

Acute traumatic orbital encephalocele related to orbital roof fracture: reconstruction by using porous polyethylene

Orbita tavan kırığına bağlı gelişen akut travmatik ensefalosel: Porlu polietilen ile rekonstrüksiyon

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A case report of acute traumatic orbital encephalocele related to orbital roof fracture and its management were presented. Acute traumatic encephalocele related to orbital roof fracture is unusual. Early diagnosis and treatment are very important since the raised intraorbital pressure may irreversibly damage the optic nerve. Orbital computerized tomography with thin axial and coronal sections should be performed in an acute traumatized patient with a concurrent orbital trauma. Reconstruction of the orbital roof is the key step of the surgical treatment and should be performed in every case. Porous polyethylene (Medpor®) has been used for many years in reconstructive surgeries and it is superior to other allografts in many ways. In our case, the orbital roof reconstruction was done by Medpor® and the early and late cosmetic results were excellent. The important features of acute traumatic encephalocele secondary to orbital roof fractures in terms of presentation, diagnosis and surgical steps were also stressed.

Key Words: Computed tomography; Medpor; orbital roof fracture; porous polyethylene; traumatic encephalocele.

Bu yazıda, orbita tavan kırığına bağlı bir akut travmatik orbital ensefalosel olgusunun tanı ve tedavisi sunuldu. Orbita tavan kırığına bağlı akut travmatik ensefalosel nadiren rastlanır. Artmış intraorbital basınç, optik sinirde geri dönüşümsüz hasara neden olabileceği için bu olgularda erken tanı ve tedavi çok önemlidir. İnce kesitli aksiyel ve koronal orbita bilgisayarlı tomografi incelemesi, orbita travmasının eşlik ettiği tüm akut travmalı hastalara uygulanmalıdır. Bu olguların cerrahi tedavisinde orbita tavan kırığının tamiri en önemli basamaktır ve mutlaka yapılmalıdır. Porlu polietilen (Medpor®) birçok açıdan diğer allogreftlere üstünlüğü olan ve uzun yıllardır rekonstrüksiyon ameliyatlarında kullanılan bir materyaldir. Sunulan olguda orbita tavan rekonstrüksiyonu Medpor® kullanılarak yapıldı, erken ve geç dönemde mükemmel sonuçlar elde edildi. Orbita tavan kırığı sonrası gelişen akut travmatik ensefaloselin başvuru tablosu, tanı ve cerrahi basamakları hakkındaki önemli noktalar vurgulandı.

Anahtar Sözcükler: Bilgisayarlı tomografi; Medpor; orbita tavan kırığı; porlu polietilen; travmatik ensefalosel.

Orbital roof fractures secondary to blunt trauma are rarely encountered,^[1,2] and acute traumatic encephaloceles related to orbital roof fractures are even rarer. Early diagnosis and treatment, including the reconstruction of the orbital roof, are very important for preventing permanent neurological injury. We present the results of an acute traumatic orbital encephalocele case in whom the reconstruction of the orbital roof was done by using porous polyethylene sheets (Medpor®, Porex Surgical Inc., GA, USA), which to our knowledge has not been reported previously.

CASE REPORT

This 1.5-year-old boy was admitted to our emergency clinic following a motor vehicle accident. The automobile in which he was travelling had struck another vehicle and his head and left eye impacted the windshield. Neurological examination revealed that he was unconscious with a Glasgow Coma Scale (GCS) score of 10 (Motor [M] response: 5, Verbal [V] response: 3, Eye [E] opening: 2). He had left periorbital hematoma, left pulsatile exophthalmus and left hemiparesis. The visu-



Fig. 1. Left periorbital hemorrhage, pulsatile exophthalmus on admission.

al acuity and extraocular muscle motility of the left eye could not be evaluated due to the excessive amount of periorbital hematoma, soft tissue swelling and the patient's reduced level of con-

sciousness (Fig. 1). Cranial and orbital computerized tomography (CT) with coronal and axial sections revealed hematoma in the right internal capsule, intraventricular hemorrhage, depressed fracture of the left orbital roof and the rim, and encephalocele formation towards the left orbit (Figs. 2a and 2b). The left globe was displaced inferiorly and anteriorly. The optic canal and the optic nerve were intact. The carotid angiography revealed no vascular injury or fistulas. The patient was transferred to the intensive care unit (ICU) of the Neurosurgery Department and treated according to our protocol for severe head injury. On the 4th day of admission to the ICU, his neurological status was stabilized and GCS score improved to 13 (M:6, V:4, E:3). The patient underwent left frontal craniotomy. The orbital roof was decompressed and the dural tear and the protruding brain tissue were identified. After the excision of the protruding part microscopically, the dura was reapproximated with a locked running stitch and water-tight closure was achieved. The orbital roof was reconstructed with high density porous polyethylene sheet (Medpor®)

