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CASE REPORT

Endoscopic endonasal-transantral surgery for an isolated orbital floor blow-out fracture in a pediatric patient

Bir çocuk hastada izole orbita tabanı blow-out kırığının endoskopik endonazal-transantral cerrahi ile tedavisi

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Orbital floor blow-out fractures occur due to blunt trauma causing displacement of orbital contents to the maxillary sinus while the orbital rim is intact. Surgical repair of these fractures includes transantral, transorbital, or endoscopic endonasal approaches with or without implant use. We report a 12-year-old boy who presented with diplopia after blunt trauma to the head while playing football. Computed tomography revealed a left isolated orbital blow-out fracture. The patient was treated by a combined endoscopic endonasal-transantral approach and stability was restored with a urethral balloon catheter following endoscopic reduction of the fracture. Healing of the orbital floor was confirmed by an early computed tomography scan. This technique restores eye volume and function without the use of external incisions or implants.

Key Words: Balloon dilatation; child; endoscopy; fracture fixation/methods; orbital fractures/surgery.

Orbita tabanı blow-out kırıkları, künt travma sonrası orbital rimin salim kalıp, orbita içeriğinin maksiller sinus içine yer değiştirmesi sonucu oluşur. Bu kırıkların cerrahi tedavisi transantral, transorbital veya endoskopik endonazal yaklaşımlarla, implant kullanarak veya kullanmadan yapılabilir. On iki yaşında erkek hasta, futbol maçı sırasında başta künt travma sonucu oluşan diplopi nedeniyle başvurdu. Bilgisayarlı tomografide sol blow-out kırığı saptandı. Kombine endoskopik endonazal-transantral yolla tamir yapılan hastada üretral balon kateter ile destek sağlandı. Hastanın erken tomografik kontrolünde orbita tabanının iyileştiği görüldü. Bu yöntem, temel amaç olan göz hacmi ve fonksiyonunun korunmasını, harici kesiler ve implantlar kullanılmadan sağlayan bir tekniktir.

Anahtar Sözcükler: Balon dilatasyonu; çocuk; endoskopi; kırık tespiti/yöntem; orbital kırık/cerrahi.

The term "blow-out fracture" was introduced to the medical literature by Smith and Regan[1] to describe orbital floor fractures due to a sudden increase in intraorbital pressure with an intact orbital rim. Orbital blow-out fractures commonly occur due to blunt trauma to the eye by an object transmitting the force to the globe rather than to the orbital rim as in the classic example of a tennis ball or a fist striking the periorbital region and causing fracture of the paper-thin bone of the orbital floor. Clinical findings include enophthalmos, diplopia, and hypoesthesia over the distribution of the infraorbital nerve.[1-3]

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Enophthalmos is usually difficult to observe in the early period when the eyelids and periorbital areas are still swollen. Fractured orbital floor traps the inferior rectus and inferior oblique muscles, restricting the eye and its mobility and causing double vision in the upward gaze.[4] If eye muscles remain trapped for more than four weeks, fibrosis occurs and treatment to improve eye mobility is usually unsuccessful. Patients ignoring initial medical treatment may come later with enophthalmos and restricted eye movements on upward gaze.[4]

CASE REPORT

A 12-year-old boy was admitted to the emergency department with diplopia after blunt trauma to the head during a football match. He had minimal edema and ecchymosis of the left eye with hypoesthesia on the distribution of the infraorbital nerve. Enophthalmos was not apparent. Ophthalmologic examination revealed significant diplopia on upward gaze with normal sight. There was significant restriction of eye movements in the left eye on the Hess screen test. Coronal computed tomography (CT) revealed a left orbital blow-out fracture (Fig. 1). A combined endonasal-transantral endoscopic repair was planned under general anesthesia. At the beginning of the operation, restriction in the eye motility was evaluated and graded by forced duction test by the ophthalmology team. A 4-mm trocar was introduced through the canine fossa to validate the CT findings and later to be used as an access site during surgery. Examination of the orbital floor showed the fractured orbital floor in a trap-door fashion and protrusion of orbital contents (Fig. 2a). Uncinectomy was performed and the maxillary ostium was gently

