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CASE REPORT

Chronic ossified subperiosteal hematoma of the skull in an 11-year-old child: a case report

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Introduction

Subperiosteal hematomas of the skull, also known as cephalhematomas, occasionally occur in neonates and most commonly result from birth trauma [1]. Subperiosteal hematomas are an accumulation of blood between the periosteum and the outer surface of the skull. Subperiosteal hematomas are usually limited within the suture lines and have a self-limiting clinical course that resolves spontaneously within a few weeks or months. Rarely, complications occur in neonates and infants, such as hyperbilirubinemia, anemia, and hemodynamic instability [1, 2]. Calcifications and ossifications are also rare complications of subperiosteal hematomas which may require surgical treatment for cosmetic reasons [3, 4].

We report a case of an 11-year-old boy with a chronic, ossified, subperiosteal hematoma that crossed over the sagittal suture line. The subperiosteal hematoma had different clinical characteristics compared to a typical neonatal cephalhematoma.

Case report

An 11-year-old boy visited our hospital with frontal scalp swelling after trauma to his head against a wall. There was no medical history of a coagulopathy, vascular abnormality, or previous craniofacial surgery. An initial brain CT scan showed a hematoma under the scalp in both frontal areas, with dominance on the right side (Fig. 1). There were no definite skull fractures or intracranial traumatic lesions. Careful observation was recommended to his parents, but the patient was lost to follow-up. After 8 months, the boy sought evaluation at the hospital because of persistent frontal scalp swelling, which extended to the right parietal area (Fig. 2). The swollen scalp was soft and consistent with fluid content, but there were some underlying hard bony components. He had no physical or neurologic deficits, and the laboratory findings were normal. The complete blood count and coagulation profiles, including the platelet count, prothrombin time, and activated partial prothromboplastin time, were within the normal ranges. A follow-up CT scan showed a large chronic hematoma in both frontal areas with some ossification of the outer wall (Fig. 3). There were no intracranial pathologic findings. The patient underwent surgical treatment.

Intraoperative findings and postoperative clinical course

With the patient in the supine position, a bifrontal scalp incision was made. A thick, dark brown-colored membrane of the hematoma was observed between the scalp and the skull, and an old hematoma was identified beneath the membrane. There was an arch-shaped abnormal bone formation in the hematoma extending from the skull to the outer hematoma membrane (Fig. 4). There was no evidence of a recent or old infection. The hematoma and membrane were completely removed and the pathologic bone was drilled out. Two vacuum-drainage catheters were placed and the scalp was closed. A compressive bandage dressing was placed for 1 week. The patient was discharged without any complications, and the head contour was normalized.

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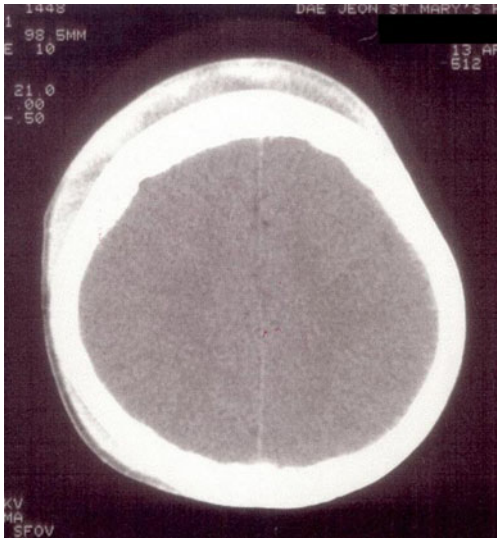

Fig. 1 Initial brain CT scan showing a scalp hematoma in both frontal areas with dominance on the right side. No skull fractures or intraparenchymal lesions were noted

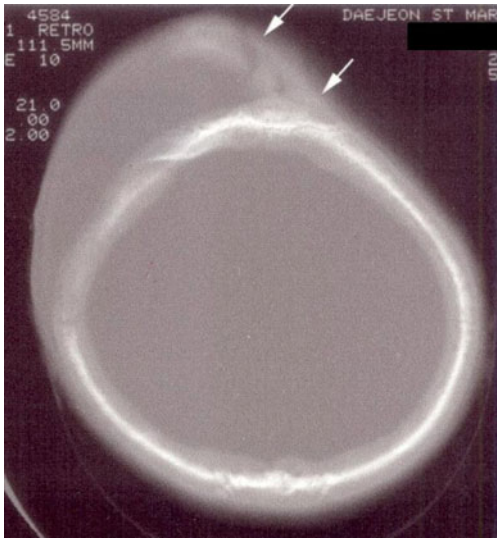

Fig. 3 Preoperative brain CT scan. A large hematoma was noted at the frontal region and partial ossification was found in the outer wall of the hematoma (*white arrows*)

Histopathologic findings

A pathologic examination revealed that the membrane of the hematoma was composed of hyalinized fibrous tissue with ossification and some granulation tissues (Fig. 5).

