Case Report

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Orbital Floor Reconstruction with Titanium Mesh: A Case Report

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ABSTRACT

Background: The purpose of this case report is to present the outcome of preoperatively-formed titanium mesh implant for the repair of orbital floor fracture. The form of the orbital floor and walls was analyzed by preoperative diagnostic Computed Tomographic (CT) scan data. The form of the virtual reconstructed orbit was transformed into a model of the orbital cavity by a template machine. Postoperative imaging by or CT scan verified the exact 3 Dimensional reconstruction of the orbital cavity. The patient demonstrated correction of exophthalmos postoperatively. Using preformed titanium mesh implants, the accuracy of 3D orbital reconstruction resulted in excellent outcome. The reconstruction using preformed titanium mesh for the repair of orbital injuries proved to be less time consuming and more precise compared to the on table manipulation of implants and grafts.

Keywords: Blowout fracture, Ortbital floor fracture, Resorbable plate, Diplopia.

INTRODUCTION

Orbital floor fractures constitute about 40% of craniofacial trauma [1]. The incidence is greater in young males, with the peak age group of 3rd decade of life [2]. They can occur as isolated orbital fractures, like the blown in or blow out fractures of the orbit or in association with other mid face fractures [3]. Orbital blowout fractures results from a traumatic force around the orbit with a greater diameter than the orbital rim. This results in fracture of the floor of the orbit and herniation of orbital contents into the maxillary sinus and / or entrapment of the ocular muscles within the fracture.

Orbital fractures are broadly divided into blow out and blow in fractures. A blow-out fracture of the orbit is defined as a fracture of one or more of its internal walls. Such fractures are typically caused by direct blunt trauma to the orbit. A pure blow-out fracture does not involve the orbital rim [4].Plethora of signs and symptoms exist for orbital factures. They include subconjunctival hemorrhage, diplopia, enopthalmos, and restriction of the ocular movements. The main aim of the orbital reconstruction is to restore the orbital volume and to prevent the above mentioned signs and symptoms. Several materials are used for orbital reconstruction with varying degrees of success. They may be autologous, allogenic, or alloplastic materials. The purpose of the present paper is to present a case of orbital floor reconstruction with custom made titanium mesh to achieve good functional and esthetic outcome.

CASE REPORT

This 24 year old male reported with multiple injuries on the face subsequent to a road traffic accident. There was subconjunctival hemorrhage, periorbital ecchymosis [Fig 1], paraesthesia over right infraorbital region was elicited and mild degree of lowering of

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Fig 1: Pre-operative photograph reveals Periorbital oedema.

Fig 2: Coronal section of CT Scan reveals of orbital contents into the maxillary sinus.

Fig 3: Subciliary incision.

Fig 4: Post operative photograph after 3 months.

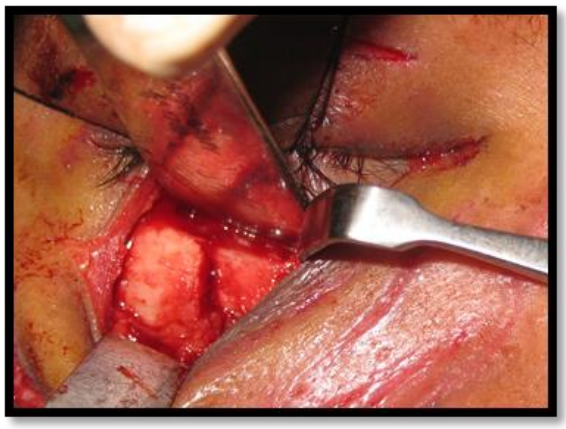

Fig 5: Exposure of fracture site.

interpupillary line. The ocular movement was restricted in upward direction and had diplopia in upward, downward,medial and lateral gazes. The vision and the ocular reflexes were unaltered. Coronal CT scan of skull revealed breach in the floor of the right orbit along with herniation of periorbital soft tissue into the antrum [Fig 2]. The diagnosis of "blow out fracture - right orbit" was established. The orbital floor was approached through subcilliary incision [Fig 3] under nasotracheal general anaesthesia. Force duction test was performed and was positive. The infraorbital nerve was identified and protected. The herniated periorbital content including inferior rectus muscle and fat was disengaged from the bony defect. The preformed titanium mesh which was shaped to match the contour and size of the defect of the orbital floor was placed carefully under the orbital contents. The mesh was placed over the defect and fixed with titanium micro screws. The incision was

sutured with 5-0 proline. Post-operative recovery was uneventful. Immediate improvement of diplopia, position of the globe, interpupillary level and movement of the eye in upward gaze was noticed. The patient was reviewed at regular intervals, initially once every week for two months, followed by every two weeks for three months and subsequently once in every month postoperatively. The one year post-operative CT [Fig 4] scan was taken to confirm the adaptation of the titanium mesh. This showed excellent adaptation and equal volume when compared with the contra lateral side.

