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Case Report

Autologous Fat Grafting in Post-Traumatic Enophthalmos

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ABSTRACT

Introduction: Correction of post-traumatic enophthalmos, especially in severe cases, remains a surgical challenge. Complex trauma involving both hard and soft tissues requires a targeted treatment strategy. Even after seemingly successful surgical intervention, recurrences may occur. To improve enophthalmos, we performed simultaneous endo-orbital fat grafting along with reconstruction of the orbital structure.

Aim: The aim of this study is to describe our therapeutic approach and objectively analyze the outcomes. Our study reports the case of a patient who suffered a road traffic accident. An 8-month follow-up period was used for the final evaluation.

Results: Postoperatively, the patient showed significant improvement in globe positioning without visual impairment.

Conclusions: Alloplastic reconstruction of the orbital floor combined with endo-orbital fat grafting represents an excellent method to provide adequate support and positioning of the globe, even in the correction of secondary enophthalmos.

Keywords: Post-traumatic enophthalmos; Complex trauma; Endo-orbital fat grafting; Alloplastic reconstruction

Introduction

Enophthalmos was first described by Lang[1] in 1876 as a recession of the eyeball within the orbital cavity. The pathogenesis of enophthalmos involves an increase in the absolute volume of the orbital cavity due to bony displacement. Additionally, fat atrophy and the loss of orbital suspensory ligaments are also believed to be involved[2].

Enophthalmos can be expected in cases where critical-sized orbital defects are left untreated. Even with correction, up to 10% of patients present with residual enophthalmos after primary reconstruction[3].

Delayed enophthalmos due to unrepaired zygomatic or orbital fractures can lead to both functional and aesthetic impairments. The sunken appearance of the superior sulcus and the recessed globe are evident cosmetic defects. Another problematic aspect is functional eye impairment. The most frequent complaints are related to movement restriction and diplopia. The most applicable procedure is early surgical repair of fractures amenable to correction, rather than relying on scar contraction or fat atrophy[4].

The objective of this article was to present a case of delayed treatment of an orbital floor fracture following a road traffic accident, with secondary enophthalmos.

Case Report

We report the case of a 17-year-old female high school student, with no significant medical history, who was involved in a road traffic accident (ejected from a car window) five years ago.

The point of impact was craniofacial.

Physical examination revealed malposition of the right eye with obvious enophthalmos **(Figures 1 and 2)**, along with good projection of the bony contours and no associated disorders.

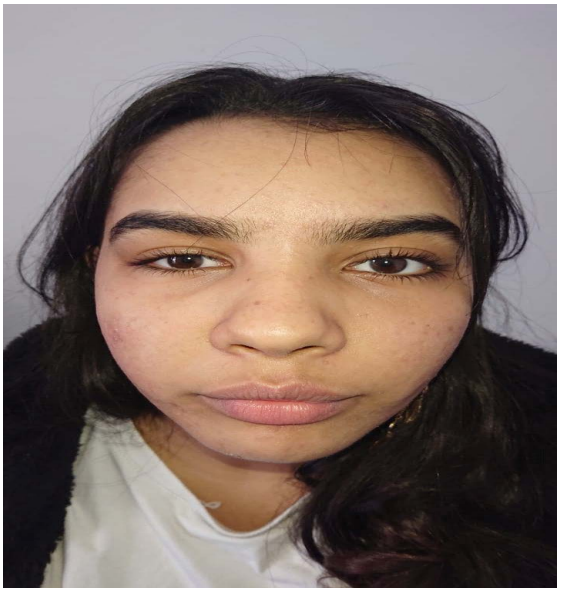

Figure 1: Visible Enophtalmos.

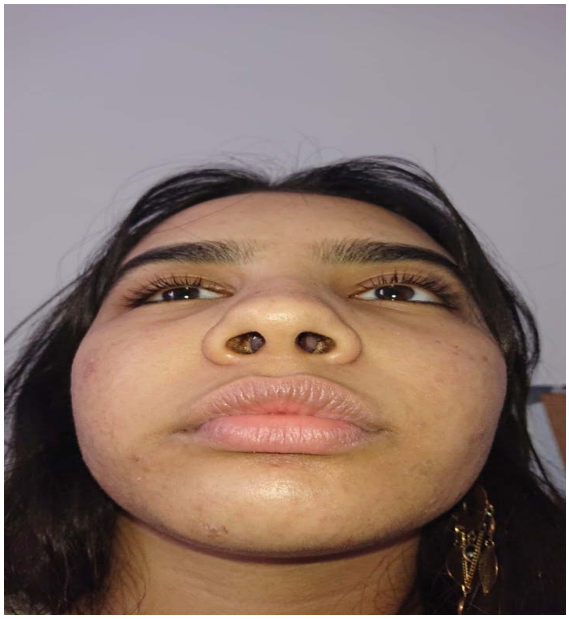

Figure 2: Visible Enophtalmos.

