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Aesthetic and Functional Results after Surgical Management of Orbital Fractures

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ABSTRACT

This study included 53 cases with displaced orbital fractures. Evaluation of all patients included: Detailed history; complete ocular examination and CT scanning. Treatment of 42 patients was done by surgical reduction and mini-plates and screws fixation. Eleven patients refused the operation. Post-operative evaluation of the aesthetic and functional results was done for all patients. In those patients treated by surgical reduction and fixation, both the aesthetic and functional results were excellent. On the other hand, in patients who refused surgery, the aesthetic results were poor with residual functional deficits in 8 patients (72.7%). The results were discussed and it was concluded that surgical reduction and mini-plates & screws fixation of orbital fractures are mandatory. If surgery is neglected serious ocular complications may result.

INTRODUCTION

Orbital fractures are severe injuries which result from blunt trauma; missile injury or a strike by a heavy hard object. The mechanism of injury is due to either a hydraulic force from soft tissue compression or a buckling force from displacement of the orbital rim that results in buckling of the thin orbital floor and fracture [1]. The clinical picture includes: Periorbital ecchymosis and subconjunctival hemorrhage; hypoesthesia in infraorbital nerve supply area; eye muscles imbalance; enophthalmos in "blow-out" fractures and exophthalmos in "blow-in" fractures. Associated injuries include head injuries; ocular injuries; lacrimal duct injuries; nasal injuries and soft tissues injury. The orbital fracture may be in the medial wall; floor; lateral wall; roof or multiple sites. Medial wall fractures can result in lacrimal duct injury; epistaxis & emphysema and distuibance of eye movements with diplopia. Fractures of the floor may lead to enophthalmos; disturbance of eye movements with diplopia and epistaxis. Lateral wall fractures may be associated with disturbance of eye movements with diplopia; facial palsy and protrusion of the eye. Orbital roof fractures can lead to CSF rhinorrhea; disturbance of eye movements with diplopia and protrusion of the eye. Intraorbital foreign bodies either metallic or vegetable matter may be present in these fractures [2,3].

Radiological diagnosis of orbital fractures can be done by plain X-rays; computerized tomography; tridimensional CT and magnetic resonance imaging [4].

The aim of the present study is to evaluate the aesthetic and functional results after surgical management of orbital fractures.

PATIENTS AND METHODS

Fifty-three patients with displaced orbital fractures were included in this study. Forty-nine patients were males and four patients were females. Their ages ranged between 22 and 56 years. The causes of injury; the sites of fractures and associated injuries are presented in Table (1).

For every patient the following were done:

- *Detailed history* of the accident and the present symptoms. Ocular symptoms include diplopia; decrease acuity of vision; epiphora; protrusion or recession of the eye globe; disturbed ocular movements; numbness of the cheek & gum and swelling around the eye.
- *Thorough clinical examination* was done, with complete ocular evaluation. The ocular evaluation includes: Tests for visual acuity and pupils; extraocular movements & slit lamp evaluation and fundoscopic examination; tests for third & seventh nerves paralysis and hertel exophthalmometry.
- *Radiological evaluation* by plain X-rays; computerized tomography; tridimensional CT and in some patients magnetic resonance imaging was done.

• *Photography* was done to allow post-treatment evaluation.

Management:

• Forty-two patients were treated by surgical reduction and mini-plates and screws fixation. Timing of the operation was within the first 24 hours after injury in 15 patients and within 10 days in 27 patients. No secondary procedures were included in this series. In 34 patients (81%), operation was done through combined lower eyelid crease incision and an eyebrow incision. In the remaining 9 patients, operation was done through associated peri-orbital wounds.

• Eleven patients refused surgical reduction and fixation of the orbital fractures.

Follow-up of patients was done for periods ranging between one and four years. Evaluation of the aesthetic and functional results was done repeatedly. The condition of the patient one year after injury (minimal follow-up period) was recorded for evaluation of the results. Grades of the aesthetic results include: excellent; good and poor results based on clinical evaluation by the surgeon and patient's questionnaire. Functional results were evaluated by different ocular tests for acuity of vision; exraocular movements; naso-lacrimal duct system and nasal functions.

