurred to the midface, there

may be an associated cervical spine or intracranial injury, which must be investigated.⁷ In addition, the clinician should perform a thorough facial exam, including palpation of all facial bones, due to the high incidence of concurrent maxillofacial injuries. If multiple facial injuries are suspected based on history or physical exam, CT of the face is necessary to fully evaluate the extent and degree of injury.⁶

Uncomplicated nasal fractures are usually treated conservatively. Ice should be applied to decrease edema and inflammation, and patients should be warned that “black eyes” (ie, periorbital ecchymoses) are a frequent complication. Keeping the head upright (even at night) will minimize this effect.⁷ The patient should be advised to follow up with an otolaryngologist to address breathing difficulties or cosmetic concerns. Complications such as epistaxis, cerebral spinal fluid (CSF) rhinorrhea, and septal hematoma should be addressed in the ED.⁵⁻⁷

Most epistaxis from nasal trauma is self-limiting and requires only direct pressure. Use of a topical anesthetic and vasoconstrictor allows optimal visualization of the nasal cavity. Some of the agents used include 5% to 10% cocaine or a 1:1 mixture of 4% lidocaine with oxymetazoline or phenylephrine hydrochloride. If bleeding cannot be controlled despite all attempts, use of nasal packing may be required.^{5,7}

If the patient has had recent facial trauma along with clear nasal drainage, CSF rhinorrhea should be suspected. Cribriform plate fracture is associated with CSF leakage and represents a violation of the subarachnoid space. Although neither sensitive nor specific, a quick method of determining whether a CSF leak is present involves placing the nasal discharge on filter paper.⁸ A patient who has a clear area surrounding the blood (ie, target sign) may have a leak. A patient with a suspected CSF leak requires head CT and a neurosurgery consultation. Untreated CSF rhinorrhea may result in serious intracranial infection (ie, meningococcal meningitis or brain abscess).^{5,6,8}

Septal hematoma refers to rupture of the perichondrial blood vessels of the nasal septum and can be ruled out by careful physical exam. It appears as a blue or purple fluctuance adjacent to the nasal septum

>>FAST TRACK<<

If significant trauma has occurred to the midface, there may be an associated cervical spine or intracranial injury.

Courtesy of Keith D. Hentel, MD

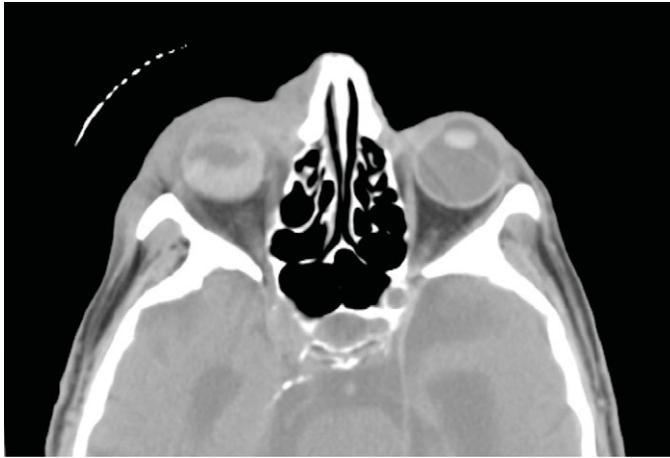


FIGURE 1. Axial CT demonstrating globe rupture of the right eye. Note the difference in globe composition (ie, hemorrhage) compared with the uninjured left globe. The lens is no longer visible. There is also slight protrusion of the globe and soft-tissue swelling.

and should be immediately drained. The area should be anesthetized, an incision for drainage should be made, and a drain may be inserted to prevent reaccumulation of blood. If untreated, septal hematomas can lead to avascular necrosis of the septum, infection, or a saddle deformity.^{6,7}

ORBITAL BLOWOUT FRACTURE

Commonly known as the *eye socket*, the orbit is a complex that includes the frontal, maxillary, zygomatic, palatine, sphenoid, and lacrimal bones.⁹ The most common orbital fracture, a blowout fracture, usually results from direct blunt trauma to the eye that leads to increased intraocular pressure (IOP).^{9,10} This increased pressure is transmitted through the orbit and commonly causes a fracture in the orbital floor (which is the superior border of the maxillary sinus), since it is one of the weakest portions of the orbit. This ultimately prevents rupture of the globe and loss of eye function. When periorbital fat and extraocular muscles are trapped within the defect caused by the fracture, abnormal eye movements may result. These fractures frequently affect the infraorbital groove, and damage to the infraorbital nerve can result in hypesthesia in its area of distribution (ie, below the eye).