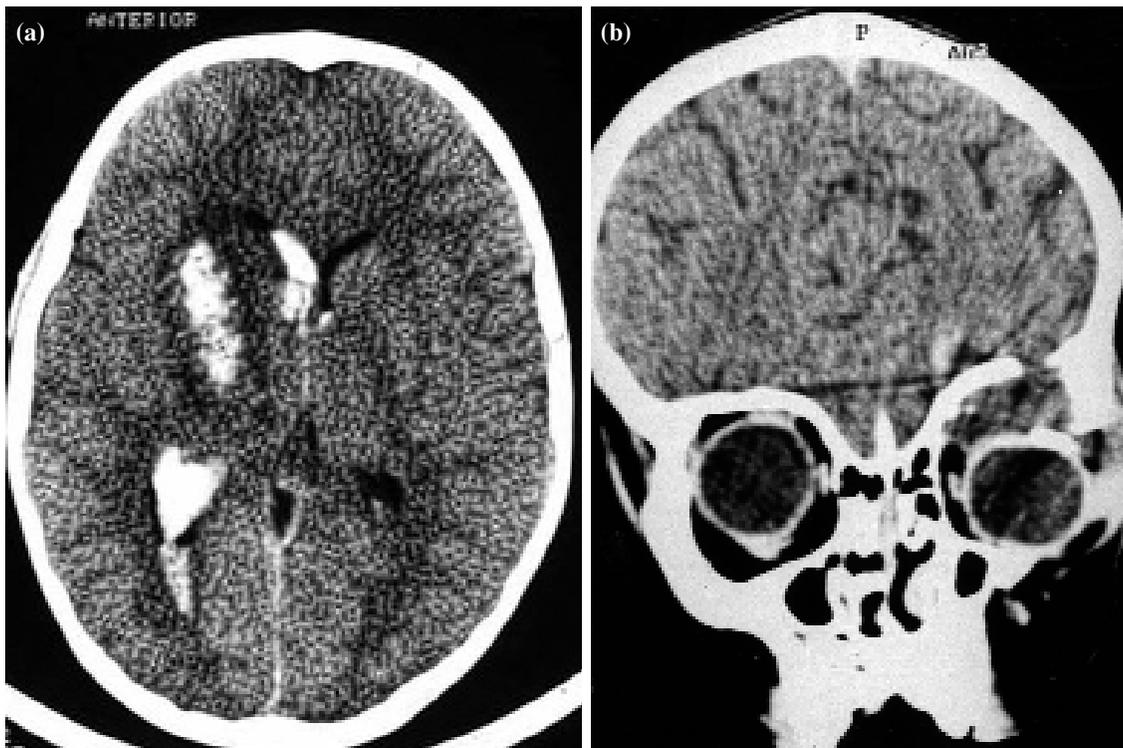


Fig. 2. (a) Axial cranial CT revealed right capsular traumatic intracerebral hematoma and intraventricular hemorrhage. (b) Left orbital roof fracture with encephalocele formation towards the orbital cavity on coronal cranial CT.



Fig. 3. Orbital roof reconstructed with porous polyethylene (Medpor®) (arrows).

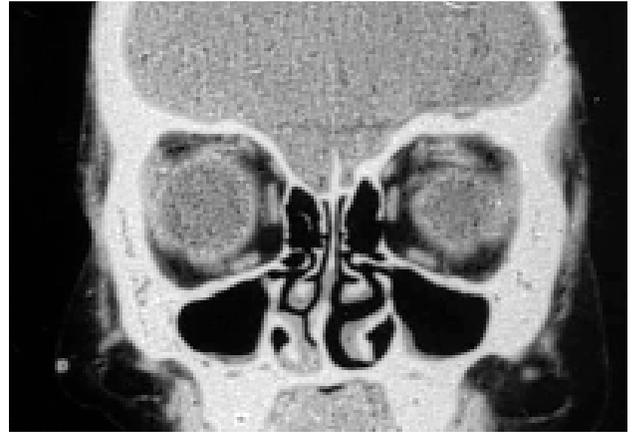


Fig. 4. Symmetrical position of the globes and the reconstructed orbital roof.