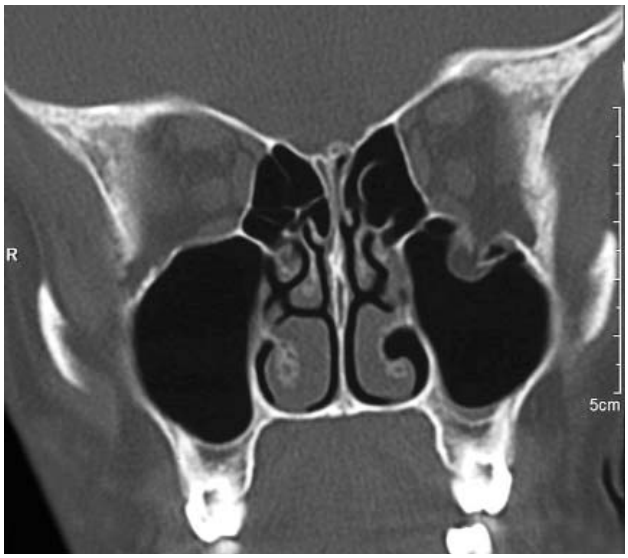

Fig. 1 - *Preoperative coronal CT scan showing fractured orbital floor and herniated orbital contents.*

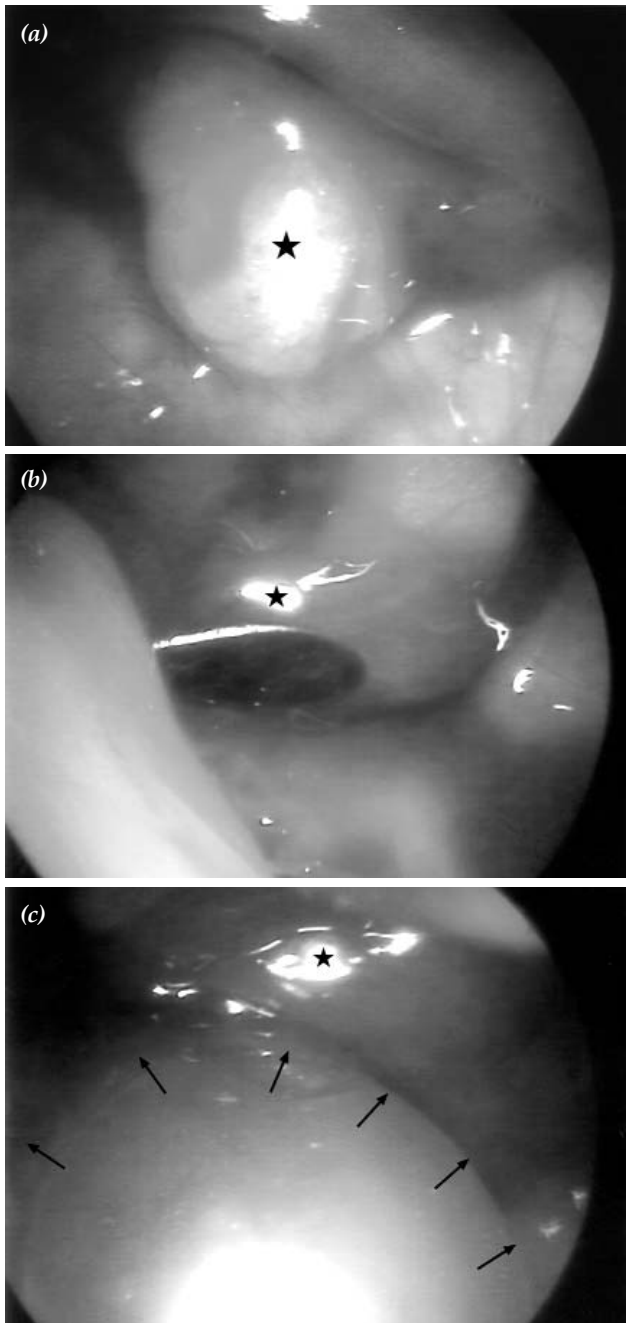

Fig. 2 - *Endoscopic views of maxillary sinus through the trocar in canine fossa:* ***(a)*** *Fractured orbital floor in a trap-door fashion and protrusion of orbital contents.* ***(b)*** *Angled instrument replacing the orbital contents back to the orbit.* ***(c)*** *Urinary catheter balloon filled with water, stabilizing the fractured site (∗ : herniated orbital contents; arrows delineate the contours of the balloon).*

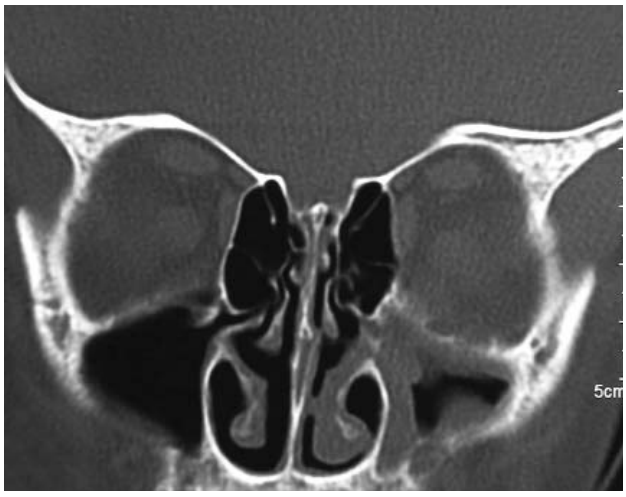

Fig. 3 - *Postoperative control CT scan demonstrating restoration of the orbital floor.*