Patients who present with a history of blunt eye trauma may complain of diplopia, enophthalmos (ie,

backward or downward displacement of the eyeball), periorbital edema, or ipsilateral hypesthesia in the distribution of the infraorbital nerve.^{10,11} There may be ecchymosis and ptosis (drooping of the upper lid), as well as point tenderness or orbital rim step-off with palpation. Sinus involvement may lead to orbital emphysema (ie, subcutaneous air), and proptosis may be present initially due to orbital edema. The patient's visual acuity, pupils, and extraocular muscles, as well as the integrity of the infraorbital nerve, should be assessed. In particular, evaluation should be made for diplopia on upward gaze, which usually indicates entrapment of the inferior rectus muscle. A slit lamp exam should be performed to evaluate for intraocular damage and IOP should be measured, unless ruptured globe is suspected.^{9,10}

The imaging modality of choice for trauma to the face, including the orbits, is CT; however, if CT is not available, facial films can be used for evaluation of bony orbital injuries. The Waters view may suggest an orbital floor fracture when air-fluid levels are observed in the maxillary sinus. Another radiographic finding of a blowout fracture is the teardrop sign, which may represent extraocular muscle or periorbital fat entrapment in the maxillary sinus. Caldwell and lateral projections are less useful for orbital floor fractures, but they may be used to evaluate the rest of the orbit and other suspected facial injuries.^{9,10}

Most isolated orbital floor fractures can be treated on an outpatient basis with an ophthalmology or otolaryngology follow-up. Conservative management includes application of ice packs, avoidance of nose blowing, and analgesics.^{10,11} There is no clear evidence that prophylactic antibiotics prevent infection from this injury.¹² During the follow-up visit, a specialist can determine whether surgical intervention is needed.

RUPTURED GLOBE

A ruptured globe occurs when there is penetrating or blunt trauma that results in full-thickness damage to the sclera or cornea. This injury leads to an increase in IOP and ultimately to a rupture at weak points of the eye, such as the limbus or prior surgical sites. If the patient reports a history of projectile objects entering the eye, a foreign body must be suspected. To prevent further damage to the eye, the IOP should not be measured if a ruptured globe is suspected.^{13,14}

As with any facial trauma, the mechanism of injury helps direct the physical exam. Patients gener-

ally present with varying levels of pain, as well as a decrease in vision or diplopia. Visual acuity and extraocular movements should be documented in all cases of eye trauma. In addition, a thorough slit lamp exam should be performed. Physical exam findings that suggest a globe rupture include irregular pupil shape, decrease in anterior chamber depth, hyphema, optic nerve damage, and retinal detachment. If the injury was penetrating, the eyelid should be examined for lacerations and the orbital area should be palpated for orbital fractures, foreign bodies, or globe displacement.^{11,13,15}

If a globe rupture is suspected but not obvious on physical exam, imaging studies may be needed. The preferred imaging modality is facial or orbital CT (Figure 1). If CT is not available, plain films may be used to evaluate the bony orbital structures and detect air-fluid levels. Although not offered in all facilities, MRI is a useful tool, but it should not be used in the presence of a suspected metallic intraocular foreign

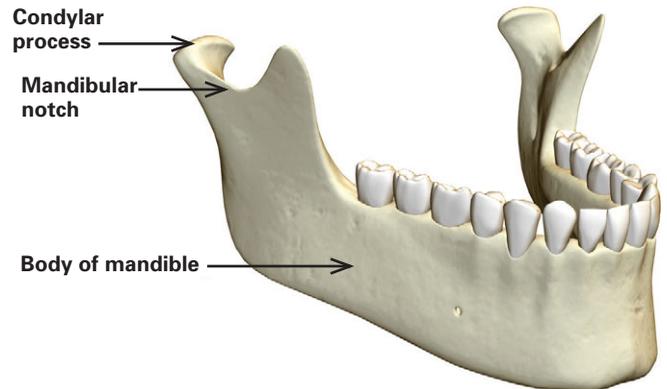


FIGURE 2. Mandible fractures are most often classified anatomically.

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body. Ultrasound is typically not used for globe rupture, as it applies pressure directly to the globe.^{11,13}

An emergent ophthalmology consult is required when a ruptured globe is identified. It is essential to control the patient's pain and vomiting to prevent any rise in IOP. A rigid shield should be applied to protect the eye and a tetanus shot should be given if the patient's vaccine status is not up-to-date. Intravenous antibiotics (eg, cephalosporin) are necessary to prevent the development of endophthalmitis. If a foreign object has penetrated the eye, it should not be removed. Instead, the patient should be admitted for surgical repair or enucleation.^{11,13-15}

MANDIBLE FRACTURE

A horseshoe-shaped structure, the mandible comprises the body, angle, ramus, condyle, alveolus, and coronoid process. Fractures occur most commonly at the angle, body, or condyles.¹⁶ Due to the mandible's shape and articulation with the temporomandibular joint (forming a ring), trauma to this structure usually results in fractures in two locations. Mandible fractures are the third most common facial fracture.^{5,17} There are many classifications for describing mandible fractures, but the anatomic classification is most widely used (Figure 2).

