



A Different Result of Minor Head Trauma; Aggressive Periosteal Reaction

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Abstract

While the literature reports cases of calvarial lytic lesion, the association with aggressive periosteal reaction is rare. There are various opinions about the mechanics and treatment of these lesions. This article discusses a case of periosteal reaction, which caused a calvarial lytic lesion after minor head trauma, within the framework of existing literature.

Keywords: Skull fracture, lytic lesion, periosteum, tumor-like imaging, skull bone tumor

Introduction

Skull fractures are common lesions whose outcomes are well known. Uncomplicated fractures can generally heal without any problems. In all head traumas, the severity of the trauma, the ratio of the surface area exposed to trauma, and the physical properties of the skull area are of importance (1). In post-traumatic skull fractures, the scalp on top is also exposed to the trauma. On the scalp, lacerations and closed injuries, such as cephalic hematoma, at various sizes may impair tissue integrity. In the healing process, lesions on the scalp may develop an infection at the wound site, which may extend to the parietal bone. Furthermore, complications such as the calcification of a cephalic hematoma may also occur (2). Complications are not expected, especially in childhood linear and simple displaced skull fractures. However, "growing skull fracture" (also known as post-traumatic porencephaly, bone absorption, leptomenigeal cyst, post-traumatic aseptic necrosis of the skull, or traumatic ventricular cyst) was identified in children under the age of 3 (3). Calvarial lytic lesions that developed after head trauma have been reported in the literature. These articles, which include case reports or case series, discuss pathogenesis and treatments. This article presents a calvarial lytic lesion, a

result of an aggressive periosteal reaction that emerged several years after minor head trauma.

Case Presentation

Consent was obtained from the patient and his relative. A 15-year-old male patient presented to our clinic with the complaint of painful swelling in his head. In the examination, painful swelling in the parietal region on the right side of the back was present, and no neurologic deficit was seen. He has stated that in the anamnesis, he experienced a swelling after hitting his head six years ago, but then the swelling decreased and became hollow. Later, it started swelling again. The patient who did not apply to any medical institution after the trauma has expressed that this swelling has gradually increased recently, and pain has developed as a result. Cranial computed tomography and magnetic resonance imaging revealed a lytic destructive lesion with a heterogeneous contrast involvement in a sporadic punctate pattern affecting the tabula externa in the right posterior parietal (Figure 1a-c). The lesion was first interpreted as significant, suggestive of eosinophilic granuloma. In the differential diagnosis, arachnoid granulation, multiple myeloma, plasmacytoma, and lytic bone metastases were observed. In the patient who

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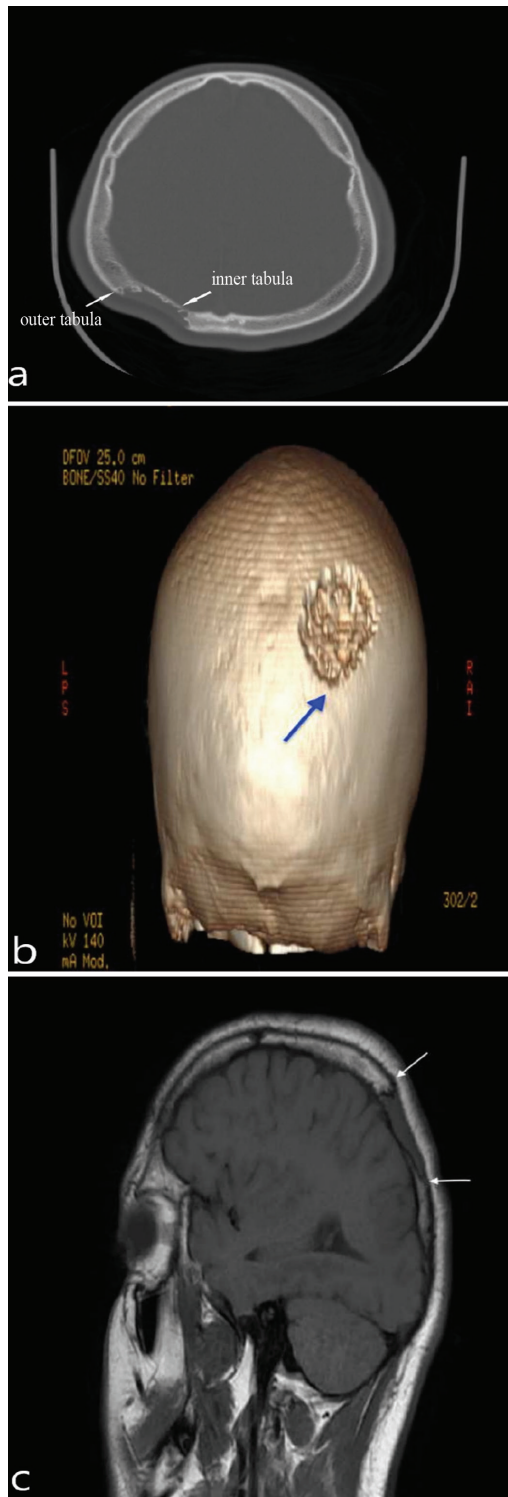