RESULTS

Aesthetic results (Figs. 1-5):

In patients treated by surgical reduction and internal fixation (42 patients), the aesthetic results were excellent in 36 patients (85.7); good in 4 patients (9.5%) and poor only in 2 patients (4.8%). Poor aesthetic results were encountered in 2 patients with severe comminuted fractures with bone loss.

On the otherhand, aesthetic results were poor in all patients who did not receive surgical management of their orbital fractures.

Functional results (Table 2):

In patients treated by surgical reduction and internal fixation (42 patients), functions recovered in 37 patients (88.1%). Residual limitation of extraocular movements occurred only in 2 patients (4.8%) with severe comminuted fractures with bone loss. Epiphora complicated 2 cases (4.8%) with lacrimal duct injuries, and were treated later on by insertion of lacrimal duct tubes. Only in one case (2.4%) with associated nasal injuries, the patient complained of partial nasal obstruction on the side of the injury.

On the otherhand, the functional results were unsatisfactory in patients who did not receive surgical management of their orbital fractures (11 patients). Only 2 patients (18.2%) recovered all functions. Residual limitation of extraocular movements occurred in 4 patients (36.4%); diplopia in 4 patients (36.4%) and diminution of visual acuity in one patient (9.1%).

No mortality or general complications were recorded in the present series.

Table (1): Causes sites and associated injuries of orbital fractures.

	No. of patients
Causes of injury:	
Road accidents	27 patients (50.9%)
Strike with a heavy hard object	14 patients (26.5%)
Blunt trauma	11 patients (20.7%)
Missile injury	1 patient (1.9%)
Total	53 patients
Sites of fracture:	
Medial wall	4 patients (7.6%)
Lateral wall	19 patients (35.8%)
Floor	21 patients (39.6%)
Roof	2 patients (3.8%)
Multiple sites	7 patients (13.2%)
Total	53 patients
Associated injuries:	
Soft tissues injury	23 patients (43.3%)
Ocular injuries	4 patients (7.6%)
Head injuries	8 patients (15.1%)
Nasal injuries	7 patients (13.2%)
Lacrimal duct injuries	2 patients (3.8%)
Mutiple injuries	9 patients (17.0%)
Total	53 patients

Table (2): Functional results after orbital fractures.

	Patients treated surgically	Patients without surgical treatment
Recovery of all functions	37 patients	2 patients
Limitation of extraocular movements	2 patients	4 patients
Diplopia	None	4 patients
Diminution of visual acuity	None	1 patient
Epiphora	2 patients	None
Partial nasal obstruction	1 patient	None
Total	42 patients	11 patients

Fig. (1-A): Fracture of the right orbital bones with lacerations of the eyebrow & lids and facial palsy.

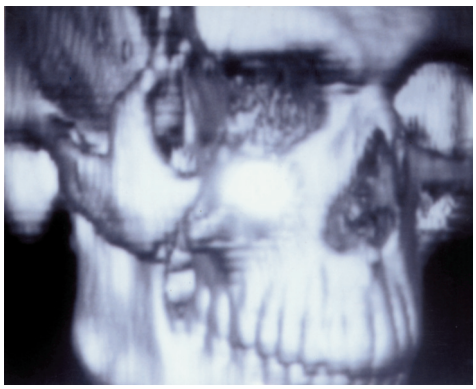

Fig. (1-B): Tridimensional CT showing fractures of the floor and lateral wall of the right orbit.

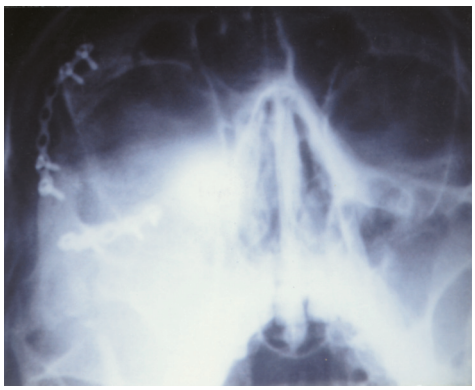

Fig. (1-C): Post-operative plain X-ray after fixation by mini plates and screws.

