Transconjunctival Endoscopic Repair of a Trapdoor Blowout Fracture in a Child

Case Report

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Abstract

Even facial fractures are common in the pediatric population, and the management of blowout fractures contains various surgical methods. Here, we report a child with a blowout fracture handled with transconjunctival endoscopic repair (TCER). A 9-year-old girl was referred with complaints of left eye swelling and erythema after blunt trauma. Physical examination revealed enophthalmos, hypoesthesia in the left cheek, and restriction of left eye movements upwards and downwards. Computed tomography showed a left orbital blowout fracture with herniation of the inferior rectus muscle and soft tissue into the maxillary sinus. TCER was performed. The patient's eye movements were normal one month after surgery. TCER of the orbital floor is a minimally invasive approach with no visible scar, small incision, less trauma to the orbital tissues, and a clear view of the surgical area. It can be used as a safe and successful alternative for orbital floor repair in the pediatric population.

Keywords: Maxillofacial trauma, orbital fractures, maxillofacial surgery, endoscopic repair, pediatric otorhinolaryngology, case report

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Introduction

Facial fractures are common after trauma in the pediatric population, and fractures of the orbital walls are one of the most common facial fractures (1-3). Fracture of the orbital floor with an intact infraorbital rim is referred to as a "blowout fracture". It may occur as an isolated fracture or with naso-ethmoid complex fractures. This fracture causes protrusion of orbital content into the maxillary sinus and causes symptoms such as enophthalmos, ophthalmoplegia, numbness due to infraorbital nerve injury, asymmetry of the face, and diplopia (1-8). The management of orbital floor fractures is, therefore, crucial.

Case Presentation

A 9-year-old girl presented with left eye swelling and erythema after blunt trauma in the pediatric emergency clinic and was referred to the department of otorhinolaryngology with a facial trauma. The patient had a blunt trauma by a swing nearly 12 hours ago. She had a nosebleed that was stopped spontaneously, but the eye swelling continued, and she started to have diplopia and nausea. Physical examination revealed an injured mucosa

at the anterior septum on the left side and left eyelid swelling. After the opening of the eyelid, light reflexes were normal on both sides, and visual acuity was checked as normal with finger counting. Eye movement restriction was seen with upward and more in downward gaze, and enophthalmos was detected. Paresthesia of the infraorbital nerve distribution was detected. Urgent maxillofacial computerized tomography showed a left orbital floor fracture (blowout fracture) with herniation of the inferior rectus muscle and soft tissues into the maxillary sinus (Figure 1).

Surgical intervention with a minimally invasive endoscopic approach was planned. Under general anesthesia, a small transconjunctival incision was done (Figure 2a), with a 0-degree endoscope. The periosteum of the inferior orbital rim was identified and elevated under endoscopic vision. Subperiosteal elevation continued posteriorly, and a trapdoor defect with an entrapped inferior rectus muscle was seen clearly with the endoscope (Figure 2b). Fracture lines involving the infraorbital canal and causing paresthesia at the left maxillary side, entrapped muscle and soft tissues were released under endoscopic vision carefully (Figure 2c). With a brain retractor, all orbital content was gently retracted superiorly, orbital defect edges were exposed with scope, and reconstruction was done. Since the defect was not larger than 30% of the orbital floor, we decided to reconstruct it with a synthetic acellular collagen dura patch. A dura patch nearly two times larger than the defect area was prepared and inserted under endoscopic vision (Figure 2d), and all retractors were released. The transconjunctival incision was sutured. Forty mg prednisolone was administered intravenously to reduce the orbital tissue edema. The patient had antibiotic eye drops three times daily for one week.

Five days after surgery, eye movements were already better, and upward gaze improved, but the patient still had diplopia and pain with eye movements (Figure 3.a,b). One month after surgery, the patient had normal eye movement with functional training, and diplopia was resolved completely. Written informed consent was obtained from the parents of the patient for the publication of this case report and the accompanying images.

Discussion

Due to the elasticity of bone in the pediatric population, a specific type of orbital floor fracture known as a "trapdoor fracture" can occur. This fracture results when the inferiorly displaced broken bone attempts to return to its original position, leading to entrapment of orbital contents within the fracture line (2). If an extraocular muscle becomes entrapped, it may cause restricted eye movements, diplopia, and the oculocardiac reflex (manifested as nausea, vomiting, and bradycardia) (2,6-8).

