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Review

Management of complex orbital fractures

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Abstract

The treatment of orbital injuries has evolved considerably over the last two decades. We describe strategies involved in the emergency management of orbital injuries, the use of imaging, preformed and customised materials for reconstruction, and endoscopic techniques.

Keywords: Orbit trauma

Introduction

The availability of multislice computed tomography (CT) and the ability to view the images on picture archiving and communications system (PACS) workstations and downloadable DICOM readers, has enabled accurate diagnosis of fractures of the orbital floor and medial wall,[1] and better planning for complex injuries. Although opinions differ about the precise indications for operation in marginal cases, particularly around the medial wall, and about the materials used for reconstruction, the differences are becoming fewer over time.[2]

Previously, the assessment of injuries was based on orbital volume as shown by the work of Dolynchuk et al,[3] but since Hammer first postulated the importance of the shape of the posteromedial wall, the importance of the shape of the orbit has been recognised.[4] Sagittal CT shows an S-shaped curve, which is why large defects treated by deformable or flat rigid materials do not yield the best results.

Orbital fractures are common. Many are minor and can be managed conservatively, but an appreciable proportion are complex, and some present a considerable surgical challenge.

Large defects that approach the deep orbit and extend into the medial wall have a high risk of complications as they require much wider dissection. As the complexity of the defect increases, the capacity for direct vision decreases. In these cases adjunctive measures are useful, and this is the subject of the paper.

The complex orbit

In many ways, the development of orbital fractures depends on the transfer of energy to the region. While the immediate cause is usually obvious,[1] the size and complexity of the defect is a reflection of the amount of energy transferred. High-energy injuries also affect the globe, and this adds further risk and complexity to the treatment. [5]

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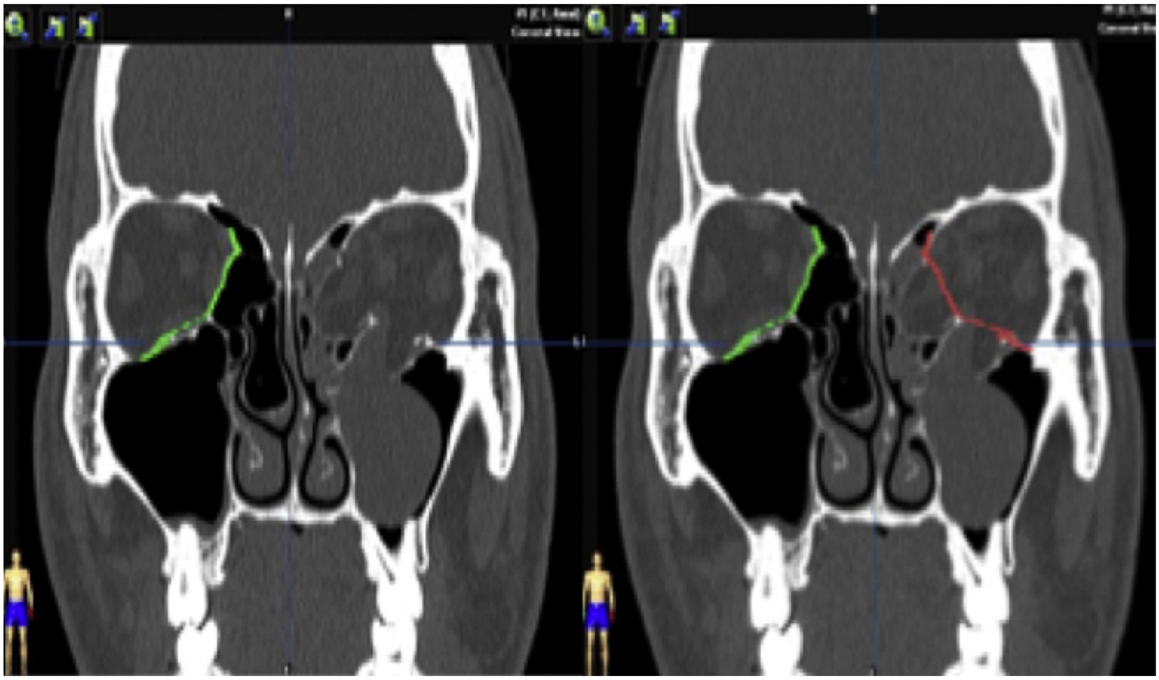

Fig. 1. Left orbital floor fracture and pre-operative reconstructive planning using navigation softwear.

Strategies for management

Initial presentation

After immediate stabilisation, we treat the sight-threatening injuries. Whilst retrobulbar haemorrhage is the most commonly cited, surgical emphysema[6] and herniation of the brain may also cause orbital compartment syndrome, and these are managed in a similar way. We have added the McCord lid-swing extension to our protocol for orbital access and think that it should lower the threshold for emergency cantholysis. Other sight-threatening injuries such as optic neuropathy and a perforated globe may also benefit from this, particularly as space-occupying collections may mask the primary damage. [7]

Definitive operation is usually delayed for 7-14 days after the initial presentation, but can be extended to 21 days if necessary.

Imaging

Rapid access to CT is one of the main advances in the management of orbital injuries, as it has focused surgical management, and the use of PACS workstations, and freely available DICOM viewers allow images to be manipulated at the clinic, theatre, or bedside.

More advanced software that enables the mirror imaging of normal to abnormal sides is useful [8] in conjunction with a navigation platform particularly in revision operations, or when planning zygomatic or complex facial osteotomies (Fig. 1).[9]

Surgical access and technique

There are several approaches to the orbit. Each approach has its proponents and individual surgeons will have their preferences. We use a retroseptal transconjunctival approach, as it hides the incision, is versatile, and a McCord lid swing and transcaruncular extension can easily be done.[1–10] It is possible to gain access to the entire orbital contents from the frontozygomatic suture laterally to the orbital floor and the anterior skull base. A direct view of the orbital process of the palatine bone is required for safe seating of the reconstruction.[11]

A subperiosteal plane can usually be achieved with initial dissection of the robust lateral wall (Fig. 2). However, the orbital septum is often breached in more serious injuries, and in large blowout fractures a polydioxanone (PDS®, Ethicon) membrane can be placed between the soft tissues and the retractor to help capture the soft tissues and improve visualisation. Dissection can be aided by use of a gauze (completely opened out and soaked in saline), this can then be left in place and suction can be used over the top of the gauze and aids haemostasis when left in place for a couple of minutes.

A good cosmetic result when closing the transconjuctival incision and the lateral canthus depends on meticulous repositioning of the lateral canthus. The upper and lower limbs of the lateral canthus tendon are approximated, and either a 5/0 polyglactin 910 suture (Vicryl Rapide™, Ethicon) is placed, or a stronger PDS® suture is passed through the lower limb and then secured to the periosteum of the lateral bony wall of the orbit. The grey line and the conjunctival incision are then stitched with 6/0 Vicryl Rapide™.