Cukurova Anestezi ve Cerrahi Bilimler Dergisi

Giant Frontal Aneurysmal Bone Cyst with Orbital and Anterior Cranial Fossa Extension in an Adolescent: A Case Report

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Abstract

Objective: The aim of this study was to present the clinical, radiological, and surgical features of a rare giant frontal aneurysmal bone cyst (ABC) with orbital, sinonasal, and anterior cranial fossa extension in an adolescent patient. **Methods:** This study was designed as a single-patient case report. A 15-year-old boy presenting with progressive painless right orbital swelling and visual impairment was included. Clinical examination, computed tomography (CT), and magnetic resonance imaging (MRI) were performed for diagnostic evaluation. Histopathological confirmation was obtained through endonasal biopsy. The patient underwent total microsurgical excision via bicoronal craniotomy using neuronavigation and CUSA assistance. Postoperative clinical and radiological follow-up findings were evaluated. **Results:** Radiological investigations demonstrated a multiloculated expansile lesion involving the frontal bone, ethmoid and maxillary sinuses, nasal cavity, and anterior cranial fossa with significant orbital compression. Histopathological examination confirmed the diagnosis of aneurysmal bone cyst. Total surgical resection was successfully achieved without intraoperative complications. Postoperatively, ocular movements returned to normal in all directions, visual acuity improved from 4/10 to 10/10, and no cerebrospinal fluid leakage or neurological deficits were observed. **Conclusion:** Giant cranial aneurysmal bone cysts involving the skull base and orbit are extremely rare lesions that may present with rapidly progressive orbital symptoms. Combined radiological and histopathological evaluation is essential for accurate diagnosis. Complete surgical excision remains the optimal treatment strategy and may provide excellent functional and cosmetic outcomes.

Keywords: Aneurysmal bone cysts; frontal bone; orbit; skull base; craniotomy

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1. Case Presentation

A 15-year-old boy presented due to a 3-month history of painless swelling of the right eye. A painless hard swelling began behind his right eye about 3 months ago, and it has grown significantly in the last month. The patient was transferred to us and admitted to our clinic. Clinical examination showed a smooth-surfaced, hard, fixed-to-bone mass that was not painful or tender. The skin over this swelling appeared normal. His protruding right eye was laterally deviated. Right ocular movements were limited in 4 directions. Visual acuity was 4/10 in the right eye while it was normal in the left.

