Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Maxillofacial Surgery

Reconstruction of the Orbital Floor Using an Iliac Crest Bone Graft: Case Report

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DOI: https://doi.org/10.36347/sjmcr.2026.v14i04.047 | **Received:** 27.02.2026 | **Accepted:** 16.04.2026 | **Published:** 23.04.2026

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Abstract | **Case Report**

Orbital floor fractures in pediatric patients present unique challenges due to the complex anatomy, ongoing facial growth, and potential for functional and aesthetic sequelae. We report the case of a 13-year-old patient who sustained an orbital floor fracture secondary to blunt trauma. Clinical examination revealed enophthalmos, diplopia on upward gaze, and infraorbital hypoesthesia. Radiological assessment, including computed tomography, confirmed a defect of the right orbital floor. Surgical reconstruction was performed using an autologous iliac crest bone graft, secured with microplates and screws to restore orbital volume and support the globe. Postoperative outcomes demonstrated satisfactory aesthetic and functional results, with resolution of diplopia and recovery of orbital contour. No donor site complications were observed. This case highlights the efficacy of iliac crest bone grafting for orbital floor reconstruction in pediatric trauma, providing a durable and biocompatible solution while minimizing long-term complications. Early intervention and meticulous surgical planning are essential for optimal outcomes in the growing facial skeleton.

Keywords: orbital floor fracture, pediatric trauma, iliac crest bone graft, orbital reconstruction, blunt trauma.

INTRODUCTION

Facial traumatology represents a significant part of the daily activity in stomatology and maxillofacial surgery. Orbital floor fractures are among the most frequently encountered facial injuries, whether isolated or associated with other facial fractures, accounting for approximately 10–20% of fractures of the facial skeleton.

Due to the disruption of the thin bony structure separating the orbit from the maxillary sinus, these fractures may lead to herniation of orbital contents and expose patients to specific functional and aesthetic complications. Their management is often challenging and requires close multidisciplinary collaboration between maxillofacial surgeons and ophthalmologists.

Early diagnosis based on a thorough clinical and radiological assessment is essential to ensure timely management and to prevent long-term functional and morphological sequelae. In this context, we report a case of orbital floor fracture and discuss its diagnostic and therapeutic management.

CASE REPORT

A 13-year-old boy with no significant medical history was admitted to the maxillofacial surgery department for the management of facial trauma following impact with a blunt object to the face, specifically the orbital region, without any loss of consciousness or vomiting at the time of injury.

On clinical examination, the patient was conscious, well-oriented in time and space, and hemodynamically and respiratorily stable.

Maxillofacial examination revealed no facial asymmetry. There was right periorbital swelling and ecchymosis, preventing opening of the right eye, associated with a lower eyelid laceration. Enophthalmos was visible, with a depression of the right inferior orbital rim, and tenderness on palpation of the bony orbital framework.

The patient underwent a CT scan of the facial skeleton, which revealed a fracture of the inferior orbital rim with collapse of the orbital floor.