Figure 1. Fifteen-year-old male patient: from a section taken at the a-transverse computed tomography (CT) bone window, a lytic lesion of about 4 cm in diameter destructing the outer tabula in the right parietal bone posterior was found (**a**); The inner tabula was kept 3D CT inspection (**b**); Sagittal T1-weighted magnetic resonance imaging shows no intracranial extension of the destructive lytic lesion (between the arrows) (**c**)

underwent surgery after preoperative preparations, the lytic mass was totally removed with 1 cm of solid surrounding tissue. The lesion had no attachment to the dura, and the cranioplasty was performed with titanium mesh. The patient was discharged at the end of the third day without any complications. In the histopathological examination, loss and decrease of bone trabecular volume at the diploe margin, ineffective/intramembranous ossification filling in the margin, and intense fibrous/mesenchymal tissue enlargement showing severe periosteal reaction, bone trabecular fragments of old bone fraction in fibrous tissue, normal diploe in the periphery and calvarial bone with bone marrow were present (Figure 2a, b).

Discussion

The presented case is the development of a tumor-like calvarial lytic lesion, a rare result of the external table fracture, caused by minor closed-head trauma. Since the patient did not seek care from any healthcare facilities after the trauma, the fracture at that time could not be documented. The skull fracture was identified through the detection of bone trabeculae of the old fracture from the pathology report and through the patient's anamnesis. Aggressive periosteal reactions can be seen not only with malignant tumors but also with more benign processes such as infection, eosinophilic granuloma (Langerhans cell histiocytosis), aneurysmal bone cyst, osteoid osteoma, hemophilia, and trauma (4,5). However, aggressive periosteal reaction after trauma is rarely observed. The histopathological findings of calvarial osteolytic lesions reported in the literature have shown differences and have suggested the availability of different mechanisms. In 2011, 2 cases reported by Hermann et al. (6) and pathological examinations of 3 cases from the literature review revealed organized hemorrhage with papillary endothelial hyperplasia, a nonspecific inflammatory reaction with intertrabecular fibroblast proliferation, and reactive fibrous tissue without dural infiltration (7,8). In the mechanism underlying all these cases, it is understood that the nonspecific inflammatory reaction of the periosteum plays a significant role. The triggering factor for this inflammatory process may be intradiploic or subgaleal hematomas resulting from trauma. In the pathological examination of the presented case, the trabecular fragments of the outer tabula indicate the presence of cephalic hematoma and hematoma in the diploe, whereas intense fibrous and mesenchymal tissue enhancement is a sign of severe periosteal reaction. These findings strongly support the information in the literature. While the aggressive periosteal reaction generally affects only the diploe and the external tabula of the skull, there are cases in the literature involving both the internal and the external tabula (7). Although surgical resection can

