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Case Report

Trapdoor Fracture in a Child Following a Domestic Accident: Case Report

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Abstract: The trapdoor fracture is a subtype of orbital fracture and is considered a rare condition that occurs primarily in children and adolescents. The treatment consists of surgery to access and remove the trapped tissue in the floor of the orbit that prevents the movement of the eyes on the affected side. The aim of this article is to present a case of a trapdoor fracture in a 4-year-old child who suffered a domestic accident and underwent surgery under general anesthesia to release the muscles trapped in the orbital floor. The postoperative outcome was considered excellent, with complete recovery of visual and aesthetic functions, without the need for reconstruction of the fractured region with any type of fixation material.

Keywords: Trapdoor fracture; Orbital fracture; Facial trauma.

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1. Introduction

Orbital fractures are relatively common in facial trauma, but the trapdoor fracture is rare and peculiar, especially in pediatric patients. It is characterized by a bone segment that displaces and becomes trapped like a "trapdoor," often imprisoning orbital tissue such as muscle or fat. Due to this entrapment, limited eye movement and diplopia are observed, causing serious functional and aesthetic damage [1]. In a study by the American National Trauma Database based on 12,739 cases of facial fractures in children conducted in 2008, orbital fractures were the least common, accounting for only 9% of cases. Mandibular (32.7%), nasal (30.2%), and maxillary/zygomatic complex fractures (28.6%) were the most common [2]. Previous studies have also indicated that orbital fractures tend to have the lowest prevalence among facial fractures in children, with their incidence varying according to age, sex, trauma etiology, and time of year, ranging from 5% to as high as 56% [3]. Boys aged 4 to 10 years are the most likely to present with orbital fractures, which are more common during the summer in outdoor activities such as sports accidents, falls, and traffic accidents.

Most orbital fractures in children are classified as greenstick or incomplete fractures due to bone composition and anatomical characteristics. The process of bone mineralization occurs mainly around the age of 3, transforming immature and elastic bone into mature and mineralized bone, allowing the pediatric facial skeleton to absorb trauma better and reducing the incidence of complete fractures [4, 5]. The treatment of this type of fracture in children has been widely discussed, with surgical intervention being the treatment of choice in most cases, making rapid and effective treatment imperative to avoid long-

term complications. Due to bone elasticity in pediatric patients and the stage of skeletal development and growth, the use of fixation and/or reconstruction materials is debatable and depends on the extent of the fracture [5, 6].

The aim of this article is to present a case of a trapdoor fracture in a 4-year-old child who suffered a domestic accident and underwent surgery under general anesthesia to release the muscles trapped in the orbital floor, restoring visual function and acuity.

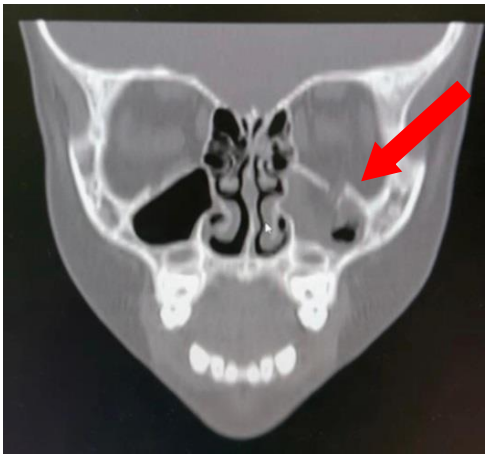
2. Case Report

A 4-year-old patient was seen in an outpatient clinic accompanied by his parents, who reported that their son was the victim of a domestic accident after slipping and hitting his eye on his father's knee. On the third day post-trauma, the patient was seen in the outpatient clinic with a history of nausea, vomiting, mild local pain, visual disturbance, and absence of upward movement of the left eye (Figure 1). Vasovagal symptoms such as vomiting, nausea, and headache are common findings due to facial trauma and the entrapment of soft tissues in the fracture, affecting the circulation in the region. During the physical examination of the facial bones, no signs of facial skeletal fracture, such as bone step-off, crepitation, or loss of continuity of the hard tissues, were detected. The bony structures of the upper, middle, and lower thirds of the face appeared intact with no clinical signs of edema, ecchymosis, or hematoma.

Figure 1. Left eye with limited upward movement. Clinically, the patient also presented with diplopia.

