Transnasal endoscopic repair of orbital blowout fracture: case report

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A blowout fracture is a fracture of the walls or floor of the orbit, due to blunt orbital trauma. Management is conservative or surgical when indicated, and classical external approaches are subciliary, transconjunctival, and subtarsal. We report a case of orbital blowout fracture, presented with vertical diplopia and managed successfully by transnasal endoscopic approach. This approach is very promising for the management of blowout fracture with ocular movement limitation owing to trapped muscles or fascia. It is minimally invasive, avoids surgical scars and eye traction, and shortens operative time. The limitation is it gives no access to lateral wall fractures.

Keywords:
blowout, endoscopic, fracture, orbital, transnasal

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Introduction

A blowout fracture is a fracture of the walls or floor of the orbit, where intraorbital contents may be pushed out into one of the paranasal sinuses. This is most commonly caused by blunt trauma of the head and personal altercations. The force of a blow to the orbit is dissipated by a fracture of the surrounding bone, usually the orbital floor and/or the medial orbital wall [1,2].

Serious consequences of such injury include diplopia in upward gaze where there is significant damage to the orbital floor. In blowout fractures, the medial wall is fractured indirectly. When an external force is applied to the orbital cavity from an object where diameter is larger than that of the orbit, the orbital contents are retropulsed and compressed. The consequent sudden rise in intraorbital pressure is transmitted to the walls of the orbit, which ultimately leads to fractures of the thin medial wall and/or orbital floor [3]. However, it is known that pure blowout fractures most frequently involve the orbital floor. This may be attributed to the honeycomb structure of the numerous bony septa of the ethmoid sinuses, which support the lamina papyracea, thus allowing it to withstand the sudden rise in intraorbital hydraulic pressure better than the orbital floor [4].

Most fractures occur in the floor posterior and medial to the infraorbital groove. In ~50% of cases, inferior blowout fractures are associated with fractures of the medial wall. Diagnosis is based on clinical and radiographic evidence. Many orbital fractures do not lead to enophthalmos, diplopia, or ocular motility dysfunction. However, predicting future outcome in the acute setting can be difficult [5,6].

We present a case of orbital blowout fracture that required surgical intervention. A transnasal endoscopic approach was successfully utilized, emphasizing the advantage of this evolving approach.

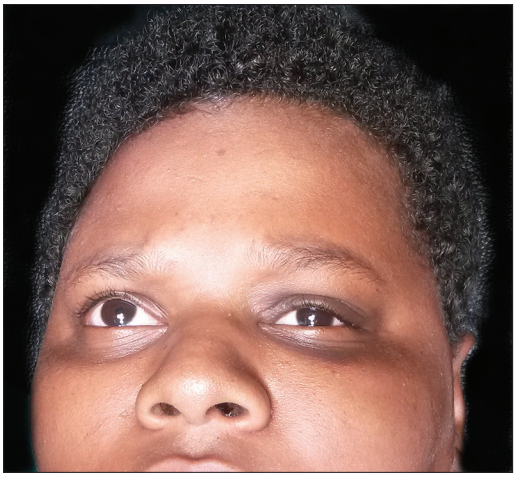
Case history

A 14-year-old boy was hit by a brick on his left eye. He presented with left upper eye lid ecchymosis and vertical diplopia, as shown in Figs. 1 and 2. Computed tomography showed a crack of the left inferior orbital wall with opacity in the left maxillary sinus' roof, as in Fig. 3. Transnasal endoscopic approach 7 days after trauma was performed. After left wide middle meatus antrostomy as in Fig. 4, mucosa of left maxillary sinus roof was peeled off by blunt dissection. A trapdoor fracture with orbital fascia being trapped was revealed as in Figs. 5 and 6. It was released by repeated forced duction and gentle reduction of the fracture. At the end of reduction, movement of the globe was free in upward direction and comparable to the right side. Septal cartilage graft was harvested to augment the fracture line, to keep the cartilage in place. A balloon catheter was placed in the maxillary sinus passing through the middle meatus, and it was left for 3 weeks. Different-angle endoscopes were used throughout the procedure: 0°, 30°, and 45°. Operative time was 25 min. The surgical video is included (Video 1). Diplopia disappeared immediately postoperatively, and improvement was sustained after removal of the balloon catheter and after 4 months, as in Fig. 7.

Figure 1

Left upper eye lid ecchymosis due to blunt trauma on the third day following trauma.

Figure 2

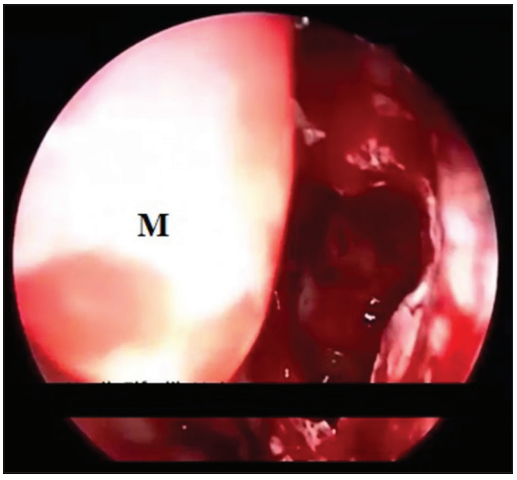


Limitation of upward gaze of left eye on the third day following trauma, note mild enophthalmos.

Figure 3

Coronal computed tomographic scan demonstrating fracture of left orbital floor and inferior rectus entrapment with soft tissue shadow at the roof of the left maxillary sinus.

Figure 4



Wide left middle meatus antrostomy, middle turbinate (m).

