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Post-traumatic Intradiploic Leptomeningeal Cyst in Adult: A Case Report and Mini-Review of Literature

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Abstract

Post-traumatic intradiploic leptomeningeal cyst (IDPTLC) manifests as an internal table disruption of the skull concomitant with a dural defect and intact external table after a previous skull fracture. It is very rare, especially in adults. We present a 30-year-old male with right occipital IDPTLC treated with duraplasty with allograft and cranioplasty with autograft ribs. Seventeen cases of IDPTLC in adulthood since 1978 were found in the literature; to the best of our knowledge, ours is the eighteenth case. Considering the possible etiology at the time of the first trauma, torn dura matter was not healed and retracted overtime. Also due to intracranial CSF pulsation, the disrupted inner table was widened and continuous force on the diploe caused a thinned swollen external table. We recommended performing overlying cranioplasty with autologous bone (rib or normal external table) with the edge of the duraplasty and the cranioplasty placed at different sites.

Keywords: Intradiploic, Leptomeningeal cyst, Adult, Duraplasty, Cranioplasty.

Introduction

Post-traumatic leptomeningeal cyst (PTLC) is a rare complication of head trauma resulting in skull fracture in pediatric populations (1). Less than one percent of pediatric skull fractures can cause PTLC, and the presence of this complication in the adult population is extremely rare (2). Among these rare cases, a small subgroup of patients experiences post-traumatic intradiploic leptomeningeal cyst (IDPTLC) that manifests as an internal table disruption of the skull concomitant with dural defect and intact external table after a previous skull fracture (3).

Objectives

Herein, we present an extremely rare case of adult IDPTLC and explain our treatment approach, and we present a comprehensive literature review.

Case presentation

A 30-year-old male referred to us with right occipital headache and progressive occipital scalp swelling from 4 months prior to his referral. He had a history of traumatic head injury at age 10 that was managed conservatively. The neurological exam was intact, and he had no seizure or other signs or symptoms. Brain computed tomography (CT) revealed a right occipital subgaleal collection with adjacent occipital bone abnormality and right occipital lobe encephalomalacia (Figure 1a). The patient had been operated on in another center, and because of cerebrospinal fluid (CSF) leakage during the operation and the abnormal appearance of the external table of the skull, surgery was stopped and a drain was placed. During the patient's first operation, CSF was flowing through invisible pores of the extraordinarily thin but integrated external table; thus, the surgeon terminated the operation without performing a craniotomy. The patient then referred to us for further treatment. Brain magnetic resonance imaging (MRI) revealed an abnormal right occipital bone concomitant with invaginations of the fluid cavity to the internal table of the skull (Figure 1b). No relation was found between cisterns and these invaginations on computed tomographic cysternography.

We decided to operate on the patient with a diagnosis of leptomeningeal cyst. During the surgery, the occipital bone was prominent with different thicknesses in different places (Figures 1c and 1d). CSF was flowing from multiple sites of thin bone. After an occipital craniectomy, we were faced with a large dural defect and lateral ventricle atrium. In fact, the dural defect was triangular, and its posterior, inferior, and superior borders were respectively superior sagittal sinus (SSS), transverse sinus, and lambdoid suture.

