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A Leptomeningeal Cyst in the Frontal Bone as a Complication of Childhood Head Trauma: A Case Report

Çocukluk Çağı Kafa Travmasının Bir Komplikasyonu Olarak Frontal Kemikte Leptomeningeal Kist: Olgu Sunumu

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Abstract

Leptomeningeal cysts secondary to trauma represent an extremely rare complication of calvarial fractures experienced during childhood. The early diagnosis and surgical treatment of such cysts can serve to prevent neurological sequelae. A 23-year-old male from a remote region attended the neurosurgery department complaining of headache, insomnia, and slowly progressing swelling over the right frontal region. The patient reported experiencing trauma (*cow horn*) in the same region of the head some 15 years previously. Non-contrast cranial computed tomography showed a lytic calvarial lesion with a large cystic area in the right frontal bone. Further, brain magnetic resonance imaging (MRI) revealed hyperintensity on the T2-weighted MRI and no enhancement on the T1-weighted post-contrast images. Moreover, there was no restricted diffusion corresponding to the cystic lesion in the frontal region. The dura mater and the bone gap were repaired using titanium mesh. The patient, whose headache and insomnia symptoms had completely disappeared, was discharged five days after the operation.

Keywords: Leptomeningeal cyst, Intradiploic leptomeningeal cyst, Headache, Calvarial defect.

Özet

Travmaya sekonder leptomeningeal kistler, çocukluk çağında yaşanan kalvarial kırıkların son derece nadir bir komplikasyonunu temsil eder. Bu tür kistlerin erken teşhisi ve cerrahi tedavisi nörolojik sekelleri önlemeyi sağlayabilir. Kent merkezine uzak bir bölgeden gelen 23 yaşındaki genç bir erkek baş ağrısı, uykusuzluk ve sağ frontal bölgede yavaş ilerleyen şişlik şikayetleri ile beyin cerrahisi bölümüne başvurdu. Hasta yaklaşık 15 yıl önce başın aynı bölgesinde bir travma (*inek boynuzu*) yaşadığını bildirdi. Kontrastsız bilgisayarlı tomografide sağ frontal kemikte geniş bir kistik alana sahip litik bir kalvariyal lezyon görüldü. Ayrıca, beyin manyetik rezonans görüntüleme (MRI), T2 ağırlıklı MRI'da hiperintensite ve T1 ağırlıklı kontrast sonrası görüntülerde herhangi bir artış olmadığını ortaya koydu. Ayrıca frontal bölgedeki kistik lezyona karşılık gelen sınırlı difüzyon yoktu. Dura mater ve kemik boşluğu titanyum ağ kullanılarak onarıldı. Baş ağrısı ve uykusuzluk semptomları tamamen kaybolan hasta operasyondan beş gün sonra taburcu edildi.

Anahtar Kelimeler: Leptomeningeal kist, Intradiploik leptomeningeal kist, Baş ağrısı, Kalvariyal defekt.

Introduction

Post-traumatic leptomeningeal cysts, which were previously referred to as growing skull fractures and are now sometimes termed craniocerebral erosion, represent an extremely rare complication of head trauma. Such cysts comprise a cystic-like mass filled with cerebrospinal fluid (CSF), and they account for just 0.5–0.6% of all cranial fractures [1]. Although leptomeningeal cysts sometimes occur with neurological findings in children, they often present as indolent bulging accompanied by a neurological deficit in adults. In the present paper, we report on the imaging findings and surgical management of a leptomeningeal cyst that developed secondary to trauma and then grew slowly.

Case Report

A 23-year-old male patient from the remote south-central part of Somalia was admitted to the neurosurgery department at Somalia-Turkey Training and Research Hospital in Mogadishu. The patient complained of headache, insomnia, and slowly progressing swelling in the right anterior part of the head. He also reported having experienced trauma (*cow horn*) in the same region of the head when he was eight years old (i.e., 15 years previously). The patient's physical examination revealed a soft lesion without pulsation and pain in the right frontal region of the head. The patient did not exhibit any neurological deficits. Moreover, the findings of the respiratory and cardiovascular system examinations were normal.

