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Surgical treatment of Blow-out fracture with titanium mesh: Case report

Tratamento cirúrgico de fratura orbitária Blow-out com tela de titânio: Relato de caso

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ABSTRACT

Blow-out fractures are known to affect the floor or medial wall of the orbit, a region located in the middle third of the face. For an accurate diagnosis of this type of fracture, a thorough clinical examination associated with imaging is necessary, among them, multi-slice computed tomography is considered the "gold standard" for diagnosis and planning of the approach to this type of fracture, since it allows the visualization of all structures without overlapping, and also allows the measurement of the degree of bone comminution. Among the tomographic planes, the coronal section stands out because it allows a better evaluation of the floor, orbit and medial wall. Signs and symptoms are usually diplopia, enophthalmos, malar alteration, restriction of ocular mobility, paresthesia of the infraorbital nerve. There are several types of surgical approaches for the treatment of this type of trauma and to reconstruct blow-out fractures, alloplastic materials or autogenous grafts are chosen. The objective of this case is to report a blow-out orbital fracture, surgical approach, reduction and fixation with a 1.5mm mini-plate of the system in the left infraorbital rim and reconstruction of the left orbital floor with titanium mesh, emphasizing the treatment of orbital floor fracture with titanium mesh and the good prognosis without signs of contamination or postoperative foreign body reaction. Adequate clinical and anamnestic examination, in addition to imaging, followed by convergent planning, increases the chances of a good prognosis, always with the objective of achieving when possible the reconstruction of the form, function and aesthetics of the traumatized area.

Keywords: Orbit, Surgical meshes, Bone fractures, Case report.

INTRODUCTION

In the routine of the oral and maxillofacial surgeon, it is not uncommon to be faced with a facial fracture, whether resulting from a car accident, motorcycle accident, contact sports, domestic or work accidents. Fractures affecting the orbit are involved in more than 40% of all facial injuries.[1]

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When it comes to the orbital cavity, you must take into account that despite being a small structure, it is quite complex, as there is a considerable amount of bones and an intimate relationship with important anatomical structures such as the optic nerve, lacrimal gland, nasolacrimal canal, eyeball and medial canthal ligament. The orbit houses the eyeball and is made up of seven bones divided into superior, lateral, medial, and inferior walls. The upper wall is formed by the frontal bones and lesser wing of the sphenoid bone; the medial wall by the orbital plate of the ethmoid bone, frontal process of the maxilla and lacrimal bone; The floor is formed by the orbital face of the maxilla, orbital face of the zygomatic bone, orbital process of the palatine bone and the lateral wall is formed by the frontal process of the zygomatic bone and greater wing of the sphenoid bone. [1, 2, 3]

The floor, infraorbital rim, and medial wall of the orbit are very fragile anatomical regions. According to Hammer, the blow-out fracture consists of a hydraulic mechanism where hydrostatic pressure is transmitted from the globe to the most fragile walls of the orbital cavity. [1]

It is common for the trauma patient to be observed by the surgeon according to the severity of the injury to perform the surgical repair. The signs and symptoms of orbital floor trauma are usually diplopia, enophthalmos, hypophthalmia, malar alteration, restriction of ocular mobility, paresthesia of the infraorbital nerve, periorbital ecchymosis and edema, hyposphagma, and decreased visual acuity. However, the patient may develop some of these signs after repair surgery, but the prognosis is usually favorable. [4]

For an accurate diagnosis of this type of fracture, a thorough clinical examination associated with imaging is necessary, among them, multi-slice computed tomography is considered the "gold standard" for diagnosis and planning of the approach to this type of fracture, since it allows the visualization of all structures without overlapping, and also allows the measurement of the degree of bone comminution. The coronal section stands out because it allows a better evaluation of the floor of the orbit and the medial wall, being able to observe the loss of bone continuity. [5.12]

In the literature, there is no consensus on which therapeutic approach is the best indicated, and if there are no signs or symptoms of functional and/or aesthetic impairment, conservative management can be adopted. However, in view of the signs and symptoms as previously described, the surgical approach may be mandatory. For this, the surgeon must have theoretical and practical mastery, as well as the availability of materials and supplies, to define the conduct.[6]

Among the materials available for reconstruction of large bone defects, there are four most common types, which are autogenous grafts, from the patient himself; allogenes, genetically different, but of the same species; xenogens, originating from a different species; and alloplastics, which are synthetic and produced in laboratories from different materials, such as polymethylmethacrylate and titanium mesh. [7]