of 1.5 mm thickness. Briefly, the implant was soaked in an antibiotic solution (80 mg gentamicin in 40 ml saline) for ten minutes and then cut with heavy general purpose scissor and contoured to cover the orbital roof defect. It could be easily shaped to parallel the bony surface and was then fixed with sutures (Fig. 3). The postoperative period was uneventful. The patient recovered well and was discharged from the hospital on the posttraumatic 20th day. He was conscious with a GCS score of 15, vision was intact and the eye movements were mildly limited. The control coronal CT scan

revealed symmetrical position of the globes and the reconstructed orbital roof (Fig. 4). The early (2 months) and late (5 years) post-operative follow-up results were functionally excellent (Figs. 5a and 5b).

DISCUSSION

Although the orbit and its components constitute a very small portion of the body, trauma to this region may have catastrophic results. Thus, the evaluation and treatment periods are of critical importance for the prevention of permanent neurological injury.^[3-5]

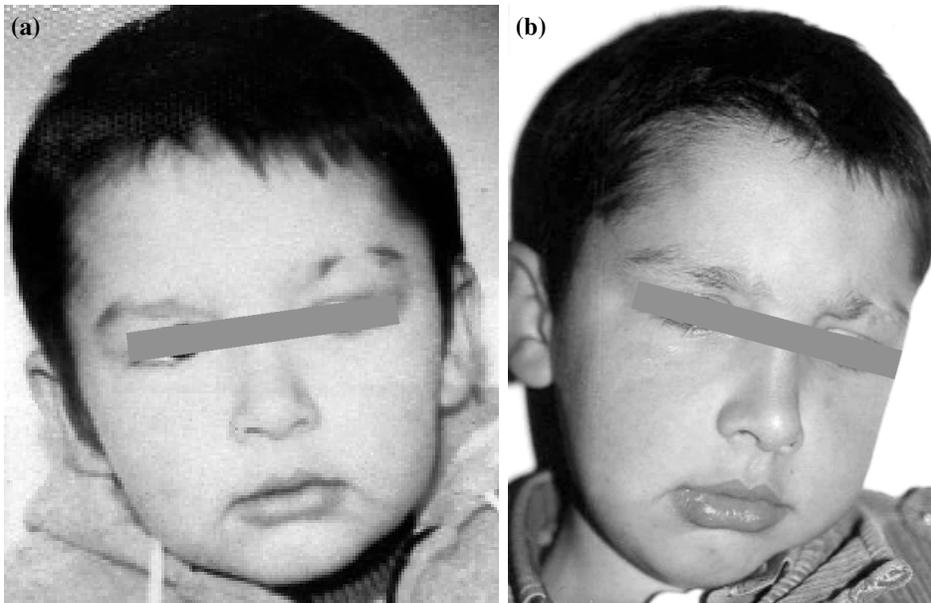


Fig. 5. (a) Early postoperative view with mild edema on the left eye (2 months). (b) Late postoperative view (5 years).

Isolated orbital fractures occur as a result of blunt trauma to the orbit and can be briefly classified into two categories, as blow-in and blow-out fractures. The former involves fractures in which the bone fragments are displaced into the orbit, causing an increase in the intraorbital pressure and/or impingement syndromes, which may lead to irreversible neurological injury especially in chronic cases.^[5,6] The latter involves the disruption of an orbital wall (usually medial or inferior wall is damaged), and the resultant decompression of the periorbital structures by bony fragments leading to the entrapment syndromes.^[5,7] Both blow-in and blow-out fractures can be pure or impure according to the involvement of the orbital rim. For example, a blow-out fracture with a concomitant orbital rim fracture is termed an impure orbital fracture.

