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Review Article

INDICATIONS & TIMING OF ORBITAL FRACTURE REPAIR: A DILEMMA

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A R T I C L E I N F O

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A B S T R A C T

The orbit is a complex area as important and delicate anatomical structures are packed together into a small space. Orbital fractures may occur alone or in combination with other mid facial fractures including zygomaticomaxillary complex fractures, lefort II & III fractures, naso-orbital ethmoidal fractures or frontal bone/ orbital roof fracture. Various treatment modalities have been advocated for the orbital reconstruction post trauma, but indication and timing of orbital reconstruction is an important determining factor with respect to the incidence of potential post-operative complications. It is necessary to distinguish between immediate, early and delayed orbital reconstruction. It has been proposed that early surgical intervention i.e. within 2 weeks may improve the ultimate outcome. Diplopia with CT evidence of an entrapped muscle or periorbital tissue associated with non-resolving occulocardiac reflex, early enophthalmos needs immediate intervention. But on the other hand any surgical correction of enophthalmos should be decided after the tissue edema subsides in order to yield a favorable aesthetic outcome, this henceforth shows that it is not necessary to repair all orbital fractures immediately. In the current literature there is no uniformly accepted guidelines for treatment of orbital fractures with respect to the interval time between trauma and reconstruction. The management of orbital fractures still continues to be intriguing. The timing or the need for surgery is solely decided by the surgeon and is determined by his/her skills and experience. The aim of this paper is to throw light on the various treatment modalities including the chronology, need for surgery and the pre and post-operative complications.

INTRODUCTION

Orbital defects are one of the most commonly encountered facial fractures because of the exposed position and thin bony walls of the midface. Orbital fractures may occur alone or in combination with other midfacial fractures, including zygomatic complex fractures, Le Fort II and III fractures, naso-orbito-ethmoidal fractures, and frontal bone/orbital roof fractures.[1]

Orbital reconstruction is challenging because of the high level of unpredictability. A perfect anatomical reconstruction does not guarantee a perfect aesthetic and functional outcome, because soft tissue involvement poses difficulties in predicting the long term effect on function and aesthetics. Different aspects of timing are believed to influence surgical outcome both positively and negatively.

The orbit is a pyramidal space enclosed within bony walls and contains globe, fat, and accessory structure. The globe itself occupies only one quarter of its volume.

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Consists of a union of following bones:[2]

- Zygomatic, Maxilla, Lacrimal, Ethmoid, Frontal, Palatine, Sphenoidal.
- The orbital rim is solid and protects the eye from most injuries.
- Bone conduction theory "buckling"
- Less energy
- Small fractures limited anterior floor
- "Hydraulic theory"
- More energy
- Larger fracture involving entire floor and medial wall
- Should suspect more extensive orbit involvement with associated injuries (globe rupture)

Blowout Fractures of Orbit defined as orbital floor fractures without fracture orbital rim, but with entrapment one or more soft tissue structures.

"Pure" blowout fractures – trapdoor rotation to bone fragments involving central area of bone.

"Impure" fracture – fracture line extends to orbital rim along with floor of orbit.

Indications

Fractures of the orbital floor result in fairly predictable symptomatology, most notably periorbital ecchymosis and edema, enophthalmos, diplopia, infraorbital paresthesia, blurred vision, and sub conjunctival hemorrhage. Less frequently, blindness, globe injury, lacrimal system injury, and restricted globe movement are encountered.

Although specific indications for orbital floor exploration remain controversial, it is generally accepted that repair should be performed in patients with enophthalmos, diplopia, and radiographic evidence of fracture, within 2 weeks of injury, or earlier if entrapment is present. Within 2 weeks, there is some resolution of soft-tissue edema, improving exposure and facilitating dissection. Restriction of ocular motility during forced duction examination suggests entrapment of extraocular muscles, requiring urgent reduction of periorbital soft tissues and orbital floor reconstruction.[5]

Assessment of orbital fractures is an area that requires a high index of suspicion.

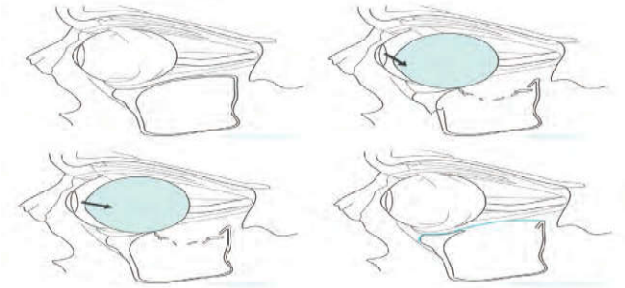

Fig 2 a.) normal situation b.) enopthalmos through increase of orbital volume c.) hypoglobus with loss of anterior support d.) repositioning the globe after orbital reconstruction

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Absolute Indications[6]

- Diplopia that persists beyond 7 to 10 days.
- Obvious signs of entrapment. (Entrapment that cause an oculocardiac reflex with resultant bradycardia and cardiovascular instability)
- Relative enophthalmos greater than 2mm.
- Fracture that involve greater than 50% of the orbital wall.
- Progressive V2 numbness.

