ORBITAL FRACTURES: CLINICAL REVIEW

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Abstract

We study orbital fractures in order to comprehend clinical orbital anatomy in relation to trauma and fractures, to stand with the assessment and examination patient exposed to periorbital trauma, then to reach medical and surgical treatment modalities in safer way. In this article we aim to spot alight for summarizing an overview for maxillofacial, neurosurgery and other specialties in the diagnosis and management of the fractures that may be more common in orbital and pre orbital region. Different range of treatment specialties result in varying levels of experience accommodation in the care of these patients. in this review we summarize and evaluation of management of commonly encountered orbital fractures.

Keywords: Orbit, Orbital fracture, Blow out fracture, Enophthalmos, Ectropion

Relevant anatomy

Orbital floor:

maxillary, zygomatic, and palatine bones make adult orbital floor. The orbital floor measures 35–40 mm depth until the most posterior end of the maxilla and sinus (1). The orbital floor gather its importance from its close relation to the inferior rectus muscle, then its importance with involvement of these muscles and the sequalae more over change in vertical position of the globe itself in case of fracture (2). The maxillary branch of the trigeminal nerve inters the exit through continues channel made from infraorbital groove, canal, and foramen through the maxilla (3). The infraorbital nerve exits the infra orbital foramen to supply the orbital floor, lateral nose and the mid part of the face by sensory fibers. Vessels those pass within the infraorbital canal will exit from it to supply almost the same areas that are supplied by corresponding nerves (4). Infraorbital nerve injury often occurs with only sensory disturbance resulting with pure orbital floor fracture; in many cases not intended for repair (3).

Medial wall:

It’s well known that the frontal process of maxilla, the sphenoid body, the orbital plate of the ethmoid

and the lacrimal bones together made the medial wall of bony orbit(5). lamina papyracea which separate the orbit from the ethmoidal air sinuses, as thin as (0.2–0.4 mm) easily damaged by trauma. Lacrimal sac lies in the lacrimal groove along the medial wall which is formed by the maxillary and lacrimal bone (6). Ethmoidal foramina placed at the junction of the medial wall and the roof of orbit, anterior and posterior ethmoidal arteries and nerves pass through (4). Bleeding may occur and encountered if these arteries injured directly at time of trauma, also during surgical repair intraoperatively. Medial rectus muscle, in close relation to the medial wall. Eye movements restrictions caused by damage or entrapment of medial rectus muscle should be considered as strong sign of medial orbital wall fracture, there are other structures for sure vulnerable to injury when medial wall trauma is considered like the medial lacrimal drainage apparatus, and canthal tendon (7).

The zygoma:

It is one of the determinants of facial morphology, as facial width and cheek prominence, it is one component forms a portion of the orbital floor and lateral wall of bony orbit (8). It is important to keep subperiosteal dissection during repair as minimum as practical to maintain bone-muscle connection of the facial animation muscles. The Whitnall tubercle, plays a crucial role in maintaining the contour of the eyelid serving an attachment of the lateral canthal tendon, located 2 mm behind the edge of the lateral orbital wall within the zygomatic bone(1)

Evaluation

History:

First of all, the mechanism of face trauma must be determined. Increased intra-orbital pressure, due to a history of the eye being impacted by an item larger than the orbit itself shall cause the orbital bones to break at a point with less strength thus give the meaning of term "blowout" fracture the. medial wall or orbital floor mostly involved. Another idea holds that buckling of the orbital floor is caused by compression of the inferior orbital rim.(2). Patients with isolated medial wall fractures frequently claim a history of trauma, straight to the nose or to the orbital region such as a fist punch.(9). A mechanism of injury involving a punch to the side of the face, and sometimes with increasing rate of a motor and crossing road accident especially with schooled age accident(10), connected with zygomatic trauma could be seen with it .

Regardless of all types of theses fracture and there close anatomical relation and being in the same anatomical region, each fracture type can result from a number of stress mechanisms (11).

Physical examination

Full assessment of the globe should be performed especially for those patients exposed to multiple trauma or crush injury, Patients with periorbital trauma, Patients with orbital fractures may present with

trauma to iris (12), or some degree of corneal abrasion, retinal tears may be seen or can be missed in diagnosis, and traumatic optic neuropathy. Orbital roof fractures may require early neurosurgical intervention with encountered complications such as pneumo-Cephalus, hematoma, or cerebrospinal fluid leaks (13). In case of involvement of the orbital rim by the fracture, the patient may have a palpable bony "step deformity" with pain during palpation along the orbital rim. Neurological deficit across the infraorbital nerve will be there for the ipsilateral injury to the infraorbital nerve. proptosis or enophthalmos if noticed then should be documented (14).

