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Traumatic orbital floor reconstruction in blow out fractures with titanium mesh: Case report

Ashish Chalana*; Vikas Singh; Ruchika Tiwari; Tejaswini Mathur

***Corresponding Author(s): Ashish Chalana**
Department of Oral & Maxillofacial Surgery, Mahatma Gandhi University of Medical Sciences & Technology, India
Phone: +91-8952930525; Email: drashishchalana@gmail.com

Abstract

Orbital wall fractures can end in a number of complications, including implications like muscle entrapment in fractured segments, diplopia, and enophthalmos due to increased orbital volume. Even though muscle entrapment is rare, enophthalmos and diplopia are relatively common sequelae of internal orbital fractures. Orbital defects are now being reconstructed soon after injury in an attempt to prevent enophthalmos. Though there will always be debate regarding which injuries (eg, size, location, displacement, amount of soft tissue herniation, etc) require reconstruction, the only goal of surgery is to restore the normal volume and form of the internal orbit. A case of a 13 years old girl was reported, diagnosed with a blowout fracture post physical aggression. The orbital floor reconstruction with a titanium mesh used in this case is an ideal treatment modality under general anesthesia. The result was satisfactory and the patient does not show visual disturbances or paresthesia in one year follow up.

Keywords

orbital; enophthalmos; muscle; surgery

Introduction

Orbital fractures involve the floor of the orbit and can have direct and enduring effects on ocular function and facial esthetics. Orbital floor fractures are the basis for extraocular muscle dysfunction, diplopia, enophthalmos, hypoglobus, and infraorbital nerve anesthesia [1-3].

The signs for surgical reconstruction of orbital floor fractures, as well as the surgical methods and materials used, are still issues of clinical debate. It is generally accepted that urgent interpolation is required in cases of ensnared extraocular muscles causing a severe oculocardiac reflex with bradycardia [3]. The need for a non-urgent intercession (usually within several weeks) is common and is directed for patients

presenting with large floor fractures with diplopia or appealingly substantial enophthalmos [3]. In such cases, surgical intervention is expected to release any orbital tissue ensnared in the fracture line and to reinstate the orbital volume.

Various surgical approaches viz. transcutaneous, transconjunctival, subciliary, Infraorbital etc. and synthetic materials like titanium mesh and autologous bone grafts can be used to restructure the orbital floor. In general, a transcutaneous approach and synthetic materials such as titanium mesh will be more appropriate for large defects that demands extensive exposure and swift reconstruction, sometimes in multi-trauma patients concurrently undergoing multiple procedures.

We present our experience with a clinical case with orbital floor fracture who underwent reconstructive surgery with titanium mesh by a team of maxillofacial surgeons at a tertiary trauma center.

Case Report

A 13 year old girl was examined at the Oral and Maxillofacial Surgery Department of the Mahatma Gandhi Dental College and Hospital, Jaipur, Rajasthan, India after physical aggression. She was submitted to a clinical assessment and showed orbital ecchymosis, traumatic telecanthus, hypertelorism, paraesthesia of the infraorbital nerve and diplopia during vertical and horizontal ocular movements. However, Ocular movement constraint was found in the superior gaze. A computed tomography scan with GE Optima CT660 128-slice, 0.625 mm slices was obtained and it revealed a blowout fracture of the floor of the left orbit and herniation of the orbital soft tissue into the maxillary sinus. A week later the trauma, the patient acquiesced to a restoration of the orbital floor, under general anesthesia. A temporary tarsorrhaphy was done, to protect the cornea during the operative procedure, trailed by a subtarsal approach to access the orbital floor.

The herniated soft tissue was repositioned and the orbital floor defect covered with a titanium mesh with approximately 25 mm on the orbit margin and 18 mm on the posterior width which was fixed on the orbital rim with 8 screws of 4 mm. A forced duction test was steered with a negative result and the globe mobility was unharmed. A 6-0 non-resorbable ethilon suture was used along the skin margin. Transnasal wiring was done to perform medial canthopexy for traumatic telecanthus correction. There were no complications and the patient was discharged 3 days after surgery. A computed tomography scan was carried out after the surgery, showing a suitable repositioning of the soft tissue formerly herniated and a good adaptation of the titanium mesh. The patient stayed under observation for one year, with no complaint of paraesthesia, no signs of visual instabilities or diplopia.

