INTERNATIONAL SEVEN JOURNAL
OF MULTIDISCIPLINARY
ISSN: 2764-9547

TREATMENT OF ORBITAL FRACTURES: SURGICAL AND CONSERVATIVE APPROACHES

TRATAMENTO DAS FRATURAS ORBITÁRIAS: ABORDAGEM CIRÚRGICA E CONSERVADORA

TRATAMIENTO DE LAS FRACTURAS ORBITARIAS: ENFOQUE QUIRÚRGICO Y CONSERVADOR

https://doi.org/10.56238/isevmjv4n6-021

Receipt of originals: 11/09/2025 **Acceptance for publication:** 12/09/2025

Guilherme Braga Toigo[1], Daniel Grigolo[2]

ABSTRACT

Orbital fractures are common and complex facial trauma injuries, with the potential to cause significant functional and aesthetic impairments such as diplopia and enophthalmos. Proper management depends on accurate diagnosis, often supported by Computed Tomography (CT), to identify emergencies such as Orbital Compartment Syndrome and muscle entrapment in “trapdoor” fractures. Most cases allow for an initial conservative approach. However, surgery is indicated in the presence of persistent diplopia, significant enophthalmos, or large bony defects. Surgical techniques have evolved to include materials such as titanium meshes and personalized implants, although complications and the need for reintervention remain challenges, especially due to improper implant positioning.

Keywords: Orbital Fractures. Facial Trauma. Orbital Reconstruction. Diplopia. Enophthalmos. Computed Tomography.

RESUMO

As fraturas orbitárias são lesões comuns e complexas do trauma facial, com potencial para causar danos funcionais e estéticos significativos, como diplopia e enoftalmia. O manejo adequado depende de um diagnóstico preciso, frequentemente auxiliado pela Tomografia Computadorizada (TC), para identificar emergências como a Síndrome do Compartimento Orbitário e o encarceramento muscular em fraturas "alçapão". A maioria dos casos permite uma abordagem conservadora inicial. No entanto, a cirurgia é indicada na presença de diplopia persistente, enoftalmia significativa ou grandes defeitos ósseos. As técnicas cirúrgicas evoluíram para o uso de materiais como malhas de titânio e implantes personalizados, embora complicações e a necessidade de reintervenção ainda sejam desafios, especialmente devido ao posicionamento inadequado de implantes.

Palavras-chave: Fraturas Orbitárias. Trauma Facial. Reconstrução Orbitária. Diplopia. Enoftalmia. Tomografia Computadorizada.

[1] Undergraduated student in Dentistry. Centro Universitário Maurício de Nassau de Cacoal (UNINASSAU).
[2] Master's degree in Dentistry. Pontifícia Universidade Católica do Paraná (PUCPR).

INTERNATIONAL SEVEN JOURNAL
OF MULTIDISCIPLINARY
ISSN: 2764-9547

RESUMEN

Las fracturas orbitarias son lesiones comunes y complejas del trauma facial, con potencial para causar daños funcionales y estéticos significativos, como diplopía y enoftalmos. El manejo adecuado depende de un diagnóstico preciso, frecuentemente apoyado por la Tomografía Computarizada (TC), para identificar emergencias como el Síndrome Compartimental Orbitario y el atrapamiento muscular en fracturas de tipo “trampilla”. La mayoría de los casos permite un abordaje conservador inicial. No obstante, la cirugía está indicada en presencia de diplopía persistente, enoftalmos significativo o grandes defectos óseos. Las técnicas quirúrgicas han evolucionado hacia el uso de materiales como mallas de titanio e implantes personalizados, aunque las complicaciones y la necesidad de reintervención siguen siendo desafíos, especialmente debido a un posicionamiento inadecuado de los implantes.

Palabras clave: Fracturas Orbitarias. Trauma Facial. Reconstrucción Orbitaria. Diplopía. Enoftalmos. Tomografía Computarizada.

1 INTRODUCTION

Orbital fractures represent a significant portion of facial trauma, being the third most common fracture in this region, affecting both the adult and pediatric populations. The etiology of these injuries is varied, often involving car accidents, physical aggression, falls, and sports practices (Døving et al., 2022; Zhou; Chambers, 2021). The anatomy of the orbit is complex, consisting of seven distinct bones that form a protective cone for the eyeball, extraocular muscles, and cranial nerves. Due to this architecture, trauma to the region can result in substantial functional and aesthetic morbidity, including diplopia, enophthalmos, and neuropathies (Zhou; Chambers, 2021).

The accurate initial assessment is decisive for the patient's visual prognosis. While most injuries can be managed conservatively or electively, certain conditions require immediate intervention to prevent permanent vision loss. Recognition of warning signs, such as orbital compartment syndrome or muscle entrapment (common in children), is crucial in initial screening (Jeffery et al., 2022; Bielecki-Kowalski et al., 2024).