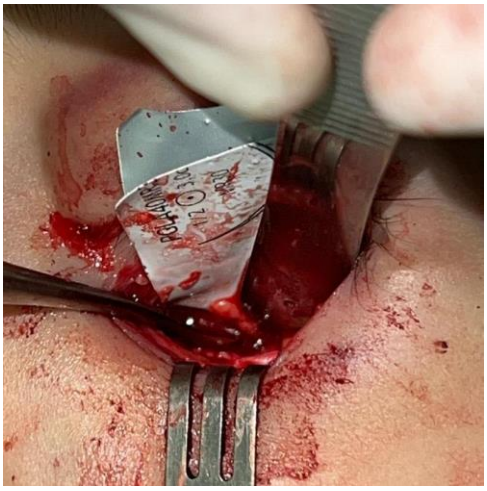
Considering the trauma history and the initial clinical characteristics, we opted for imaging examinations, and a computed tomography (CT) scan with coronal and sagittal sections of the child's face was performed to evaluate the bony structures. The imaging examination revealed a fracture of the left orbital floor with entrapment of the inferior rectus muscle and opacification of the left maxillary sinus, as shown in Figure 2 and indicated by the red arrow. These findings confirmed a trapdoor fracture of the left orbital floor, leading to the previously described clinical signs. With the fracture diagnosis established and after clearance from the neurology team, the case was classified as urgent, given the entrapment of vital structures in the fracture line, which could lead to local tissue necrosis due to the lack of blood supply.

Figure 2. Coronal CT scan showing a trapdoor fracture of the left orbital floor and opacification of the maxillary sinus.



After conducting laboratory tests and evaluation by the anesthesiology team, the surgical procedure under general anesthesia was initiated following orotracheal intubation in a hospital setting. Through a subciliary incision with a 15c blade and blunt dissection with scissors, the left orbital floor and fracture line were exposed by periosteal elevation and careful retraction of the eyeball, revealing the entrapment of muscular and fatty tissue. Using a Molt elevator, the muscular and fatty tissue was released from the fracture line (white arrow), and the area was cleaned with saline solution (Figures 3 and 4).

Figure 3. Rectus muscle and fat entrapped in the fracture line of the orbital floor. Using a Molt elevator, the muscular and fatty tissue was released from the fracture line (white arrow).



After evaluating the extent of the fracture line and the possibility of maintaining the tissues in their original anatomical positions, the surgical team decided not to reconstruct the area with any type of material, as there was no fragmentation of the bone tissue or loss of continuity. The surgical procedure was then concluded, and the access was sutured using the intradermal technique with 6-0 nylon sutures. The patient was discharged from the hospital 24 hours after surgery and showed satisfactory progress, with no diplopia and complete restoration of eye movements on the left side and consolidation of the fracture, as observed in clinical imaging and computed tomography 90 days postoperatively (Figures 5 and 6).

Figure 4. Release of the entrapped soft tissue without the need for reconstruction materials due to the integrity of the orbital floor.

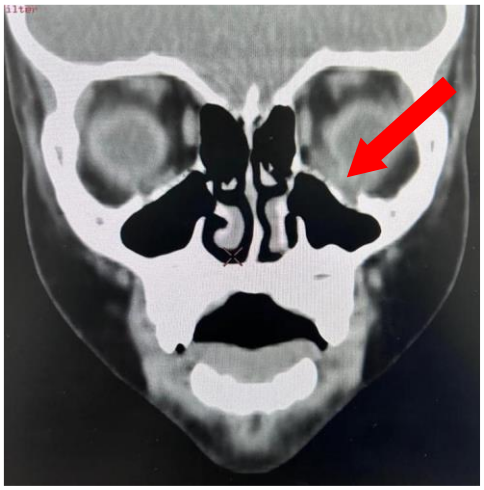
Figure 5. Three-month postoperative follow-up with complete functional recovery of the left eye, absence of diplopia, and a faint scar from the surgical access.

3. Discussion

The trapdoor fracture is an ophthalmic emergency due to the risk of muscle ischemia and impairment of ocular function caused by the entrapment of muscular and fatty tissue within the fracture line. Early intervention is crucial to avoid complications such as muscle fibrosis and persistent diplopia. Literature reviews reveal that most cases occur in children aged 8 to 15 years, often resulting from sports injuries or falls [1]. This article presents a rare but classic case of a trapdoor fracture in a child who suffered a domestic accident. Diplopia and limited ocular movements on the left side were observed, confirming tissue entrapment in the orbital floor. These clinical features provide important data and guide the professional to suspect this type of fracture, differentiating it from blowout fractures, where the entire structure of the eyeball collapses into the maxillary sinus and requires

reconstruction and/or fixation materials to restore the previous anatomy and functions [1, 4, 7].

