



## Surgical treatment of orbital floor blowout fracture in children: A case report

Hirurško lečenje *blowout* preloma poda očne duplje kod dece

Saša Z. Tabaković\*, Ivana Ilić Dimitrijević†

\*Clinic of Maxillofacial Surgery, Department of Dentistry, Faculty of Medicine, University of Prishtina with temporary seat in Kosovska Mitrovica, Kosovska Mitrovica, Serbia; †Department of Maxillofacial Surgery, Faculty of Dentistry, University of Belgrade, Belgrade, Serbia

### Abstract

**Introduction.** Orbital floor blowout fracture is a common traumatic lesion of the craniofacial complex, but rarely in children population, consequently representing challenge in surgical treatment. Timely diagnosis and surgical treatment prevent the probability of the occurrence of the functional complications. **Case report.** We presented surgical treatment of on 8-year-old girl with a blowout orbital floor fracture one month after the injury. The predominant symptoms were: ocular bulb motility disorder with consecutive strabismus and double vision. Orbital floor reconstruction was made by an autogenous mandibular symphyseal graft. A year after the orbital floor reconstruction additional correction of strabismus was performed due to functional disorder of the bulbomotor muscles. **Conclusion.** Delayed surgical treatment of blowout orbital floor fracture in children leads to unsatisfactory functional results in the majority of cases. In such a situation surgical correction of strabismus is necessary in order to obtain functionally quality vision and satisfactory aesthetic appearance.

### Key words:

orbital fractures; diagnosis; child, ophthalmologic surgical procedures; treatment outcome.

### Apstrakt

**Uvod.** *Blowout* prelom poda očne duplje česta je traumatska lezija kraniofacijalnog kompleksa, međutim, retka u dečijoj populaciji, tako da predstavlja terapijski izazov. Blagovremenom dijagnozom i hirurškim lečenjem, sprečava se mogućnost nastanka funkcionalnih komplikacija. **Prikaz bolesnika.** U radu prikazano je lečenje osmogodišnje devojčice sa *blowout* prelomom poda očne duplje mesec dana posle povrede. Dominantni simptomi bili su: poremećaj motiliteta očnog bulbosa sa prisutnim strabizmom i diplopijom. Rekonstrukcija defekta poda orbite urađena je autogenim koštanim transplantatom simfizne regije mandibule. Godinu dana posle rekonstrukcije poda orbite urađena je dodatna korekcija strabizma zbog funkcionalnog poremećaja bulbomotornih mišića. **Zaključak.** Kasno hirurško lečenje *blowout* preloma poda orbite kod dece najčešće ne daje zadovoljavajuće funkcionalne rezultate. Kod najvećeg broja bolesnika, neophodna je hirurška korekcija strabizma kako bi se omogućio funkcionalno kvalitetan vid i estetski zadovoljavajući izgled.

### Ključne reči:

orbita, prelomi; dijagnoza; deca; hirurgija, oftalmološka, procedure; lečenje, ishod.

### Introduction

Injuries of the craniofacial region in children are not frequently found<sup>1</sup>. Blowout orbital fractures create less than 10% of injuries of facial skeleton in the pediatric population<sup>2</sup>. Fractures of the floor and the inner orbital wall are the most frequent fractures sites<sup>1,3</sup>.

Bulbar conjunctiva ecchymosis, periorbital hematoma, diplopia, enophthalmos and paresthesia of the infraorbital nerve distribution are the commonest symptoms of blowout orbital floor fracture<sup>4</sup>. The defect results in herniation of the

periorbital fatty tissue and bulbomotor muscles to the maxillary sinus. Incarceration (entrapment) of the periorbital tissue leads to ischemia, atrophy and scarring on the bulbomotor muscles, resulting in motility disorder of ocular bulb as well as esthetic problems.

Due to the craniofacial disproportion of the medial facial massif, underdevelopedness of the maxilla and paranasal cavities as well as protrusion of the frontal region, blowout fractures of the orbital floor are very rare in children below 8 years of age<sup>5</sup>.

The young bone is rich in osteoblasts making it elastic and less fragile. Due to the greater elasticity of the bones in

children, the orbital floor fracture appears more in the form of a linear fracture – “trapdoor” and less in the form of “blowout” fracture with defect. If a fracture is not treated on time, serious complications may occur such as bulb motility with the presence of diplopia and enophthalmos. Contrary to children, in adults, where the bone is more fragile, fractures with comminution are present more frequently<sup>6</sup>.

Adequate diagnosis and successful treatment require, in addition to clinical examination, pre-operative computed tomography (CT) with 3D-CT reconstruction of the orbit and ophthalmological Hess-Lancaster test.

Opinions differ as to the indications and time of surgical treatment, operative approach and material used for reconstructive defects in blowout fractures<sup>7</sup>. Good clinical results, in the sense of corrected ocular motility disturbance, diplopia and enophthalmos are achieved if the surgical treatment is carried out within maximum 7 to 10 days after the injury. This standpoint pertains to blowout orbital floor fractures in adults. If the treatment is not carried out within 24 to 72 hours after injury in children, the risk of functional and cosmetic complications is much higher<sup>8,9</sup>.

