Management of an Isolated Orbital Blow-out Fracture

Lt Col TK Bandyopadhyay*, Brig BL Sapru (Retd) vsm⁺

MJAFI 2004; 60 : 392-394

Key Words : Iliac crest bone graft; Orbital blow out fracture; Orbital reconstruction

Introduction

Fracture of the orbital floor (57.4%) can occur from zygomatico-maxillary complex fracture in middle third facial skeletal injuries. However, isolated orbital floor fracture-the term coined as 'blow out fracture' represents upto 21.4% [1]. Anatomically, the antero-medial 3rd of the floor is formed by orbital surface of maxilla, where as the postero-medial part is formed by palatine bone and lateral 3rd is formed by zygoma. The medial wall of the orbit is formed anterior to posterior, by frontal process of the maxilla behind its lacrimal crest, lacrimal bone, orbital plate of ethmoid and body of sphenoid. The 'blow out' fracture of orbit usually involves the medial wall and floor of the orbit being the thinnest. Absolute indications for reconstruction of orbital floor are diplopia with muscle entrapment, enophthalmos and large defect [2]. Many materials have been described for the reconstruction of orbital floor defects with varying rate of success. They include autogenic, allogenic and alloplastic material.

This article reports management of a case of orbital blow-out fracture using autogenous iliac crest bone graft to reconstruct the defect of the orbital floor.

Case Report

This 14 year old boy reported with the complaints of double vision developed subsequent to a road traffic accident (RTA). There was subconjunctival ecchymosis and mild degree of enophthalmos of right eye with lowering of interpupillary line. The ocular movement was restricted in upward direction and had diplopia in medial, upward, downward and lateral gazes (Fig 1). Force duction test was positive. However the pupillary, corneal and conjunctival reflexes were normal and no paraesthesia over right infra-orbital region was detected. Water's projection of skull showed classical 'hanging drop' sign at the roof of the maxillary antrum. Axial view CT scan of skull revealed breach in the floor of the right orbit alongwith 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 subciliary incision under nasoendotracheal general anaesthesia. The infraorbital nerve was identified and protected. The herniated periorbital content including inferior rectus muscle and fat was disengaged from the bony defect. From the inner table of right iliac crest a small bone piece was harvested which was shaped to match the contour and size of the defect of the orbital floor. The graft was placed over the defect and fixed with titanium microscREW. 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. Patient had mild degree of diplopia on medical gaze. 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. On his last 6th monthly visit the patient did not have any diplopia in any gaze (Fig 3). The post-operative radiograph showed well established graft in place (Fig 4).

Discussion

The etiology of the blow out fracture of the orbit is controversial, though the concept of transmission of hydraulic force against the orbital wall to cause fracture is widely accepted [3]. Anatomically the inclined plane of the orbital floor which is also the thinnest, helps the resultant force vector to travel in downward and medial direction. However, in practice the orbital floor undergoes fracture in posteromedial part since the tubular architecture of the canal provides some mechanical strength to the floor. The outcome of this type of fracture depends upon proper diagnosis, timing of surgery, appropriate surgical approach and selection of suitable graft material.

There are varied opinions regarding the indication of repair of orbital floor. According to some authors, diplopia alone is not an indication for surgical repair [2]. A few workers opine that if the Lockwood's suspensory

*Associate Professor, Department of Dental Surgery, Armed Forces Medical College, Pune-40, ⁺Ex-Commandant & Command Dental Advisor, Command Dental Centre (Northern Command), Udhampur

Received : 13.1.2002; Accepted : 3.12.2002.

Fig. 1 : Restriction of movement of right eyeball in upward gaze

Fig. 2 : Pre-op CT showed herniation of peri-orbital soft tissue into maxillary antrum

ligament is intact there is no substantive reason to reconstruct the orbital floor [4]. Some authors suggest that the reconstruction may be dispensed if the defect is less than 0.5 cm[5]. Therefore, to ascertain the location and extent of the defect proper investigations viz X-rays, CT are mandatory. In our case, coronal view CT scan and PNS view X-rays were carried out to plan the surgery. The timing of surgery is also not undisputed. Some authors suggest that surgical exploration can be obviated in case of diplopia which resolves within 14 days unless extensive bony wall defect is detected [6]. Another school advocates waiting period of 4-6 months prior to undertaking surgical exploration while others recommend early surgical intervention [7]. We preferred early surgical intervention because the defect was large as well as the Force duction test was positive, which denoted definite entrapment of the peri-orbital content, indicating fibrosis, though some workers achieved good result performing surgery even after 4-6 weeks of injury.

Fig. 3 : No restriction of movement of right eyeball in upward gaze

Fig. 4 : Post-op CT showed well aligned graft in place

The commonly used surgical approaches to reconstruct the floor of the orbit are transconjunctival, subciliary and infraorbital. However, considering the exposure required and aesthetics, we preferred the subciliary type of approach.