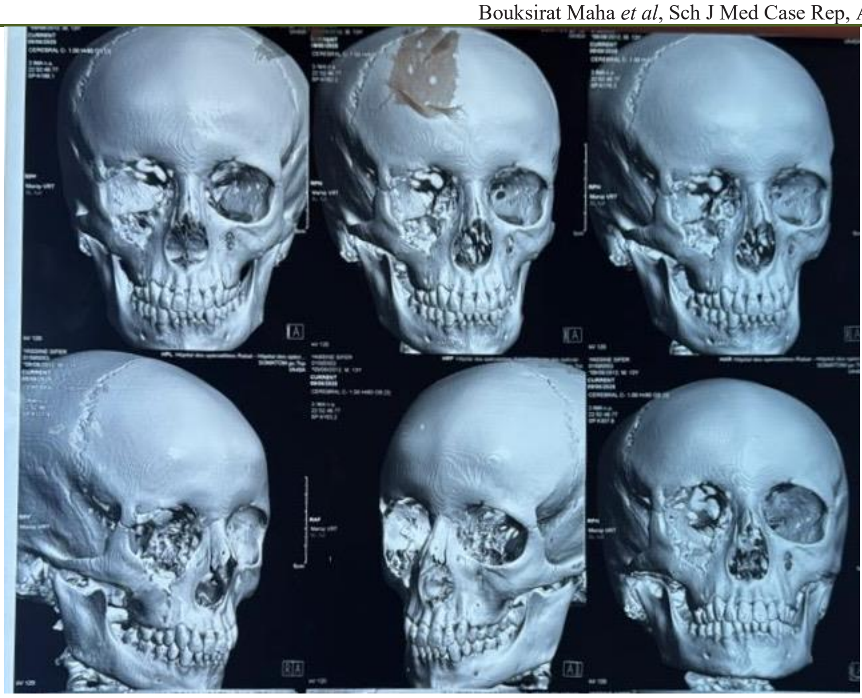

Figure 1: 3D reconstructed CT scan showing right infraorbital bone defect

Figure 2: Coronal CT scan

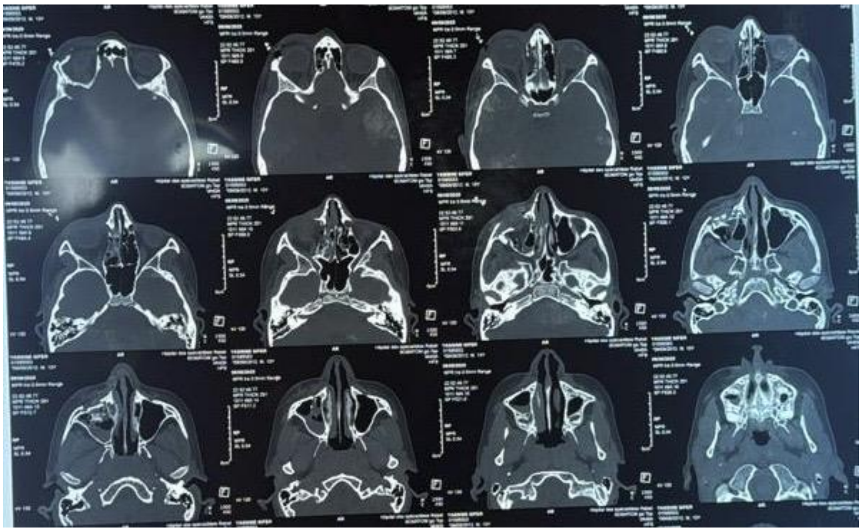

Figure 3: axial CT scan

The patient underwent surgical management of the fracture using a bone graft harvested from the right iliac crest, which was secured to the orbital rim with a microplate and fixed with four microscrews.

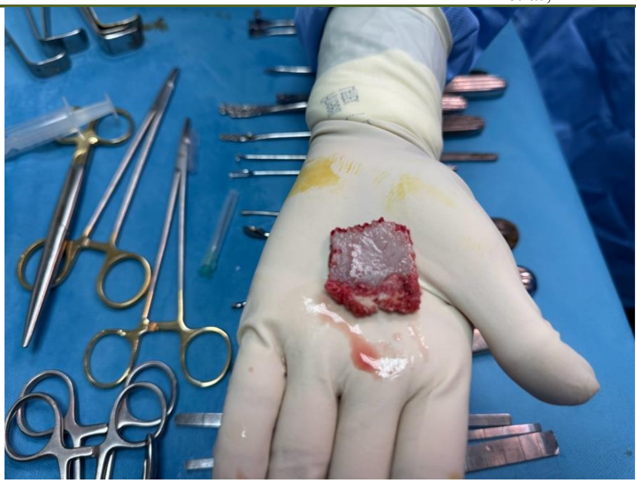

Figure 4: Autologous bone graft from the right iliac crest

Figure 5: Iliac crest bone graft fixed with microplate and screws

An intraoperative duction test was performed. Postoperative recovery was uneventful, with early ambulation and notable correction of the enophthalmos by postoperative day 3.

