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CASE REPORT

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Orbital Trauma: Keep an Eye for the Details!

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ABSTRACT

Orbital injuries are often missed out when they occur concomitantly with other facial bone fractures. Clinical examination and plain radiographic findings alone may prove inadequate in the detection of orbital floor fractures. Refined imaging techniques like CT scans and MRI are immensely helpful in the diagnosis of orbital blowout fractures. A case of 'impure' orbital blowout fracture which went undetected at the time of initial examination and its secondary surgical reconstruction is reported here. This case report emphasizes the importance of careful clinical and radiologic evaluation in orbital injuries.

Keywords: Orbital floor fracture, CT scan, Enophthalmos, Diplopia, Titanium mesh, Reconstruction.

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INTRODUCTION

Blunt injury to the orbit sustained during sports or road traffic accidents may result in an orbital blowout fracture.[1,2] In 1960, Converse and Smith introduced the concept of 'pure' (isolated floor) and 'impure' blowout fractures (associated with orbital rim, often related to midface fractures as zygomatic-orbital-maxillary complex bone segments).[3] The proposed mechanisms for blowout fractures include the so-called 'hydraulic theory' whereby the hydraulic transmission of forces through the orbital soft tissues disrupts the orbital walls. The 'buckling theory' by contrast maintains that the forces applied to the orbital rim(s) are directly transmitted to the interior of the orbit, which leads to buckling of one or more of the walls.[4,5]

The advent of computed tomography scan (CT) in the early eighties was a major advance in the detection of orbital fractures. This has narrowed down the broadly divergent therapeutic approaches to a fairly uniform protocol.[6]

A CT scan with coronal sections is known to be the best imaging modality for evaluating orbital floor fractures.[7] MRI offers increased soft tissue details, but poorer visualization of bone. Ultrasound imaging can also be used as an adjunct to other imaging methods.[2] The use of cone-beam CT has been found to be useful in the detection of isolated orbital floor fractures.[8]

CASE REPORT

A 35-year-old male reported to the oral and maxillofacial surgery department of our institution in April 2010, with enophthalmos and diplopia involving the right eye (Fig. 1). He gave a history of alleged road traffic accident and hospitalization about 2 months previously. A couple of weeks following his discharge from the hospital he noticed that his right eye was sunken and he was having double vision. The treatment records revealed that he had sustained a zygomatic complex fracture for which he underwent closed reduction. On preliminary examination, the patient had diplopia in superior, inferior and lateral gaze, hypoglobus

Fig. 1: Preoperative photograph

and restricted upward movement of globe. There was deepening of supratarsal fold and paresthesia in the infraorbital region. Patient was also referred to an ophthalmologist. Forced duction test was found to be positive. Visual acuity was normal.

A coronal CT scan of orbit was taken which revealed fractures at infraorbital rim, lateral wall and floor of right orbit (Fig. 2). There was herneation of orbital contents into the right maxillary sinus. MRI scan of orbit revealed sagging of right orbital floor into the maxillary sinus and the level of the right orbital floor was 8 to 9 mm below the left (Fig. 3). Inferior rectus muscle was slightly pulled down. Right globe was pulled posteriorly and inferiorly.

Considering the cosmetic and functional impairment, the patient was posted for orbital floor reconstruction under general anesthesia.