Non-contrast cranial computed tomography (CT) revealed a well-defined cystic lesion in the patient's right frontal bone. The internal structure of the lesion was found to be the same density as the CSF. It was observed that the lesion was causing extrinsic compression to the cortex of the frontal lobe (Figure 1). Similarly, magnetic resonance imaging (MRI) revealed the same signal with regard to the CSF. The lesion was hyperintense on the T2-weighted images and hypointense on the pre-contrast T1-weighted images. Moreover, the post-contrast T1-weighted images showed no contrast enhancement. In addition to the conventional MRI sequences, the diffusion-weighted images (DWI) demonstrated that the lesion had no restricted diffusion. Further, it was observed that the brain tissue was normal and there was no pathological signal (Figure 2).

In light of the clinical and radiological findings, surgical treatment was planned following the pre-diagnosis of a leptomeningeal cyst. During the surgery, a U-shaped flap incision was made to the patient's scalp. Next, the cystic mass was excised by means of a circular craniotomy. The bone and dura mater defects were repaired using titanium mesh (Figure 3). The patient was discharged five days after the operation when his headache and insomnia symptoms had completely disappeared. The follow-up examinations performed two weeks later did not reveal any symptoms.

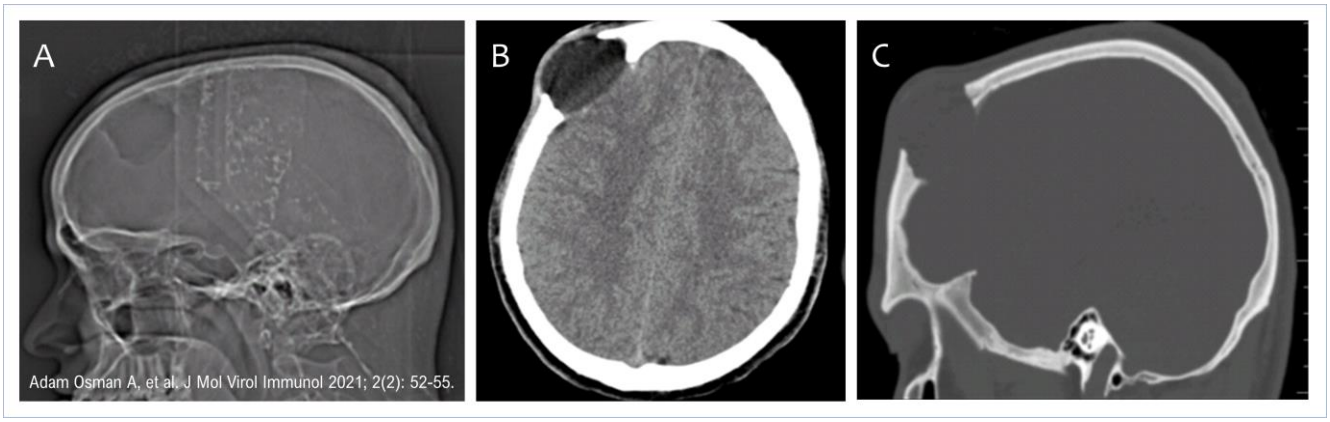

Figure 1. Lateral skull image (**A**) demonstrates the 4 cm diameter of a well-defined lytic lesion in the right frontal bone. The non-contrast axial and sagittal computed tomography scans of the brain (**B, C**) demonstrate a large calvarial defect in the right frontal lobe with a cystic lesion of the same density as the cerebrospinal fluid.