The basic objective of reconstruction of orbital defect is to restore orbital volume, function and aesthetics[5,7]. To reconstruct the defect of the orbital floor, various autogenous as well as allogenic and alloplastic material have been used with their merits and demerits. In the

present case, autogenous iliac cortical bone graft was used to repair the defect as it maintains the volume better in comparison to the cancellous one irrespective of their origin and there is least chance of contamination of the graft. In the present case, the autogenous iliac crest cortical bone graft served the basic goal of reconstruction of the orbital defect satisfactorily.

References

1. Seiberer M, Sullivan WG, Smith DJ Jr. An analysis of 1423 Facial fractures in 788 patients at an urban trauma center. *J Trauma* 1989;29:388.
2. Maniglia AJ. Conjunctival approach for the repair of pure orbital blow out fractures. *Otolaryngol Clin N Am* 1983;16:575-83.
3. Converse JM, Smith B, Obear MF, Smith W. Orbital blow out fracture. A ten years survey. *Plast Reconstr Surg* 1967;39:20-5.
4. Lew D. Orbital floor reconstruction with autogenous mandibular symphyseal bone grafts: Discussion. *J Oral and Maxillofac Surg* 1997;55:330-2.
5. Rowe NL, Williams JL. Fractures of zygomatic complex and orbit. Rowe and William's Maxillofacial injuries 1994;Vol.1:475-590. Churchill Livingstone.
6. Emery JM, Van Noorden GK, Schlernitzaver DA. Management of orbital floor fracture. *Am J Ophthalmol* 1972;74:299-306.
7. Courtney DJ, Thomas S. Isolated orbital blow out fractures : Survey and review. *Br J of Oral and Maxillofac Surg* 2000;Mar:496-502.

Answer to Radiological Quiz

Dermoid cyst with rupture into the subarachnoid space

The NCCT scan of the head shows a well-defined extra-axial mass lesion with heterogenous internal densities, arising from the suprasellar cistern slightly to the Right of the midline and extending subfrontally. The hypodense areas within the lesion had attenuation value of -72 HU which was indicative of lipid content. There were hyperdense areas within the lesion having attenuation value of 330 HU indicative of calcification. In addition, the subarachnoid spaces had scattered hypodense 'globules' having attenuation values of -23HU suggestive of fat 'droplets'. Based on these findings, a diagnosis of a suprasellar dermoid cyst with rupture into the subarachnoid space was made.

Dermoid cysts are non-neoplastic developmental tumours, which are rare in intracranial location, with reported incidence of less than 2% of all intracranial tumors, occurring more commonly in male [1,2]. They arise from inclusion of ectodermal elements in the neural groove at the time of its closure, and microscopically may contain elements from all layers of the skin [3]. These lesions occur in the midline, being commonest in posterior cranial fossa, but occur frequently in the suprasellar cisterns. The cyst walls are thick and may contain sebaceous glands, sweat glands and hair follicles. Dermoids have fatty content of triglycerides and unsaturated fatty acids and peripheral calcification in the cyst wall is frequent [2,3]. Clinical presentation is usually in the third decade of life, with headache or seizures as the presenting symptom [1,3]. Rupture of cyst capsule may occur, disseminating the fat content of the cyst into the subarachnoid space or cerebral

ventricles, and may lead to chemical meningitis / ependymitis [2].

On CT, the wall is typically isodense to brain (except where it is calcified) but cyst contents makes these lesions to stand out sharply as a well-defined, low density mass, reflecting their high fat content (-20 to -80HU). There is no enhancement seen post-contrast. Rupture is diagnosed by identification of ventricular fat-fluid levels and presence of fat droplets in the cerebro spinal fluid (CSF) spaces [4]. As small fatty droplets in the CSF spaces may be overlooked, they should be searched for specifically whenever an intracranial dermoid is detected [1]. On MRI, dermoids show heterogeneous signal intensity related to their contents. On T1-weighted scans, the cysts appear hyperintense because of their high fat content while on T2-weighted scan, they are variably hypointense [3]. Fat suppression images may be useful, although not all dermoids will exhibit suppression of fat signals [1,4]. These lesions do not exhibit enhancement post-contrast. Subarachnoid rupture is easier detected on T1-weighted MRI than on CT, as droplets and streaks of high signal intensity stand out within the otherwise hypointense sub-arachnoid spaces and cisterns.

References

1. Sharma A, Singh S, Anandmoyee et al. Teratodermoid in Parasellar region - a rare entity Imaging findings. *IJRI* 2003;132:209-11.
2. Grossman CB. Intracranial neoplasms and cysts. In : MRI and CT of the Head and Spine, 2nd ed. Williams and Wilkins 1996:217-8.
3. Atlas SW. Extra-axial brain tumors. In : MRI of the Brain and Spine, 3rd ed. Lippincott, Williams and Wilkins 2002:761-2.
4. Smith A, Benson J, Blasser S et al. Diagnosis of ruptured intracranial dermoid cyst: Value of MR over CT. *AJNR* 1991;12:175-80.