SURGICAL PROCEDURE

A subciliary incision was placed 4 mm below the lower eyelid margin in the skin crease orbicularis oculi muscle was dissected and muscle fibers were splitted at a lower level to expose the orbital septum. Dissection was continued inferiorly to expose the infraorbital rim and posteriorly about 20 mm along the orbital floor. The fibrofatty tissues of the orbit were found to be entrapped in between the segments of a malunited infraorbital rim fracture. The infraorbital rim had to be refractured to release the entrapped tissues. Intraorally, a sublabial incision was made to approach the right maxillary sinus. The herniated orbital contents were lifted up. The orbital floor defect was reconstructed using a 0.3 mm titanium mesh (Synthes, Switzerland) positioned in such a way as to support the globe. Anterior margin of the titanium mesh was bent over the infraorbital rim and secured to it using 1.5 mm titanium screws (Fig. 4). The wound was closed in two layers with 4.0 vicryl and 6.0 prolene. The sublabial incision was closed with 3.0 vicryl. During the hospital admission period, the patient received parentral antibiotics and corticosteroids. Postoperative period was uneventful. He was advised regular follow-up at an interval of 1 month. There was remarkable improvement in the movement of globe and marked reduction in diplopia by the end of 1 month. After one and half years from the orbital floor reconstruction, enophthalmos and hypoglobus have completely resolved (Fig. 5). Diplopia is limited to extreme lateral gaze only. Visual acuity and globe movements are normal as per ophthalmologist’s evaluation. MRI scan revealed that the position of inferior rectus muscle was normal with only slight inferior bulge of right orbit into maxillary sinus (Fig. 6).

Fig. 2: Preoperative CT scan

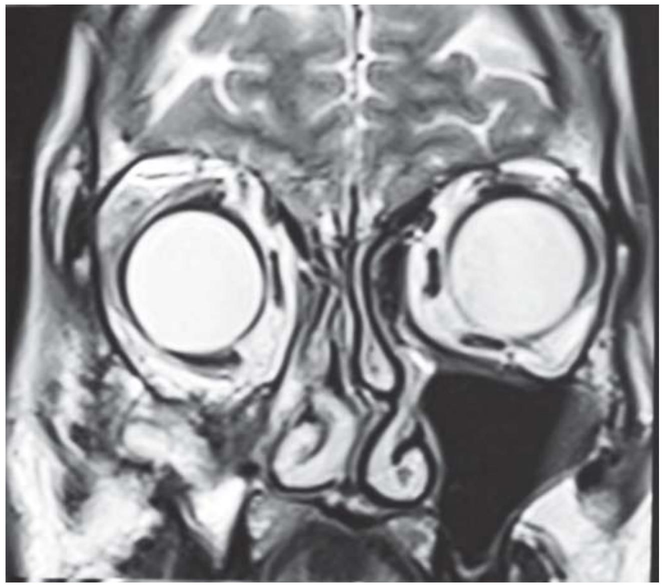

Fig. 3: Preoperative MRI scan

DISCUSSION

Orbital structures are affected in about 40% of all craniofacial trauma.[9] Majority of orbital injuries occur as a result of assault with considerable force. If improperly diagnosed or treated these may lead to serious complications later. The consequences of orbital floor fractures include enophthalmos, diplopia, limitation of ocular movement and altered sensation in the distribution area of infraorbital nerve.[2,3,7,10,11]

Current management of orbital blowout fractures has become more standardized over the past few years, but treatment remains individualized.[2] The ideal technique, reconstructive material, various surgical approaches and the time of intervention could be influenced by many factors including the type of maxillofacial trauma and the experience