Figure 6: Post-operative photograph

Discussion

Orbital fractures are increasingly prevalent and predominantly affect young adults, with a clear male predominance reported in most series [1, 2]. The leading causes are road traffic accidents and interpersonal violence, while other etiologies, such as sports or domestic accidents, are less frequent [1]. Clinically, orbital floor fractures manifest with diplopia, ocular motility disorders, sensory disturbances, and enophthalmos, which are also the primary indicators for surgical intervention [3, 4].

The frequency of post-traumatic enophthalmos varies across studies. While some authors have attempted to predict patients at risk for enophthalmos following a blowout fracture, it is generally agreed that neither clinical examination nor imaging, including computed tomography, can reliably forecast this complication [6]. Diplopia often results from inferior orbital wall fractures with incarceration of the inferior rectus muscle, and less commonly the medial rectus muscle [3, 7]. In most cases, the initial diplopia is exacerbated by orbital edema, which tends to resolve over time, potentially leading to spontaneous improvement [8]. Sensory disturbances, typically involving the infraorbital nerve, result from contusion or stretching at the fracture site and resolve in the majority of cases, though reported incidence ranges from 13 to 53% [1, 3].

Management of orbital floor fractures remains a subject of debate, particularly regarding surgical indications, timing, and the choice of reconstruction method. Nevertheless, the goals of treatment are universally recognized: support orbital contents, release any soft tissue incarceration, and restore orbital volume to prevent or correct secondary enophthalmos [9]. Some authors advocate early surgical intervention for defects exceeding half of the orbital floor to prevent rapid periorbital fibrosis, which complicates delayed repair both functionally and aesthetically. Established enophthalmos is notably more challenging to treat than preventive reconstruction. Conversely, in cases without early enophthalmos, many surgeons prefer a brief observation period of approximately two weeks to allow edema and hemorrhage to resolve before definitive intervention [11].

Oculomotor disturbances remain the main postoperative complication after orbital floor reconstruction. The incidence of persistent, residual, or iatrogenic diplopia ranges from 0 to 50%, regardless of reconstruction material [15]. Available reconstructive options range from autologous grafts, including iliac crest bone and cartilage, to alloplastic materials such as PDS plates or custom-made titanium implants [16]. The selection of material depends on multiple factors, including surgeon experience, defect size, biomechanical properties of the graft, graft thickness, and the pressure exerted by orbital contents [17].

Autologous iliac crest bone grafts offer distinct advantages in orbital floor reconstruction. They provide rigid structural support, allow precise contouring to restore orbital volume, and integrate biologically with host bone, reducing the risk of infection or extrusion compared to synthetic implants. Iliac crest grafts are particularly valuable for large or posterior floor defects where rigid support is required, or in patients with a high risk of post-traumatic enophthalmos. Fixation is typically achieved using microplates and screws, ensuring stability while allowing for anatomical restoration of the orbital floor. Compared to cartilage grafts or PDS plates, iliac crest bone offers superior long-term volume maintenance and can effectively prevent secondary enophthalmos in complex or delayed reconstructions.

While titanium meshes are widely used, particularly for extensive posterior fractures, they have been associated with higher rates of revision surgery. Conversely, PDS plates and cartilage grafts are preferred for smaller or anterior defects, with a generally lower risk of postoperative complications. Ultimately, no single technique has demonstrated statistically superior outcomes; the choice of reconstruction should be individualized based on defect characteristics, patient factors, and surgical expertise.

Conclusion

Orbital floor fractures, resulting from blunt facial trauma, require precise evaluation and timely surgical intervention to restore both function and aesthetics. In this case, reconstruction using an autologous iliac crest bone graft, secured with a microplate and microscrews, effectively restored orbital support, corrected enophthalmos, and allowed rapid postoperative recovery. The procedure proved safe and reliable, demonstrating that iliac crest grafting is an excellent option for orbital floor reconstruction. Careful surgical planning and intraoperative assessment, including duction testing, are essential to achieve optimal outcomes.

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