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Case Report

Armored brain: A case report and review of the literature

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Abstract

Background: Calcified chronic subdural hematomas occur infrequently. When the calcifications are extensive and bilateral, the condition is termed "armored brain". We describe a case of "armored brain" incidentally discovered in an adult presenting with abdominal pain and mild headaches, long after initial placement of a ventriculo-peritoneal (VP) shunt.

Case Description: A 38-year-old woman, treated at infancy with a VP shunt, presented with a 2-month history of abdominal pain associated with nausea and chills. She was neurologically intact on exam. An abdominal computed tomography (CT) scan demonstrated a rim-enhancing loculated fluid collection surrounding the patient's distal VP shunt catheter tip. As a part of her initial work-up, she received a head CT to evaluate the proximal VP shunt, which demonstrated large bilateral chronic subdural hematomas with heavily calcified walls. She was eventually taken to the operating room (OR) for replacement of the distal catheter. It was felt that her acute clinical presentation was unrelated to the bilateral, calcified subdural hematomas and thus the decision was made to manage them conservatively.

Conclusions: This rare complication of chronic shunting for hydrocephalus is sometimes referred to as armored brain. Surgery for armored brain is infrequently indicated and beneficial in only small subgroup of patients, with management guided by clinical presentation. Our patient fully recovered after shunt revision alone.

Key Words: Armored brain, calcification, subdural hematoma, ventriculo-peritoneal shunt

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INTRODUCTION

Chronic subdural hematomas are not uncommon; however, calcification or ossification in a chronic subdural hematoma occurs less frequently. Bilateral, calcified chronic subdural hematomas or "armored brain" has been reported in subdural hematomas of various etiologies, although rarely as a consequence of shunting for hydrocephalus.[11] The condition occurs more commonly in children and a variety of presentations have been reported. We describe a case of "armored brain" incidentally discovered in an adult presenting with abdominal pain and mild headaches, long after initial placement of a ventriculo-peritoneal (VP) shunt.

CASE REPORT

A 38-year-old woman with a history of obstructive

hydrocephalus since infancy, treated with a VP shunt, presented with a 2-month history of abdominal pain associated with nausea and chills. She reported a long-standing history of occasional mild intermittent headaches since childhood as well. On physical examination, she was found to be neurologically intact. A computed tomography (CT) scan of her abdomen (not shown) revealed a large rim-enhancing, loculated fluid collection within the mid-abdomen, surrounding the patient's distal VP shunt catheter tip. These findings were concerning for pseudocyst formation.

The shunt was tapped and cerebrospinal fluid cultured. Her shunt was then subsequently externalized and her pseudocyst was drained by interventional radiology. The patient was kept on broad-spectrum antibiotics until all cultures returned negative and ultimately she was taken to the operating room at that time for replacement of the distal shunt catheter. As a part of her initial work-up, on admission, she received a head CT [Figure 1a, b] and a shunt survey [Figure 2] to evaluate the proximal VP shunt. The imaging demonstrated large bilateral, heavily calcified chronic subdural hematomas. Given her neurological exam it was felt that her acute clinical presentation was unrelated to the bilateral, calcified subdural hematomas and thus the decision was made to manage them conservatively. She has continued to do well postoperatively on follow-up more than 1 year out from distal shunt revision.

DISCUSSION

Although chronic subdural hematomas are common, it is rare to observe calcification or ossification.[10,14,16] The exact incidence of calcification in chronic subdural hematomas is unknown but has been reported to typically range from 0.3 to 2.7%,[9,15,21,22] with another paper describing it as high as 10% as detected by skull film in children.[7] Calcification can occur unilaterally; however, when calcification is extensive, bilateral and involves the entire hemisphere, this condition is referred to as "armored brain" – given the appearance of an encased brain.[11]

Calcified chronic subdural hematomas have been reported most commonly as a late complication of traumatic brain injuries[5,7-9,13,21] or in cases of post-meningitic subdural effusions.[11,12] The condition may be a complication of chronic shunting for hydrocephalus, although more rarely.[2,6,11,16,17,20] Generally, calcified post-shunt subdural hematomas have been described as being less extensive.[11]

The clinical presentation of patients with "armored brain" is characterized by a slow progression of neurological signs and symptoms. While the majority of patients remain asymptomatic, symptoms can include gait disturbance, chronic headache, deteriorating vision, epileptic seizure, dysphasia, behavioral problems, paresis and even plegia.[4,5,9,10,15,16,19]

The pathogenic mechanisms underlying the calcification of chronic subdural hematomas remain poorly understood.[18] It has been suggested that metabolic factors play an important role in the development of calcification.[3,18] Still others suggest that several vascular factors lead to calcification, such as poor circulation and absorption in the subdural space and vascular thrombosis.[1] Some feel that there are also local factors that play a role as evidenced by patients with bilateral chronic subdural collections, but only unilateral calcification.[13] The usual interval between hemorrhage and development of calcification varies between 6 months and many years.[1,3,5,7]

Patient management is determined on an individualized basis. Patients who are asymptomatic, elderly or without progressive neurological deterioration may be managed

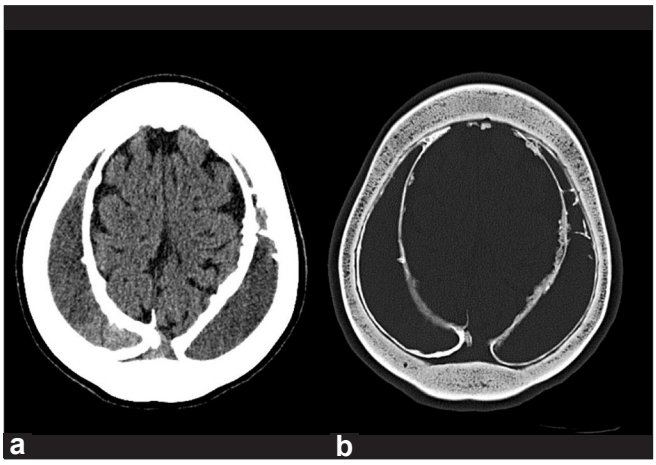

Figure 1: Non-contrast head computed tomography – (a) Brain and (b) bone windows on axial computed tomograph imaging of the head demonstrating large bilateral chronic subdural hematomas with heavily calcified walls

Figure 2: Shunt survey – Significantly calcified walls of the subdural hematomas on plain X-ray of the skull as a part of the shunt survey

conservatively with observation. Surgical intervention may be necessary in young patients or in situations where patients are clearly symptomatic from the calcified subdural hematomas. Although successful surgical removal has been described, it is frequently technically difficult to obtain complete excision.[1,9,14-17] Due to the infrequency of indicated surgical intervention, there is insufficient information regarding outcome.

CONCLUSION

Here we report a patient, shunted from infancy, who presented with chronic mild headaches and acute findings consistent with a symptomatic abdominal pseudocyst. During the initial work-up, the patient was found to have "armored brain". The patient's symptoms were successfully managed with VP shunt externalization, antibiotics, pseudocyst drainage and subsequent distal shunt revision. The extensive bilateral, calcified chronic subdural hematomas were managed conservatively. Management of this rare condition should be guided by clinical presentation, as surgery is beneficial in only a subgroup of patients.

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