Radiographic

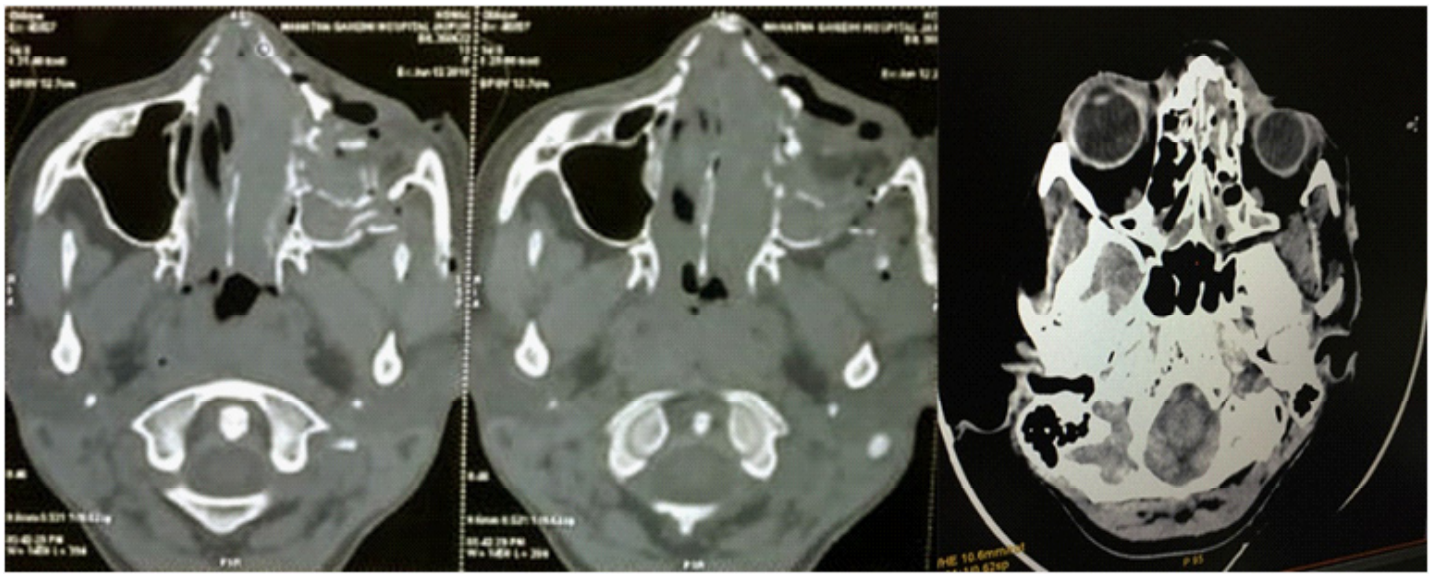


Figure 1a-c: Ta-c. Axial View

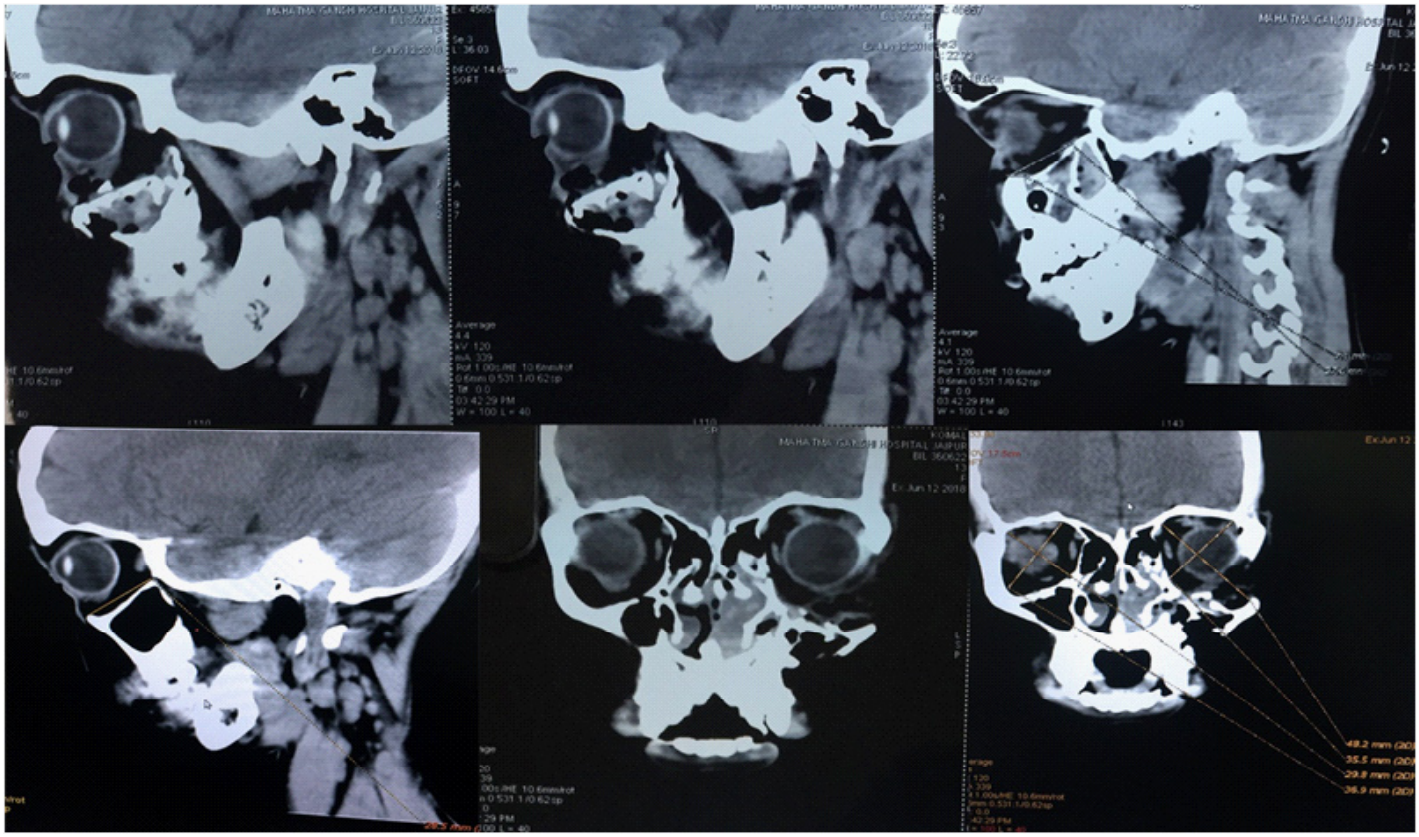


Figure 2d-i: Sagittal & Coronal View

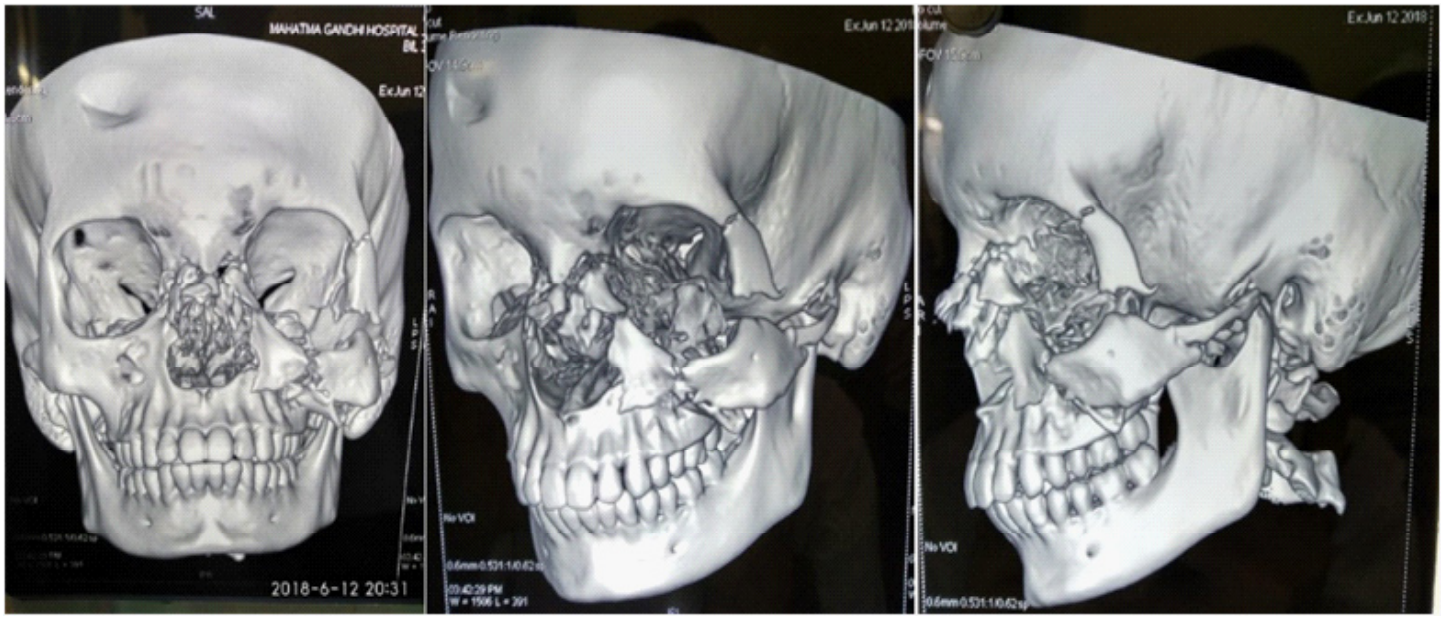


Figure 3g-h: Sagittal & Coronal View

Pre-operative Pictures

Figure 4: A 13-year-old girl with trauma to left orbit showing left enophthalmos with periorbital hematoma & restricted eye movement.