Immediate Repair

- Non resolving oculocardiac reflex with entrapment. (Bradycardia, heart block, nausea, vomiting, syncope)
- Early enophthalmos or hypoglobus causing facial asymmetry.
- "White-eyed" floor fracture with entrapment.

Observation

- Minimal diplopia not in primary or downgaze.
- Good ocular motility.
- No significant enophthalmos or hypoglobus.

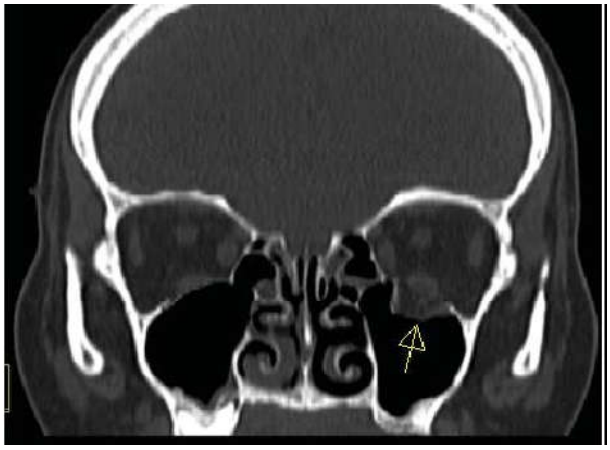

Fig 2 Coronal CT scan showing Entrapment of Inferior Rectus Muscle

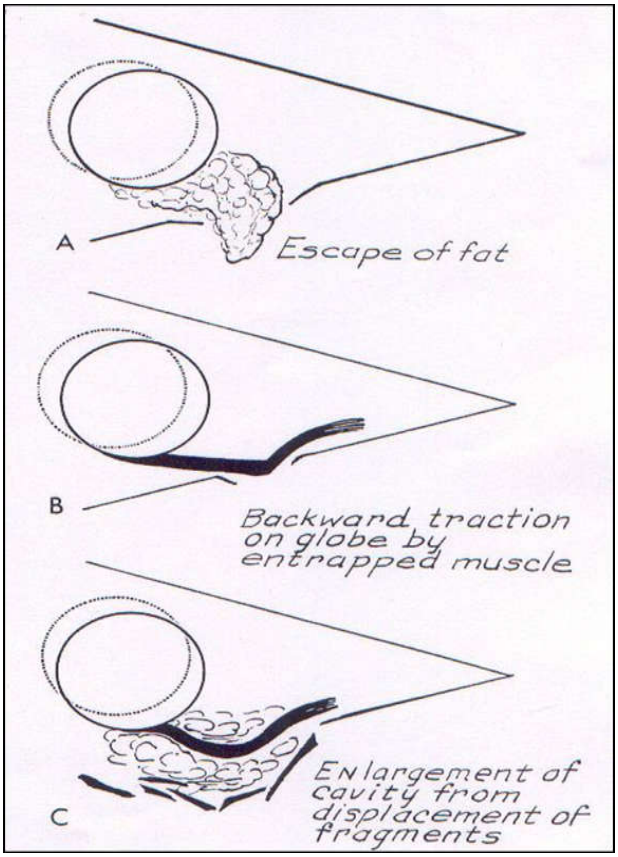

Fig 3 Displacement of the orbital content causing Enophthalmos

What is the best timing for orbital reconstruction?

- The timing of the repair is debated.
- Most agreed that if operative intervention is not undertaken in the first 24 hours, it should be delayed 10 days to let the edema resolve.
- Fracture repair should be undertaken prior to 14 days to prevent scarring of floor contents, to the bone fragments and contents of maxillary sinus.
- The high resolution CT scan (coronal cut) with forced duction test, a clinical test to access for indications to intervene.

Surgical intervention, when indicated, should be prompt because subsequent scarring decreases the efficacy of future intervention.

Burnstine criteria for orbital fracture surgery timing.[3]		
Immediate	**Early**	**Observation**
• Diplopia with CT evidence of an entrapped muscle or peri-orbital tissue associated with a non-resolving oculocardiacreflex: bradycardia, Heartblock, nausea, vomiting, or syncope.	Symptomatic diplopia with positive forced duction test, evidence of an entrapped muscle or peri-muscular soft tissue on CT examination, and minimal clinical improvement over time	Minimal diplopia (not in primary or downgaze), good ocular motility, and no significant enophthalmos or hypo-ophthalmos
White-eyed blowout fracture in a young patient (<18 years),history of peri-ocular trauma, little ecchymosis or edema(white eye), marked extraocular motility, verticalrestriction,and CT examination revealing an orbital floor fracture with entrapped muscle or peri-muscularsoft tissue.	Large floor fracture causing latent enophthalmos	
	Significant hypo-Ophthalmos,	
	Progressive infraorbital hypaesthesia	
• Early enophthalmos/hypoglobus causing facial asymmetry		

Contraindications[1,7]

Although contraindications are relative, delaying intervention may be reasonable in the following cases.

