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Inferior rectus entrapment in a medial orbital wall fracture: A case report

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ABSTRACT

Orbital fractures are typically caused by blunt periocular trauma and are one of the most common types of facial fractures. The most common entrapment is that of the inferior rectus muscle in a fractured floor. However, we present a unique case of an inferior rectus muscle entrapment in a medial orbital wall fracture.

Orbital fractures are typically caused by blunt periocular trauma and are one of the most common types of facial fractures [1]. An important complication of orbital fractures is entrapment of extraocular muscles and orbital fat in a trapdoor fracture. This occurs most commonly in the pediatric population, as their bones are more pliable and elastic [2]. In a trapdoor fracture, the bone is fractured on one side but remains intact on the other which can entrap orbital fat and muscle in the fracture site. Most often the inferior rectus and medial rectus muscles can be involved.

The inferior rectus originates from the lower tendon of Zinn and parallels the orbital floor. It passes through a connective tissue pulley and follows the curve of the globe to insert inferior to the limbus [3]. The inferior rectus depresses and adducts the eye. If the inferior rectus were to become entrapped, patients often present with vertical gaze diplopia and restriction of upgaze [4]. The medial rectus originates from both the upper and lower tendon of Zinn and parallels the medial orbital wall. It also passes through a pulley and then follows the curve of the globe to insert medial to the limbus [3]. The function of the medial rectus is to adduct the eye. Entrapment of the medial rectus tethers the globe and prevents lateral gaze, resulting in horizontal diplopia.

The most common entrapment is that of the inferior rectus muscle in a fractured floor. We present a unique case of an inferior rectus muscle entrapment in a medial orbital wall fracture.

1. Case presentation

A 69-year-old female was involved in a motor vehicle collision at highway speeds. Upon arrival to the Emergency Department (ED), she was complaining of a headache, double vision, and nausea. Physical exam was significant for severe edema of the left eyelids requiring manual distraction to open the palpebral fissure. Upon opening the fissure, there was only white sclera visible as the pupil was restricted in a caudal and medial direction (down and in), which is demonstrated in Fig. 1. The patient had significant restriction of superior gaze (Fig. 2) and lateral gaze of the left eye. She also had diplopia on gross visual examination and severe nausea and vomiting refractory to anti-nausea medication.

The maxillofacial computerized tomography (CT) demonstrated an acute fracture involving the left medial orbital wall with the medial rectus directly abutting the fracture. The medial wall defect at its largest diameter in the coronal view measured 13.8mm. On closer inspection, the inferior rectus was seen to be flattened with a small extension entrapped at the junction of the posterior-inferior fracture fragments (Fig. 3). Due to entrapment and intractable nausea and vomiting, the patient was taken to the operating room emergently.

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Fig. 1. Photograph demonstrating left eye restriction in a caudal and medial direction.

Fig. 2. Photograph demonstrating left eye restriction with superior gaze.

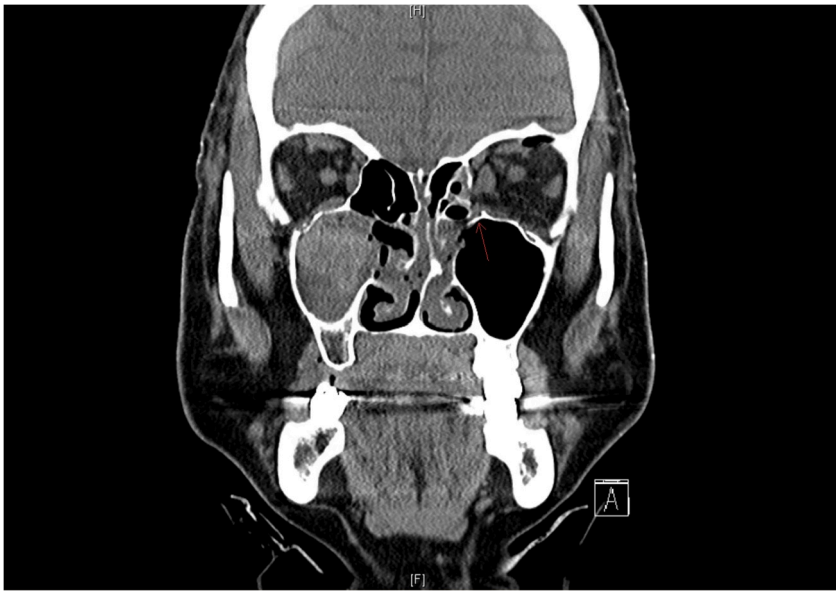

Fig. 3. Pre-operative CT scan with the arrow demonstrating the entrapped inferior rectus muscle in the fracture site.