Patients usually present with a history of facial trauma, along with jaw pain, inability to open and/or close the mouth, dental malocclusion, and paresthesia in the distribution of the inferior alveolar and/or mental nerve (ie, lower lip).^{5,16} Initial evaluation should include palpation of the entire mandible for tenderness, swelling, or step-off that may indicate the location of injury. An internal oral exam should be performed to look for gingival bleeding, localized edema, lacerations (ie, open fracture), ecchymosis in the floor of the mouth, and tooth stability.¹⁷

The imaging study of choice is the panoramic x-ray (ie, panorex), as it demonstrates the entire mandible. If this x-ray is not available, bilateral lateral oblique views and the Towne's view should be obtained. If there are unaccounted missing teeth, a chest x-ray should be performed to rule out aspiration. In patients with significant facial trauma, facial CT should be ordered to fully evaluate for other maxillofacial injuries.^{5,16,17}

For patients with a closed, stable mandibular fracture, a Barton bandage, consisting of an elastic bandage wrapped around the jaw and top of the head

to provide support, can be used. Consultation with an otolaryngologist or oral surgeon is warranted to determine treatment options, which vary by type of injury and may be performed on an outpatient basis.^{16,17} However, a patient with an open or unstable fracture should be admitted and treated with IV antibiotics (ie, penicillin, clindamycin, or first-generation cephalosporin).^{5,17} □

REFERENCES

- Howard ML. Middle ear, tympanic membrane, perforations. eMedicine. <http://emedicine.medscape.com/article/85868> 4-overview. Updated September 25, 2009. Accessed November 1, 2009.
- Tintinalli A, Lucchesi M. Common disorders of the external, middle and inner ear. In: Tintinalli JE, Gabor D, Stapczynski JS, eds. *Emergency Medicine: A Comprehensive Study Guide*. 6th ed. New York, NY: McGraw-Hill Professional; 2003:1518.
- Oghalai JS. Tympanic membrane, middle ear and mastoid disease: tympanic membrane perforation. Baylor College of Medicine: Department of Otolaryngology-Head and Neck Surgery Web site. http://www.bcm.edu/oto/jsolab/tm_me_mastoid/tympanicmembrane.htm. Updated January 6, 2006. Accessed November 1, 2009.
- Pappas S, Nikolopoulos TP, Korres S, et al. Topical antibiotic ear drops: are they safe? *Int J Clin Pract*. 2006;60(9):1115-1119.
- Peacock WF IV. Face and jaw emergencies. In: Tintinalli JE, Gabor D, Stapczynski JS, eds. *Emergency Medicine: A Comprehensive Study Guide*. 6th ed. New York, NY: McGraw-Hill Professional; 2003:1526.
- Smith JE, Perez CL. Nasal fractures. eMedicine. <http://emedicine.medscape.com/article/391863-overview>. Updated October 2, 2009. Accessed November 1, 2009.
- Kucic CJ, Clenney T, Phelan J. Management of acute nasal fractures. *Am Fam Physician*. 2004;70(7):1315-1320.
- Welch KC, Stankiewicz J. CSF rhinorrhea. eMedicine. <http://emedicine.medscape.com/article/861126-overview>. Updated September 28, 2009. Accessed November 1, 2009.
- Widell T. Fracture, orbital. eMedicine. <http://emedicine.medscape.com/article/825772-overview>. Updated March 6, 2008. Accessed November 1, 2009.
- Kwitko GM. Orbital fracture, floor. eMedicine. <http://emedicine.medscape.com/article/1218283-overview>. Updated May 15, 2009. Accessed November 1, 2009.
- Mitchell JD. Ocular emergencies. In: Tintinalli JE, Gabor D, Stapczynski JS, eds. *Emergency Medicine: A Comprehensive Study Guide*. 6th ed. New York, NY: McGraw-Hill Professional; 2003:1501.
- Martin B, Ghosh A. Antibiotics in orbital floor fractures. *Emerg Med J*. 2003;20(1):66.
- Robson J, Behrman AJ, Abuhl S. Globe rupture. eMedicine. <http://emedicine.medscape.com/article/798223-overview>. Updated July 16, 2009. Accessed November 1, 2009.
- Friedman N, Kaiser P, eds. Sclera. In: *Essentials of Ophthalmology*. Philadelphia, PA: Saunders; 2007:167.
- Peak D, Chisholm C, Knoop K. Ophthalmic trauma. In: Knoop KJ, Stack LB, Storrow AB, eds. *Atlas of Emergency Medicine*. 2nd ed. New York, NY: The McGraw-Hill Companies Inc; 2002.
- Barrera JE, Batuello SG. Mandibular angle fractured. eMedicine. <http://emedicine.medscape.com/article/868517-overview>. Updated November 10, 2008. Accessed November 1, 2009.
- Widell T. Fracture, mandible. eMedicine. <http://emedicine.medscape.com/article/825663-overview>. Updated March 6, 2008. Accessed November 1, 2009.