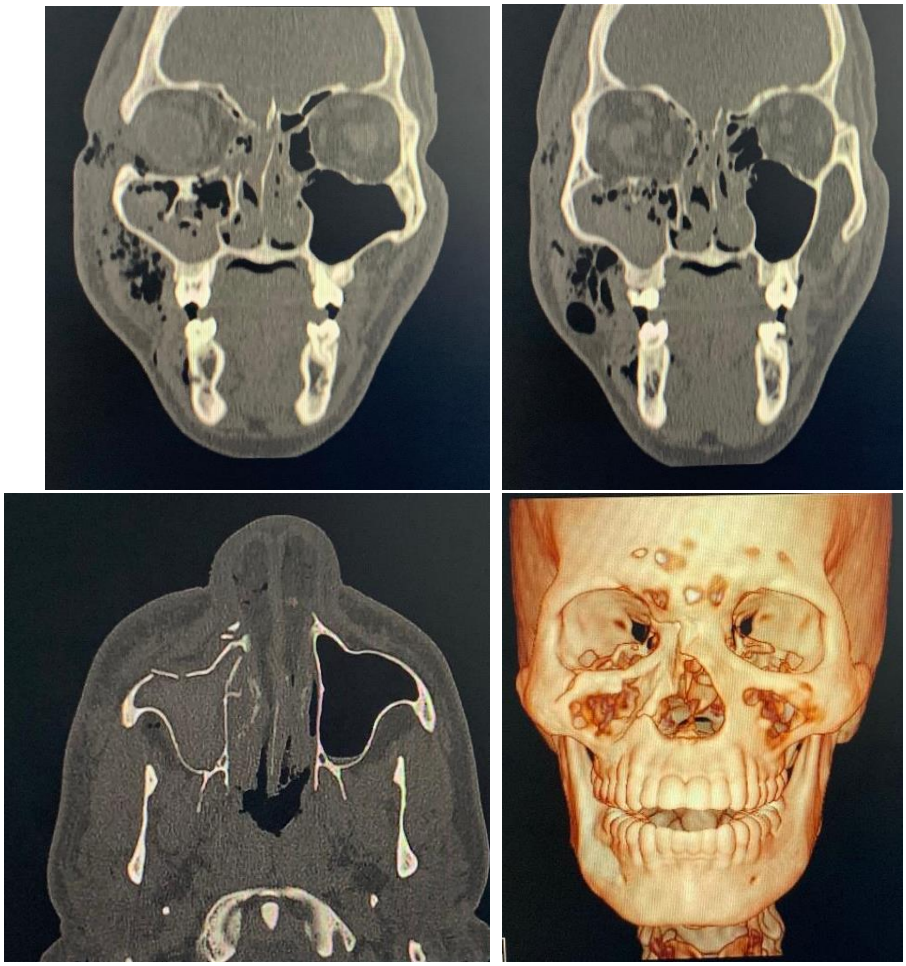
Therefore, the objective of this article is to report a clinical case of blow-out orbital fracture, surgical approach, reduction and fixation with a 1.5mm mini plate of the system in the right infraorbital rim and reconstruction of the right orbital floor with titanium mesh, in a patient victim of a motorcycle accident, conducted by the oral and maxillofacial surgery and traumatology team of the GENERAL HOSPITAL OF THE STATE OF BAHIA.

CASE REPORT

A 30-year-old male patient, victim of a motorcycle accident, with facial trauma, attended the HGE-BA for treatment of the injuries. Maxillofacial physical examination revealed preserved bone contours in the frontal bone, continuity solution in the right infraorbital rim, bilateral periorbital edema and ecchymosis, preserved extrinsic ocular motricity, referred diplopia, mild enophthalmos and hypophthalmos, crepitus in the bones of the nose (OPN), deviated septum to the right and sinking of the nasal pyramid, stable maxilla, absence of atypical mobility of the mandible to manipulation, and good mouth opening (Figure 1). On facial tomography, signs of OPN, left floor of the orbit with herniation of the contents of the eyeball, and incomplete left zygoma fracture were observed (Figure 2).

Figure 1. Preoperative clinical images, showing bilateral periorbital edema and ecchymosis, enophthalmos and hypophthalmia.

Figure 2. Coronal and axial sections, as well as 3D reconstruction of the computed tomography of the face, showing signs of OPN fracture, floor fracture of the right orbit with herniation of the contents of the eyeball, and incomplete right zygoma fracture.