Intra-Operative Pictures

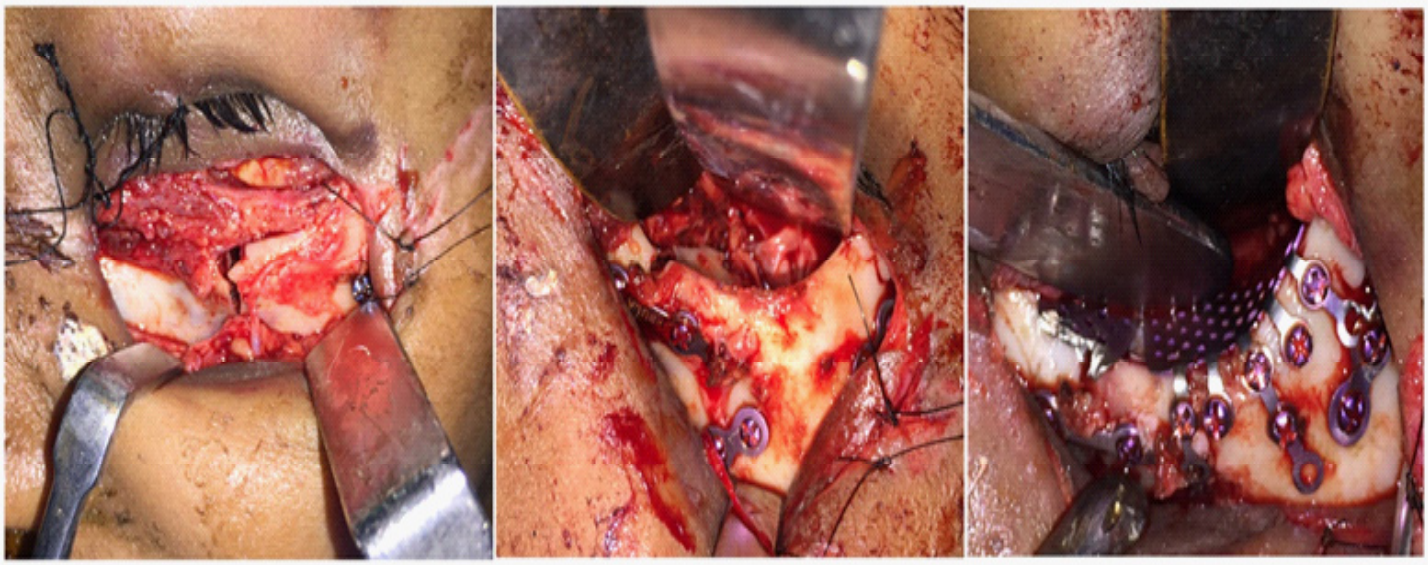


Figure 5: Intraoperative View of 13-year-old girl with trauma to left orbit showing reconstruction & fixation with titanium mesh.

Postoperative