Discussion

Subperiosteal hematomas of the skull most commonly result from birth trauma in neonates or from head injuries in infants. Subperiosteal hematomas can also appear under additional circumstances, such as previous craniofacial surgery, hematologic disease, or anticoagulation therapy [5–9]. Pathophysiologically, subperiosteal hematomas are made by sudden compression of the skull, which results in displacement of the skull from the periosteum, causing a tearing of vessels between the periosteum and the external surface of the skull. Because the periosteum is most tightly attached at the suture lines, subperiosteal hematomas are limited within the suture lines [1, 2, 10, 11].

In most cases, subperiosteal hematomas are self-limiting and resolve spontaneously within a few weeks or months and do not need any treatment. However, in rare cases, complications occur, such as hyperbilirubinemia, anemia, hemodynamic instability, and infections in neonates and infants [1, 2]. Calcification and ossification can occur in <5% of patients who may need surgical treatment for cosmetic reasons [3, 4]. The case presented herein had several different characteristics compared to typical cases of subperiosteal hematomas.

First, the subperiosteal hematoma occurred in an 11-year-old boy. Although there are several case reports of subperiosteal hematomas in older children after craniofacial surgery, subperiosteal hematomas in older children after minor head

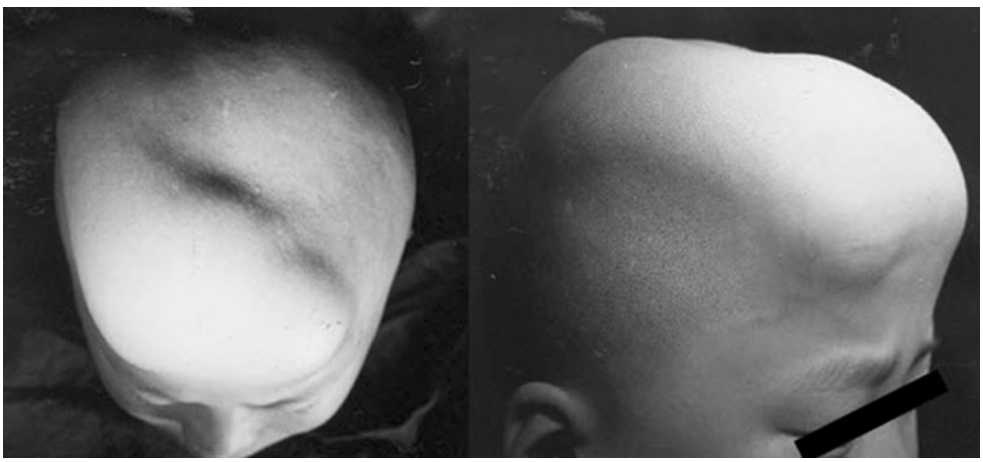

Fig. 2 Eight months after the head trauma, scalp swelling expanded from the frontal to right parietal region

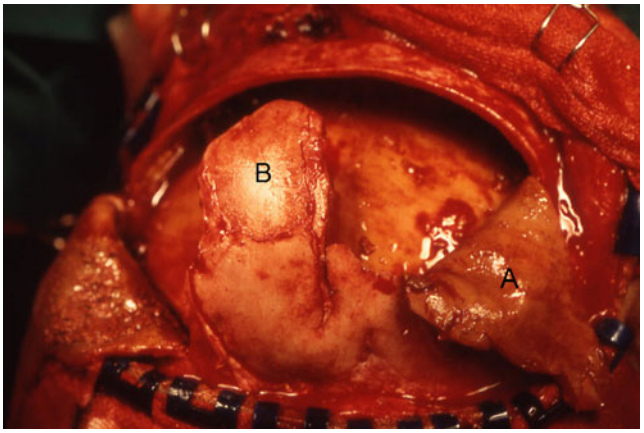

Fig. 4 Intraoperative view showing a thick membrane covering the hematoma (**a**) and new bone formation (**b**) beneath the membrane

trauma occur very rarely because the periosteum is tightly attached to the skull at this age [12].

Second, the hematoma of this patient crossed over the sagittal suture line. Such a phenomenon is extremely rare and only two cases in older children have been reported before. Aguas et al. [8] reported a similar case in a 15-year-old boy and Fujiwara et al. [9] reported a case in a 14-year-old boy. It has been suggested that the tight attachment of the periosteum to the suture lines becomes loose as the child grows older [13, 14]. In neonates, only two such cases have been reported previously, both of which exhibited sagittal craniosynostosis [15, 16].

Third, the patient underwent a chronic clinical course and a thick membrane around the old hematoma had formed, which resembled a chronic subdural hematoma. Only one such case report has been published [17]. Specifically, Palatinsky et al. [17] reported a case involving a 76-year-old man with a clinical course of 40 years. We found two other cases of chronic subperiosteal hematomas of the orbit, but in those cases the hematoma was not within the scalp [18, 19]. Pathophysiologically, we believe that the initial hematoma acted like a chronic subdural hematoma, which expanded by neovascularization and microhemorrhage from the outer membrane [17, 20–22].