enlarged just adequate for angled instruments to pass and for illumination and endoscopic visualization. A widely enlarged ostium may cause impairment of the lymphatic drainage; furthermore, excessive enlargement in the anterior direction would inevitably result in damage to the lacrimal apparatus in children. Thus, we preferred to enlarge the ostium minimally. Considering technical difficulties in using angled instruments and angled endoscopes simultaneously through a small space in the pediatric nose, we preferred to use two access points, namely, the transantral and maxillary sinus ostium routes. Angled instruments were introduced through the ostium, while a 0° endoscope was introduced through the trocar. Angled instruments were used to gently handle the fractured bones and replace the orbital contents back to the orbit (Fig. 2b). The balloon of a urethral catheter was inserted through the ostium while the orbital floor was supported by an elevator. Then the balloon was filled with water till it suspended and stabilized the fractured site (Fig. 2c). Forced duction test was repeated to evaluate the mobility of the globe at the end of the operation, and significant improvement was documented. It also helped us estimate the volume of the water necessary to inflate the balloon and avoid overinflation that might increase the intraorbital pressure. After the operation, the patient recovered consciousness and it was apparent that his eyes were free to move in every direction and diplopia was no longer present. The Hess screen test showed total correction. Postoperative prophylactic antibiotics were prescribed and the patient was discharged the following morning. The balloon catheter was left in the sinus for three weeks, after which the balloon was deflated and removed under topical anesthesia upon detection of normal eye motility in all directions. Restoration of the orbital floor was observed on an early control CT scan (Fig. 3).

DISCUSSION

Management of orbital blow-out fractures is controversial. Results of a survey conducted among fellows of the British Association of Oral and Maxillofacial Surgeons showed that many controversies existed.[5] Even there was no consensus on the use of prophylactic antibiotics, 91% of the participants prescribed postoperative antibiotics, and over half of the respondents prescribed steroids. In our case, we prescribed prophylactic antibiotics but did not use steroids. The most commonly used imaging technique was CT. Ophthalmologic consultation was obtained by 60%, and visual acuity was assessed by 65% of respondents. We routinely ask for ophthalmologic consultation in these patients to evaluate visual acuity and to document restriction in eye movements, which we believe to be important on medicolegal grounds. More than half of the respondents preferred surgery 6 to 10 days after trauma. We prefer to operate early when possible. In the survey, surgical routes to the orbital floor were subciliary (41%), infraorbital (37%), subciliary-infraorbital (11%), transconjunctival (7%), and mid-lower eyelid (3%) approaches. Silicone elastomer was the most commonly used implant material (66%).[5] Porous polyethylene is another implant material used for traumatic orbital floor defects.[6]

Each surgical approach has inherent pros and cons. Subciliary incision is associated with high rates of persistent ectropion especially in the elderly and scleral show.[7] Mid-lower eyelid incision provides good access to both the medial wall and floor of the orbit with minimal scarring and rapid approach.[8] Thus, it is convenient to combine the advantages of infraorbital incision (no ectropion or scleral show) with those of subciliary incision (in particular minimal scarring).[7] Although the subconjunctival approach is associated with an invisible scar, it provides limited access unless a lateral canthotomy is performed.[8,9] In the presence of pronounced restriction to upward and downward gaze, early surgical intervention within a few days of trauma is advocated in children with blow-out fractures, even if they have minimal soft tissue signs, minimal disruption of the floor on radiological examination, and no enoph-

thalmos.[10] Gatot and Tovi[11] described a transantral window route for repair and balloon catheter for stabilization in children with blow-out fractures. Ikeda et al.[12] described endoscopic endonasal repair of orbital floor fractures combined with the use of a urethral balloon catheter for stabilization. Our method is a combination of these two techniques, utilizing advantages of both while minimizing complications. Using a 4-mm trocar reduces the risk for damage to the infraorbital nerve and tooth roots. Avoiding a classical antral window prevents further developmental problems such as hypoplastic maxillary sinus and midfacial deformities. Minimally enlarged ostium has the above-mentioned advantages in children. We believe that our technique, combined endonasal-transantral endoscopic repair, is practical with a low complication risk. Compared with open surgeries, avoiding both external incisions and use of foreign implant materials such as silicone is advantageous.

We believe that combined endoscopic endonasal-transantral surgery with the use of a urethral balloon catheter to stabilize the fracture site is an appropriate alternative for the treatment of orbital blow-out fractures in pediatric patients.

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