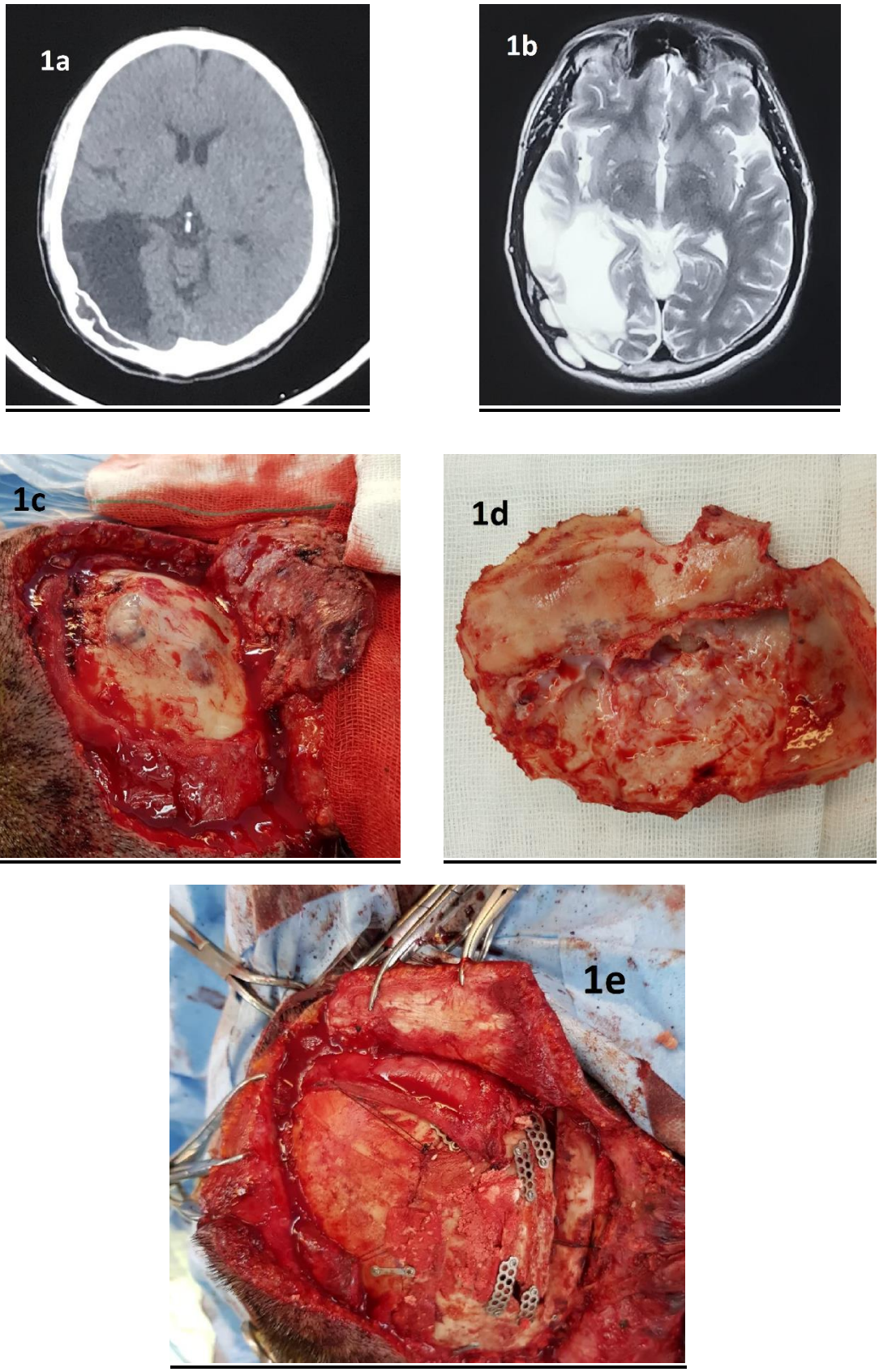

Figure-1. A 30-year-old male with right occipital post-traumatic intradiploic leptomeningeal cyst. The preoperative brain computed tomographic scan (1a) revealed a right posterior temporal and occipital lobe encephalomalacia with abnormal covering skull bone that on magnetic resonance imaging, axial T2 (1b), invaginations of the fluid cavity to the internal table of the skull can be seen. Intraoperatively, we were faced with abnormally thinned integrated external table without any visible defects (1c and 1d). After craniotomy and repair of the dura with allograft, we performed a cranioplasty with autograft ribs (1e).

Table-1. The literature review shows all reported cases with adult (more than 18 year-old age) intra-diploic leptomeningeal cyst.

Case Number	Author	publication Year	Sex, age	Cause, at age	Signs and symptoms	Location	Surgical treatment	Duration of follow-up/ Outcome
1	Bohutová et. al. (7)	1978	M, 70	Trauma, 4	Headache	Temporo-occipital	Duraplasty	Early postoperative period/ Good
2	D'Almeida et. al. (8)	1981	M, 53	Trauma, 48	Incidental	Rt. frontal	Duraplasty, methacrylate cranioplasty	Early postoperative period/ Good
3	Cook et. al. (9)	1988	M, 37	Trauma, 36	Scalp swelling	Lt. frontal	Duraplasty, acrylic cranioplasty	Early postoperative period/ Good
4	Eames et. al. (10)	1991	M, 36	Trauma, 6	Rt. Retro-orbital headache	Anterior skull base (sphenoid bone)	Transnasal sphenoidotomy, packing of cavity	1 year/ only with minimal headache
5	Lunardi et. al. (11)	1991	M, 35	Trauma, 30	Painful scalp swelling	Lt. parietal	Duraplasty, methacrylate cranioplasty	Early postoperative period/ Good
6	Byrne et. al. (12)	1992	M, 44	Trauma, 3	Repeated meningitis, Otorhinorrhea	Lt. temporo-occipital	Duraplasty	4 years/ No problem
7	Britz et. al. (13)	1998	M, 35	Trauma, 30	Painful scalp swelling	Lt. parietal	Duraplasty, cranioplasty	Early postoperative period/ Good
8	Açikgöz et. al. (14)	2002	F, 59	Trauma, early childhood	Ataxia, gait disturbance, Rt. Homonymous hemianopia	Lt. occiput	Duraplasty, acrylic cranioplasty	7 months/ No problem
9	Menkü et. al. (15)	2004	F, 30	Trauma, 25	Headache, scalp swelling	Rt. parietal	Duraplasty, cranioplasty with autograft bone (outer table)	6 months/ No problem
10	Gorgulu et. al. (16)	2006	F, 29	Trauma, 9	Headache, neck pain	Occiput	Duraplasty	15 days/ No problem
11	Seo et. al. (17)	2009	F, 28	Trauma, 1.5	Headache, occipital mass	Occiput	Duraplasty, cranioplasty with autograft bone (outer table)	1 year/ No problem
12	Mahaney et. al. (18)	2014	F, 21	Trauma, 2	Lt. forearm numbness, headache	Occiput	Duraplasty	4 years/ No problem and good
13	Bava et. al. (3)	2015	M, 21	Trauma, 11	Headache	Occiput	N/A*	N/A
14	Singh et. al. (19)	2016	F, 58	Trauma, 28	Headache, Lt. proptosis	Anterior skull base (sphenoid bone)	Duraplasty, cavity reconstruction by autograft bone (thigh)	Early postoperative period/ Good

