Dermis Fat Graft: A Utility Tool for Soft Tissue Augmentation in Orbital Fractures

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ABSTRACT

Orbital fractures are common in facial trauma, with an incidence from 18% to 50% of all cranio-maxillofacial traumas. Posttraumatic orbital reconstruction has been a challenge for decades in cranio-maxillofacial surgery. Complications like enophthalmos, diplopia, and soft tissue deformities are common when orbital trauma occurs, affecting people’s daily life as well as their appearance. Advances in technology and research have provided us with a variety of filling materials that we can choose from to handle the bony and soft tissue deformities. Soft tissue augmentation following correction of the orbital volume is important to provide an overall satisfactory treatment. However, the best type of material for the repair of orbital deformities is a controversy and remains a dilemma. In this report, we have used dermis fat graft as a soft tissue filler following orbital trauma, to improve cosmetic and achieve adequate volume enhancement.

KEYWORDS: Orbital Fracture, Dermis Fat Graft, Soft tissue volume augmentation, Soft tissue filler

INTRODUCTION

Orbital fractures are commonly encountered in facial trauma. Its incidence ranges from 18% to 50% of all Cranio-maxillofacial traumas. The eye is well protected in a bony cage by the strong orbital rims, but the orbital floor and the medial wall are comparatively thinner. These thin walls act as crumple zones and undergo gross comminution following orbital trauma leading to functional as well as aesthetic deformities. Trauma commonly displaces the bony walls. The problem is further compounded by true soft tissue loss into the paranasal sinuses by herniation of the tissues overall. This increase in orbital volume with decreased padding of soft tissue volume causes the eyeball to sink within the bony cup of the orbit, which manifests as Enophthalmos, Orbital dystopia, and Diplopia. Hence, along with the need to repair the orbital fracture, appropriate biomaterials to restore the soft tissue volume of the orbit need to be used for ideal reconstruction and balance.

Post-traumatic orbital reconstruction has been a challenging mission for decades in cranio-maxillofacial surgery. Several different materials are available for restoration of the orbital walls, and there is no consensus about which is preferable; however, there is a general consensus that the ideal material for orbital floor repair should be strong enough to support the orbital contents, inexpensive, readily available, easy to contour, resorbable, and, most importantly, biocompatible. Various biomaterials, including autografts, allografts, xenografts, alloplastic implants such as titanium implants, biological ceramics, and composites, have been used for correction of bony defects. The alloplastic orbital implants have been developed to prevent postoperative orbital volume and soft tissue deficit. Solid implants risk disturbing ocular motility and compromising neurovascular function, particularly of the optic nerve.

As mentioned earlier, repairing only the bony fracture is not sufficient because it may lead to post-operative late sequelae such as enophthalmos due to soft tissue deficits. An ideal soft tissue material is aimed to replace the abnormal soft tissue and to restore the volume of the orbit to restore complete ocular function as well as the aesthetic appearance. Soft-tissue filling materials can be divided into autologous grafts, allografts, xenografts, and alloplastic grafts. Silicone oil was the first injectable material placed into the orbit for volume augmentation but was associated with complications like extrusion, immigration of implant, and infections. Since the end of the 19th century, autologous fat grafts (either free fat or dermal fat graft) have been used to handle various soft-tissue defects. Neuber first used fat autografting to correct facial defects in 1893. However, in first attempts at the end of the 19th century, marked atrophy of the implanted free fat was observed, and this technique was regarded not to be useful in the augmentation of volume deficit for many years.

Later, composite grafts consisting of dermis and fat proved to be less prone to lose volume after implantation. The dermal portion of the composite graft serves as a scaffold for conjunctival growth over the superficial...
surface of the graft. Autologous fat may be the ideal filler because of its ease of placement, versatility in adjusting to various defects, and biocompatibility. The most common use for dermis fat graft has been the augmentation of soft tissues in volume deficient orbital sockets. Dermis fat graft has been proved an effective method for orbital reconstruction after enucleation and evisceration, as either primary or secondary procedure. It provides simultaneously volume augmentation as well as a scaffold for conjunctival overgrowth.

This paper reviews the use of dermis fat graft in both extraconal as well as intraconal spaces following orbital trauma.

**CASE REPORT**

**Case 1**: A 40-year-old male reported to us with a chief complaint of facial symmetry following a Road traffic accident with a head injury and facial injuries with left orbital fracture two months back. There was a history of ICU stay for 1 month for treatment of head injury. On examination, facial asymmetry noted, as seen in Figure 1. The Nose deviated to the left side. Depression noted over the left infraorbital region. On ophthalmic examination, evident enophthalmos of 3 mm were measured using Hertels exophthalmometer, dystopia, ptosis, and reduced palpebral fissure height noted with the left eye. Extraocular movements were performed without restrictions in all nine gazes without pain, and diplopia in any direction. Bilateral pupils were reactive to light with no change in pupillary level. No reduction in mouth opening was noted, and the occlusion was satisfactory. Computed Tomography (CT) was suggestive of a left zygomatic complex with left orbital floor fracture. An increase in the orbital volume of 3.5 ccs was calculated on the CT with the left eye compared to the right eye. An orbital volume discrepancy of 14% was noted with the left eye on virtual DICOM image analysis.