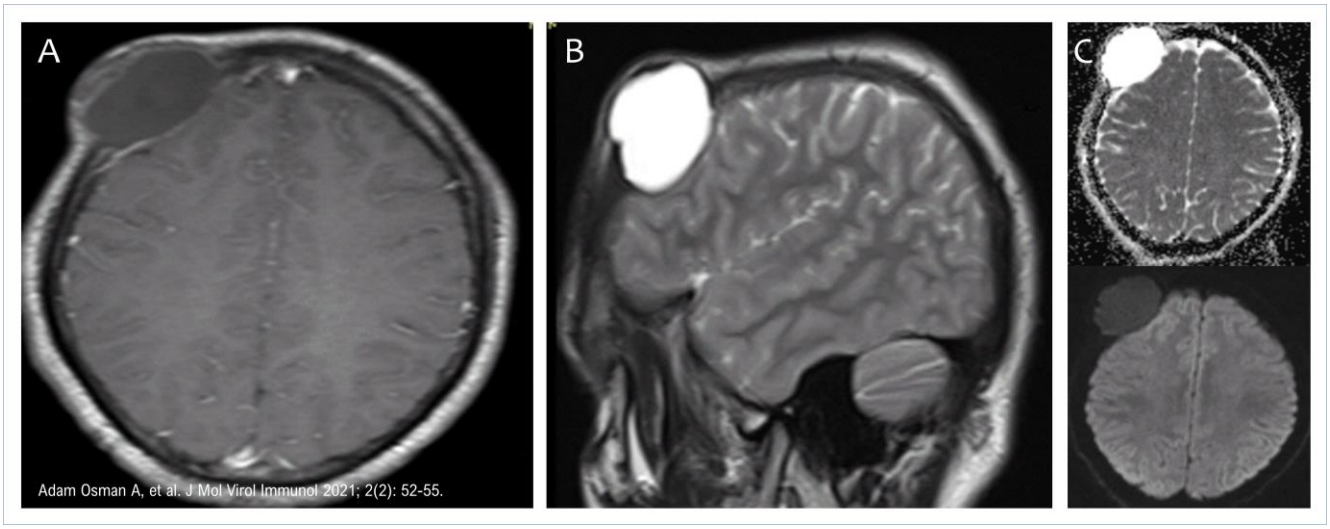

Figure 2. Axial post-contrast T1-weighted image (**A**) shows that the cyst is hypointense and has no contrast enhancement. Sagittal T2-weighted image (**B**) reveals a large calvarial defect and a cystic lesion. Diffusion-weighted image (**C**) shows that the cyst has no restricted diffusion.

