Controversies in the Management of the Trauma Patient

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KEYWORDS

• Facial trauma • Orbital trauma • Mandibular trauma • Maxillomandibular fixation • Condylar fracture • Endoscopic repair • Blowout fractures

KEY POINTS

- There is debate about the optimal timing of repair, as well as material chosen to repair orbital floor fractures. There is a trend toward early repair in patients with large, displaced fractures and observation of smaller ones. When choosing a material to repair the fracture, the critical issue is the magnitude of the fracture, with large fractures requiring a stronger, supportive material.
- Intraoperative computed tomographic scan and intraoperative navigation are expensive technologies, but may reduce costs overall by decreasing the number of revision surgeries needed.
- There is still much debate about open versus closed repair of subcondylar fractures. Several studies have shown improvements in facial and ramus heights on the side of the open repair as well as improved occlusion with the open technique. Closed technique carries less risk for facial nerve injury and scar formation.
- Endoscopic-assisted subcondylar repair may be a compromise, allowing the benefits of open repair with lower risks. However, this technique is difficult and has a steep learning curve.
- Maxillomandibular fixation has been used for decades to achieve optimal occlusion during and after mandible repair, but there are new data suggesting this may not always be necessary.

INTRODUCTION

Facial trauma is a significant cause of morbidity in the United States. In one analysis, there were 407,167 Emergency Room (ER) visits for facial fractures with a cost approaching $1 billion.[1] Despite the large volume of trauma surgeries at most academic institutions, there is controversy regarding management of certain traumatic injuries. The literature lacks clear-cut best practices with many fractures. In orbital trauma, there is debate about the optimal timing of repair, preferred biomaterial to be used, and the utility of intraoperative computed tomographic (CT) scans. In mandible fractures, there is debate regarding open versus closed versus endoscopic repair of the condyle. Maxillomandibular fixation (MMF) has been used for decades to achieve optimal occlusion during and after mandible repair, but there are new data suggesting this may not always be necessary. The purpose of this article is to review the salient points of each side of the debate and cite literature that exists to support each position.

REPAIR OF ORBITAL FRACTURES

Timing

Yadav and colleagues[2] noted that the rate of CT use in the US ERs quadrupled from 1996 to

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2007. Patients totaling 4.1 million presented to an ER with, and were treated for, injuries of the eye and face. Of those, 20% (820,252 patients) underwent CT imaging, with 102,999 patients (12.5%) diagnosed with an orbital fracture. Another study reported that although the number of facial traumas has gone up between 1991 and 2007, the number of facial fracture repairs has decreased.[3] Although this may in part be attributed to changing causes of fractures, it is likely that these trends are related to increasing use of CT imaging, resulting in decreasing severity of facial injuries being diagnosed. With an increase in the diagnosis of facial fractures, the question about which fractures should be repaired and which should be observed has grown more complex. For those that are repaired, what is the ideal timing of repair?

The 3 generally accepted categories of repair are immediate (within 24 hours), early (less than 2 weeks), and late (greater than 2 weeks). There is consensus on criteria that necessitate immediate repair. The first is activation of the oculocardiac reflex, with CT evidence of an entrapped muscle or periorbital tissue causing bradycardia, heart block, nausea, vomiting, or syncope. The second is entrapment of the perimuscular tissue with marked limitation of extra ocular movements on upward gaze.[4] There is also a trend toward early repair in patients with large, displaced orbital fracture with increased orbital volume. Several investigators have demonstrated improved postoperative results, with decreased diplopia and enophthalmos by performing early intervention.[5–7] It has been suggested that greater intrinsic damage leads to subsequent fibrosis, which results in poorer motility outcomes despite complete release of soft tissues. There is a suggestion that earlier intervention for such injuries might improve outcomes.[5]

The real question then is, which patients need early orbital reconstruction and which patients are candidates for delayed repair? This uncertainty applies to patients with orbital fractures that have good ocular motility and only slight displacement of the orbital contents. The indication for surgery in solitary medial wall fractures is also controversial. Indications for surgery in these patients who do not have diplopia is usually the development of enophthalmos. However, enophthalmos rarely becomes significant (more than 2 mm) in the first 2 weeks after trauma.[8] Although there is the Jaquiery classification, which describes the extent of the orbital fracture,[9] and Hertel exopthamometry, the literature lacks a 3-dimensional volume-based classification to assist in clinical decision-making. At this time, there is not a clear definition of degree of injury that will or will not necessitate repair. For the patient who does undergo repair, there is some evidence for early repair, but this has not been proven conclusively. A review of the literature by Dubois[4] found 4 studies that indicated some advantageous effects for surgery performed at less than 2 weeks for adults,[10–13] although 5 studies found no significant differences.[14–18] In pediatric patients, one study showed a correlation between earlier repair and diplopia and motility disorders,[19] whereas 5 studies were inconclusive.[20–23] In patients with small fractures, a watchful waiting approach may be appropriate, and surgery may be avoided in some cases.

Materials

The choice of reconstructive material presents another major decision in the care of a patient with an orbital fracture. A perfect biomaterial would be chemically inert, biofriendly, nonallergenic, and noncarcinogenic. It should also be cost-effective to place, readily available and able to be sterilized, and easy to handle, yet have the ability to be stable and retain its shape once manipulated. Preferably, it should be radiopaque to enable radiographic evaluation but without producing artifacts that may mask important features on subsequent radiologic examination.[24] Unfortunately, this ideal graft material does not exist at this time. There are dozens of materials from which to choose.

Materials for repair can be placed into 5 main categories: autogenous, allogenic, alloplastic absorbable, alloplastic nonabsorbable, and xenograft. Autogenous grafts are usually bone, cartilage, or temporalis fascia. Bone grafts may be taken from iliac crest, calvarium, nasal septal bone, rib, maxillary, and mandibular bone. Bone grafts are a popular option because of the strength and rigidity of bone as well as the ability of the body to vascularize and incorporate the tissue with minimal immune reactivity. The major disadvantage of bone is that the rigidity does not allow contouring without fracture. When deciding on a harvest site, the following should be taken into account: iliac crest and rib bone show significant and unpredictable resorption, up to 80%, because of their endochondral origin[25,26]; calvarial bone remains a popular choice because of its accessibility and proximity to the surgical field, various sizes of grafts that can be harvested, and a hidden scar with minimal pain.[27] One study illustrated the use of nasal septal bone, which restored orbital volume and alleviated symptomatic nasal passages.[28]