The purpose of the present paper is to assess the internal orbital reconstruction using titanium mesh in terms of achieving functional and esthetic appearance of the orbit.

DISCUSSION

The floor of the orbit is commonly fractured in midface fractures. The floor fracture may be isolated or occur in conjunction with other facial injuries. According to Luhrs, [5] isolated orbital wall fractures represent 5% of all midfacial fractures Males are more susceptible for orbital trauma than females and the age group is between age group of 20-30years. [6]. The anatomic location of the orbit, just above the maxillary sinus results in herniation of periorbital tissues into the maxillary sinus in the orbital trauma. Unfavorable esthetic and functional outcomes are frequently seen in orbital floor reconstruction. The aim of the reconstructive surgery is to restore the eye to the near preoperative status both functionally and esthetically. This involves repositioning of herniated orbital fat and muscles in the orbit and repairing, the post-traumatic or postoperative defect [7,8] Preservation of the orbital volume is necessary to obtain a satisfactory final outcome of orbital wall reconstruction [9]. Plain X rays give the basic information of the orbital floor fractures but the multiplanar CT Scan provide the exact details of the fracture. Advances in imaging have revolutionized the treatment planning. In this paper, we report a case of 28 years old male with orbital floor fracture, which was reconstructed by Titanium mesh with excellent outcome. The outcome was measured by comparing the preoperative and post operative CT Scans.

The major complications of inferior blow-out fractures (IOBFs) are diplopia, exophthalmoses, and gaze limitations, particularly with the upward gaze [10 - 12]. The indications for the repair of orbital floor fractures are controversial. Initially many orbital floor fractures may be treated with observation. But with the advent of good diagnostic and surgical expertise, the orbital floor reconstruction has become commonly performed. Indications for repair include exophthalmos or hypoglobus of greater than 2 mm, diplopia at or near central gaze, apparent extra ocular muscle entrapment in the fracture, and fractures larger than a critical size (1 or 2 cm) [13, 14]. In our case, there was diplopia, restricted ocular movement and evidence of herniation of ocular contents into maxillary sinus. The timing of surgery in orbital reconstruction is debated. The advantage of delaying surgical repair for several weeks or months is to give symptoms of diplopia or disturbances in extra ocular motility an opportunity to improve. However, many studies have reported suboptimal results regarding the correction of exophthalmos or diplopia with delayed repair [15]. Various materials were used with varying results. However, bone grafts have been the gold standard in orbital wall reconstruction [16]. But because the autogenous bone grafts are associated with donor site morbidity, various alloplastic materials were tried. A material for successful orbital wall repair should meet the following criteria [17]. It should be nonreactive, provide good structural support, be easily positioned, and be readily available. It should not cause foreign body reaction or be toxic, and should prevent transmission of infectious diseases. The material should not prolong the operating time or cause donor site morbidity. Titanium is an accepted alloplastic implant material in craniomaxillofacial reconstruction due to its excellent biocompatibility and Osseo integration. Titanium implants have been successfully used for more than a decade in orbital reconstruction [18]. For the correction of exophthalmos deformities titanium mesh is used to cover extensive defects in the internal orbit for the restoration of the orbital volume [19]. Titanium is a soft material which can be easily molded and adapted. In this case, the titanium mesh is pre-fabricated on a model and is used for the reconstruction of the orbital floor fracture with no complications.

The efficacy of the orbital reconstruction was evaluated with a CT scan one year postoperatively. The scan showed excellent adaptation of the mesh on to the floor of the orbit. There is no volumetric difference in comparison with the contralateral orbit.

CONCLUSION

Orbital floor reconstruction with titanium mesh proved to be a good method for the treatment of both functional and esthetic requirements of orbital floor fractures. Titanium mesh is considered a valuable material for orbital floor reconstruction as it is biocompatible, adaptable to the orbital contour. It is strong enough in thin sections permitting the bridging of larger defects. The placement of the preformed implants for the reconstruction of extensive orbital defects proved to be less time consuming and more precise with no post-operative complications and with good esthetic and functional result.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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