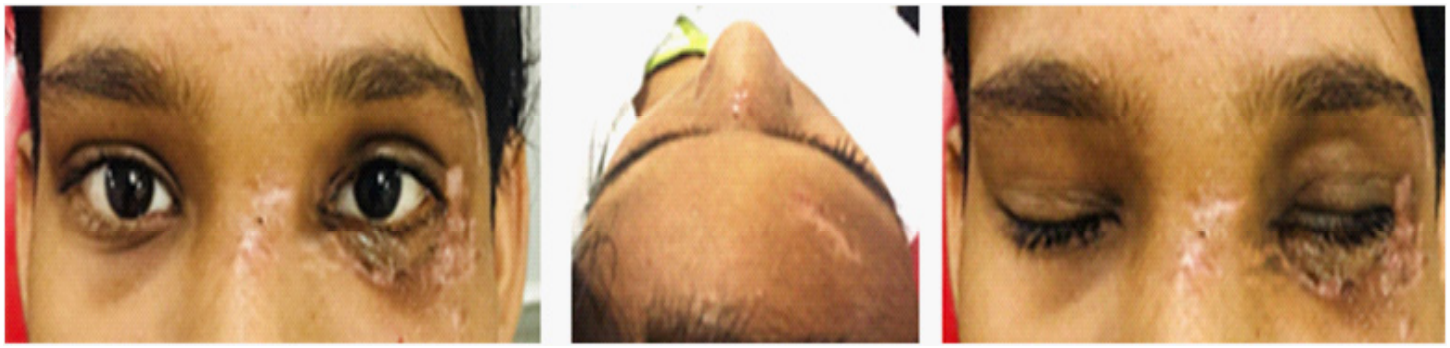
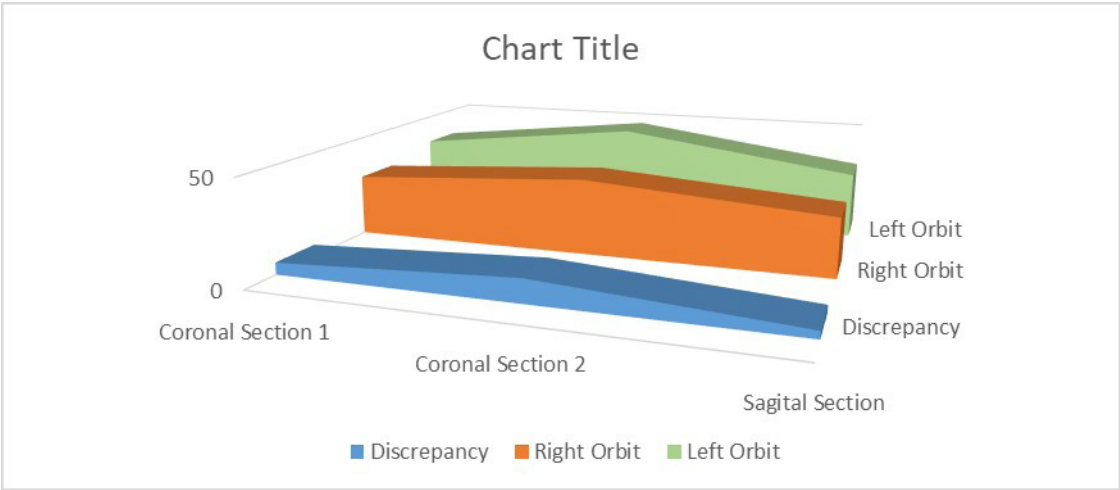


Figure 6: Postoperative View of 13-year-old girl with trauma to left orbit showing correction of orbital volume, enophthalmos & diplopia.