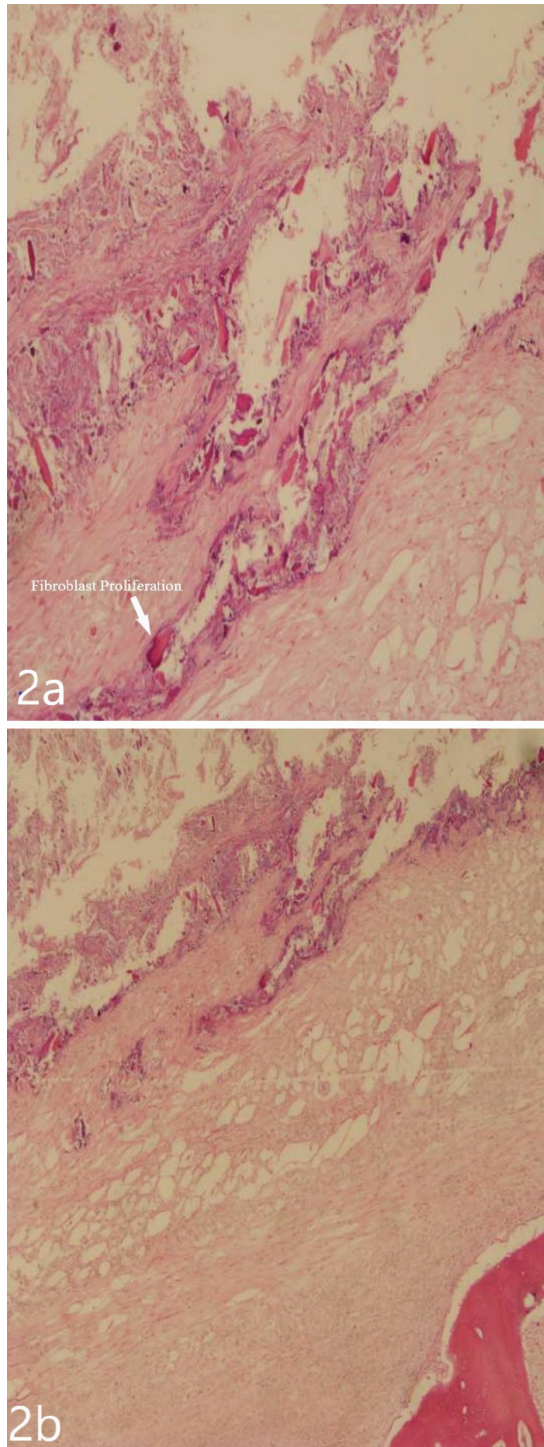


Figure 2. Fibrin, ossification around the fragmented old bone trabeculae in the bone fracture site and fibroblast proliferation surrounding them (H&Ex100) **(a)**; Fragmented bone in the fracture site in the upper left corner; fibroblastic proliferation in between; narrowing at the diploe margin; and Haversian bone in the lower right corner (H&Ex40) **(b)**

H&Ex: Hematoxylin and eosin

be considered for histopathologic diagnosis and other diagnoses, literature information is found stating that spontaneous reossification is also possible (6-8). On the other hand, the fact that the presented case has lasted for about 6 years and the pathologic findings showing ineffective ossification within the range of the diploe and a decrease in the bone trabecular volume indicate that reossification is not always possible. The periosteal reaction contributes to the healing of the bone structure. However, an aggressive periosteal inflammatory reaction may result in focal osteolysis, as in our case, through invasion of the diploe margin on the fracture surface. In the cases presented in the literature, the time between the trauma and admission is between 1 and 7 months (6-8). Due to our presented case being diagnosed about 6 years after the trauma, having radiological features of the lesion and eosinophilic granuloma as pre-diagnosis, and being a painful lesion, craniotomy and cranioplasty were performed.

In conclusion, the aggressive periosteum reaction should be kept in mind and prior head trauma should be examined in the differential diagnosis of the calvarial lytic lesions. Options such as surgery and monitoring should be considered in the treatment of these types of lesions. The decision should be made according to the characteristics of the patient and the lesion.

Ethics

Informed Consent: Consent was obtained from the patient and his relative.

Footnotes

Authorship Contributions

Surgical and Medical Practices: M.E.A., Concept: E.E.E., Design: M.E.A., Data Collection or Processing: E.E.E., Analysis or Interpretation: E.K., Literature Search: E.E., Writing: M.E.A., E.K.

Conflict of Interest: No conflicts of interest were declared by the authors.

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