Fourth, the subperiosteal hematoma of the patient had an ossified component within its periosteal membrane. Although there are several reports of ossified subperiosteal hematomas in neonates or infants, ossified subperiosteal hematomas are very rare in older children and only two cases have been reported previously. Sabetet al. [23] reported a

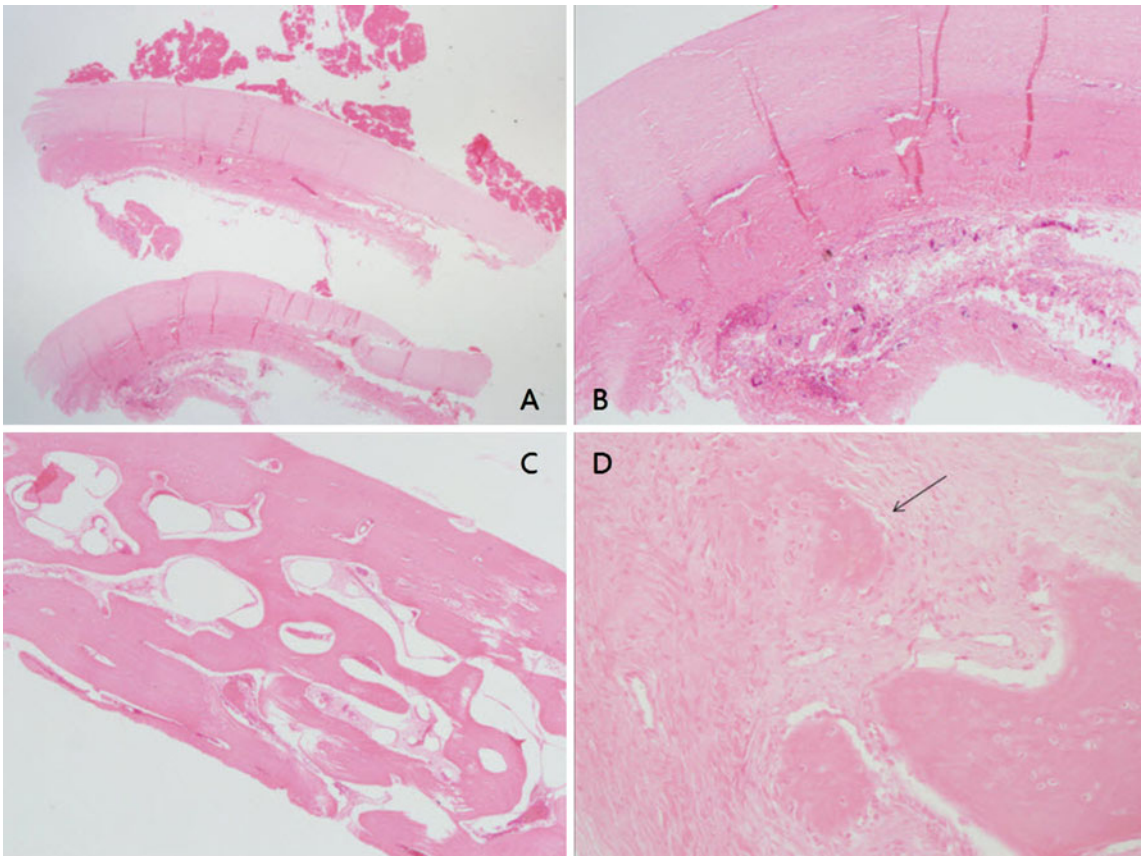

Fig. 5 Histopathologic examination of the outer wall of the hematoma. The hematoma sac was composed of hyalinized fibrous and granulation tissues (hematoxylin-eosin, **a**; ×2, **b**; ×40). Ossification is noted (hematoxylin-eosin, **c**; ×40, **d**; ×200)

subperiosteal hematoma of the orbit with osteogenesis in a 9-year-old boy and Chung et al. [3] reported a parietal ossified subperiosteal hematoma in a 4-year-old boy. The mechanism of new bone formation is not clear, but it is possible that the osteogenic progenitor cells in the periosteum, along with the cytokines and growth factors in the hematoma, play a role in the process of ossification, similar to the events occurring at healing fracture sites [24, 25]. In the case of ossified hematomas, surgical treatment is needed for cosmetic reasons.

In summary, we have reported a very rare case of a chronic subperiosteal hematoma in an 11-year-old boy. Subperiosteal or subgaleal hematomas in children are usually self-limiting and resolve spontaneously within a few weeks or months and do not need any treatment. However, if the hematoma persists for greater than a few weeks or increases in size, a chronic subperiosteal hematoma should be considered even though it is a very rare complication.

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