Fig. 4: Intraoperative photograph—titanium mesh placement

Fig. 5: Postoperative photograph

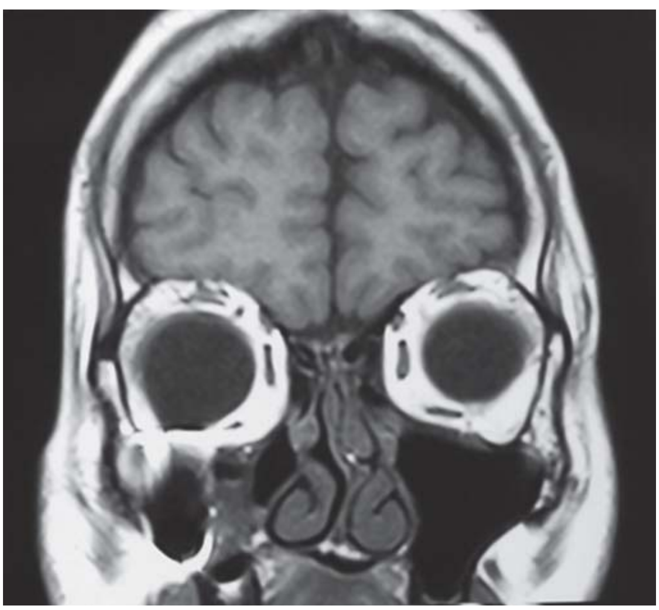

Fig. 6: Postoperative MRI scan

of the surgeons.[3] The potential benefits and risks of surgical intervention must be carefully evaluated. The timing of surgery remains an issue of debate. Many of the surgeons immediately repair orbital floor fractures based on their demonstration by CT or if the size of the fracture portends late enophthalmos or if diplopia has not resolved within 2 weeks of injury.[6,10,11]

A large number of articles have been published on the subject of orbital tissue reconstruction. Despite the enormous literature available, orbital injuries remain as some of the most difficult reconstructive challenges in maxillofacial surgery. The complex geometry of the orbit makes it almost impossible to obtain a true three-dimensional reconstruction, especially in two-wall fractures.[9] Goals of orbital floor reconstruction are to free incarcerated or prolapsed orbital tissue from the fracture defect and span the bony defect with reconstructive implant materials, together with facial bone restoration.[3] The timing of repair and modality of surgical intervention are critical factors that strongly affect the overall outcomes of orbital floor fracture treatment.[11]

Conventional radiographs can show conspicuous infra-orbital border fractures, but the diagnosis can be easily missed, resulting in delayed treatment.[7] This is why early diagnosis of the fracture and performance of computed tomography (CT) are important.

Significant enophthalmos after orbital injury and floor fracture is usually not immediately apparent because of edema of the orbital tissues. This edema and hemorrhage after orbital injury may even cause proptosis on the injured side.[11] In our case, the patient underwent a closed reduction procedure for zygomatic complex immediately after the road traffic accident. He had not noticed the enophthalmos and diplopia until 2 weeks after the procedure. The edema of the orbital tissues may have masked the enophthalmos. Diplopia of late onset may be due to entrapment of inferior rectus muscle in the malunited fracture segments. The non availability of CT scan at the time of initial correction might have led to the missed diagnosis of an orbital floor fracture.

The orbital floor may be approached by a variety of surgical incisions including subciliary, transconjunctival or transmaxillary approach.[12] The choice of approach and the incision placement are guided by the following goals: Good intraoperative visibility, minimal postoperative scar formation and good esthetic results. Despite several different surgical approaches all result in a very narrow operating field. This makes the process of fitting and aligning implants within the orbit rather time-consuming.[9] We used the subciliary approach in the present case because it provided a better access to the infraorbital rim as well as orbital floor and also enabled us in placement of the titanium mesh to support the sagged orbital floor.

Numerous materials have been used for orbital tissue reconstruction including lyophilized dura, silastic polyethylene or polydioxanone sheets, hydroxyapatite blocks, titanium mesh, ceramic inlays and autogenous bone grafts.[12, 13] The more elastic materials are unable to withstand the dynamic stresses of large defects. Resorbable implants may be prone to foreign-body reaction and implant exposure. The disadvantages of autologous bone grafts include minimal contour ability and a donor site defect. In addition, implant resorption can occur.[12,13] Titanium mesh has a long track record of reconstruction of large orbital floor defects and correction of globe malposition. Some advantages of titanium mesh plates are availability, biocompatibility, easy intraoperative contouring and rigid fixation.[12] These advantages justified our decision to go for a titanium mesh reconstruction.

