

Armored Brain in Patients with Hydrocephalus after Shunt Surgery: Review of the Literatures

Şant Cerrahisinden Sonra Hidrosefali ile Zırlı Beyin: Literatür Taraması

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ABSTRACT

Armored brain or chronic calcified subdural hematoma is a rare complication of cerebrospinal fluid diversion with few cases reported in the literature. Seventeen patients with this pathology have been published. A complete review of the literatures regarding this topic has been collected and discussed. The author also presents a 12-year old boy with triventricular hydrocephalus who had undergone ventriculoperitoneal medium pressure shunt system since birth. The patient presented to our clinic with a 2-year history of seizures. The patient was conscious and without neurological deficits on examination. Computed tomography of the brain showed bilateral high density mass with surface calcification. X ray skull and MRI confirmed the calcified subdural hematoma bilaterally. We preferred conservative treatment and the patient continued his antiepileptic treatment. At one year follow up, the patient had the same neurological state. The case highlights the importance of frequent follow up CT brain after shunt surgery.

KEYWORDS: Armored brain, Subdural hematoma, Hydrocephalus, Ventriculoperitoneal shunt, Complications

ÖZ

Zırlı beyin veya kronik kalsifiye subdural hematom serebrospinal sıvı diversiyonunun nadir bir komplikasyonudur ve literatürde sadece birkaç vaka vardır. Bu patolojinin bulunduğu on yedi hasta bildirilmiştir. Bu konuyla ilgili literatür tam olarak gözden geçirilmiştir ve burada yer almaktadır. Yazar ayrıca triventriküler hidrosefalisi olan ve doğuştan beri ventriküloperitoneal orta basınçlı bir şant sistemi bulunan 12 yaşında bir erkek hastayı sunmaktadır. Hasta kliniğimize 2 yıldır havale öyküsüyle başvurdu. Hastanın bilinci açıktı ve incelemede herhangi bir nörolojik defisit yoktu. Beyin bilgisayarlı tomografisi yüzey kalsifikasyonlu bilateral yüksek dansiteli bir kitle gösterdi. Kafa filmi ve MRG bilateral kalsifiye subdural hematomu doğruladı. Konservatif tedaviyi tercih ettik ve hasta antiepileptik tedavisini kullanmaya devam etti. Bir yıllık takipte hastanın nörolojik durumu aynıydı. Vaka şant cerrahisinden sonra sık beyin BT ile takibin önemini vurgulamaktadır.

ANAHTAR SÖZCÜKLER: Zırlı beyin, Subdural hematom, Hidrosefali, Ventriküloperitoneal şant, Komplikasyonlar

INTRODUCTION

In 1884, Von Rokitansky described calcified chronic subdural as a finding at autopsy (23). Goldhan reported the first case of armored brain or calcified chronic subdural hematoma in 1930 (15). This was an 11-year-old child with the typical dense shadow of calcification under the cranial vault on the left side (8). Calcifications occur in the membranes of chronic subdural hematoma in the range of 0.3% to 2.7% (5, 10, 18). Although usually seen in posttraumatic subdural hematoma, they have been reported in patient with post-meningitic effusion and in patients with hydrocephalus after ventriculoperitoneal shunt (10). This article reported a 12-year-old patient with bilateral calcified chronic subdural hematoma after ventriculoperitoneal shunt for management of congenital hydrocephalus as well as a review of the literature for similar cases.

