Bunt trauma to the inferior orbital rim is a frequent cause of orbital floor fractures and is often secondary to physical altercations, motor vehicle accidents, and sporting injuries. Orbital floor fractures may occur with other ocular, periocular, and facial injuries. Prompt evaluation and appropriate decision making are important to the care of these patients. This article reviews the key ophthalmic portions of the examination and treatment plan for patients with a suspected orbital fracture.

EVALUATING A PATIENT WITH ORBITAL TRAUMA

Proper treatment begins with a thorough evaluation. A multidisciplinary trauma team must rule out life-threatening processes. Attention may then be directed toward the ophthalmic examination.

The first priority for the ocular specialist in evaluating facial trauma is to rule out a ruptured globe. A thorough history of the events that led to the trauma is helpful. It is important to ask the patient specifically about the symptoms of decreased or double vision, numbness, pain with ocular movement or chewing, and bleeding from the nose. The examination should include

- a measurement of visual acuity in each eye
- an assessment of extraocular motility
- a determination of primary position and gaze-evoked ocular alignment
- palpation of the orbital rim
- a sensory examination
- a slit-lamp examination and fundus evaluation

The goal of the initial assessment is to determine if imaging is warranted. Specific signs of concern for an orbital floor fracture are severe periocular ecchymoses, limitation of extraocular motility, binocular diplopia, subcutaneous emphysema, trismus, hypoesthesia in the infraorbital nerve distribution, and enophthalmos (Figure 1A). It is important to recognize that, even in the setting of large orbital floor fractures, enophthalmos may be masked by pre- and postseptal edema and hemorrhage.

If worrisome symptoms and signs warrant, a computed tomography scan with both thin-cut axial and coronal sections should be performed (Figure 1B). In the acutely injured patient with associated neck trauma, reformatted coronal images may be necessary. Contrast is not routinely given to evaluate bony damage. Magnetic resonance imaging generally is not helpful for imaging orbital trauma, unless the physician is considering vascular injuries, such as carotid-cavernous sinus fistulas or superior ophthalmic vein thrombosis.

Figure 1. A patient presents 3 days after a left orbital floor fracture (A) demonstrating subconjunctival hemorrhage, enophthalmos, and periocular ecchymoses. Coronal imaging (B) demonstrates a left orbital floor fracture with hemorrhage in the maxillary sinus. Intraoperative view (C) of the implant’s placement (Medpor Titan implant with microscrew fixation). Three weeks after initial surgery (D), the enophthalmos has resolved, and symmetry has improved.
INDICATIONS FOR THE REPAIR OF ORBITAL FLOOR FRACTURES

After confirming the diagnosis of a floor fracture with computed tomography scanning, the ocular specialist must decide between operative intervention and conservative management. The following orbital floor fractures require urgent surgical repair:

- Diplopia present with radiological evidence of an entrapped muscle or periorbital tissue and an associated unresolved oculocardiac reflex (bradycardia, heart block, nausea, syncope)
- The “white-eyed” fracture (minimal ecchymosis or edema) in a patient less than 18 years old with clinical evidence of vertical limitation in ocular movement and corresponding radiological evidence of an entrapped inferior rectus muscle or perimuscular soft tissue

Aside from these two emergency conditions, the remainder of orbital floor fractures requiring intervention can be treated on a subacute level. Simply speaking, this means performing a repair as soon as reasonably possible after determining that surgery is necessary. Additional surgical indications for nonemergency repair of orbital fractures include

- Clinical evidence of enophthalmos or hypoglobus that is of functional or cosmetic concern
- Diplopia that is associated with either clinical (limitation in forced duction testing) or radiological evidence of entrapment
- Extensive floor fracture (≥50% of the orbital floor or increased volumetric orbital expansion)

Often, orbital floor fractures will occur in conjunction with medial orbital fractures. Surgical decision making should include consideration of the risk of entrapment of the medial rectus muscle in the medial orbital fracture and the risk of enophthalmos from additional medial orbital expansion. Often, the medial orbital wall can be addressed via the same orbitotomy approach to the floor, or if needed, an additional medial orbitotomy can be performed.