Orbital roof fractures secondary to blunt trauma are rarely encountered.^[1,2] Traumatic encephaloceles related to orbital roof fractures are even rarer, with the first case reported in 1951.^[1,8] The main symptoms and signs are diplopia, exophthalmus, orbital edema and hemorrhage, restricted eye movements and loss of vision. Patients can be presented acutely or the symptoms and signs may gradually appear as the fracture in the orbital wall grows over time. Growing fractures of the orbital roof have been reported several times.^[3,9-13] In a patient with persistent ocular symptoms and a history of orbital trauma, growing fracture of the orbital wall must be suspected.^[14]

Our patient was the victim of an acute traumatic encephalocele related to orbital roof fracture, which is unusual and has been rarely reported.^[15-18] For such cases, early diagnosis and treatment are very important since the raised intraorbital pressure may irreversibly damage the optic nerve. In our case, the patient was operated on the 4th day of admission, as soon as his neurological status was stabilized.

After an acute orbital trauma, the surrounding soft tissue swelling and hematoma usually make it difficult for the physician to sufficiently evaluate the vision and ocular motions. Radiological investigations, especially CT with thin axial and coronal sections, play a major role in the evaluation of the intraorbital content.^[4] Although magnetic resonance imaging (MRI) has been offered as the investigation of choice for traumatic orbital injury by some authors,^[1] it is not always easy to perform, especial-

ly in an emergency condition. Moreover, prolonged scan time, limited availability, higher cost and suspicion about the potential presence of ferromagnetic foreign bodies in the orbit can be cited as the disadvantages of MRI over CT. In our case, orbital CT with thin coronal and axial sections was performed and satisfactory results were obtained.

The main steps of the surgical intervention can be summarized as the removal of free orbital bone fragments, excision of the herniated brain tissue, duraplasty and reconstruction of the orbital roof and rim. In our opinion, the reconstruction step is the *sine qua non* of the surgical treatment and should be performed in every traumatic orbital encephalocele case in order to prevent late meningocele or encephalocele formation.

There is considerable confusion and controversy regarding the use of alloplastic implants in reconstructive surgeries. A variety of alloplastic implants such as titanium, hydroxyapatite, vitallium, silicone rubber, polypropylene, polyamide mesh and porous polyethylene have been used as alloplastic materials for reconstruction of the orbit and periorbital regions.^[19,22] Although there are reported cases where methacrylate plates^[18] or silastic implants^[23] were used in orbital roof reconstruction, a great majority of surgeons prefer using autogenous materials due to the possible complications of alloplastic implants.^[15,16,24] However, one has to keep in mind that using autogenous materials in reconstruction has its own disadvantages. Autologous bone grafts, especially cranial, are difficult to shape and contour to fit the exact defect of the orbital roof. This brings another disadvantage, which is the increased operating time.^[25,26] Moreover, resorption of the graft over time may occasionally result in the recurrent malposition of the globe.^[27,28] Donor site morbidity has also been reported.^[29]

The excellent biocompatibility of porous polyethylene is reflected by the rarity of known allergic reactions to Medpor® and by the favorable response of tissues to its surfaces.^[26,30] Because of its interconnected, open porous character, porous polyethylene is well vascularized early, followed by soft tissue ingrowth and collagen deposition.^[31,32] These features offer superior advantages against infection, and even if infection does occur, treatment may be possible with systemic antibiotics^[33] rather than by the removal of the implant, which is

the case for most of the other alloplastic implants.

Medpor® proved to be a good material for orbital reconstructive surgeries, such as for the reconstruction of medial or lateral orbital wall defects as well as for the orbital floor.^[22] Rubin et al.^[26] reported their clinical experiences with Medpor® in a series of 37 orbital reconstructions. They experienced no major complications except for infection, encountered only in one case, in the mean follow-up of 18.5 months. Romano et al.^[25] also reported one implant infection requiring removal in a series of 140 patients operated for facial and orbital fractures.

To our knowledge, this is the first case in the English literature of traumatic encephalocele related to orbital roof fracture where the roof reconstruction was done by using Medpor®.

CONCLUSION

Acute traumatic encephalocele related to orbital roof fracture is unusual and should be treated as soon as possible. Orbital CT with thin axial and coronal sections should be performed in an acute traumatized patient with a concurrent orbital trauma. Reconstruction of the orbital roof is the key step of the surgical treatment and should be performed in every case. Porous polyethylene has been used for many years in reconstructive surgeries and it is superior to other allografts in many ways. The long-term cosmetic and functional results in our case were excellent, and Medpor® can be suggested as a useful alternative for surgeons who prefer using autologous bone grafts for the reconstruction of the orbital roof.

Acknowledgements

The authors would like to thank Ms. Hande İmga for her secretarial assistance.

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