CASE REPORT

A 12-year-old boy was admitted to our outpatient clinic with

history of seizures 2 years ago. The patient received medium pressure ventriculoperitoneal shunt at birth at another hospital for his congenital hydrocephalus. According to his family; the patient had a smooth and uneventful course but showed low school performance which was accepted by the family. The family stopped follow up with time as the patient was asymptomatic. 2 years ago, the patient started have seizures that were treated with antiepileptic drugs by the family doctor without asking for computed tomography. The patient presented at our outpatient clinic and his neurological examination revealed normal findings with delayed filling at the VP shunt reservoir. The patient was not complaining from symptoms of increased intracranial pressure. Computed tomographic examination of the brain showed bilateral calcified chronic subdural hematoma (Figure 2A-D). MRI brain and x ray skull were also performed to confirm the diagnosis of calcified hematoma (Figures 1A,B; 3A,B). We choose conservative treatment as we do not believe that epilepsy will improve with surgery. At one year follow

up; the patient showed no symptoms or signs of increased intracranial pressure, with the same visual acuity and school performance.

REVIEW of the LITERATURE

Including the current study, 18 cases with calcified chronic subdural hematoma in patients after ventriculoperitoneal or ventriculoatrial procedures were reported in the literature to the best of our knowledge as shown in table (1). The patients consisted of 5 females and 13 males. Their ages ranged from 10 months to 43 years. 4 patients were asymptomatic and discovered incidentally during routine imaging after shunt surgery, while 14 patients were symptomatic. Craniotomy was performed in 8 patients while the remaining 10 patients were treated conservatively. All patients treated conservatively maintained their neurological status without deterioration, while the remaining 8 patients treated with craniotomy showed stable neurological status or slight improvement.

DISCUSSION

Armored brain or Matrioska head is an adhering calcification extending to the cerebral cortex corresponding to the inner membrane of chronic subdural hematoma (18). In such a pathology that reflects the computed tomogram finding, there appears to be another concentric skull inside the cranium (18). It is more commonly seen in children although it has been

reported in all age groups (10, 18). The clinical presentation varies from patients who are asymptomatic to those with signs of increased intracranial pressure, seizures, mental retardation or even transtentorial herniation (5, 17). Epilepsy may occur several years after a shunt operation as in our patient who suffered from epilepsy 10 years after his operation. Amr et al in their case report described a 30-year-old female patient who had epilepsy 29 years after shunt operation (2). The asymptomatic cases after ventriculoperitoneal shunt may be due to sufficient CSF drainage that compensates the raised intracranial pressure (1). The presence of calcification after hematoma was identified at intervals of months and several years (1, 16). However, Iwakuma and Brunngraber reported microscopic signs of ossification on the 9th day after head injury in a 9-month-old baby (12). The precise mechanism of calcifications remains unclear. Microscopic calcium deposits can be seen within the membranes of chronic subdural hematoma. In some cases these deposits may proceed to extensive calcification and even ossifications. Poor circulation and delayed resorption of the hematoma fluid within the subdural space are blamed (1). An underlying metabolic abnormality as an inherent tendency to calcification in patients with parathyroid disorders has been postulated (4). The calcification develops primarily on the dural side of the hematoma so the outer layer of the capsule is usually thicker (12). Subdural collection due to rapid lowering of intracranial pressure is a well known and rare complication after CSF diversion procedures (19). Several precautions are required to minimize the subdural collections after CSF diversion procedures including minimal CSF leak at the time of ventricular catheter insertion, use of medium, high pressure or programmable valves, slow return to upright position and close follow up including postoperative CT (19). Preoperative diagnosis of calcified chronic subdural hematoma is important for the selection of proper therapeutic strategy (10, 13). The combination of CT and MRI brain is very useful in making the diagnosis. Calcification of the membranes of subdural hematoma appears as bone on the computed tomography as in our patient, while organized or partially calcified lesions appear as heterogenous moderate high density areas on CT and as mixed areas of low and high intensity lesions on T1-weighted MR imaging, with heterogenous web or net-like appearance in the hematoma cavities. T2-weighted imaging also shows the calcification as a characteristic heterogenous