SURGICAL PROCEDURE

Upon deciding to surgically repair the orbital floor, the ophthalmologist must use a sound surgical technique to limit complications. Protection of the globe is paramount. Surgery is performed under general anesthesia. The author’s technique can be broken down into the following components:

Preparation of the Patient

The patient is placed in the supine position under general anesthesia. Each pupil is evaluated for preoperative size. A local anesthetic (2% lidocaine with 1:100,000 epinephrine) is injected subcutaneously along the lower eyelid.

Surgical Procedure

Placement of the Implant

Many implant materials exist, and a vast number of articles have been published describing them. In addition to autogenous materials such as bone or cartilage grafts, many alloplastic options have been reported, including high-density porous polyethylene, silicone, and titanium mesh. The author generally uses Medpor Titan implants (Porex Corporation, Fairburn, GA), which are 1 mm thick and have incorporated titanium mesh (Figure 1C). The surgeon trims the implant to the appropriate size and places it to cover the defect, while taking care to re-create the natural orbital contours. The implant can be fixated with microscrews, a flap created in the implant, or glue, depending on the surgeon’s preference. The ophthalmologist confirms the following:

- The anterior edge of the fracture is identified.
- The traction suture (previously placed) in the inferior rectus muscle is passed through the belly of the muscle.
- A unipolar cutting device, and the surgeon uses a periosteal elevator to carefully lift the periosteum off the orbital floor. The anterior edge of the fracture is identified.
- Release of the Entrapped Tissue

The majority of blowout fractures occur along the medial extent of the floor, medial to the infraorbital nerve. The dissection begins at the anteromedial extent of the fracture, the safest area for avoidance of the infraorbital nerve. The periorbita is teased off this portion of the fracture. The surgeon uses a hand-over-hand dissection technique to gently free all of the entrapped tissue from the fracture site. The traction suture (previously placed) in the inferior rectus muscle can be used for identification of the muscle.

Exposure of the Fracture Site

Once a preseptal dissection to the inferior orbital rim is complete, the assistant uses Desmarres and malleable retractors to identify the rim. The surgeon performs a layered dissection at the anterior edge of the rim with a unipolar cutting device, and he or she uses a periosteal elevator to carefully lift the periosteum off the orbital floor. The anterior edge of the fracture is identified.

Exposure of the Orbital Rim

A transconjunctival, swinging-eyelid approach gives wide exposure of the orbital rim and floor. Other surgeons have advocated similar approaches to the floor, and variations have been described. Depending on the patient’s anatomy and the amount of exposure required, floor fracture repair can be performed without a canthotomy and cantholysis.

Exposure of the Fracture Site

The patient is placed in the supine position under general anesthesia. Each pupil is evaluated for preoperative size. A local anesthetic (2% lidocaine with 1:100,000 epinephrine) is injected subcutaneously along the lower eyelid and in the lateral canthal region. Care is taken to avoid any postseptal injection that could cause pupillary dilation. After surgical prepping, forced duction testing is performed on each eye. A 6–0 silk suture is passed through the belly of the inferior rectus muscle for future identification. A protective corneal shield is inserted into the operative eye. A 4–0 silk traction suture is passed full thickness through the lower eyelid, just below the lash line.

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position of the globe and performs forced duction testing prior to closure.

Closure

Placement of an orbital drain is often performed to decrease early postoperative swelling and potentially to protect against retrobulbar hemorrhage. A layered closure, with careful attention to appropriate anatomical landmarks, is executed for the periorbita and conjunctiva. If removed, the lateral canthus is replaced with permanent sutures to the lateral orbital tubercle.

Postoperative Care

Patients are admitted overnight for observation as well as control of pain and nausea. If a drain is placed, it is left for suction, changed as needed, and usually removed on the morning of the first postoperative day. The author routinely prescribes a 1-week course of antibiotics and a Medrol dose pack (Pfizer Inc., New York, NY). Patients also use a combined antibiotic/steroid eye drop four times daily for 1 week. They are instructed to avoid strenuous activity for 2 weeks after surgery. They use ice compresses periodically during the initial 48 to 72 hours postoperatively (Figure 1D).

CONCLUSION

Orbital floor fractures are common and usually occur in the setting of blunt trauma to the midface. Many cases do not require surgical treatment. Those that do are usually not emergencies, but operative management should occur as soon as reasonably possible after the decision to operate has been made. Protection of the globe and the ocular adnexa is paramount in fracture repair.

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