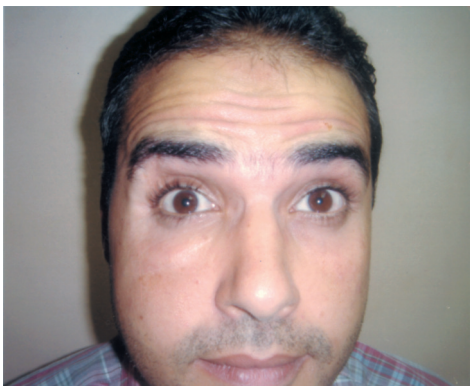

Fig. (1-D): Post-operative picture, 18 months after surgery with excellent aesthetic results and recovery of the facial palsy.

Fig. (2-A): Bilateral fractures of orbital bones. Notice squinting of the left eye.

Fig. (2-B): Post-operative picture, 8 months after internal fixation by plates and screws-the squint disappeared.

Fig. (3-A): Bilateral fractures of the facial bones with severe facial lacerations.

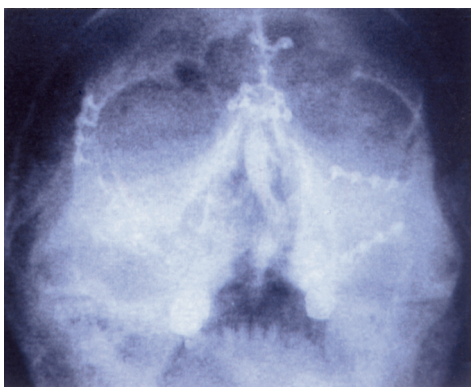

Fig. (3-B): Post-operative plain X-ray after fixation by mini plates and screws.

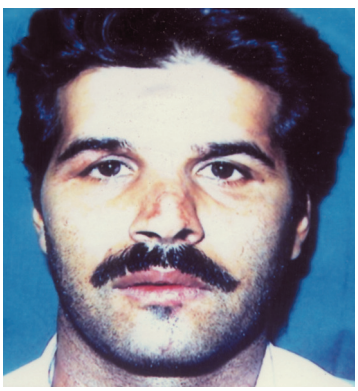

Fig. (3-C): Post-operative picture, 5 months after surgery with excellent aesthetic results.

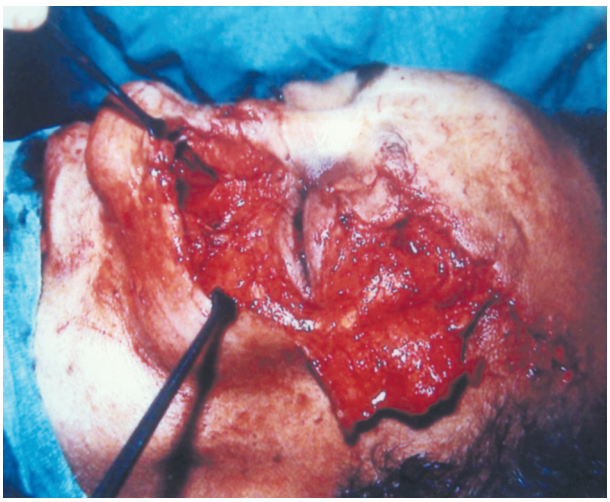

Fig. (4-A): Compound fractures of nasal and left orbital bones with severe lacerations of the eyebrow, eyelids and forehead.

Fig. (4-B): Post-operative picture, 4 months after internal fixation. Notice the residual left facial palsy.

Fig. (4-C): Correction of the facial palsy by temporalis muscle slings for the eyelids.

Fig. (4-D): Post-operative picture, 4 years after trauma showing excellent aesthetic results.