A CT scan revealed a healed (consolidated) fracture of the orbital floor with an enlargement of the right orbital cavity **(Figure 3)**.

Surgery was performed under general anesthesia. A sub ciliary (lower eyelid) approach was used to access the orbit and reconstruct the orbital floor with a 2.5 × 2 cm titanium mesh. A fat graft was harvested from the juxta-umbilical abdominal region through a small incision, with proper tissue collection and good closure of the donor site.

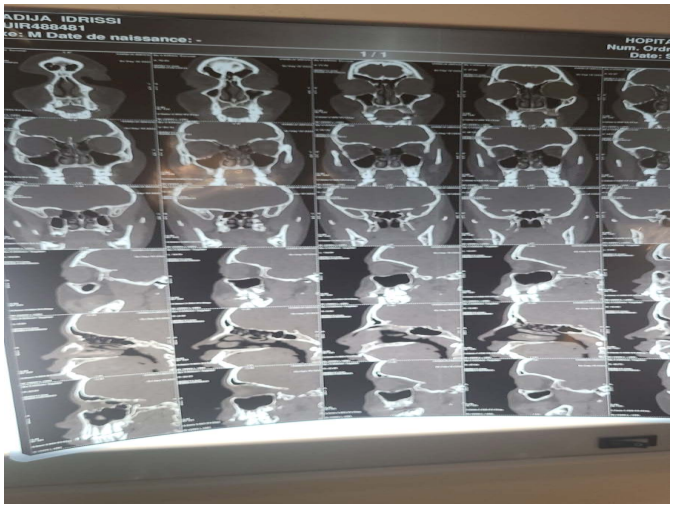

Figure 3: Scanner Shoping the Enlargement of the Orbit.

The fat graft was inserted into the posterior part of the orbital cavity, allowing adequate projection of the globe **(Figure 4)**.

Figure 4: Resolution of Enophtalmos.

Discussion

Enophthalmos is characterized by a posterior displacement of the eyeball within the bony orbit. Clinically, enophthalmos of 2 to 3 mm can be detected, while displacement greater than 5 mm is considered disfiguring. Enophthalmos involves the shift of a relatively constant volume of orbital soft tissue into an enlarged bony orbit. Key factors in this mismatch between soft tissue and orbital volume include scar contracture and fat atrophy.

Because it often occurs in patients with inadequately treated orbital fractures involving the floor, enophthalmos is usually accompanied by inferior displacement of the globe. This globe recession alters the upper eyelid drape and tends to deepen the superior tarsal fold, leading to upper eyelid ptosis. The reported incidence of enophthalmos associated with facial bone fractures ranges from 12.5% to 65% in patients suffering high-energy trauma[5].

It has been reported that delays of more than two months in orbital floor reconstruction result in poorer outcomes compared to early surgery. In the absence of an urgent surgical indication, a two-week observation period is generally recommended for most orbital floor fractures[6].

Titanium mesh implants are highly biocompatible and adapt easily to both simple and complex architectural defects, providing strong support without altering shape or position over time. They can be adequately fixed to adjacent bone. Their osteointegration

is well documented; they are easily sterilizable and readily available, although their cost may be higher. Unfortunately, the mesh holes can allow tissue ingrowth, making removal more difficult, and the cut edges can catch periorbital soft tissue during placement. The utility of titanium mesh implants has been demonstrated in previous studies comparing titanium mesh with calvarial bone grafts. A statistically significant improvement in reconstructed orbital volume was observed in cases involving multiple orbital wall fractures. This was shown through pre- and post-reconstruction volumetric measurements in patients reconstructed with titanium mesh[7].

Although the pathogenesis of delayed enophthalmos primarily lies in orbital enlargement, many authors have recently attempted to prevent or correct this deformity by augmenting the periorbital soft tissues. Multiple studies have demonstrated that the degree of enophthalmos is correlated with loss of intraconal fat. CT scan measurements have shown a 5% reduction in retrobulbar fat volume in enophthalmic cases[5]. Ramieri[8] reported that posterior fat is reduced and fragmented by scar tissue. Ilankovan[9] stated that since retrobulbar fat accounts for around 70% of orbital volume, fat atrophy and necrosis play a major role in the development of enophthalmos.

The effects of intraconal fat grafting in post-traumatic enophthalmos patients were studied by Hunter and Baker[10], who performed the procedure in both healthy orbits and anophthalmic sockets. Their research showed that enophthalmos stabilized within 3 months using this technique. Overall outcomes were good, though multiple injections were required in 64% of cases.

In our case, we used an abdominal fat pad graft due to its simple harvesting technique and low donor-site morbidity.

Conclusion

Simultaneous reconstruction of the orbital framework and autologous fat grafting allows for excellent three-dimensional correction of globe positioning and compensation for soft tissue deficits in cases of even delayed post-traumatic enophthalmos.

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