15	Timonov et. al. (20)	2016	M, 73	Trauma, 60	He was found dead at home, scalp swelling	Lt. parietal	He was dead with no treatment	He was dead with no treatment
16	Shi et. al. (21)	2017	M, 45	Trauma, 9	Lt. lower limb paresis, gait disturbance	Rt. parasagittal parietal	Duraplasty, cranioplasty with titanium mesh	2 months/ Good recovery of paresis
17	Araújo Neto et. al. (22)	2018	M, 22	Trauma, 6 months age	Progressive lt. retro-auricular swelling	Lt. temporal (mastoid)	N/A	N/A
18	Present Study	2018	M, 30	Trauma, 10	Headache, scalp swelling	Occiput	Duraplasty, cranioplasty with autograft bone (ribs)	13 months/ No problems

*Not available

At the antero-inferior angle of the dural defect, anterior to the sino-dural angle, the dural defect extended to the posterior part of the middle cranial fossa floor. Dural borders were thick and had adhesions to the normal brain pia-arachnoid. We meticulously released the adhesions and then repaired the dural defect with an allograft dural patch. Furthermore, using the right 8th and 9th ribs, we reconstructed the cranial bone defect with an autograft (Figure 1e). After 13 months, a neurological examination of the patient was good, he had no complaint and no problems in follow-up imaging.

Discussion

Historically, Soule et al. reported the first case of post-traumatic leptomeningeal cyst in 1946 (4). Then in 1952, Taveras and Ransohoff explained thoroughly the mechanism of the formation of PTLC in 7 pediatric patients (5). PTLC is a complication of skull fracture concomitant with adjacent dural tearing occurring in patients less than 3 years old (6). At this age, the rapid growth of the brain can prevent healing of a skull fracture, and if there is dural rupture, intracranial pulsation can cause herniation of the brain beyond the fracture line. This process, also known as growing skull fracture, finally results in the formation of leptomeningeal cyst. This complication usually appears in childhood, and the presentation of PTLC in adulthood is extremely rare (2).

Theoretically, if skull fracture at the time of a previous head trauma causes only internal table disruption or structural weakness accompanied by dural tearing while the outer table is intact, IDPTLC may form over time. IDPTLC is the cavity in the diploe covered by the arachnoid and a thinned outer table (3). Considering the possible etiology at the time of the first trauma, the torn dura matter does not heal and becomes retracted overtime. Moreover, because of intracranial CSF pulsation, the disrupted inner table is widened, and continuous force on diploe causes a thinned swollen external table.

A literature search revealed 17 cases of IDPTLC in adulthood since 1978 (Table 1). The most prevalent signs and symptoms in these cases were headache and scalp swelling. In such cases, occipital bone was the most common site of adult IDPTLC in contrast with PTLC in which the parietal bone was the most common site (1). Age at the time of diagnosis in the cases found in the literature ranged between 21 and 73 years. The time interval between suspected head injury and diagnosis of PTLC ranged from 5 to 66 years. Overall, the outcomes of different treatment approaches to all reported IDPTLCs were good. Only in a case reported post-mortally by Timonov et al. were we faced with the death of a patient. The longest follow-up period was 4 years in cases reported by Byrne et al. and Mahaney et al. Our patient had 13 months of follow-up and a good outcome and, thus, is placed after them. Among these 17 IDPTLCs, as in our case, the most common approach for surgical treatment was duraplasty and concomitant cranioplasty with autograft bones, e.g., rib, outer table of skull bone, or even thigh.

For successful surgical treatment of IDPTLC, care must be taken to repair the dural defect properly in a water-tight manner and to cover it meticulously with a hard structure, e.g., allograft or autograft bone or another substance used for cranioplasty; we prefer autologous bone from ribs. It must be ensured that the edges of the repaired dura matter are not in the same site as the edges of the bone defect so as to prevent recurrence; to achieve this goal, the edge of the craniectomy

defect can be resected beyond the edge of the site of the repaired dura matter. However, in most reported cases as in the case reported herein, dural retraction causes a wider dural defect in comparison with the loss of internal table

Conclusions

This paper presents a rare case of adult IDPTLC that was treated surgically with dural repair and cranioplasty with autograft rib. In the literature, without considering treatment approach, the overall outcome for surgical treatment of adult IDPTLCs was good. We recommend performing overlying cranioplasty with autologous bone (rib or normal external table) while taking care not to place the edge of the duraplasty and the cranioplasty in the same site.

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We obtained an informed consent from the patient to report all his necessary information and photographs with unidentified identity.

Authors' Contribution

All authors pass the four criteria for authorship contribution based on the International Committee of Medical Journal Editors (ICMJE) recommendations.

Conflict of Interests

The authors declared no potential conflict of interests with respect to the research, authorship, and/or publication of this article.

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