The CTBMF team performed a closed reduction of the OPN fracture without fixation, performing anterior nasal packing. For the reconstruction of the orbital floor in the case discussed, we opted for a surgical approach with the subtarsal access, and a tarsorrhaphy was also performed to protect the eyeball (Figure 3). The reconstruction of the right infraorbital border was performed with plates and screws of the 1.5 mm system, and the affixing of a titanium mesh for reconstruction of the orbital floor (Figure 4).

Figure 3. Surgical approach performed with subtarsal access

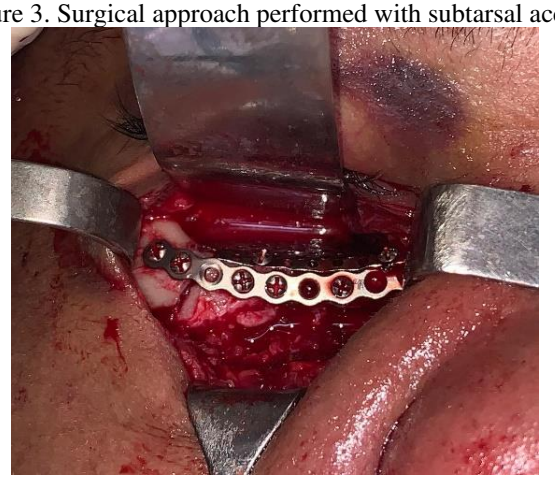
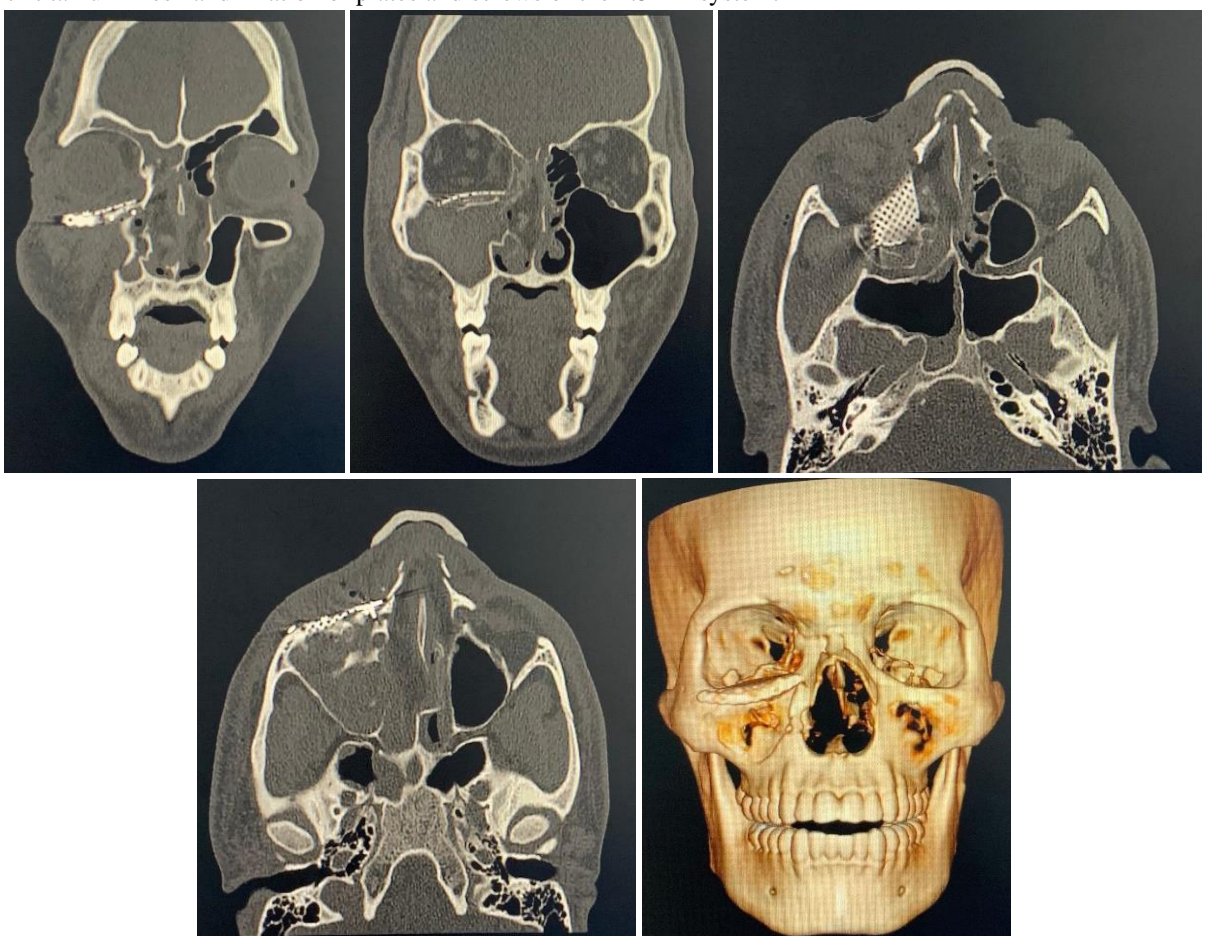