Volumetric Analysis



A 11 year study analysis of facial bone fractures was done in 2010 [8], which revealed, out of total facial bone fractures, 7.2 % constitutes the orbital fractures out of which total orbital floor fracture (>5 mm) are only 1.2%, which is very rare.

This case report is one of the rarest case of total orbital floor fractures > 5mm (correlating with category IV and V from Mario Francisco *Gabrielli et. al orbital floor defects classification* [9])

In 1999, a cluster of researchers [7] showed that "hydraulic" mechanism created larger fractures with the engrossment of the floor and medial wall, where the herniation of orbital contents was normal as compared to the "buckling" mechanism.

Correlating, this case report associated to the "hydraulic" theory, as the orbital floor with medial wall was broadly damaged and the herniation of the soft tissue was present. Not only did our patient showed herniation of the soft tissue, but also paresthesia of the infraorbital nerve and diplopia throughout horizontal and vertical ocular movements, therefore he was acquiesced to a surgical treatment.

If the restoration of the orbital floor is not performed or if it is suspended, the herniated or entrapped soft tissue can initiate the curative process and a contracture of these tissues can occur leading to ocular drive restriction and visual instabilities.

The aims of this case report for orbital fracture treatment are not only to free herniated soft tissue, but also to reinstate the anatomy and volume of the internal orbit and to avert damages like perpetual enophthalmos and paresthesia.

Numerous provisions, natural and synthetic substances, are available for restructuring damaged orbital walls, to reinstate volume of orbit. The perfect material is the one that has biomechanical properties and which better imitates the tissue it replaces. Rigid materials are best fit for restructuring of large defects, to avoid sagging and displacement into the maxillary antrum.

According to the article printed in 2003, [10] the capability of titanium mesh to conform to the contours of the orbit makes it an enhanced material for restructuring not only isolated floor fractures but also those blemishes that encompass both the floor and medial wall and this is somewhat based on the outcome that many of the bone grafts used are too bushy: decreasing orbital volume compared with the uninjured side and also uplifting the floor in the anterior orbit produces an adverse effect elevating the globe. Also, the titanium mesh has decent biocompatibility and is effortlessly adjustable. It is easy to trim and outline exactly to the orbital contour. Moreover, with this mesh assembly, connective tissue can develop around and through the implant, avoiding its migration and it can be reliably stabilized with screws in areas such as the infraorbital border [11].

Because of the advantages, and presence of the defect size >5mm we decided to take titanium mesh as a reconstructive material.

Although dissection of the orbital walls for reconstruction was usually extensive in the study, no blindness or loss of visual acuity occurred. Diplopia was found postoperatively and regressed spontaneously without further intervention, suggesting a reversible cause such as edema, hematoma, or motor nerve or muscle reversible damage.

Conclusion

Reconstruction of orbital walls defects is a very delicate surgery and difficult to perform. Orbital dissection should carefully be extended to completely expose the defect and allow proper positioning and support to the reconstructive material. An analysis of the data obtained in course of this study, coupled and compared with data obtained while reviewing literature, directs us to the conclusion that titanium mesh is a good material for reconstruction of total orbital floor defects. Hence, this case report is a rare case of total orbital floor defect reconstructed with titanium mesh with no complications in long term follow up makes it a unique case.

Acknowledgement

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Authors Information: Ashish Chalana*; Vikas Singh; Ruchika Tiwari; Tejaswini Mathur
Department of Oral & Maxillofacial Surgery, Mahatma Gandhi University of Medical Sciences & Technology, India

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