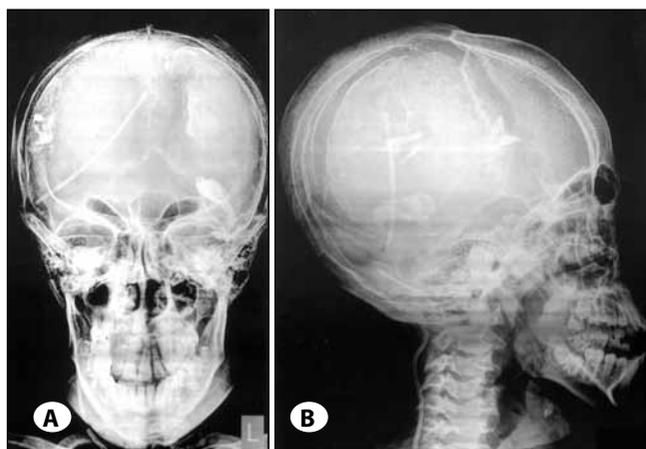


Figure 1A,B: X ray skull AP and lateral views show bilateral thickening of the skull in the frontal region.

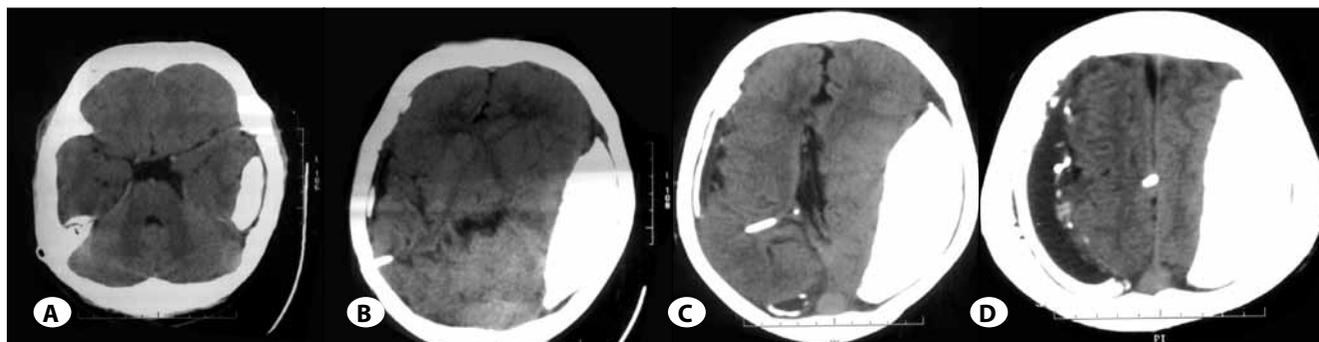


Figure 2A-D: Computed tomography of the brain axial cuts show the bilateral calcified subdural hematoma and its extension.