An informed consent to participate was signed by the patient and his guardian; it included sharing of photographs in scientific publications, magazines, etc.

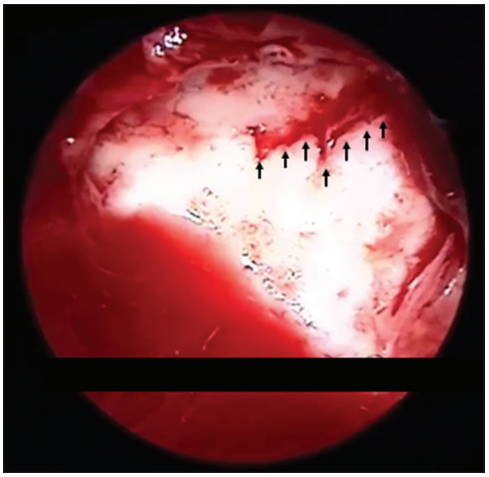
Discussion

The decision to observe a fracture or proceed with surgery is based on the clinical examination findings, orbital imaging, and assessment of the risk and benefit of either option. Indications for surgical intervention can be separated into immediate versus delayed repair.

Immediate repair indications are oculocardiac reflex and enophthalmos; the oculocardiac reflex may be elicited in an orbital fracture owing to entrapment of the extraocular muscles [7]. Thus, urgent surgery is necessary to release the incarcerated tissues and relieve the stimulus. It is also found to be more commonly associated with entrapment of the inferior rectus muscle. Another relative indication for immediate intervention is significant enophthalmos at the time of injury, to prevent long-term enophthalmos [8].

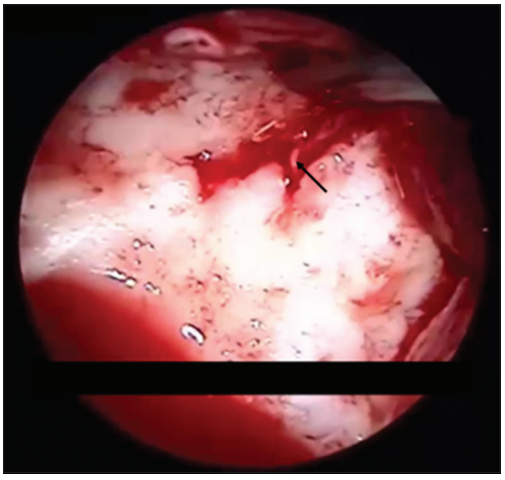
Regarding delayed repair (within 2 weeks), most orbital fractures are managed initially with observation, and then with surgical intervention, if indicated, within 14 days of injury. The delay allows periorbital edema to decrease, which can assist in subsequent examinations and provides a window for concomitant injuries to be addressed. Indications for surgery are enophthalmos (>2 mm), ocular motility dysfunction, persistent diplopia in primary gaze or reading position, computed tomography findings of ocular muscle impingement and over 50% of floor involvement, progressive maxillary nerve (V2) hypoesthesia, and abnormal forced duction testing [8,9]. On initial presentation,

Figure 5



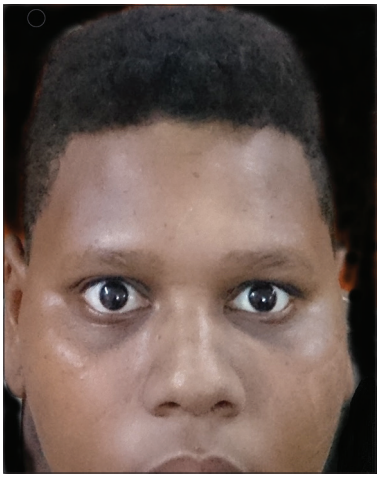
Endoscopic view of left maxillary sinus roof, using 45° endoscope, black arrows indicate fracture line.

Figure 6



Endoscopic view of left maxillary sinus roof, using 45° endoscope, black arrow point to trapped inferior rectus fascia.

Figure 7



Recovery of left upward gaze after transnasal endoscopic repair, patient's photo 4 weeks following repair.

these examination findings may be difficult to obtain. The decision to proceed with surgery should rely on the collection of indications found in both the clinical and radiographic assessments.

The approach to the fracture site depends on the type of injury, surgeon' experience, and available equipment. Subciliary, subtarsal, and transconjunctival incisions are the most commonly utilized. Interest in the endoscopic approach to the floor and medial wall has increased as surgeons try to avoid eye lid complications and improve visualization of the orbital walls.

Cheung *et al.* [10] recently reviewed nine studies involving 172 patients in which endoscopic approaches were used for orbital wall fractures. No patients underwent conversion to an open approach, and the most common complication was transient cheek numbness.

According to the present case, we can summarize the advantages of endoscopic approach:

(1) It can safely be done early to repair fracture associated with trapped inferior rectus muscle/fascia
(2) It avoids manipulation of orbital contents, increase of intraorbital pressure, and intraocular bleeding and has lower lid complications like ectropion, entropion, scleral show, and scars
(3) Excellent assessment of prolapsed orbital contents and posterior bony niche of the fracture
(4) Safe and easy to remove bone fragments off inferior rectus muscle and infraorbital nerve
(5) Magnification done on the screen provides precise and prefect view of maxillary sinus contents
(6) Gentle manipulation of orbital fat when reduced will keep it viable (keeping its volume) within the orbital cavity with no subsequent atrophy, enophthalmos, etc.

The use of powered microdebriders is discouraged for these procedures to avoid inadvertent injury to the orbital contents.

An important limitation of the endoscopic approach is that it does not permit access to lateral and multiple orbital fractures.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the

patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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