The criteria for orbital floor reconstruction are as follows: Orbital volume discrepancy of more than 13%, fracture of more than two walls of orbit, enophthalmos more than 2 mm. Since all the above criteria were met in this patient and depression in the left infraorbital region was noted, a treatment plan of orbital floor reconstruction after orbital rim reconstruction along with the use of dermis fat graft as a soft tissue filling material was contemplated.

Intraoperatively the left infraorbital rim and the lateral wall were exposed using transconjunctival incision along with lateral canthotomy and fracture exposed. The fracture was reduced, and a floor titanium mesh was placed. Dermis fat graft was harvested from the gluteal region, as seen in Figure 2. The size of the graft was decided as per the defect and an elliptical incision was taken, followed by which the epithelium was denuded. After removal of the epithelium, the graft was harvested with sharp dissection, and primary closure of the donor site was achieved. The fat graft was trimmed and debulked until the desired globe level, or hypoglobus was corrected. The harvested graft was placed over the titanium orbital implant and sutured using vicryl 6-0, as seen in Figure 3. Closure of the Transconjunctival incision was then done using 6-0 vicryl. At one-month follow-up, the patient showed resolution of dystopia, enophthalmos, and hypoglobus with the elimination of depression over the left infraorbital region, as seen in Figure 4.

**Case 2**: A 32-Year-old male reported to our emergency department with a history of a road traffic accident. On examination, facial asymmetry was noticed, and there was a full-thickness laceration of size 5*4*2 cm over the right eyebrow and upper eyelid. The patient had evident

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**Figure 1**: Worms eye view showing evident enophthalmos with left eye

**Figure 2**: Harvested dermis fat graft from gluteal region

**Figure 3**: Placement of the harvested dermis fat graft over titanium implant as a soft tissue filler material
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enophthalmos and dystopia with the right eye, as seen in Figure 5.

An evident fracture was seen over the right supraorbital rim. His CT scan confirmed a comminuted fracture of the supraorbital rim and fracture of the roof of orbit on the right side, as seen in Figure 6. Intraoperatively, the fracture was approached, and identified through the existing laceration. The loose bone pieces were removed and fracture of the superior orbital rim was reduced and plated. Dermis fat graft was then harvested from the hip using an elliptical incision and was de-epithelialized. The graft was then placed in the bony defect in the roof and sutured using 6-0 vicryl, as seen in Figure 7. The closure was then achieved by 6-0 vicryl and 5-0 ethilon over the eyebrows. Post-operatively on one-month follow up, no evident facial asymmetry was noted, as seen in Figure 8.

DISCUSSION

The field of orbital reconstruction has shown a significant improvement and progress in the past decade. In 1889, Lang was first to recognize that traumatic enophthalmos is caused by a fracture of the orbital walls and the associated orbital tissue abnormality. Numerous unwanted and troublesome complications like enophthalmos and constant diplopia can occur with Orbital fractures. On performing a review of 55 studies in the literature, performed on orbital reconstruction, it was found that the indication for surgery was based on the following factors: the presence of diplopia in 18.3% of cases and on preoperative enophthalmos in 29.8% of cases. The primary goal of orbital reconstruction is to repair post-trauma defects, to correct the anatomical position of the eye, accurate restoration of the volume of orbit, to avoid post-operative sequelae such as enophthalmos, and restoration of ocular function. Orbital fractures may be isolated or with other craniomaxillofacial fractures, which may complicate the reconstruction. The healing of small defects may take...
place by the formation of scar tissue, whereas for larger defects, especially those associated with enophthalmos and hypoglobus, materials of sufficient strength to support the orbital contents and restore the contour of the orbit are the need of the hour.

Orbital volume is composed and defined by the skeletal framework and soft tissue component, predominantly orbital fat and extraocular muscles. Following intraoperative handling and repositioning, orbital fat undergoes shrinkage and resorption. Hence, it is pertinent for Dermis fat grafts to extend and occupy the extraconal space, which is useful for volume augmentation of the tissues within the sockets. The grafts that are placed in the upper and/or lower sulci are particularly useful where volume has already been augmented by orbital floor implants, and any further orbital floor implantation would carry a significant risk of optic nerve damage. The advantages of dermis fat graft are that it is autologous, easy to harvest, negligible risk of rejection, minimal risk of infection, minimal donor site morbidity, can be used for both intraconal as well as extraconal spaces. The cases presented to us were the ideal cases of orbital trauma to be treated by dermis fat graft, and excellent results were obtained. No complications were observed in these patients and excellent post-operative aesthetic results were seen. The use of dermis fat graft as a dual entity that is temporary biological dressing and soft tissue supporter, can be considered in such unique scenarios.

CONCLUSION

Various materials have been advocated for orbital reconstruction. Dermis fat graft provides an autologous, easy to harvest, and excellent material for soft tissue replacement. With recent advanced technology, soft tissue volume of orbit can be measured separately, and the same amount of the fat harvested can be grafted in situ for orbital soft tissue volume reconstruction. In spite of the versatility of dermis fat graft, up to 30–40% of fat undergoes atrophy and necrosis, and hence there is a need for over-correction of the defect. Dermis fat graft should be judiciously used as a soft cover and space filler because sometimes in cases of supraorbital roof fractures with bone loss, there may be abutting brain tissue above, and the graft may be in direct contact with the brain tissue increasing the chances of infection. In spite of all the advantages and disadvantages, in our experience, dermis fat graft, has proved to be an excellent biomaterial for soft tissue volume augmentation with excellent post-operative results.

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REFERENCES


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