INTRODUCTION

An orbital blow-out fracture is a fracture of the orbital floor caused by blunt trauma to the orbit. Blow-out fractures are usually caused by round or oval object with a diameter slightly larger than the orbital diameter such as a baseball, snowball, tennis ball or fist. The mechanism of fracture is controversial. The three most accepted theories are: 1) the “retropulsion” theory which proposes that the fracture is a result of a sudden increase in intraorbital pressure when the globe is pushed posteriorly; 2) the “buckling” theory which states that the fracture is secondary to the force applied to the orbital rim and transmitted to orbital bones; 3) a mixture of the first two theories. Blow-out fractures can cause several problems. To manage these problems, orbital reconstruction is mandatory. Various surgical approaches and materials are reported in the literature. Objective: This case report shows a retroseptal approach with sutureless closure and reconstruction of the orbital floor using titanium mesh. Results: The authors discuss on pre and retroseptal approaches and potential postoperative complications. Conclusions: Many researchers have concluded that titanium mesh implants are a simple and reliable option for routine orbital floor repair. The authors consider the retroseptal approach and the use of titanium mesh as satisfactory and reliable for correction of immediate blow-out fracture in adults.

Descritores: Fraturas Orbitárias; Telas Cirúrgicas; Zígoma.

ABSTRACT

Introduction: An orbital blow-out fracture is a fracture of the orbital floor caused by blunt trauma to the orbit. Blow-out fractures are usually caused by round or oval object with a diameter slightly larger than the orbital diameter such as a baseball or tennis ball. The mechanism of fracture is controversial. The three most accepted theories are: 1) the “retropulsion” theory which proposes that the fracture is a result of a sudden increase in intraorbital pressure when the globe is pushed posteriorly; 2) the “buckling” theory which states that the fracture is secondary to the force applied to the orbital rim and transmitted to orbital bones; 3) a mixture of the first two theories. Blow-out fractures can cause several problems. To manage these problems, orbital reconstruction is mandatory. Various surgical approaches and materials are reported in the literature. Objective: This case report shows a retroseptal approach with sutureless closure and reconstruction of the orbital floor using titanium mesh. Results: The authors discuss on pre and retroseptal approaches and potential postoperative complications. Conclusions: Many researchers have concluded that titanium mesh implants are a simple and reliable option for routine orbital floor repair. The authors consider the retroseptal approach and the use of titanium mesh as satisfactory and reliable for correction of immediate blow-out fracture in adults.

Key words: Orbital Fractures; Surgical Mesh; Zygoma.
the orbital floor. Proponents of the “buckling” theory propose that the orbital floor is particularly vulnerable as the infraorbital canal further weakens the floor’s already delicate bony structure.

**Transconjunctival approach**

When the repair of the fracture requires exposure of the orbital floor and rim (transconjunctival approach), both preseptal and retroseptal dissection planes have been described. This technique has proven an excellent approach for the exposure of the orbital floor and inferior rim. The main advantage to this technique is the lack of visible scar. A recent review and study of this technique has demonstrated that this approach is indeed safe and effective in patients who have not undergone a previous transconjunctival incision.

**Choice of reconstruction material**

The unique and complex anatomy of the orbit, unless prebent plates are used, requires significant contouring of the implants to restore the proper anatomy.

The majority of cases require reconstruction of the orbital floor to support the globe position and restore the shape of the orbit. The reason for this is that the bony walls are comminuted and/or bone fragments are missing. Therefore, one is reconstructing missing bone rather than reducing bone fragments. This can be accomplished using various materials.

There is hardly any anatomic region in the human body that is so controversial in terms of appropriate material used for fracture repair: nonresorbable versus resorbable; autogenous/allogeneous/xenogenous versus alloplastic material; non-prebent versus preformed (anatomical) plates; standard versus custom-made plates; nonporous versus porous material; noncoated versus coated plates.

Many surgeons recommend using materials that allow bending to an anatomical shape, that are radiopaque (to allow for intra or postoperative radiologic confirmation of placement), and stable over time.

Reconstruction of the dislocated orbital walls is demanding. Secondary changes to this contour are undesirable. This is why critical consideration of the use of resorbable materials is necessary.

There are different preferences of implant material depending on regional differences, variations in schools of teaching, and socio-economic factors. There is a paucity of evidence to support the ideal choice for an orbital implant. Modern imaging analysis offers a unique chance to quantitatively assess the surgical result and stability over the time. This can provide valuable information for future recommendation.

**Titanium Meshes**

Advantages: availability; stability; contouring (eased by the artificial sterile skull); adequate in large three-wall fractures (the pre-bent plate is limited to medial wall and orbital wall fractures only); radiopacity; spaces within the mesh to allow dissipation of fluids; no donor site needed; tissue incorporation may occur.

Disadvantages: costs; possible sharp edges if not properly trimmed.

The extensive use of mesh for orbital reconstruction in traumatized orbits has been shown to be safe, with few problems due to infections and no problems with secondary displacement due to additional trauma, on condition of proper handling, contouring, and fixation of the mesh.

The purpose of this paper is to report on the surgical outcome of a patient undergoing orbital fracture repair without periosteal or conjunctival closure.

This work has been approved by the appropriate ethical committee related to the Federal University of Paraiba - Brazil - in which it was performed and that the patient gave informed consent to the work.

**CASE REPORT**

A 25 year old male patient presented to our hospital with chief complaint of double vision while looking upwards and his eyes not being at the same level. Anamnesis revealed that patient met with a road traffic accident and sustained facial injuries. On extra oral examination, patient was having significant enophthalmos of the left eye, diplopia on upward gaze and dystopia. Intraorally, occlusion was normal and there was no other significant finding. Waters view showed orbital blow-out fracture (Figure 1). There was radiopacity in right maxillary sinus suggesting herniation of orbital contents into the sinus. Patient was medically fit and was planned for orbital floor reconstruction with titanium mesh under general anesthesia.