- In patients who are critically ill or who have head injury.
- Patients with a coexisting globe rapture in which globe repair takes precedence over fracture repair.
- Patient who is monocular, in this case patient does not experience diplopia, and intervention for volume reconstruction must be weighed against the potential for blindness in the only eye with vision.

Complications[7]

Any orbital surgery carries with it the potential for complications. Complications may result from the initial trauma or from surgical repair. It may cause in either way in conservative as well as surgical management.

Failure to diagnose fractures that require early treatment may result in intra-operative or postoperative complications due to fibrosis, contracture, and unsatisfactory union.

- Intraoperative complications include globe and optic nerve injury caused by direct trauma, excessive retraction. Inadequate reduction of prolapsed tissue, orbital hemorrhage.
- Postoperative complications may include loss of vision, traumatic optic neuropathy, diplopia, overcorrection or undercorrection of enophthalmos, lower eyelid retraction, bleeding, infection, extrusion of an orbital implant, infraorbital nerve damage with resultant hypoesthesia, orbital congestion, and epiphora.

DISCUSSION

When it comes to surgical repair of orbital fracture, the consensus among surgeon is that less is often more. Many fractures of the orbit, a common occurrence with facial trauma can be treated conservatively. And even if surgery is needed, there may be no rush. sometimes waiting yields better outcome. surgery may also be delayed because of contraindications such as the patient'sgeneral condition not allowing surgery, an orbital fracture near the only seeing eye, or severe ocular Injury (e.g. retinal detachment, ruptured globe, hyphema, or traumatic optic nerve lesions).

The issue is, which of these fractures need to be fixed, when do they need to be fixed, and most importantly what time frame?

A recent consensus is that early reconstruction results in less enophthalmos because of minimal soft tissue scarring. The initial haematoma with contusion, shearing, and laceration of the orbital content cannot be prevented, but early reconstruction may limit damage to the fatty tissue. This theory states that late reconstruction leads to novel haematoma formation and may therefore subsequently cause even more fatty tissue atrophy. However, supporting evidence remains limited.

For diagnostic purposes, both clinical features and CT information on the size, location and complexity of the orbital defect must be carefully considered before surgery. By combining thisinformation with clinical experience, the surgeon will be able to choose whether need for immediate repair or observation till edema subsides.

Many authors agree that early repair of orbital fractures before the onset of edema or after its resolution offers the ideal opportunity to facilitate exposure for appropriate surgical reconstruction.

Rarely, the immediate surgery for orbital fractures is indicated in "trapdoor fracture" when significant enophthalmos occurs in association with orbital soft-tissue entrapment, resulting in oculocardiac reflex and diplopia. For most orbital fractures, a 2-week window of observation was suggested in the absence of urgent surgical indications for orbital floor repair.

In contrast to other midfacial fractures, orbital defects need reconstruction rather than reduction and fixation of fragments, but the indication for this intervention is arbitrary. In some institutions, a surgical approach is advocated even in cases of small defects with no functional impairment, whereas in other centres, a non-surgical approach is the treatment of choice.

Nevertheless, a prolonged period of observation before surgical intervention may yield suboptimal outcomes. delays in the timing of orbital reconstruction beyond 2 months yielded inferior results compared with early surgery. Regardless of the

timing of surgery, the primary goal of surgery is to reconstruct the orbital wall to its pre trauma condition.

The present study revealed that the enophthalmos incidence was not influenced by the time interval between injury and surgery. Significant enophthalmos is usually not immediately apparent following initial orbital trauma. In severe orbital trauma, the edema of the periorbital tissue may even cause proptosis on the injured side.

Consequently, any surgical correction of enophthalmos should be decided after tissue edema subsides to yield favorable esthetic outcomes. Hence, it is not necessary to repair all orbital fractures immediately, and the indications for surgical repair should be individualized. A delay in the surgery for varying periods of time is feasible and does not affect the treatment outcome

CONCLUSION

In view of all the existing controversies, good clinical decision-making in the management of orbital fractures is challenging. Achieving predictable results can be difficult, especially in complex cases.

The size and location of the fracture are critical factors, which directly influence the decisions to be made. Underestimation potentially leads to undertreatment, whereas over estimation can cause overtreatment.

In conclusion, the visual appraisal of a surgeon can hamper the accurate and consistent estimation of orbital fracture size and complexity. CT measurements have been shown to be the most consistent and accurate tool for measuring the size of the defect. Substantial overestimation of the size of critical defects may result in surgical overtreatment, which may in turn produce erroneous overestimation of the treatment outcome. The management of orbital fractures still continues to be intriguing. The timing or the need for surgery is solely decided by the surgeon and is determined by his/her skills and experience.

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