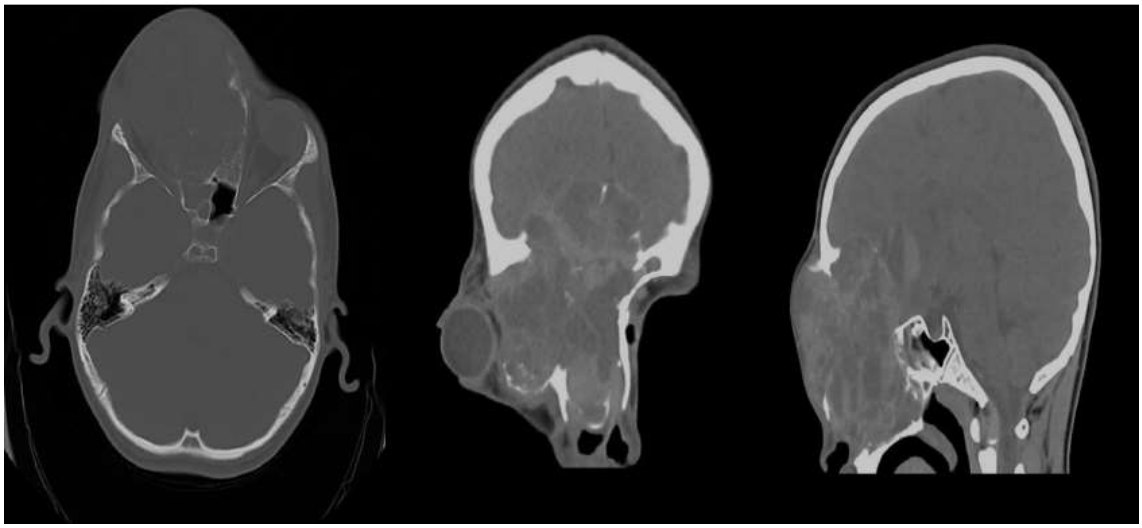

Figure 1. Preoperative CT images demonstrate the multiloculated expansile frontal lesion with sinonasal and orbital extension.

CT (Figure 1) and MRI (Figure 2) showed a lesion that started from the right frontal, ethmoid, and maxillary sinuses, filling the nasal cavity and extending intracranially extradurally to the right frontal horn of the lateral ventricle. A mass lesion with multiloculated cystic septa and walls containing dense content of liquid–liquid level was observed. The lesion was initially thought to be compatible with an aneurysmal bone cyst. The mass created a compression effect on bilateral orbits, more prominent on the right, and displaced the medial rectus muscle, optic nerve, and globe laterally and anteriorly in the right orbit.

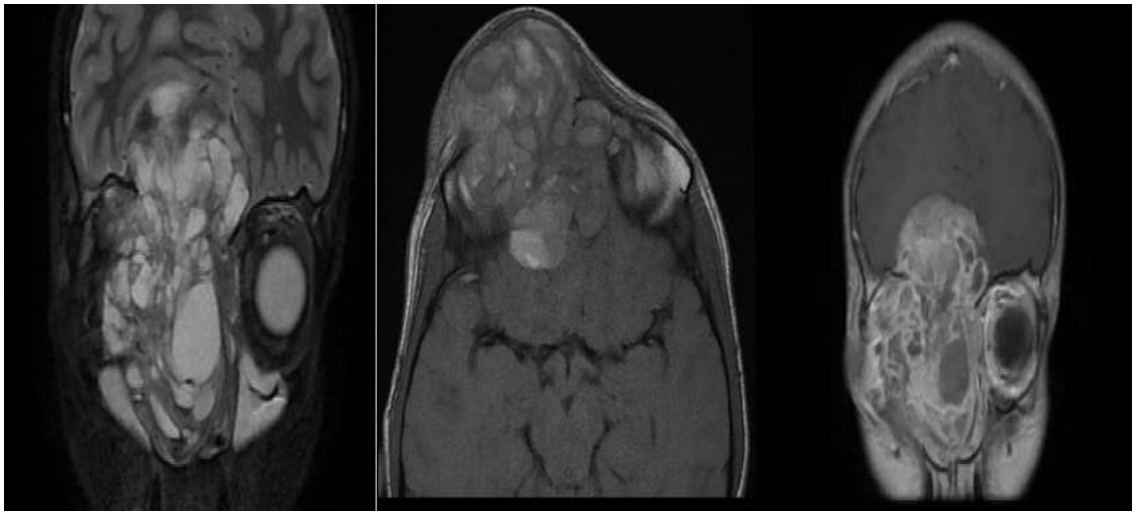

Figure 2. Preoperative MRI showing the lesion with multiloculated cystic septa, liquid–liquid levels, and anterior cranial fossa extension.

A decision was made to perform a biopsy through the nose to determine the nature of the mass. Histopathological results were consistent with ABC.

To access the lesion, after making a bicoronal skin incision, the temporal muscle was dissected. Neuro-navigation was used to assess tumor expansion. A right frontal craniotomy was performed. A thick-walled, fluid-filled lesion with an irregular wall was observed. It was indenting the medial and superior walls of the right orbit. The lesion

extended into the ethmoids and posteriorly along the orbital roof. Using the microscope and CUSA, a total resection was performed. The part that extended from the skull base to the frontal lobe was totally removed.

