



Growing Skull Fracture in an Infant: A Case Report

Bebek Hastanın Büyüyen Kafatası Kırığı: Bir Olgu Sunumu

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Abstract

Growing skull fracture (GSF) is a rare complication of cranio-cerebral injuries in infants and children under three years of age. Falls and blunt force head trauma are the most frequent causes of head injuries. GSF usually results from a linear calvarial fracture, however, it may also occur due to a closed-head injury. The most common symptom is scalp swelling without progressive tenderness or pain. The most common site of GSF is the parietal region. GSF may cause epilepsy, neurologic disorders and calvarial asymmetry. Duraplasty in early period of GSF is recommended in order to have better results. Here, we report a 15-month-old girl with parietal bone fracture who was followed closely both clinically and radiologically and underwent surgical repair of GSF and enlargement of the dural defect.

Keywords: Growing skull fracture, children, sequel of trauma, cephalohematoma, dural tear

Öz

Büyüyen kafatası kırıkları (GSF); yenidoğan ve üç yaş altı çocuklarda, kafatası ve serebral travma sonrası oldukça nadiren ortaya çıkan komplikasyonlardır. Kaza şekli çoğunlukla yüksekte düşme veya ağır bir obje ile çarpışma sonrası oluşan kafatası yaralanmasıdır. Genellikle düz kafatası kırıklarından oluşmakla birlikte, kapalı kafa travmasında da oluşur. En önemli semptom; saçlı deride, ilerleyici hassasiyeti veya ağrısı olmayan şişliktir. Parietal bölge en sık lokalizasyondur. GSF nörolojik defisitler ile ilerlemesine ve kraniyal asimetriye neden olur. GSF’de erken dönemde cerrahi olarak dura yırtık tamiri yapılması klinik sonuçların daha iyi olması için önerilmektedir. Bu çalışmada, parietal kemik kırığını klinik ve radyolojik olarak yakından takip ettiğimiz 15 aylık bir kız çocuğu sunulmaktadır. Altı ay sonra, GSF ve dura yırtığının genişlediği gözlemlendi. Cerrahi onarım yapıldı.

Anahtar Sözcükler: Büyüyen kafatası kırıkları, çocuk, travma sekeli, sefal hematoma, dura yırtığı

Introduction

John Howship described growing skull fracture (GSF) in the 18th century for the first time (1-3). The etiopathologies of GSF have not been fully understood. Post-traumatic skull defect diastasis may occur because of arachnoid herniation of dural tears and cerebrospinal fluid (CSF) leakage from the fracture line (4-8).

GSF is a rare complication associated with traumatic skull fractures in children under three years of age GSF (9-11). GSF has been reported to occur in 0.05%-1.6% of cases (1,4,8-12). The parietal region of the skull is the most commonly affected area (1,13).

Seizures, neurological deficits, and pulsatile swelling are the most common presenting features.

Early diagnosis and prompt surgical intervention are necessary for the prevention of progressive brain damage associated with GSF. The time interval between head

trauma and diagnosis varies between a few days and several years (6,8,14).

Plain radiography and computed tomography (CT) are the methods of choice for the diagnosis of GSF (6,9,15,16). Magnetic resonance imaging (MRI) scans provide details about brain tissue damage, herniation and CSF leakage. (9,15,17).

If GSF is not promptly treated, seizures or neurologic disorders associated with brain injury may occur (1,5,9). Duraplasty and cranioplasty are treatment modalities. (1,4,8,9).

Case

A 15-month-old girl with cephalohematoma in the right parietal region was admitted to our emergency department. She had a minor head injury. On examination, she had cephalohematoma in the right parietal region and

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CT scans showed a fracture line between the parietal bone and the frontal bone (Figure 1). Neurologic exam was normal. Three months later, follow-up MRI scans showed a dural tear and CT scan showed enlargement of diastasis of the parietal bone (Figure 2). After six months of the trauma, X-ray showed a bone diastasis greater than 4 mm (Figure 3), and pulsative swelling of the parietal bone region. After written informed consent was taken from her family, surgery was performed.

Under general anesthesia, we encircled the parietal fracture defect with Kerrison rongeur (Figures 4, 5). Duraplasty was done by galeal graft (Figures 6, 7). The patient had an uneventful recovery. There were no complications, such as hematoma and CSF leak.

