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Effectiveness of Treatment of Orbital Floor Blowout Fractures with Autologus Iliac Crest Graft: A Report on 14 Cases

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Abstract: ***Aim**: The present study is to estimate the effectiveness of iliac crest graft for repairing traumatic orbital floor defects. **Materials and Methods**: Fourteen patients with orbital floor blowout fractures were included in thestudy; in 8 cases, there was associated fracture of the inferior orbital rim. The decision to proceed surgically was based on the presence of at least one of the following conditions: diplopia, enophthalmos, herniation of orbital tissues through gaps in the orbital floor bone, and concomitant displacement of bone fragments of the inferior orbital rim. Autologus iliac crest graft was used in all cases. Access to the orbitalfloor was via subciliary incision. **Results**: The incidence of clinical signs during follow-up and the surgical complications found (1 caseof entropion, 1 case of palpebral edema) are fully comparable with those reported in the literature; they do not appear to be correlated to the use of a cartilage graft. **Conclusions**: The use of iliac crest graft has wide application for varied size orbital floor defects and is easy to harvest. It provides an optimal support function and stability for the globe with minimum donor-site morbidity.*

Keywords: Orbital floor fracture,iliac crest graft, diplopia

1. Introduction

The treatment of orbital floor fractures is still controversial with regard to indications and time of surgery,1access,and reconstruction techniques. Inadequate treatment of fractures involving one or more orbital walls usually results in functional and/or aesthetic disorders such as diplopia and enophthalmos, both due to herniation of the orbital contents and increase in the volume of the orbital cavity. Thus the treatment goal must always be to prevent these anatomic and dysfunctional defects, by restoring the original shape and volume of the orbit, so as to ensure correct positioning of the globe. These may be achieved by interposing an autologous graft or a biomaterial between the residual orbital floor and the soft tissues prolapsed into them axillary sinus, suitably repositioned inside the orbit.

In recent years, biomaterials have undoubtedly benefited from enormous progress in research, which has provided materials that are increasingly bioadaptable and well tolerated, with minimal risk of extrusion and/or infection.

The operative surgeon must always be aware that any non resorbable material has the potential to cause infection even after an interval of many years. Forthis reason, autogenous grafts are still widely used, in full awareness of their limits: risk of resorption and morbidity at the donor site. Of autografts, iliac crest bone graft 3,4is indicated for the reconstruction of gaps in the orbital floor, due to a shape that is very similar to that of the floor, the simplicity and speed with which it can be removed, its good support function, and the limited morbidity at the donor site.

2. Material and Methods

A total of 14 patients admitted in Dept of Plastic & Reconstructive Surgery, SMS Medical College & Hospital from June 2017 to June 2018 were included in the study. Autogenous iliac crest graft was used in all the 14 patients. Patients were evaluated for the presence or absence of diplopia, enophthalmos, infraorbitalnerve paresthesia, and ocular motility disorders.

Surgical indications for orbital exploration included entrapment of orbital tissues, large orbital defect (greater than 50% of the orbital floor or more than 8 mm), or orbital floor defects with involvement of other zygomatico-frontal complex fractures.

Inclusion criteria

The present study comprised of 14 patients having orbital floor fractures associated with other maxilla-mandibular fracture, attending the outpatient department and emergency services in a tertiary care centre. The patients were selected randomly irrespective of age, sex, and other social categories.

Exclusion criteria

Patients with debilitating diseases, e.g., diabetes, acute infection, cardiac insufficiency, metabolic bone disorder, patient taking immuno-suppressive drugs and patient with compromised immunity were excluded.

Preoperative medical and dental history was recorded and informed consent was taken. Patients were diagnosed on the basis of clinical and radiographic examination. CT scan (axial, coronal and 3-D reconstruction) of mid-facewere done to confirm the clinical diagnosis.

Patients were operated under general anesthesia. Operating sites were exposed through an infra orbital approach or pre-existing laceration or scar mark. After adequate exposure, entrapped fatty-muscular tissues were released. The desired iliac crest graft was placed. Antibiotic and analgesics were given for 5 days postoperatively.

Postoperative assessment of the patients was done under following parameters:
1) Pain: Visual Analogue Scale (VAS) (0–10).
2) Swelling: Present/Absent.
3) Diplopia charting with red green glass.
4) Clinical enophthalmos—measured by Hertel's exophthalmometer.
5) Infraorbitalparesthesia-Present/Absent.

Follow-up was done at 3months and 6months after surgery

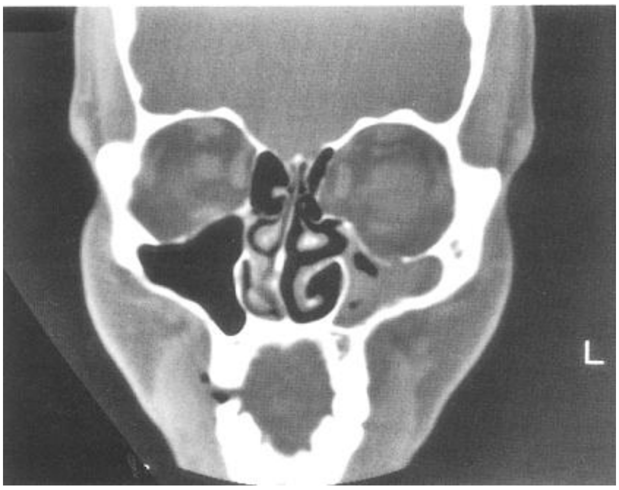

Figure 1: Preoperative CT scan: orbital floor blowout fracture with herniation of orbital contents.