There are different approaches described in literature, such as transcaruncular, subciliary, and transconjunctival, and trans maxillary approaches. To avoid cutaneous incisions and external scars on the face, the transconjunctival approach is the best method, especially in pediatric cases. Still, a risk of lower eyelid retraction and ectropion may rarely occur (9,10). Surgical indications for orbital floor fractures are

Figure 1. Maxillofacial computed tomography coronal sections show fracture lines with herniated orbital content and entrapped inferior rectus muscle. Close relationship with infraorbital canal (white arrow: fracture line, black arrow entrappedorbital soft tissues and muscle)

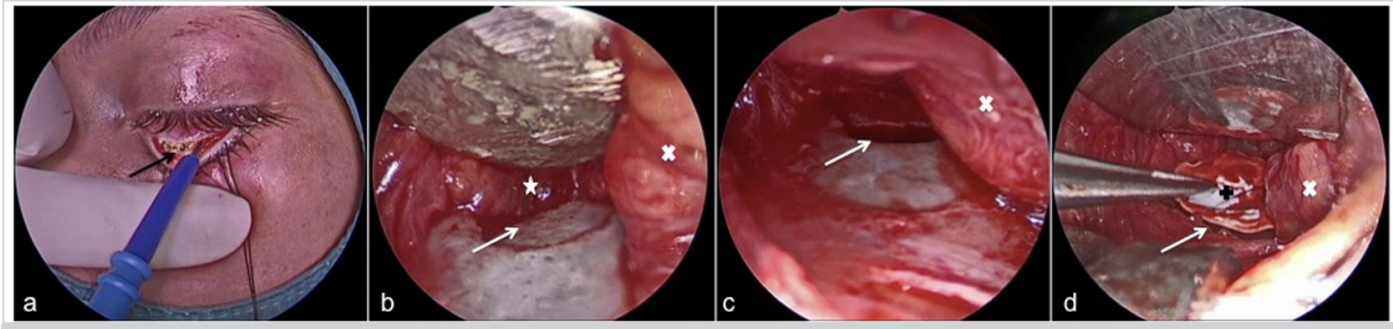

Figure 2. Intraoperative view **a.** transconjunctival incision **b.** endoscopic view of fracture line, trapdoor fracture and entrapped muscle **c.** endoscopic view after release of entrapped tissues and full edges of bony defect **d.** repair with an acellular collagen dura patch (black arrow: incision, white arrow: trap-door fracture, white star: entrapped muscle, x: orbital fat, +:acellular collagen graft)

Figure 3. a. Preoperative eye examination eye movement limitations with infraorbital erythema **b.** Postoperative early outcome (5 days later): better eye movements with no visible scars but still some discomfort in eye movements.

limitations of eye movement, enophthalmos, bony defects in the orbital floor, and herniation of orbital-periorbital content (5,6,8,9). If oculo-cardiac reflex occurs due to a trapdoor fracture, an urgent intervention is required (8,9). Most surgeons favor earlier intervention in the pediatric age group. Late interventions may affect facial development and vision. Multiple studies showed that early intervention (in 48 hours after trauma) may result in improved eye motility in the long-term (5,6,8,9). Surgical intervention aims for reconstruction of the fracture side (revision of fractured bone or using graft for bony defect), release of herniated, entrapped tissue (6-10). Chang et al. (10) reported a series of adult and pediatric patients with combined medial and inferior wall fractures repaired with transcaruncular and transconjunctival approaches. Koryczan et al. (4) reported a series of pediatric patients with blowout fractures and concluded that the severity of posttraumatic enophthalmos does not affect surgical outcomes and that transconjunctival access is the optimal approach in children. Broyles et al. (8) had a large series with 72 pediatric patients and stated that surgical intervention improves enophthalmos but won't affect visual outcomes if there is visual acuity. The study also showed that patients with only mild enophthalmos without any other findings could be managed conservatively. Valente et al. (9) reported a 1-year-old case in which they performed a transconjunctival approach under direct vision and showed early intervention is crucial in the pediatric population due to lack of proper expression of their complaints and to achieve the best outcome.

Endoscopes are primarily used for combined endonasal and open approaches to address inferior orbital wall and medial wall fractures. Although the transconjunctival approach allows direct visualization, our case demonstrates that use of endoscopes offers advantages, including a smaller incision, a clear view of bony defect edges, minimally invasive release of entrapped muscle, and precise graft positioning.

Various materials are suitable for bony reconstruction in the pediatric population, including autologous bone, resorbable materials, and non-resorbable materials (2-4,6,8). Non-resorbable materials may interfere with the normal growth of the facial skeleton and should be used with caution. In our case, an acellular collagen graft provided effective mechanical support for the orbital soft tissues.

Conclusion

Endoscopic transconjunctival repair of the orbital floor is a minimally invasive approach that leaves no visible scar, requires a small incision, causes less trauma to orbital tissues, and offers a clear view of the entire surgical field. It represents a safe and effective alternative for orbital floor repair in the pediatric population.

Main Points

- Orbital fractures are common following maxillofacial trauma in children.
- Pediatric orbital floor fractures require early diagnosis and treatment to achieve the best functional outcome.
- We presented a blowout fracture treated with transconjunctival endoscopic repair in the pediatric population.
- Endoscopic transconjunctival repair of the orbital floor is a minimally invasive treatment with clear visibility of the whole surgical area.
- It may be used as a safe and successful alternative surgical method for orbital floor repair in pediatric population.

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