In follow-up after surgery, ocular movements were normal in all 4 directions. Visual acuity was 10/10 bilaterally and there was no rhinorrhea. Postoperative CT scan is shown in Figure 3. A one-year follow-up MRI demonstrated complete healing and no evidence of recurrence (Figure 4).

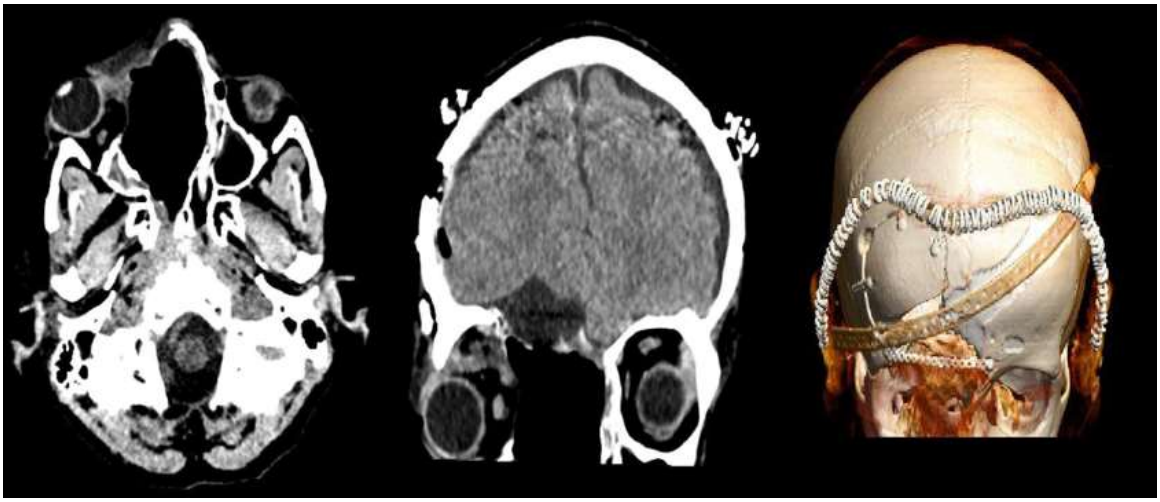

Figure 3. Postoperative CT scan demonstrating total resection of the lesion.

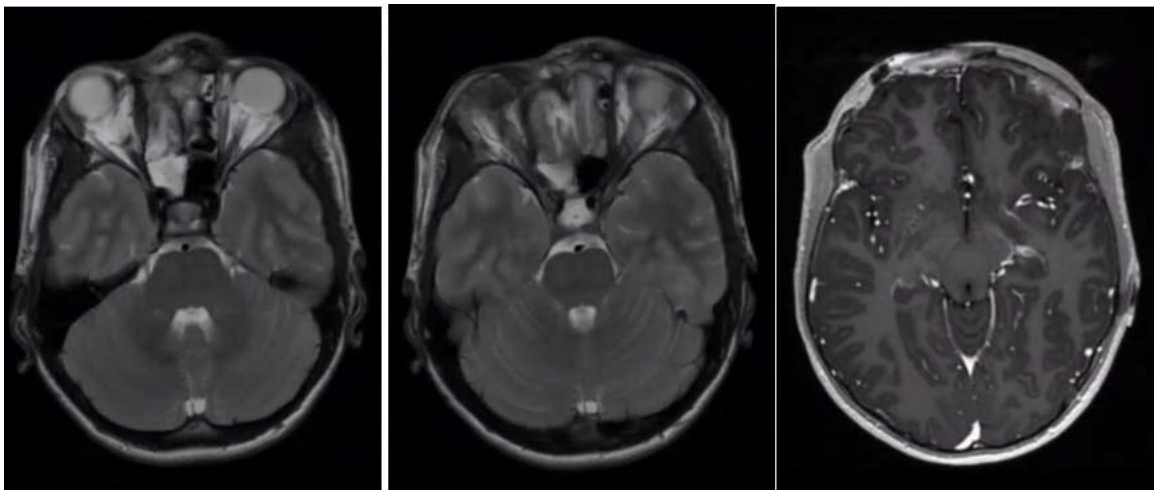

Figure 4. One-year follow-up MRI showing complete healing with no evidence of recurrence.