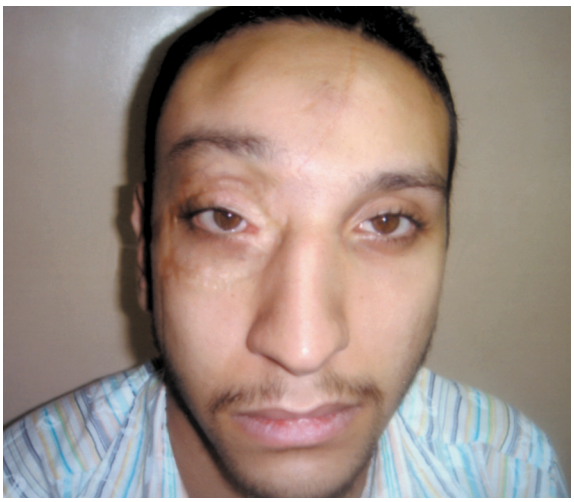

Fig. (5-A): A patient with neglected fractures of the right orbital bones who refused surgical correction, showing enophthalmos of the right globe, downward displacement of the medial canthus, ptosis and extensive scarring.

Fig. (5-B): Tridimensional CT of the same patient showing the displaced malunited fractures of the floor and medial wall of the right orbit.

DISCUSSION

Surgical treatment of orbital fractures poses one of the most demanding tasks in maxillofacial trauma due to the anatomical complexity of the orbito-nasal framework **[5]**. Problems associated with these fractures are related either to tissue displacements of orbital contents in the fragile periorbital region; cranial nerve deficits or to associated injuries. Entrapment of orbital muscles may result in either horizontal or vertical diplopia. Displacement of the globe may result in either enophthalmos or exophthalmos. Associated nerve injuries result in either motor or sensory deficits usually in the territories of the third or seventh cranial nerves. Fortunately, optic nerve injury is rare in these fractures **[6]**.

Rigid fixation of orbital fractures with plates and screws has been introduced for treatment of these fractures with significant improvement in the results of management **[7]**. However, there are scarce reports in the literature which deal with the comparative results between surgical and non-surgical management of these fractures.

The aim of the present study was to evaluate the aesthetic and functional results after surgical management of orbital fractures. Results showed excellent aesthetic outcome with marked recovery of functions in patients treated by surgical reduction and internal fixation by plates and screws. On the otherhand, aesthetic and functional results were unsatisfactory in patients who did not receive surgical management of their orbital fractures. These findings point up to the vital importance of early surgical reduction and internal fixation of orbital fractures **[8]**.

Post-operative recovery of ocular symptoms as movements of the globe and diplopia was observed in patients after rigid internal fixation of orbital fractures. In some patients, mild enophthalmos was observed. This can be attributed to the primary trauma which displaces some periorbital fat from around the globe to the surrounding spaces, usually the maxillary sinus in fractures of the orbital floor **[3]**. This condition is acceptable and usually does not need any treatment.

Ocular complications were much more evident in patients who did not receive surgical treatment (Table 2). In this report, the commonest complication was limitation of the extraocular movements. Distressing diplopia was the second complication in this series. Diminution of vision after orbital fractures is uncommon, however, it was observed in one patient as a squeal of retrobulbar haemorrhage. Epiphora was observed in some patients, however, in most cases it was transient and disappeared after internal fixation. Only in two patients, epiphora did not improve after surgery and required intubation of the lacrimal duct **[9,10]**.

Concerning timing of surgical management in this series, it was within the first 24 hours in some patients with associated open wounds. However, in most patients, surgery was done after stabilization of the patient's condition and subsidence of the traumatic oedema, within 10 days after injury **[11]**.

Many surgical routes are described for treatment of orbital fractures including: Associated open wounds; the eye brow; the lower eye lid crease; the inferior fornix and the temporal region **[12,13]**. In the present study, operation was done through combined lower eyelid incision and an eyebrow incision in most cases. This combined approach proved to be very satisfactory in dealing with most types of orbital fractures, without any subsequent scarring. The trans-conjunctival approach may lead to ophthalmic complications including corneal epitheliopathy causing reduced vision, conjunctival granuloma and symblepharon **[14,15]**.

In conclusion, surgical reduction and mini-plates & screws fixation of orbital fractures are mandatory. If surgery is neglected, serious aesthetic and functional complications may result.

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