Orbital floor

Orbital edema that if very severe may be connected with more serious fractures and can result in proptosis. Enophthalmos may be evident after the edema has gone (typically within 1–2 weeks) (15). Proptosis from retrobulbar or peribulbar bleeding, on the other hand, must be considered; vision will be affected if present in severe cases (12). Entrapment of the inferior rectus or the peri-muscular fascia into or within the fracture site may cause limited vertical mobility. In the case of suspected entrapment, look for indicators of the oculo-cardiac response, such as bradycardia, nausea, and syncope "white eye syndrome. In addition, the so-called "trapdoor" fracture in children is a subgroup of orbital fracture with entrapment (7).

Medial wall

Periorbital edema, ecchymosis, and subconjunctival bleeding considered as nonspecific signs for medial orbital wall fracture, other more important symptoms includes subcutaneous emphysema due to accompanied some part of destruction area of the ethmoidal air cells, epistaxis, and CSF rhinorrhea collectively give solid diagnosis for medial wall disruption. The medial rectus muscle is shown to be entrapped. Pseudo-retraction Duane's syndrome, or globe retraction of the and narrowing or looking slightly closing of the palpebral fissure on abduction, is pathognomonic for medial wall fracture coupled with medial rectus entrapment (16). It is critical to be on the lookout for CSF rhinorrhea because it indicates meningeal damage and hence necessitates preventive broad-spectrum antibiotics and neurosurgical consultation (17).

Damage to the lacrimal drainage system and/or involvement of medial canthal ligament can result from a combination of medial wall fractures and ethmoid–orbital fractures (18). The medial canthal tendon is damaged in some of these fractures, resulting in traumatic tele canthus (19).

Zygomatic

Malar subsidence depression accompanied by step at the infraorbital rim, frontozygomatic suture, and zygomatic buttress of the maxilla can be obvious for naked eye on external inspection. In 70% of cases, zygomatic bone fractures cause discomfort when palpated (11).

The distribution of the infraorbital, zygomaticofacial, or zygomaticotemporal nerves is typical of paresthesia. Posterior displacement of the fracture zygoma fragment may obstruct and restrict mandibular motion by impending mandibular coronoid, causing mastication issues. Inferior migration of the broken zygomatic bone may be indicated by inferior displacement or singe of dropped angle of the palpebral fissure which indicated with drop in lateral canthal angle (20).

Although they are not real orbital blowout fractures, the contributions of the zygomatic bone to the orbital floor may result in trapping of orbital fat, enophthalmos, and diplopia with limitation of mobility. It's may be difficult to measure the relative enophthalmos or proptosis because the lateral orbital rim displacement in the majority of zygomatic complex fractures, which is, serves as a reference measurement point for it (21).

Imaging

Although not true orbital blowout fractures, contributions of the zygomatic bone to the orbital floor may result in orbital fat trapping, enophthalmos, and diplopia with limited mobility. Because the lateral orbital rim displacement in the majority of zygomatic complex fractures serves as a reference for measurement point for relative enophthalmos or proptosis, it may be difficult to measure the relative enophthalmos or proptosis (22).

The size and shape of the fracture should be clarified and determined, which aids in both clinical evaluation and surgical planning. A CT scan can determine whether or not the fracture has entered the optic canal. A CT scan can play the master role to reveal whether a patient's acute proptosis is the result of orbital bleeding, a potentially vision-threatening type of emergency, or in orbital emphysema (20).

A CT scan can also aid in the detection of rectus muscle entrapment, which is indicated by muscle displacement into the fracture site, with or without bone displacement (23).

Management

Medical Treatment

Patients should be encouraged to refrain from blowing from the nose for few weeks after the injury to reduce the risk of orbital emphysema and the possibility of visual damage. Nasal sprays of decongestant drugs are frequently used (24). Many practitioners also prescribe preventive antibiotics to avoid ocular

cellulitis from bacterial spread if a fracture causes direct orbital connection with the sinuses. When ocular edema is significant, whether or not surgery is necessary, steroids may be given to reduce orbital edema (25).

Surgical Treatment

The criteria for surgical intervention in medial and, more typically, inferior orbital wall blowout fractures are contentious and frequently contested. Currently, three broad recommendations for surgical intervention are widely accepted. Diplopia owing to motility restriction with a positive forced duction test and with radiological confirmation of an orbital fracture implies rectus muscle or peri-muscular tissue entrapment. Repair is recommended if diplopia persists days after trauma (21).