### Case report

An 8-year-old girl underwent treatment of orbital floor blowout fracture one month after the injury. Medical records were obtained heteroamnesticly, provided by parents. Two weeks after the injury, motility restriction of the left ocular bulb was observed. The patient was referred for further treatment based on suspicion of a posttraumatic dysfunction of the bulbomotor muscles within blowout fracture.

On clinical examination convergent strabismus was present with disturbance of the left ocular bulb motility (Figure 1).



**Fig. 1 – Globes position before surgical treatment.**

Double vision (diplopia) was present on upward and left gaze. Enophthalmos was evident in addition to infraorbital nerve paresthesia. Fracture with an orbital floor defect on the left side was diagnosed by CT with 3D reconstruction (Figure 2).



**Fig. 2 – Computed tomography (CT) of the orbit showing left orbital floor fracture.**

Ophthalmological examination (Hess-Lancaster test) also confirmed the dysfunction of the bulbomotor muscles with a limited elevation which was pronounced in the medial position and adduction.

After the preoperative preparation, exploration of the orbital wall was performed under general endotracheal anesthesia by subciliary approach. Prolapse-herniation of the periorbital fatty tissue and muscles (*m. rectus* and *m. obliquus inferior*) into the maxillary sinus area was established (Figure 3).



**Fig. 3 – Prolapse of the orbital tissue.**

The periorbital fatty tissue, muscles and fibrous adhesions were released by blunt preparation taking care of the infraorbital nerve. The defect in the medial orbital floor area was about 0.5 × 1cm. The reconstruction was done by an autogenous mandibular symphyseal graft. The size of the bone graft was 1 × 1.5 cm, 2–3 mm thick, which represented a safety margin in the zone of the permanent teeth germs (Figure 4).



**Fig. 4 – Donor site after symphyseal graft harvesting.**

The bone graft was placed with the peripheral edges positioned minimum 3 mm from the edge of the orbital floor defect on a firm bone (Figure 5).



**Fig. 5 – Insertion of the autogenous mandibular symphyseal graft.**

One month following the operation the patient did not feel paresthesia of infraorbital nerve. Diplopia was present even after six months with a manifest alternating strabismus. The patient was referred to the ophthalmologist for continuation of the treatment. Surgical correction of strabismus was performed and bulb motility established (Figures 6 and 7).



**Fig. 6 – Globes position after retroposition of bulbomotor muscles.**



**Fig. 7 – Globes position on upward gaze.**

## Discussion

Similar to adults, orbital floor fracture in children causes the ocular bulb motility disturbance accompanied by diplopia and enophthalmos. The disturbance is a result of incarceration of the orbital contents and bulbomotor muscles. Surgical treatment includes releasing of orbital tissue and muscle entrapment and reconstruction of the orbital floor.

The retrospective study of Gerber et al.<sup>10</sup> including 24 patients with orbital floor fractures (mean age of 13.5 years) show that isolated injury occurred in 14 (58%) cases while the other 10 (42%) had a compound fracture. Also, 11 (46%) patients had a trapdoor fracture and 9 (38%) a blowout fracture. Almost all the patients (n = 22) were treated surgically with the mean time of 4 days after the injury. A better postoperative result was observed in those operated on the first day following the trauma. As a consequence of the injury, diplopia remained in 6 out of 11 patients with trapdoor fracture, as well as limited bulb motility in 3 patients. Out of 9 patients with blowout fracture, secondary enophthalmos was registered in one and paresthesia in three. Regardless of the type of fracture the authors conclude that surgical treatment within the fourth day from the injury gives better postoperative results in children<sup>10</sup>.

The other authors present similar results, i.e. surgical treatment of blowout fracture of the orbital floor in children give best results if treatment takes place before the seventh day after the injury<sup>9</sup>.

Entrapment of the periorbital fatty tissue and bulbomotor muscles is present in orbital floor fracture. As a result of poor development of the periorbital fatty tissue in children, lesions of muscles (*m. rectus* and *m. obliquus inferior*) are more frequent in children than in adults. Considering that entrapment causes shortening of the muscle which leads to bulb motility disturbance and diplopia, the release of the entrapped muscles is vital as this prevents their dysfunction caused by ischemia and scarring<sup>11</sup>. Reconstruction of the orbital floor also prevents the possibility of secondary enophthalmos which can cause functional as well as cosmetic problems. The bulb motility disturbance after surgery can also be improved conservatively – by functional orthoptic exercises. When orthoptic exercises do not give satisfactory results, surgical correction of bulbomotor muscles is required<sup>12</sup>.