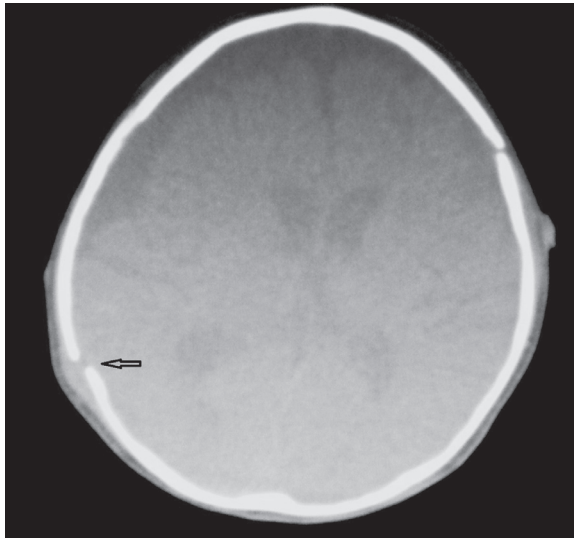


Figure 1. Computed tomography scans showed the parietal to frontal fracture line

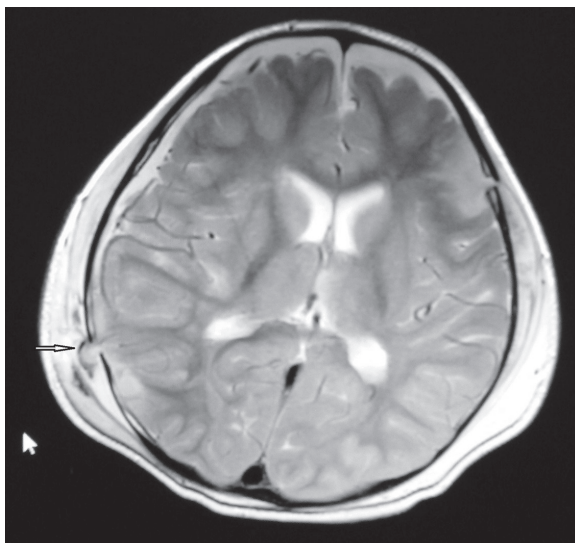


Figure 2. Magnetic resonance imaging scans showed dural tear

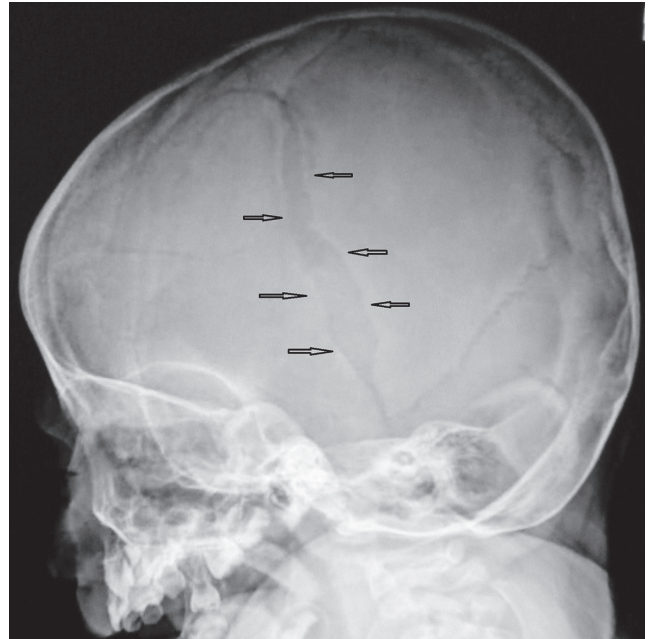


Figure 3. X-ray showed the bone diastasis more than 4 mm

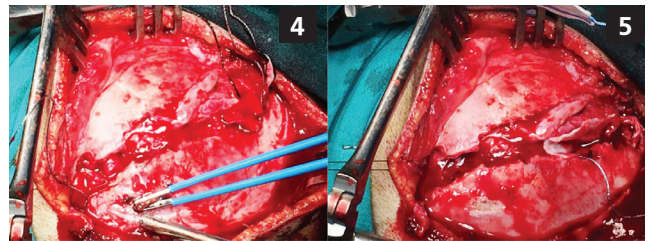


Figure 4, 5. The bony and dural defect

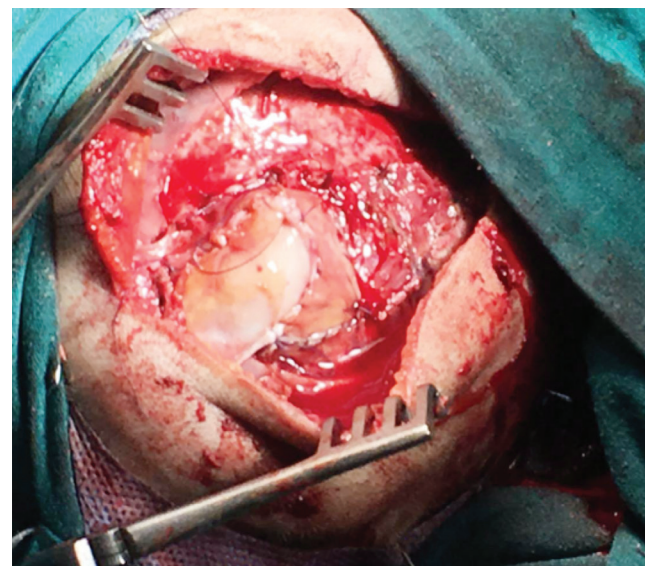


Figure 6. Dural margins were identified all around and watertight duraplasty

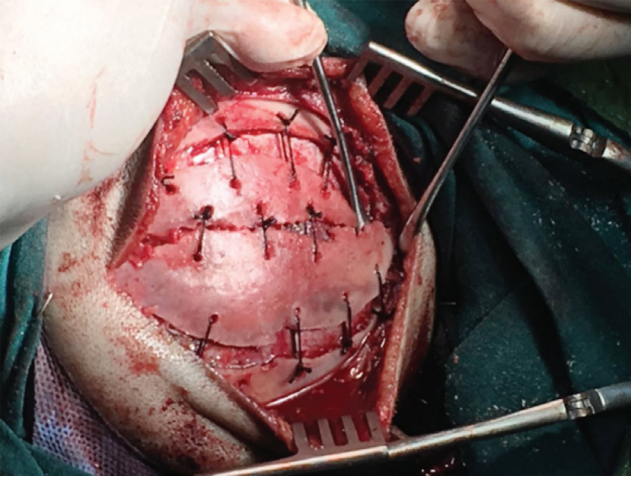


Figure 7. Cranioplasty

Discussion

There are many terminologies describing GSF (leptomeningeal cyst, traumatic ventricular cyst, etc.) (1,5,18).

Young children especially those under three years of age are mostly affected (1,4,19). Adult manifestation is rare 1 it has been reported that 90% of cases of GSF occurred in children younger than three years of age and more than 50% occurred in those below the age of 12 months (4).

Fall from a height is the most common cause of GSF and cephal haematoma is usually at trauma side and bone diastasis and dural tears are the main start points of GSF (1,4,5,19). Parietal bone is the most commonly affected area (1,10,19).

The etiopathogenesis of GSF has not been fully understood. It has been described that after a head trauma causing skull bone fracture with underlying dural tear, healing of the fracture margins is hindered by an intercranial hypertension syndrome and pulsation of the CSF, and with invagination and entrapment of arachnoids into a diastatic fracture, bone diastasis associated with leptomeningeal herniation occurs (18,20).

Tightly dural adhesion to the calvarium and the skull bones may be the cause of GSF (8,9,16).

Early diagnosis of GSF is important (1,13,21). Radiological methods are useful in the diagnosis. X-ray scans can show the bone fracture lines and defects (4,19). CT scans show the exact location and enlargement of bone defect and possible brain tissue damage (9,10). CSF leak, dural tear and herniation of the brain can be detected via MRI scans (1,9,11).

