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Case Report
Trauma

Non-displaced pediatric orbital fracture with displacement of the inferior rectus muscle into the maxillary sinus: a case report and review of the literature

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K. Maloney: Non-displaced pediatric orbital fracture with displacement of the inferior rectus muscle into the maxillary sinus: a case report and review of the literature. Int. J. Oral Maxillofac. Surg. 2014; 43: 29–31.

Abstract. Orbital fractures occur less frequently in the pediatric population than in the adult population. Due to the elasticity of the bones that comprise the orbital floor it is not uncommon for the orbital floor to fracture and immediately self-reduce. This puts the muscles and soft tissues of the orbital floor at an increased risk of entrapment. There is no exact agreement in the literature as to the ideal timing of surgical intervention for these types of injuries. However, there are many surgeons who advise early intervention in the first few days of the injury. This article describes a case of a non-displaced orbital fracture with displacement of the inferior rectus into the maxillary sinus that was treated in the first 24 h and resulted in an excellent outcome.

Keywords: orbit; fracture trauma; pediatric; emergency.

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Introduction

Pediatric facial fractures are less common than in the adult population, accounting for 3–6% of all facial fractures.[1] Orbital floor fractures make up 15% of all pediatric facial fractures, and pediatric cases make up 22% of all orbital fractures requiring surgery.[2]

There are few facial fractures that require urgent surgical intervention. Pediatric orbital fractures can be one of them.[3,4] These fractures can differ from adult orbital fractures in signs and symptoms, fracture pattern, and urgency.[1–3,5] In children, due to the elasticity of the bone, the fractured floor has the tendency to return to the original anatomic position. When this occurs there can be minimal displacement of the floor with entrapment of muscle and soft tissues within the fracture site.[1,3,4] Clinically this can result in decreased motility, nausea and vomiting, and diplopia.[1,3–7] Most facial trauma surgeons advocate early surgical intervention for these types of injuries to prevent ischemia to the inferior rectus muscle.[1,3,5,7] Few cases exist in the literature specifically referring to the inferior rectus muscle being completely displaced into the maxillary sinus after a trapdoor orbital

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fracture.[6] This report describes a case of a non-displaced orbital fracture with the inferior rectus displaced into the maxillary sinus that was treated immediately, resulting in an excellent outcome.

Case report

A boy aged 8 years and 1 month was struck by a car while riding his bike. The patient's past medical history was significant for attention deficit hyperactivity disorder. The child was not wearing a helmet at the time of the traumatic event and there was no reported loss of consciousness. The patient was brought to the emergency department and was diagnosed with lower extremity fractures, left facial abrasions, and a left orbital fracture.

The following day Oral and Maxillofacial Surgery was consulted for facial trauma evaluation. The patient had persistent nausea and vomiting that was unsuccessfully treated with ondansetron. The child also complained of severe left eye pain. On examination there was mild left peri-orbital swelling, the pupils were equally round and reactive to light, there was profound vision loss in the left eye, binocular diplopia, and restricted superior motility accompanied by severe pain. The patient was seen by ophthalmology and the decreased visual acuity in the left eye was attributed to traumatic optic neuropathy. Pain with superior movement of the left globe was suspicious for entrapment given the history of blunt facial trauma. Because of the severe eye pain, a retrobulbar hematoma was also considered on the differential diagnosis. This was however less likely, as there was no proptosis present. Computed tomography (CT) of the facial bones (Fig. 1) showed a non-displaced fracture of the left orbital floor with the inferior rectus located in the superior aspect of the maxillary sinus. The patient was then taken to the operating room. The time from the traumatic event to surgical intervention was 22 h. First a forced duction test was performed which was positive, exhibiting restriction of superior movement. The left orbital floor was approached via a subtarsal incision. The orbital floor was stable and non-displaced but showed muscle herniating through the orbital floor. The fractured segment was gently depressed while the muscle was relieved and repositioned superiorly onto the orbital floor. The displaced orbital floor was repositioned to the correct location with excellent stability. Gelatin film was placed on the orbital floor as a barrier to prevent the muscle from herniating through the fracture site.

Fig. 1. CT scan of the facial bones, coronal view; non-displaced orbital floor fracture with inferior rectus muscle in the superior aspect of the maxillary sinus.

Fig. 2. Patient at 2 weeks postoperative, forward gaze.