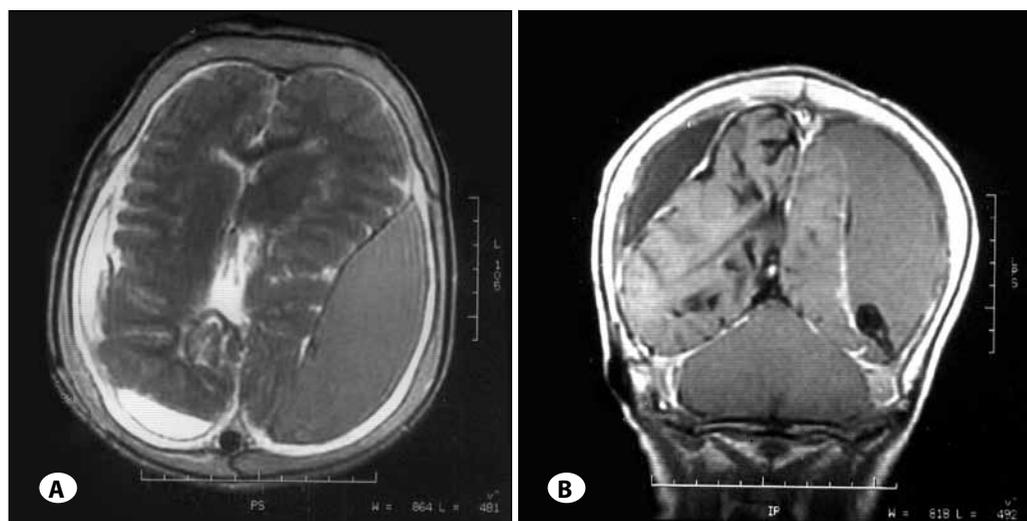


Figure 3: A) Axial T2-weighted MRI showing the bilateral calcified subdural hematoma. B) Coronal T1-weighted MRI showing the calcified subdural hematoma of different intensity.

Table I: Armored Brain in Patients with Hydrocephalus after Shunt Surgery in the English Literature

Study	No	Age and sex	Symptoms	Type of shunt	Treatment	Outcome
Takaku and Komatsu, 1973 ²²⁾	1	6y-F	mental retardation	VA	Surgery	GR
Tvete and Larsen, 1978 ²²⁾	2	5y-M 7y-M	seizures mental retardation, increased ICP	VA VA	Surgery Surgery	ND ND
Mori, 1982 ¹⁵⁾	1	5y-M	right hemiparesis, mental retardation	VP	surgery	GR
Ludwig, 1983 ¹³⁾	3	8y-M 3y-F 18y-F	asymptomatic epilepsy asymptomatic	ND ND ND	conservative conservative Surgery	GR GR GR
Gandolfi, 1983 ⁷⁾	1	12y-M	headache, vomiting, apathy	VA	surgery	GR
Barmeir, 1985 ³⁾	2	15y-F 10y-M	headache, vomiting asymptomatic	VP, VA	conservative	GR
Spadaro, 1987 ²¹⁾	1	13y-M	gait disturbance	VA	conservative	GR
Sharma, 1999 ²⁰⁾	2	9y-M 10y-M	vomiting, disturbed consciousness	VP VP	Surgery Surgery	GR GR
Al Wahaib, 2003 ¹⁾	1	10m-M	asymptomatic	VP	conservative	GR
He XS, 2005 ⁹⁾	1	15y-M	headache, right hemiparesis, urinary incontinence	VP	Surgery	GR
Dimogerontas, 2006 ⁵⁾	1	43y-M	headache, vomiting	VP	conservative (shunt revision)	GR
Papanikolaou, 2008 ¹⁸⁾	1	33y-M	Increased ICP	VA	conservative (shunt revision)	GR
Amr, 2008 ²⁾	1	30y-F	Epilepsy	VP	Conservative	GR
Current study	1	12y-M	Epilepsy	VP	Conservative	GR

Abbreviations in Table I: GR; Good recovery, ICP; Increased intracranial pressure, F; Female, m; month, M; Male, ND; No data, VA; Ventriculoatrial, VP; Ventriculoperitoneal, Y; Year

structures (10). The management of calcified chronic subdural hematoma is a matter of controversy and it is recommended that surgical intervention should be limited to patients who have progressive neurological deficits or evidence of increased intracranial pressure (18). The surgical intervention for calcified chronic subdural hematoma has no effect on the long term brain atrophy and the symptoms are related to that brain damage rather than the calcified mass as in our patient with epilepsy. MacLaurin and MacLaurin (14) reported no improvement in the IQ of their 6 children after surgery. Iplikcioglu et al in their patient showed seizure control after surgery but the patient continued his anti epileptic treatment (11). Moreover, the commonly atrophic parenchyma after discharged from its armor is not liable to expand completely so the increased brain volume will not be enough to prevent accumulation of subdural hygroma. Ludwig et al (22), in their only patient treated surgically because of disturbed consciousness after cranial trauma, reported that the increase in brain volume was only moderate after surgery and the patient required shunting of the recurrent subdural hygroma. We did not believe that removal of such lesions were necessary or beneficial for our patient

DISCLOSURE

The author report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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