In their study including seven patients, Naim-Ur-Rahman found three main types of GSF based on CT and surgical findings, etiopathogenesis, and management

strategies required: a leptomeningeal cyst in three patients, damaged and gliotic brain in three patients, and a porencephalic cyst extending through the skull defect into the subgaleal space in two patients.

Duraplasty is the main point (22,23). Dural tears with pulsation of CSF cause bone diastasis (4,19). We should first see the defect and then, duraplasty should be done (9,19). After duraplasty, cranioplasty should be performed, but if a herniated gliotic parenchymal/leptomeningeal cyst is present, the surgical treatment can include resection of the tissue and the cyst (1,4,9,19).

GSF may be the cause of seizures in 10-50% of patients (1,9,11,13,19). Seizures mostly occur within two years after trauma.

The incidence of neurological deficits associated with GSF is between 10% and 65% (1,9,11,19).

Mortality rate is between 0% and 8% (anesthesia- and meningitis-related) (1,4,9,10,19). In order to protect the brain and lessen the seizures, surgery should be done immediately (1,9,10,19).

Multiple head trauma, large defects crossing the superior sagittal sinus, delayed surgery, age over eight years and female gender are the factors for poor prognosis. Parent education level and awareness are important for early detection of GSF (1).

Infants and children with linear skull fractures must be followed up closely, both clinically and radiologically. In the presence of CT finding of bone diastasis and MRI finding of dural tear herniation of brain matters, surgery should be performed promptly to prevent neurological deficit or seizures.

Authorship Contributions

Surgical and Medical Practices: A.A., B.M.K. Concept: A.A., M.N.D., B.M.K. Design: A.A., M.N.D., B.M.K. Data Collection or Processing: A.A. Analysis or Interpretation: A.A. Literature Search: A.A. Writing: A.A.

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