A forced duction test was immediately performed which showed complete mobility of the left globe in all directions. Postoperatively the patient had immediate return of superior gaze with overall minimal discomfort and no nausea or vomiting. At discharge on postoperative day 4 the patient had mild binocular diplopia. The patient was discharged on methylprednisolone for 1 week for the optic neuropathy. The patient was seen 2 weeks postoperatively (Figs. 2 and 3) with no complaints of pain and full range of motion of all extraocular movements without any discomfort. There was still mild binocular diplopia. The visual acuity had minimal improvement. At 2 months postoperatively there was full resolution of the diplopia. At 15 months there was full range of motion and no diplopia. Visual acuity in the right eye was 20/20 and visual acuity in the left eye was 20/70. The optic neuropathy was being treated with an eye patch and spectacles. The patient is continuing to see a retina specialist for the optic neuropathy.

Fig. 3. Patient at 2 weeks postoperative, superior gaze.

Discussion

Children 7 years and younger are more likely to have orbital roof fractures than orbital floor fractures due to the protection of the floor from the thick sinus walls, larger cheek fat pads, and a smaller midface.[2] After 7 years of age, orbital floor fracture incidence surpasses orbital roof fractures.[3] Trapdoor fractures characterized by medially hinged minimally displaced fractures are common in children and often cause entrapment. The mechanism of entrapment is via the fractured floor displacing inferiorly and reducing back to or close to the pretraumatic position. In the instant that the floor is displaced, the soft tissues of the floor herniate through the temporary defect and remain trapped between the fractured segments after the fracture reduces.[3] Severe entrapment can lead to ischemia, fibrosis, and irreversible scarring.[2,4] Immediate sequelae of pediatric orbital fractures often include pain, nausea and/or vomiting, diplopia, and motility restriction, and rarely the oculocardiac reflex, characterized by the triad of syncope, bradycardia, and nausea/vomiting.[2,5] Long-term complications from pediatric orbital fractures include restricted motility and diplopia.[2,3] Soll and Poley published the first report stating the difference between internal orbital fractures in children and adults. They noted that children were more likely to have linear and/or trapdoor type fracture patterns due to their bones being more flexible. Adults were more likely to have

comminution.[8] de Man et al. were the first to advise immediate surgery for pediatric orbital fractures with positive forced duction tests.[9] In 1998, Jordan et al. reported multiple cases of patients below the age of 16 years with restricted superior and inferior motility despite minimal soft tissue damage, enophthalmos, and floor displacement on imaging. Due to the lack of subconjunctival ecchymosis, this was termed the 'white-eyed blowout' fracture. Jordan recommended surgery within the first few days of the injury to avoid permanent restriction of extraocular movements.[7] Yano et al. reported a case of immediate intervention for a blowout fracture with a 'missing rectus' in the maxillary sinus on CT. Their patient was an 8-year-old who presented with limited upgaze and downgaze, diplopia, and severe nausea/vomiting. At 2 months postoperatively the patient had complete absence of diplopia in all directions. He emphasized urgent repair for cases with a 'true missing rectus', and if there are signs, symptoms, and CT evidence of strangulation there should be immediate surgical intervention.[6] Egbert et al. reviewed 34 patients under the age of 18 years with isolated orbital fractures who underwent surgery. Twenty-two of 34 had limited extraocular movements and four of 34 had limited extraocular movements and enophthalmos. He concluded that patients who had surgical repair within 7 days of the injury had more rapid improvement in motility and diplopia than those who had surgery later.[10] Bansagi and Meyer agree that early surgical intervention is indicated for patients with restricted motility and nausea and vomiting.[5] Grant et al. state that patients with symptoms of entrapment with a trapdoor fracture should have surgical intervention as soon as the diagnosis is made, unless contraindicated by the patient's health or ocular injuries that may benefit from a delayed intervention.[3] Gerbino et al. published a review of 24 pediatric patients with trapdoor-type fractures and concluded that the success rate for patients treated within 24 h was greater than for those who had surgery later. They concluded that trapdoor orbital fractures are a true surgical emergency.[4] Recently Wei and Durairaj did the most comprehensive review of the literature using data from 25 studies on pediatric orbital fractures. In their conclusion, they recommend that children who exhibit diplopia with positive forced duction tests, soft tissue entrapment on CT, and/or trapdoor fractures with restricted ocular motility, have surgery within 48 h.[2]

In conclusion, in reviewing the literature many authors recommend early surgical intervention for children with trapdoor orbital floor fractures with signs and symptoms of entrapment. This report presents a case of a pediatric orbital fracture with inferior rectus muscle displacement into the maxillary sinus treated with immediate surgical intervention that had an excellent outcome with no restriction of extraocular movements and no diplopia. The author agrees that pediatric patients with trapdoor orbital fractures showing signs and symptoms of entrapment should have early surgical intervention to prevent ischemia of the inferior rectus and increase the chances of a positive outcome in eliminating diplopia and regaining full ocular motility.

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Competing interests

None declared.

Ethical approval

Not required.

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