Orbital surgery is not risk free. The potential surgical complications like implant infection, worsening of diplopia and blindness should also be borne in mind when the decision to proceed with surgery is made. Based on the pathogenesis of orbital blowout fractures in which the fibro-fatty muscular complex is drawn to varying degrees between the bone fragments, some degree of soft tissue damage might be anticipated. Intrinsic fibrosis and contracture can tether the globe movement, despite complete reduction of the herniated tissue from the site.[6] The surgeon should have a thorough knowledge of healing and the possible prognosis of each case. Folkestad et al[14] has recommended the use of a visual analog scale which would help to evaluate the recovery from orbital floor fractures. This could be useful in assessing patient discomfort and indicate differences between patients' and doctors' opinions.

CONCLUSION

In the light of our experience with the present case, it is worthy to emphasize that a careful clinical assessment and physical examination of the patient is vital for the diagnosis of orbital floor fractures.

CLINICAL SIGNIFICANCE

Orbital injuries are overlooked in the initial period following trauma due to the presence of edema. Axial and coronal CT scans should be obtained in order to discern the extent of the orbital injuries as well as any other facial fractures that might be present. Early detection of orbital fractures and their prompt surgical management helps to improve the clinical outcome.

REFERENCES

1. Jones NP. Orbital blowout fractures in sport. Br J Sp Med 1994;28:272-75.
2. Brady SM, McMann MA, Mazzoli RA. The diagnosis and management of orbital blowout fractures: Update. American Journal of Emergency Medicine 2001;19:147-54.
3. Kanno T, Sukegawa S, Takabatake K, Takahashi Y. Orbital floor reconstruction in zygomatic-orbital-maxillary fracture with a fractured maxillary sinus wall segment as useful bone graft material. (Article in press) Asian J Oral Maxillofacial Surg 2011.
4. Bullock JD, Warwar RE, Ballal DR, Ballal RD. Mechanisms of orbital floor fractures: A clinical, experimental and theoretical study. Tr Am Ophth Soc 1999;97:87-113.
5. Ethunandan M, Evans BT. Linear trapdoor or white-eye blowout fracture of the orbit: Not restricted to children. Br J Oral and Maxillofacial Surgery 2011;49:142-47.
6. Harris GJ, Garcia GH, Logani SC, Murphy ML, Sheth BP, Seth AK. Orbital blowout fractures: Correlation of preoperative computed tomography and postoperative ocular motility. Tr Am Ophth Soc 1998;96:330-53.
7. Wang S, Xiao J, Liu L, Lin Y. Orbital floor reconstruction: A retrospective study of 21 cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008;106:324-30.
8. Drage NA, Sivarajasingam V. The use of cone-beam computed tomography in the management of isolated orbital floor fractures. British Journal of Oral and Maxillofacial Surgery 2009;47: 65-66.
9. Kozakiewicz M, Elgalal M, Loba P, Komun´ ski P. Clinical application of 3D prebent titanium implants for orbital floor fractures. Journal of Cranio-Maxillofacial Surgery 2009;37: 229-34.
10. Gosse EM, Ferguson AW, Lymburn EG, Gilmour C. Blowout fractures: Patterns of ocular motility and effect of surgical repair. British Journal of Oral and Maxillofacial Surgery 2010;48: 40-43.
11. MA Burnstine. Clinical recommendations for repair of isolated orbital floor fractures: An evidence-based analysis. American Academy of Ophthalmology 2002, Elsevier Science Inc 1207-10.
12. Baino F. Biomaterials and implants for orbital floor repair. Acta Biomaterialia 2011;7:3248-66.
13. Metzger MC, Schön R, Weyer N, Rafii A, et al. Anatomical 3-dimensional prebent titanium implant for orbital floor fractures. Ophthalmology 2006;113:1863-68.
14. Folkestad L, Aberg-Bengtsson L, G Granström. Recovery from orbital floor fractures: A prospective study of patients' and doctors' experiences. Int J Oral Maxillofac Surg 2006;35: 499-505.

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