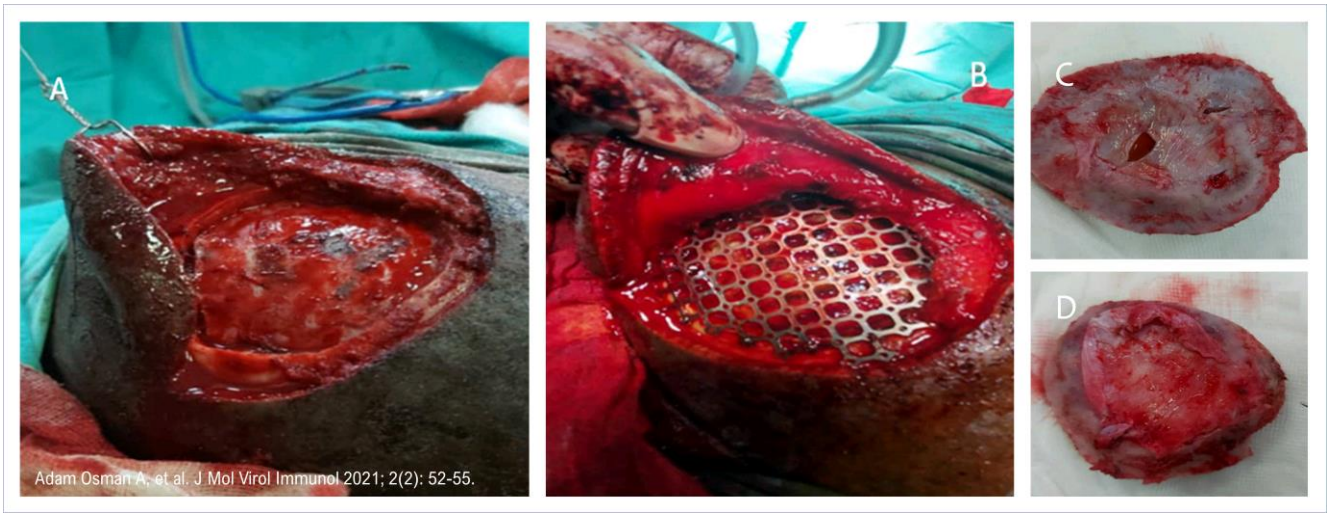

Figure 3. (**A**) A U-shaped scalp flap incision with a circular craniotomy. (**B**) The bone defect was repaired using titanium mesh. (**C**) The inner side of the cyst was covered by a thin endosteal layer of the dura. (**D**) The outer part was covered by a glial layer.

Discussion

Leptomeningeal cysts typically occur following head trauma experienced during childhood. However, they remain an extremely rare complication, accounting for only 0.5–0.6% of all cranial fractures [2]. The course of osteolytic lesions of the skull, including benign and malignant tumors, infections, trauma, and granulomas, may continue progressively [3]. If the flow of the CSF is strongly pulsatile, it may enlarge the small tear in the dura mater, which can result in the herniation of the brain tissue. In adults, leptomeningeal cysts most commonly present as a non-tender, non-pulsatile scalp swelling due to a distant history of trauma [4]. There are many differential diagnoses, such as epidermoid cyst, metastasis, eosinophilic granuloma, congenital calvarial defects, and intradiploic meningioma [5]. In 1967, Goldstein et al. confirmed that a dural tear is important in relation to leptomeningeal cysts, although the underlying cyst is important in terms of the pathogenesis [2]. Yet, as described by Penfield and Erickson, extradural cyst formation or encephalomalacia is not always encountered, while herniated brain may be present [6]. Our patient's condition had been gradually worsening over the 15 years from the initial trauma to the

time of diagnosis. The imaging and surgical findings revealed a large calvarial defect in the CSF-dense cystic area. The patient complained of headache and insomnia. As with most pediatric-onset leptomeningeal cysts, our patient presented with a long-lasting, non-sensitive, and non-pulsatile scalp mass. In addition, the patient's neurological examination revealed no neurological deficits. Skull radiography, which provides limited information in terms of general neuro-imaging, can reveal post-traumatic leptomeningeal cysts in the diploic space with an expansion of eggshells. CT can provide information regarding the size of the bone defect and the connection between the neural structures due to its high spatial resolution. Moreover, it also plays a very important role in surgical planning involving three-dimensional (3D) reconstruction. An MRI examination of the brain represents the best way of examining the neural tissue due to its high soft tissue resolution. Further, using DWI to exclude dermoid and epidermoid cysts assists with the diagnosis of leptomeningeal cysts [7]. The signal intensity of post-traumatic leptomeningeal cysts is similar to that of the CSF in both T1-weighted and T2-weighted images. In our case, the density of the cyst was the same as the density of the CSF. We were also able to rule out dermoid and epidermoid cysts using the DWI. The 3D CT imaging performed prior to the surgery facilitated the delivery of correct and efficient treatment.

Conclusion

As leptomeningeal cysts represent a rare cause of headache following childhood trauma, knowledge of such cysts is important for radiologists and neurosurgeons when it comes to diagnosing a treatable cause of headache. In addition, leptomeningeal cysts should be considered in the differential diagnosis of other intracranial and calvarial cystic lesions that mimic such cysts.

Ethical Approval: The patient was treated in accordance with the ethical standards established by the institutional and national committees on human experimentation as well as with the requirements of the Declaration of Helsinki (1975 and subsequent revisions). According to the ethics committee guidelines of the Somalia-Turkey Training and Research Hospital, institutional approval was not required to publish the details of this case. **Consent for publication:** The patient provided written informed consent regarding the publication of details concerning his case as well as the images shown in the figures. **Conflict of interest:** The authors declare that there is no conflict of interest. The authors alone are responsible for the content and writing of the paper. **Financial disclosure:** There is no financial support to this study.

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