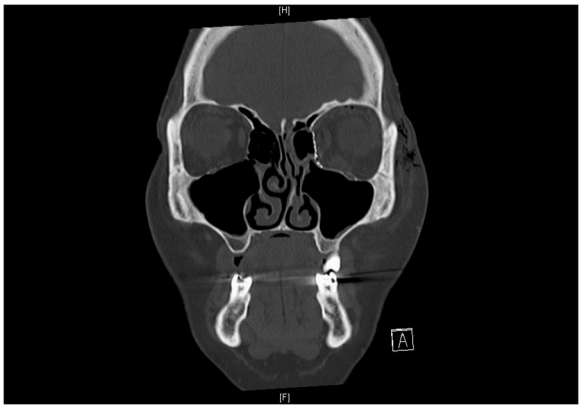

Fig. 4. Post-operative CT scan demonstrating adequate reduction of the fracture segments.

At the start of the case, the left globe was evaluated with forced duction, and there was significant restriction with attempted superior displacement of the globe. An inferiorly extended *trans*-caruncular approach to the medial orbital wall was used for exposure. The inferior rectus was identified and found to be entrapped as visualized on the pre-operative CT. The entrapped muscle was reduced from the fracture segment, and the globe was again tested with the forced duction test and found to have full unrestricted range of motion. The medial rectus was then identified superior and anterior to the fractured segment, and it was not found to be entrapped. The medial wall was reconstructed with customized titanium mesh and secured using a 4mm screw into the antero-inferior medial wall. At the end of the case, the patient was found to have full ocular range of motion.

A CT was obtained on post-operative day 1 to assess the efficacy of surgical reduction (Fig. 4). The medial wall reconstruction plate was in near-anatomic position. The inferior rectus muscle was significantly more edematous than the pre-operative CT, which supported the findings of trauma to the muscle and entrapment ischemia. The medial rectus was clearly reduced away from the fracture segment by the titanium plate.

The patient was evaluated three weeks post-operatively where she reported continued diplopia and blurred vision in most directions. Her examination was significant for restriction of upgaze of her left eye with difficulty with downgaze. She was referred to ophthalmology for further evaluation, and it was felt that the upward restriction of her left eye was likely due to paresis of the inferior rectus muscle. However, she was again evaluated six months post-operatively, and she was found to have marked improvement in her diplopia and motility.

2. Discussion

To our knowledge, there have been no published reports of entrapment of the inferior rectus muscle in a medial orbital wall fracture. Extraocular muscle entrapment in an adult is rare, and most published cases describe the pediatric orbital floor [5]. There have been only a few reported cases in adults, including a medial orbital wall fracture resulting in medial rectus entrapment [6] and one inferior rectus entrapment in an orbital floor fracture [7].

Post-operatively at three weeks, our patient did have residual diplopia, which in previous literature has affected up to 37% of patients post-operatively [8]. It is unknown what exactly may cause the diplopia, but possible mechanisms include direct trauma to the muscles, ischemia or compartment syndrome, iatrogenic trauma during reconstructive surgery, adhesions or fibrosis, or entrapment under alloplastic materials [9]. Our patient also had pre-operative diplopia on examination, and it has also been statistically shown that these patients are more likely to have post-operative diplopia [10]. In our patient, it may have been a combination of initial trauma to the muscle and residual swelling and edema that caused her diplopia to persist. However, as the edema and inflammation decreased, her vision returned to normal by six months.

3. Conclusion

This is the first case report, to our knowledge, of an inferior rectus entrapment in a medial orbital wall fracture. The importance of a thorough history and physical examination and CT evaluation were required to diagnose this patient. We believe that urgent diagnosis and surgical intervention ultimately contributed to the patient returning to her baseline vision. If there is entrapment with severe gaze restriction, we recommend surgical reduction to be completed as soon as possible.

Declaration of interests

The authors have no conflicts of interest to disclose. There were no sources of funding for this research. All authors have viewed and agreed to the manuscript submission. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5). Written informed consent was obtained from the patients for being included in this study and for the use of photographs.

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