Figure 6. Coronal CT scan image at 3-month postoperative follow-up. The arrow indicates fracture consolidation and absence of maxillary sinus opacification, with preservation of the orbital cavity structures.



Pediatric patients presenting with trapdoor or blowout fractures tend to exhibit vasovagal symptoms such as vomiting, nausea, and headache, which can be interpreted as a response to cerebral concussion after trauma and also due to the entrapment of soft tissues in the fracture, affecting circulation. Thus, emergency surgery becomes mandatory to avoid tissue necrosis [8]. The characteristics presented by the patient in this case corroborate the clinical findings described in the literature, prompting us to perform emergency surgery to eliminate the risks of tissue necrosis and permanent damage.

Considering the clinical findings, the forced duction test is fundamental for diagnosing and classifying the degree of the patient's limitation. Combined with imaging examinations, the professional will classify the severity of the orbital lesion and fracture and decide on the best course of treatment. The imaging exams of choice should be computed tomography and magnetic resonance imaging, even considering that such exams do not always confirm the fracture, as greenstick fractures may not be easily detected [5 ,8]. With the aid of computed tomography, as shown in Figure 2, we were able to confirm the type of fracture and the degree of soft tissue entrapment, leading to the decision for immediate surgical intervention to restore the patient's functions.

Surgery for treating trapdoor fractures is indicated in cases where the patient presents loss of function and/or diplopia. The subciliary approach is the most indicated, consisting of a linear incision with a 15 blade and dissection by planes until exposure of the periosteum. The periosteum is then incised, and the entire orbital floor should be exposed by retracting the eyeball with specific instruments to fully visualize the orbital fissure and fracture lines. The entrapped tissue should be carefully released, and in some situations, the use of a titanium mesh and/or graft harvested from the hip, skull cap, or ear cartilage is recommended [1, 6].

We always opt for the use of reconstruction, fixation materials, or grafts in cases where there is destruction and fragmentation of the orbital floor, which differs from classic trapdoor fractures where bone fragmentation is not observed, and the floor remains intact with only a fracture line entrapping the tissues. In the present case, we successfully opted only for tissue release and layered closure. Postoperative follow-up is mandatory, and typically the patient is discharged from the hospital on the first day after surgery and given full discharge after six months, when complete recovery of functions is achieved [1].

4. Conclusion

In conclusion, early diagnosis is essential in cases of orbital fracture in children, as it allows for proper identification and classification of the fracture through imaging exams, thus determining the urgency of treatment. In cases of trapdoor fractures, rapid surgical intervention is crucial to avoid tissue necrosis and preserve ocular functions. The use of fixation or reconstruction materials should be reserved for situations where there is bone fragmentation of the orbital floor and the need to support the structure within the orbital cavity, ensuring stability and functionality of the affected area.

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Research Ethics Committee Approval: We declare that the patient approved the study by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

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Conflicts of Interest: None.

Supplementary Materials: None.

References

1. Hermansson A, Nilsson J. Fraturas Orbitárias "White Blowout" (por explosão) ou "Trapdoor" (com encarceramento): Dificil de encontrar, importante tratar. IX Manual de otorrinolaringologia pediátrica da IAPO.
2. Imahara SD, Hopper RA, Wang J, et al. Patterns and outcomes of pediatric facial fractures in the United States: a survey of the National Trauma Data Bank. J Am Coll Surg 2008;207(5):710–6. Epub 2008 Aug 9. Erratum in: J Am Coll Surg.2009;208(2):325.
3. Bales CR, Randall P, Lehr HB. Fractures of the facial bones in children. J Trauma 1972;12(1):56–66.
4. Moore MH, David DJ, Cooter RD. Oblique craniofacial fractures in children. J Craniofac Surg 1990; 1(1):4–7.
5. Posnick JC, Wells M, Pron GE. Pediatric facial fractures: evolving patterns of treatment. J Oral Maxillofac Surg 1993;51(8):836–44 [discussion: 844-5].
6. Grant JH 3rd, Patrnely JR, Weiss AH, Kierney PC, Gruss JS. Trap door fracture of the orbite in a pediatric population. Plast Reconstr Surg. 2002;109:482-9.
7. Criden MR, Ellis FJ. Linear non displaced orbital fractures with muscle entrapment. J AAPOS. 2007;11:142-7.
8. Cohen SM, Garret CG. Pediatric orbital floor fractures: náusea/vomiting as signs of entrapment. Otolaryngol Head Neck Surg. 2003;129:43-7.