Figure 2: Postoperative CT scan: the soft tissues have been repositioned within the orbit and the floor has been reconstructed with iliac crest graft

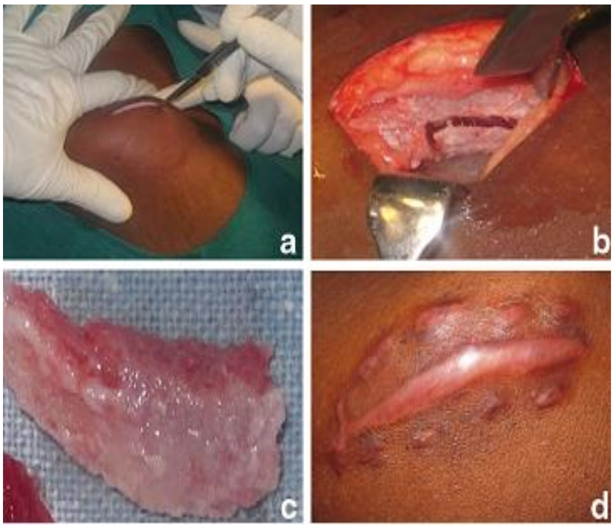

Figure 3: Harvest of graft from the iliac crest a skin incision; b) Osteotomy cut; c the graft; d visible scar formation secondary to harvest of iliac bone graft

Figure 4: Placement of harvested iliac crest graft

Figure 5: Preoperative view of patient with orbital floor fracture

Figure 6: Post operative view of patient with unrestricted eye movements

3. Results

The results are summarized in Table 1.The complications observed do not appear to be correlated to the use of a cartilage graft, because the one case of entropion may be attributed to adhesion caused by the miniplate used to fix the orbital rim; the condition resolved spontaneously. The case of persistent palpebral edema involved a patient who sustained an accident at work and had very extensive injuries to the lower and upper eyelids, which we used for access to the orbit. The positive findings for some clinical signs at follow-up are also quantitatively comparable to those reported in the literature, independent of the type of reconstruction used.6

Table 1: Prospective Analysis of 14 Patients with Orbital Floor Fracture in 8 Cases Associated with Inferior Orbital Rim Fracture

Patient	Gender	Defect Location	Defect Size(mm)	Fracture	Clinical Finding	3mo f/u	6mo f/u	Complication
1	M	ANT	16x18	OF+OR	BD+D+TE	--	--	--
2	M	ANT	15x10	OF+OR	BD+H	H	--	--
3	F	POST	18x10	OF	TE+D	--	--	--
4	F	POST	15x15	OF	BD+TE+D+E	E	D	Entropion
5	F	ANT	15x15	OF+OR	BD+TE	--	--	--
6	M	ANT	15x20	OF+OR	TE	--	--	--
7	M	POST	10x20	OF	BD+H+TE+D	D+H	D	Palpebral edema
8	M	ANT	15x18	OF+OR	TE+E	--	--	--
9	M	ANT	10x15	OF+OR	TE+D	D	--	--
10	F	ANT	16x18	OF+OR	TE	--	--	--
11	M	POST	15x20	OF+OR	BD+D+TE	--	--	--
12	M	POST	15x18	OF	BD+H	H	--	--
13	M	POST	10x20	OF	TE+D	D	--	--
14	M	POST	10x20	OF	TE+E	--	--	--

Note. Preoperative clinical and postoperative (3 and 6 months) signs and any complications.

Abbreviations: OF, orbital floor; OR, inferior orbital rim; ANT, anterior third; POST, posterior two thirds; D, diplopia; E, enophthalmus; BD, bone displacement; TE, tissue entrapment; H, hypesthesia.

4. Discussion

The orbital walls are easily damaged by rising trauma, with subsequent diplopia as one of the most common complication. This is due to entrapment or injury of the extraocular muscle, damage of nerves, and change in the height of the eyeball caused by the reduction of intraorbital volume in blowout fracture, enophthalmosis attributed to several causes: loss of ligament and bone support for the globe and fat atrophy or fat loss. Management of orbital fractures is a challenging problem for the oral and maxillofacial surgeon. Their reconstruction requires (1) release of herniated orbital contents, (2) avoidance of enophthalmos, diplopia, and dystopia, (3) return of physiologic function of the extraocular muscles

Debate is still ongoing for the choice of material for reconstruction and filling-in the defect of the orbital floor, especially when various autogenous and synthetic materials have been introduced for this reconstruction. Autogenous grafts have the advantages of biocompatibility and lower potential for infection, exposure, and foreign body reaction.Cortical bone and endochondral bones are widely used for reconstructing the orbital floor. Nevertheless, the drawback of bone grafts is unexpected resorption [6]. Kontio et al. [7]have reported almost 80 % resorption of iliac bone grafts, with 75 % concurrent new bone formation, probably because of the presence of osteoblasts in cortical bone. Regarding morbidity, complications at donor sites of autographic materials are few, most commonly scars and rarely cutaneous nerve injury.

Of the autogenous materials, mainly cortex bones suchas cranial bone and iliac bone are used. Although the cortical bone is strong enough, processing it is not easybecause of its strength and lack of flexibility to fit the contour of the orbital floor. Because the cortical bonecontains a smaller number of cells such as osteoblasts and osteoprogenitor cells than do the periosteum and medullabone, it provides poor remodelling and is sometimes absorbed [13, 15]. On the other hand, it is also suggested that membranous bone grafts undergo significantly less resorption than endochondral bone grafts when applied to the craniofacial skeleton.

Kontio et al. stated that reconstruction of the orbital walls with iliac bone grafting is reliable. It restored the volume and shape of the orbit well. However as being a fairly rigid material, intraoperative three-dimensional assessment and accurate placement of the bone graft were difficult. The resorption rate was high, but most of the resorption was advantageous remodelling so a slight over correction is beneficial [17, 19].

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