In addition, the therapeutic decision between conservative and surgical management depends on a multifactorial analysis that considers the size of the fracture, the presence of functional defects, and changes in the position of the eyeball (Folkestad et al., 2023). A detailed understanding of the anatomy, combined with appropriate imaging tests, allows the planning of reconstructions that aim to restore orbital volume and binocular function (Persson et al., 2023). This study aims to review contemporary approaches to the management of these fractures, outlining the criteria for surgical indication and the nuances of conservative treatment.

2 METHODOLOGY

This work is a narrative literature review, elaborated with the aim of compiling and critically analyzing the current scientific evidence regarding the treatment of orbital fractures. Data collection was conducted in the PubMed database, using the descriptors "Orbital Fractures", "Treatment" and "Surgery", which were associated through the Boolean operators AND and OR, in accordance with the Medical Subject Headings (MeSH) vocabulary. The established time frame covered publications from the last five years, selecting articles available in full in English or Portuguese that dealt directly with the proposed theme. Studies that did not have direct relevance to the object of study, duplicate publications, and studies with inaccurate methodology or not indexed in the

database were discarded from the selection. The screening initially occurred by reading titles and abstracts, advancing to the complete analysis of the texts to ratify their eligibility, and the resulting data were organized in a descriptive manner.

3 RESULTS AND DISCUSSION

3.1 DIAGNOSTIC EVALUATION AND IDENTIFICATION OF EMERGENCIES

The effective diagnosis of orbital fractures begins with a detailed anamnesis of the trauma mechanism, followed by physical examination and radiological confirmation. Computed Tomography (CT) is considered the gold standard, allowing the visualization of fractures, hematomas, and the positioning of extraocular muscles (Døving et al., 2022). A relevant tomographic finding is the "rounding" of the inferior rectus muscle, which has a statistically significant correlation with the presence of diplopia, orbital floor defects, and soft tissue herniation (Folkestad et al., 2023).

It is imperative to distinguish ophthalmological emergencies that require immediate intervention. Orbital Compartment Syndrome (OCS), characterized by increased intraorbital pressure due to retrobulbar hemorrhages, can lead to permanent blindness if not treated within 60 to 100 minutes. The first-line treatment for COS, in the presence of symptoms such as proptosis and decreased visual acuity, is canthotomy and lateral cantholysis for decompression (Bielecki-Kowalski et al., 2024; Jeffery et al., 2022). Another surgical emergency is white-eyed blowout, more common in children, where muscle entrapment can trigger the oculocardiac reflex, causing bradycardia and nausea, requiring urgent surgical clearance to avoid muscle necrosis (Døving et al., 2022; Zhou; Chambers, 2021).

3.2 INDICATIONS FOR SURGICAL VERSUS CONSERVATIVE TREATMENT

Most orbital fractures do not require immediate surgical correction, allowing a conservative approach while the edema regresses. Conservative treatment is indicated for small fractures without persistent diplopia or significant enophthalmos (Zhou; Chambers, 2021). It is recommended to avoid blowing the nose and the use of nasal decongestants to prevent orbital emphysema (Døving et al., 2022).

Surgical intervention is classically indicated in three main scenarios: 1) persistent diplopia with evidence of muscle entrapment on CT; 2) clinically significant enophthalmos (usually >2 mm) or extensive orbital floor defects (involving more than 50% of the

surface); 3) trapdoor-type fractures with symptomatic incarceration (Persson et al., 2023; Zhou; Chambers, 2021). The optimal time for surgery in non-emergency cases is usually within two weeks of trauma, a period that balances the reduction of edema with the prevention of scar fibrosis (Døving et al., 2022; Folkestad et al., 2023).

3.3 RECONSTRUCTION TECHNIQUES AND COMPLICATIONS

The goal of surgery is to restore bone anatomy and orbital volume. Transconjunctival approaches are often preferred over subciliary or subtarsal approaches, due to the lower risk of eyelid retraction and visible scarring (Zhou; Chambers, 2021; Persson et al., 2023). Materials such as titanium meshes, porous polyethylene (Medpor), and custom 3D-printed implants are used to reconstruct the orbital walls (Døving et al., 2022).

Despite advances, complications occur and often require reintervention. An analysis of 93 orbital reconstructions revealed that 13% of patients required early reoperation (within one month), most due to poor positioning of the implant in the posterior region of the orbit. Inadequate reconstruction of the deep posterior portion is a frequent cause of residual enophthalmos and persistent diplopia. In addition, secondary surgeries for the correction of enophthalmos present significant challenges and rarely completely restore ocular symmetry, reinforcing the importance of precision in primary surgery (Persson et al., 2023). Late complications, such as ectropion and entropion, are also more frequent in patients undergoing multiple surgical interventions (Persson et al., 2023).