![Waters view shows orbital fracture and opacification of the maxillary sinus due to herniation of the orbital content.](image)
Surgical Procedure

Transconjunctival incision was used to approach orbital floor (Figure 2). Local anesthesia Xylocaine with adrenaline 1:100,000 was injected under the conjunctiva to aid in hemostasis. Traction sutures were placed through the upper and lower lid to assist in subsequent surgery. Retroseptal approach was used to keep orbital content out of the surgical field. Periosteum was lifted to expose the orbital floor and the entrapped tissues were released. This approach has following advantages: lower incidence of ectropion, no visible external scar and it facilitates the disengagement of any entrapped or prolapsed orbital tissues under direct vision. Figure 3 shows the titanium mesh placed over the orbital floor and Figure 4 shows the soft tissue release after forced duction test. A forced traction or duction test should be performed where the attachment of the inferior rectus muscle is grasped together with the conjunctiva with fine forceps to check that the eyeball moves freely. In this case, orbital fracture repair was performed without perioseal or conjunctival closure. Figure 5 shows the immediate postoperative facial aspect and Figures 6 and 7 reveal the radiographic control after surgery demonstrating a satisfactory result.

DISCUSSION

Severe midfacial trauma presents several challenges to the reconstructive surgeon. Diplopia and enophthalmos are relatively common problems associated with this fracture, as is herniation of the orbital contents with defects of the orbital floor. To manage these problems, orbital floor reconstruction is necessary. The aim of the surgery is to avert anatomic and functional defects. Various materials have been used for immediate orbital reconstruction.

First of all, we believe that the retroseptal transconjunctival approach provides excellent exposure with less risk of postoperative eyelid retraction and ectropion. On the other hand, other authors affirm that the use of the preseptal transconjunctival approach in orbit reconstruction surgery is preferable to a retroseptal approach because of minimal disturbance of the...
intraorbital connective tissue framework in as much as
the anatomic optimal dissection line also results in a
lower complication rate.

In relation to titanium meshes, several authors have
demonstrated the safety and effectiveness of titanium in
orbital reconstruction. One question posed by clinicians is
what happens to large pieces of titanium in communication
with the paranasal sinuses or nasal-oral-pharyngeal area.
This question becomes increasingly relevant as titanium is used to reconstruct extensive defects for which the
destruction of bony architecture requires the placement
of mesh in proximity to these areas. There is a study that
provides evidence of titanium’s compatibility with soft
tissue. The mesh underwent progressive incorporation
with soft tissue that was then resurfaced by indigenous
cells, including respiratory epithelia and goblet cells. This
phenomenon occurred despite communication with the
nasal-oral-pharyngeal area and paranasal sinuses9.

Titanium meshes are thin, stiff and easy to contour.
They are easily stabilized, maintain their shape, and
have the unique ability to compensate for volume without
the potential for resorption. When titanium meshes were
introduced, it was generally believed that they needed
no removal, since titanium is a highly biocompatible
material. However, it has been shown that both titanium
and aluminium are released from titanium implants into
the adjacent structures and even into regional lymph
nodes. The clinical relevance of this release is not yet
known. In our personal experience, we believe that these
potential clinical problems are irrelevant in long-term
outcomes.

It has been suggested that in pediatric surgery in
the 20 areas of bony resorption and deposition,
metallic fixation plates should be removed due to plate
displacement and to restriction of growth. There are
further disadvantages with titanium implants in orbital
wall reconstruction. These include the risk of extrusion
due to dehiscence of covering soft tissue and the risk
of infection. There is also a theoretical risk of injury to
the tissues of the orbital apex from any subsequent blow
to the orbit. Because of the mesh structure, the orbital
implant is difficult to remove. Concordantly, we perform
bioabsorbable systems in pediatric surgery as routine.
Moreover, in our understanding the mentioned risks are
feasable and should be considered especially for adults
who play radical sports.

Titanium implants have been used to span large
defects in the internal orbit to provide a platform for bone
graft support. Many researchers have concluded that
titanium mesh implants are a simple and reliable option
for routine orbital floor repair7.

**Post-Operative Management**

The patient’s vision should be monitored in the
immediate post-operative phase, whilst still in the
recovery room and over the next few hours. Functional
tests, in particular, for diplopia and mobility, should be
performed once the swelling has subsided using standard
ophthalmological procedures. Radiological assessment
(CT) is not required if functional findings are normal.

**Complications**

Operative complications of the transconjunctival
inferior fornix approach are related in the literature such
as: cicatrical entropion, lower eyelid retraction, canthal
dehiscence, lower eyelid avulsion, canicular laceration,
buttonhole laceration of the lower eyelid, conjunctival
chemosis, and lacrimal sac laceration. Attention to
anatomic landmarks and sound surgical execution will
prevent these complications in most patients8.

The most severe complication that may occur
during or following surgery is the loss of vision caused
by damage to the optic nerve, e.g. by intrusion of bone
fragments into the dorsal orbital conus. Extra-ocular
muscles and the nerves innervating them are subject to
damage especially in the region of the anterior orbital
door as a result of traumatic detachment of the peri-orbita
or massive fragment displacement during reduction2.

In our opinion, a meticulous surgical technique
prevents potential problems and postoperative
complications. The authors consider the retroseptal
approach and the use of titanium mesh as satisfactory
and reliable for correction of immediate blow-out fracture
in adults.

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Operative complications of the transconjunctival inferior fornix