Figure 4. Axial and coronal sections and 3D CT reconstruction, showing the infraorbital floor and ridge reconstructed with titanium mesh and fixation of plates and screws of the 1.5mm system.



At 30 days postoperatively, the restoration of the projection of the nasal dorsum can be noticed, reconstruction of the infraorbital region, and the patient's function and aesthetics can be restored. Preserved ocular motricity, self-reported visual acuity, and no signs of diplopia were observed (Figure 5).

Figure 5. 30 days postoperatively, with satisfactory contours and aesthetics.

DISCUSSION

Blow-out fractures, which cause traumatic injury to the floor and medial wall of the orbit, mainly affect young adult males [8]. The mechanism of this type of trauma is forces transmitted directly into the eyeball, where hydrostatic forces affect the weaker walls of orbit [1].

In the above-mentioned clinical case, the patient was 30 years old, male, and was the victim of a motorcycle accident, with a traumatic character only in the right orbital floor, incomplete fracture of the right zygomaticus and signs of crackle in OPN, without association with another type of fracture.

According to the literature, the most common types of accesses for surgical approach to this type of fracture are: supratarsal, transconjutival subtarsal, and infraorbital incision. There is still no precise indication of the best approach, the authors describe that it will depend on each case and the experience of the surgeon. The approach chosen by the team in this case was the subtarsal approach, which allows an adequate and wide visualization of the operative area, and a tarsorrhaphy was also performed to protect the eyeball.[2,6,9]

In order to reconstruct and treat bone defects in CTBMF, there are several materials to choose from. For blow-out fractures, it is more common to use autogenous and alloplastic grafts such as polymethylmethacrylate and titanium mesh. The graft produced by the body itself is an ideal option because it has similarity with the damaged material and a small rate of susceptibility to infection, it tends to be used mainly in the reconstruction of large bone defects, but it has a considerable rate of resorption, possibility of morbidity at the donor site and increased surgical time. [5,7,10]

In the case series reported by Castellani8 (2002) and Penna11 (2017), grafts taken from the cartilage of the auricular concha were used for the reconstruction of orbital floor fractures, it was observed that because it has a shape equivalent to the floor, ideal flexibility, and good resistance to sustain the orbital content, it became a viable option compared to other autologous grafts.

The alloplastic material is also indicated because it is biocompatible, with additional requirements such as radiopacity, it must be thin, resistant, light and easily cut without losing its shape. Titanium mesh, for example, is an alloplastic material that meets these criteria. [2.10]

Biocompatibility and mechanical properties have made titanium the material of choice in the maxillofacial area. Titanium offers advantages compared to autogenous grafting. This includes flexibility, which allows for conformation and molding, even for a complex contour, a modulus (degree of elasticity or stiffness) adapted to easily match the cortical bone, and also reducing the surgical time required. Three-dimensional rigidity and stability and little risk of infection, even when exposed to the paranasal sinuses. [2,5,7,9,12]

Therefore, considering the above-mentioned factors, titanium mesh was the material of choice for the clinical case discussed in this study, and fixation with a 1.5 mm system plate in the infraorbital ridge region. Concluding with the achievement of excellent postoperative results and absence of signs and symptoms that were previously presented in the preoperative period, restoring function and aesthetics of the traumatized area.

FINAL THOUGHTS

The treatment of blow-out fractures, as well as other types of trauma, requires good planning to apply the best surgical approach and the most appropriate material for the clinical case. Adequate clinical and anamnestic examination, in addition to imaging, followed by convergent planning, is expected to obtain a good prognosis. However, always with the objective of achieving, when possible, the reconstruction of the form, function and aesthetics of the traumatized area.

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