The conservative approach is indicated for orbital fractures that do not result in significant functional or aesthetic deficits, avoiding unnecessary interventions and their associated risks. Studies have shown that many isolated orbital floor fractures can be treated expectantly, especially when there is no soft tissue herniation, muscle entrapment, or clinically relevant enophthalmos (ZHOU; CHAMBERS, 2021). For example, "eggshell" fractures of the orbital floor, where bone fragments remain connected by the periosteum, often heal spontaneously without surgical intervention, as long as there is no significant expansion of the orbital volume (FOLKESTAD et al., 2023).

During conservative management, supportive measures include elevation of the head of the bed, application of ice for the first 72 hours, and sinus precautions, such as avoiding sneezing or blowing the nose, to prevent infection or further displacement (ZHOU; CHAMBERS, 2021). Clinical reassessment after 7 to 10 days is essential to

identify signs of deterioration, such as persistent diplopia or enophthalmos, which may indicate the need to transition to surgical treatment.

Research indicates that up to 7% of patients with periorbital trauma without evident physical findings may have asymptomatic orbital fractures, reinforcing the importance of a low threshold for imaging tests, such as computed tomography (CT), even in conservative approaches (ZHOU; CHAMBERS, 2021).

Surgical intervention is recommended in cases of orbital fractures with specific indications, such as enophthalmos greater than 2 mm, involvement of more than 50% of the orbital floor, persistent diplopia, or muscle entrapment (ZHOU; CHAMBERS, 2021). Comparative studies between CT images and surgical findings reveal that the agreement between preoperative and intraoperative examinations is high for pure burst fractures (92%), but lower for complex fractures of the zygomatic-maxillary complex (FOLKESTAD et al., 2023). This highlights the need for integration between neuroradiology and surgery to optimize outcomes.

Common surgical techniques include preseptal or retroseptal transconjunctival approaches for orbital floor access, using implants such as Medpor® or titanium mesh for reconstruction (PERSSON et al., 2023). For medial wall fractures, the transcaruncular approach is preferred for its superior aesthetics and lower risk of eyelid complications (ZHOU; CHAMBERS, 2021). Recent advances, such as endoscopic surgery and virtual planning with mirror imaging, have reduced postoperative diplopia and improved anatomical accuracy (ZHOU; CHAMBERS, 2021).

Surgical complications include early reinterventions in up to 13% of cases, often due to poorly positioned implants in the posterior orbit, leading to muscle interference or restriction of ocular motility (PERSSON et al., 2023). Secondary surgeries are required in about 10% of patients, mainly for correction of residual enophthalmos, with variable success rates and increased risk of eyelid complications such as ectropion or entropion (PERSSON et al., 2023). The timing of surgery is controversial: early interventions (within 2 weeks) can prevent excessive scarring, but late interventions allow for better resolution of edema (FOLKESTAD et al., 2023).

4 CONCLUSION

The treatment of orbital fractures requires an individualized approach, balancing the risks of surgical intervention with the possible sequelae of conservative management.

The current literature reinforces the importance of CT for diagnosis and planning, as well as the need to promptly identify ophthalmologic emergencies. While conservative therapy is feasible for smaller fractures without functional impairment, precise reconstructive surgery is mandatory for cases with extensive defects or persistent symptoms. The success of surgical treatment depends on the accurate restoration of the orbital anatomy, minimizing the need for reoperations and optimizing long-term functional and aesthetic results.

REFERENCES

Bielecki-Kowalski, B., Kaźmierczak, K., & Nowak, R. (2024). Orbital hematoma treatment—A retrospective study. Journal of Clinical Medicine, 13(19), Article 5788. https://doi.org/10.3390/jcm13195788

Døving, M., Høiskar, E., & Helseth, E. (2022). Orbital fractures. Tidsskrift for Den norske legeforening, 142(6). https://doi.org/10.4045/tidsskr.21.0743

Folkestad, L., Jönsson, L., & Karlsson, T. (2023). Orbital floor fractures—A comparison between CT images and findings at surgery. European Archives of Oto-Rhino-Laryngology, 280(6), 2795–2803. https://doi.org/10.1007/s00405-022-07837-6

Jeffery, R. C. H., Dobes, J., & Chen, F. K. (2022). Eye injuries: Understanding ocular trauma. Australian Journal of General Practice, 51(7), 476–482. https://doi.org/10.31128/AJGP-02-22-6340

Persson, A. A. E., Strömbeck, A., Sandblom, G., & Nowinski, D. (2023). Treatment of orbital fractures—A critical analysis of ophthalmic outcomes and scenarios for re-intervention. Journal of Plastic Surgery and Hand Surgery, 58, 1–7. https://doi.org/10.2340/jphs.v58.18499

Zhou, P., & Chambers, C. B. (2021). Orbital fractures. Seminars in Plastic Surgery, 35(4), 269–273. https://doi.org/10.1055/s-0041-1736393