Diplopia may be visible immediately following the trauma, although it may fade when the ocular edema or bleeding lessens. Several investigations in children with "white-eye" or "trapdoor" fractures have shown a more complete cure of diplopia if these instances are operated on extremely early or as soon as the established diagnosis is recognized (26). Because there is little obvious loss in the orbital floor or leak of blood in the maxillary sinus, a careful study of the CT scan is required. Many surgeons admit that if diplopia is present for ten to fourteen days after trauma for "non-trapdoor" varieties, it will not recover without care. Enophthalmos more than 3 mm present 14 days after trauma that is visually of high demand to the patient may warrant surgery (27).

When surgery is needed, many people think that it is ideal to have it done as soon as possible after the incident. This permits the swelling to go down and a more thorough inspection of the orbit to take place. Furthermore, the scarring of the strangulated muscles is typically not reach that point enough to preclude appropriate surgical repair (9).

Surgical Technique

The orbital floor is approached surgically in a variety of ways. It is accessible by a conjunctival route, cutaneous exposure, or a trans-antral method. Endoscopic methods through the maxillary and nasal cavities have been reported. Despite the fact that they were reported more than ten years ago, these methods have failed to gain mainstream adoption. Endoscopic method supporters highlight to various advantages of conventional procedures when utilized in the appropriate settings (25).

The primary benefits are improved visualization and the avoidance of negative effects on the eyelid. Once access is gained, it is possible to explore and relieve misplaced or entangled soft tissue. This

should help to reduce any entrapment-related motility issues (3). The goal of orbital floor and maxillary sinus roof restoration is to repair the bony defect by relocating bone pieces in order to restore orbital volume. Manipulable implants are utilized to help with orbit recontouring. The optimal implant properties should be biocompatible, practical, and cost effective, with a low risk of infection or extrusion. In this case, we must ensure that the implant type chosen can be properly and securely anchored to surrounding tissues. It should not promote the production of fibrous tissue (20). Most orbital floor discontinuity deficits can be corrected by synthetic biocompatible implants composed of metal miniplates and or polyethylene mesh or sheets silicone blocks and slices, polydioxanone mesh, or other similar resorbable polymers. It is possible to use autogenous bone graft from the maxilla or calvaria, as well as nasal septum cartilage. A variety of surgical techniques can be used to restore the medial orbital wall in situations with medial fractures (27).

The best strategy is determined by the size of the fracture as well as its relationship with additional fractures. The Lynch incision was once the standard method for repairing medial wall fractures. Although the Lynch incision allows for great exposure, it can cause extensive fibrosis or webbing of the medial canthal area (28). For zygomatic complex fractures that do not involve the orbital floor or medial wall, several care and attention should be taken. There are studies reveal that up to 50% of zygomaticomaxillary complex fractures do not necessitate or even need surgical intervention nor corrections. This is truly appropriate for fractures that are not displaced or are at least slightly displaced (19). Open reduction procedures with rigid fixation (ORIF) with plating systems are now the standard of care for fractures that are unstable or potentially unstable. Although lateral orbital wall fractures are infrequent and usually occur in conjunction with a zygomatic complex fracture; they are treated alongside zygomatic fractures (14).

Complications

Unfortunately, orbital surgeries do not go easily without the possibility of complications. Like fractures require immediate treatment misdiagnosed may result in intra-operative or postoperative problems can end with scarring fibrosis, sometimes encounter contracture, and eventually mal-union until nonunion and bone necrosis or resorption (26). Bleeding, infection, extrusion of an orbital implant, optic neuropathy, ectropion, enophthalmos over or under correction, diplopia, even loss of vision. Infraorbital nerve damage, orbital congestion, and epiphora are all possible postoperative complications. All give the demand for a comprehensive examination post-operatively (11).

The majority of difficulties are caused by either misalignment of the implant or the use of the incorrect

size implant. Persistent or intra-operative caused diplopia, the most prevalent consequence, can cause severe postoperative morbidity in patients. This diplopia, on the other hand, is typically temporary or, if present, only occurs under extreme gazing and does not necessitate intervention. muscular weakening may develop following the release of the entrapped muscle but usually its only transient, causing in chronic diplopia, although it usually improves, sometimes within few months (19).

However, surgical correction or repositioning of the extraocular muscles which already displaced or detached. Postoperative enophthalmos that persists adds to the clinician's effort. The most prevalent cause of this issue is insufficient orbital volume restoration following the initial therapy, but orbital fat dystrophy also can be a cause that annoying after treatment completion. If the enophthalmos is severe, the implant may need to be surgically relocated or extra implant material inserted (18).

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