Cases describing orbital floor reconstruction in children with an autogenous mandibular symphyseal graft are very

rare although they gave excellent results. Because of the corticocancellous nature of the graft which insures stability and less susceptibility to resorption, the absence of immune reaction, the possibility of occurrence of secondary enophthalmos is minimized. Also, no deformities in the donor region remained and continuity of the mandible is preserved. However, disturbance of sensitivity of the mental nerve (*n. mentalis*) is possible. To prevent that complication, it is extremely important to avoid strong retraction of the mucoperiosteal flap and the soft tissues during surgery<sup>13</sup>.

The presented reconstruction of the orbital floor with an autogenous mandibular symphyseal graft, prevented the appearance of secondary enophthalmos, and paresthesia of the infraorbital nerve disappeared a month after the surgical treatment. The vitality of the teeth in the donor region was completely preserved. However, bulb motility disturbance and diplopia remained as the consequence of fracture. Due to the limited elevation of the ocular bulb, orthoptic exercises were conducted, which did not yield results in improved motility and elimination of diplopia. The Hess-Lancaster test was conducted six months after the surgical treatment and has showed a dysfunction of the bulbomotor muscles which resulted in alternating strabismus. Because of that, the patient underwent surgical correction of strabismus by the ophthal-

mologist. Bulb motility was established by bilateral retro-positioning of the internal rectus muscle (*m. rectus internus*). Functional correction also achieved a satisfactory cosmetic result.

### Conclusion

Timely diagnosis and surgical treatment of blowout fracture of the orbital floor in children can prevent complications such as disturbance of binocular vision leading to diplopia. Releasing of the periorbital tissue with reconstruction of the orbital floor in children, should be done as soon as possible, within the first 3 days after the injury. Surgery done later may not give satisfactory results in most of the cases. In the presented case, surgical correction of bulbomotor muscles was necessary in order to improve functional quality vision, as well as to provide satisfactory aesthetic appearance.

The orbital floor can be reconstructed successfully with autogenous mandibular symphyseal graft. Enough bone could be collected avoiding injury of teeth roots or teeth buds in the symphyseal region without deformities in the donor region. Complications like mental nerve paresthesia are rare if careful retraction of the mucoperiosteal flap was used.

### R E F E R E N C E S

1. Kaban LB, Mulliken JB, Murray JE. Facial fractures in children: an analysis of 122 fractures in 109 patients. *Plast Reconstr Surg* 1977; 59(1): 15–20.
2. Posnick JC, Wells M, Pron GE. Pediatric facial fractures: evolving patterns of treatment. *J Oral Maxillofac Surg* 1993; 51: 836–44.
3. Koltai PJ, Amjad I, Meyer D, Feustel PJ. Orbital fractures in children. *Arch Otolaryngol Head Neck Surg* 1995; 121(12): 1375–9.
4. Jović N, Cvetinović M, Mirković Z. Fractures of the zygomaxillary complex: indications for exploration and reconstruction of the orbital floor. *Vojnosanit Pregl* 1992; 49(4): 330–4. (Serbian)
5. Anderson PJ, Poole MD. Orbital floor fractures in young children. *J Craniomaxillofac Surg* 1995; 23(3): 151–4.
6. Jordan DR, Allen LH, White J, Harvey J, Pasbby R, Esmali B. Intervention within days for some orbital floor fractures: the white-eyed blowout. *Ophthal Plast Reconstr Surg* 1998; 14(6): 379–90.
7. Kwon J. Update in treatment of orbital blowout fractures. *Korean J Otorhinolaryngol Head Neck Surg* 2011; 54: 317–23.
8. Ning Chia W, Lib M, Shu Ya W, Fu Rung Y, Yueh Ju T. Orbital Blow-out Fractures in Children: Characterization and Surgical Outcome. *Chang Gung Med J* 2010; 33(3): 313–20.
9. Eibunandan M, Evans BT. Linear trapdoor or "white-eye" blowout fracture of the orbit: not restricted to children. *Br J Oral Maxillofac Surg* 2011; 49(2): 142–7.
10. Gerber B, Kivanuka P, Dharival D. Orbital fractures in children: a review of outcomes. *Br J Oral Maxillofac Surg* 2013; 51(8): 789–93.
11. Neinstein RM, Phillips JH, Forrest CR. Pediatric orbital floor trapdoor fractures: outcomes and CT-based morphologic assessment of the inferior rectus muscle. *J Plast Reconstr Aesthet Surg* 2012; 65(7): 869–74.
12. Nishida Y, Hayashi O, Miyake T, Kakinoki M, Yoshida K, Inami T, et al. Quantitative evaluation of ocular motility in blow-out fractures for selection of nonsurgically managed cases. *Am J Ophthalmol* 2004; 137(4): 777–9.
13. Anitha GL, Mabeswari G, Sethurajan B. Mandibular symphysis graft versus iliac cortical graft in reconstructing floor in orbital blow out fracture: A comparative study. *Ann Maxillofac Surg* 2012; 2(1): 24–9.

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