2. Discussion

Aneurysmal bone cysts account for about 2% of all primary osseous tumors. They were initially identified by Jaffe and Lichtenstein in 1942 as an uncommon vascular and benign tumorlike osteolytic lesion of the bone[1]. There is a 2:1 gender ratio that favors women[2]. They can be seen in any part of the skeletal system. In 50% of cases, they are found in the metaphysis of the long bones[3]. Aneurysmal bone cysts are found in the cranium on rare occasions, accounting for 3–6% of all cases. The calvaria is more commonly involved than the skull base. In the literature, approximately fifty cases of frontal ABC have been reported[4,5].

We describe an intriguing case of a young male who presented with a massive intracranial frontal aneurysmal bone cyst that developed rapidly over 3 months. Due to the unusual location and highly destructive behavior, it was a difficult clinical and radiological diagnosis. The final pathological and molecular diagnosis was a frontal aneurysmal bone cyst. The clinical presentation is influenced by the mass's position, size, and compressive effects on the nearby structures. Neurological impairments occur when the skull base is involved. The exact etiology of ABCs has not been elucidated. Depending on whether an associated lesion is present or absent, these lesions are categorized as primary or secondary; primary lesions appear in isolation, while secondary lesions can form in a variety of benign and malignant bone lesions or after trauma. The most common associated lesions are giant cell tumor, chondroblastoma, osteoblastoma, osteosarcoma, chondromyxoid fibroma, and fibrous dysplasia[6]. The most popular theory is that ABC represents a reaction to intraosseous or subperiosteal bleeding. This bleeding is believed to be caused by a localized circulation abnormality and obstructed venous drainage, which lead to increased venous pressure and dilatation of the surrounding vascular network. When there is an initial vascular damage, pressure rises and causes nearby bone tissues to expand, erode, and reabsorb[7]. However, a third or more of ABC instances are secondary in character, believed to arise from disruption of the osseous circulation by the accompanying lesion. Malignant transformation has been recorded in approximately 3% of cases, even though the lesion is benign[8]. The origin of this lesion may be related to hormonal changes, and although uncommon, there have been reports of a link between this lesion and pregnancy as well as ABC expansion during pregnancy[9]. Additionally, a rare hereditary ABC instance has been documented[10]. In the medical literature, some cases of spontaneous regression of ABC have also been reported[11]. CT can show a lytic lesion with septations, and on MRI, internal septations dividing into small cavities can be observed. The peripheral capsule and internal septations significantly enhance after gadolinium injection. The fluid–fluid levels that represent the sedimentation of red blood cells in hemorrhagic cavities, which were slightly present in our case, are the hallmark of an ABC[12].

3. Conclusion

Total excision is the best treatment for ABCs. Because the lesion is not cancerous, extensive or radical surgery is usually not recommended. However, when the lesion is large or involves the skull base, complete surgical resection may be more difficult to achieve. In such cases, partial excision or intralesional curettage should be considered, along with adjunctive therapy such as pre-operative arterial embolization. Because of the risk of sarcomatous degeneration, radiotherapy is not recommended.

genAI: No artificial intelligence-based tools or generative AI technologies were used in this study. The entire content of the manuscript was originally prepared, reviewed, and approved by all authors.

Statement of Ethics: Written informed consent was obtained from the patient's legal guardian for the publication of this case report and the accompanying images. Ethical committee approval was not required for this single-case retrospective report in accordance with institutional guidelines.

Data Availability: The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Conflict of Interest: The authors declare no conflict of interest.

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