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Pure Endoscopic Endonasal Removal of Unusual Anterior Skull Base Aneursymal Bone Cyst Extending to the Frontal Lobe

Ali Erdem Yildirim, MD Ibrahim Ekici, MD Emin Cagil, MD
Denizhan Divanlioglu, MD Ahmed Deniz Belen, MD

Abstract: Aneurysmal bone cysts (ABCs) are benign, nonneoplastic, hemorrhagic, and expansile osseous lesions that present most frequently at age younger than 20 years. Aneurysmal bone cysts typically involve long bones of extremities, thorax, pelvis, or spinal column. Skull base involvement is very rare. The authors report the case of a 23-year-old woman with ABC of the skull base and total removal of lesion with pure endoscopic endonasal approach. The patient had presented with nasal obstruction for 6 months. Physical and neurological examination findings were normal except for bilateral anosmia. Cranial magnetic resonance imaging (MRI) revealed a tumor occupying ethmoid sinuses anterior skull base that extended into bilateral frontal lobes. The patient underwent pure endoscopic endonasal surgery, and the tumor was resected gross-totally. Histologic examination revealed ABC. Consequently, ABC should be considered in differential diagnosis of skull base pathologies. Endoscopic endonasal surgical approach is a safe, minimally invasive, and effective way in the treatment of these tumors.

Key Words: Aneurysmal bone cyst, anterior skull base, endoscopic endonasal, frontal lobe

Aneurysmal bone cysts are members of benign fibrosseous lesion groups such as ossifying fibroma, fibrous dysplasia, and benign osteoblastoma.[1–4] Aneurysmal bone cysts were first described by Jaffe and Lichtenstien as a nonneoplastic, hemorrhagic, multiseptate cystic and expansile benign osseous lesions in 1942.[5–9] They are most commonly found in long bones of extremities, thorax, pelvis, and spinal column; and skull base involvement is very rare.[5,10] Most patients having ABCs are younger than 20 years.[5,6,11,12] According to Lichtenstien, ABCs could be lesions that developed secondary to circulation impairment as seen in venous thrombosis or arteriovenous malformation.[13,14]

Clinical findings of ABCs depend on affected region. In cranial involvement, headache, nasal obstruction, and cranial nerve paralysis are remarkable for ABCs.[12,13,15] Radiography of aneurysmal bone cysts generally shows an expansile cystic lesion with a honeycomb or a soap-bubble appearance.[1,16] Treatment options of ABCs include surgical resection, curettage, cryotherapy, sclerotherapy, and radiotherapy.[5,7,17–22] Many transcranial surgical approach with different succes rates, cosmetic problems, and reconstruction problems have been used for surgical resection of skull base ABCs until today.[1,5,11] Surgical resection with gross-total excision has perfect outcome and considered as best approach for treatment of ABCs.[1,11,23,24]

The authors present gross-total resection of a rare ABC that occupies anterior skull base and extends to bilateral frontal lobes with pure endoscopic endonasal surgical approach.

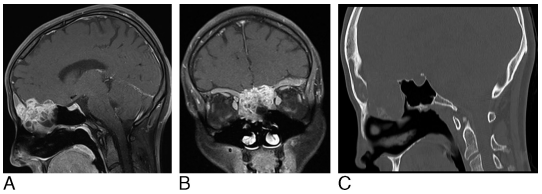

FIGURE 1. T1-weighted sagittal MRI (A) and T1-weighted coronal MRI (B) show a multiseptated, trabeculated mass lesion, which occupied ethmoid sinuses, expanded through nasal cavity and frontal lobes, with a diffuse heterogenous contrast enhancement. Sagittal reconstruction paranasal CT (C) shows the antreior skull base destruction and thin bone lamellas into the lesion.

CLINICAL REPORT

A 23-year-old woman presented with impairment of the sense of smell. Neurological examination was remarkable for bilateral anosmia. Cranial magnetic resonance imaging and paranasal computed tomography revealed a multiseptated, trabeculated tumor, which occupied ethmoid sinuses and expanded through nasal cavity, anterior cranial fossa, and frontal lobes, with a diffuse heterogenous enhancement after gadolinium administration (Figs. 1A–C). Digital subtraction angiography was performed to reveal lesion vascularity and relation with cerebral vascular structures. Vascular supply of tumor arises from branches of bilateral external carotid artery; left branches dominated. In addition, intense tumor blush was demonstrated at late capillary stage (Fig. 2). No endovascular embolization was performed.

The patient underwent a binostril endoscopic endonasal transethmoidal transcribriform approach in supine position. Bilateral ethmoid sinuses were occupied by yellow-white, hemorrhagic tumor with multiple bony compartments. The tumor extended to anterior cranial fossa and eroded the dura. The tumor was resected gross-totally including the intracranial part. Both of the olfactory nerves were seen and preserved. After resection, free graft of fascia lata from the right thigh and fibrine tissue adhesives were used for skull base reconstruction. At the end, a foley catheter was placed for immobilization of reconstruction materials. External lumbar drainage catheter was replaced. No nasal packing was used.

Postoperative cranial computed tomography and cranial magnetic resonance imaging showed the gross total removal of the tumor (Fig. 3). Nasal foley catheter was removed at postoperative second day, and the external lumbar drainage catheter was removed at postoperative third day. The postoperative course was uneventful, and the patient was discharged at postoperative fifth day. Olfactory function was intact after surgery. She did not receive postoperative radiotherapy. No recurrence was observed after 10 months.

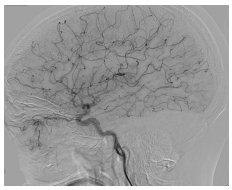

FIGURE 2. Sagittal digital substruction angiogram shows the intense tumor blush at late capillary stage.

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Fig 4 4/C

Histopathological examination showed cavernous spaces filled with blood. The spaces were separated by collagenous tissue containing fibroblasts, focal collections of osteoclast, hemosiderin-laden macrophages, and reactive bone formation (Fig. 4). Histological evaluation confirmed that the lesion was an ABC.

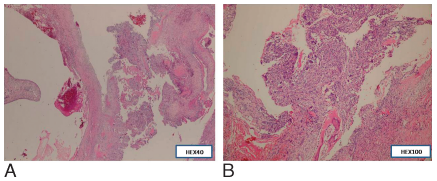

FIGURE 4. A, Photomicrograph showing the blood-containing cystic spaces that contain blood in the lumen. The cyst walls consist of fibrous septum that do not contain cells and osteoid formation in cyst walls (hematoxylin and eosin stain; original magnification ×40). B, Osteoid formation and adjacent cellular region in cyst walls and osteoclast, fibroblast, and hemosiderin-laden macrophages constitude cellular region. Osteoblastic and osteoclastic accumulation are noted arround immature bone trabeculae.

DISCUSSION

Aneurysmal bone cyst is a nonneoplastic lesion that is seen rarely. Aneurysmal bone cyst presents most frequently during the first 2 decades. Pathogenesis of ABC include several stages; the first stage is composed of osteolysis and periosteal widening.[5,10] Progressive bone destruction constitute second stage that the lesions grow rapidly, after that lesions get more stabile stage. [5,10] Typically, ABCs are most commonly found in long bones of extremities, thorax, pelvis, and spinal column. Skull base and cranial bone involvement is very rare.[5,10] In this report, the authors present a patient's clinical presentation and treatment with aneurysmal bone cyst involving skull base and extending intracranially.

Treatment options of ABCs include surgical resection, curettage, cryotherapy, sclerotherapy, and radiotherapy.[5,7,17–22] Percutaneous sclerotherapy is a minimally invasive therapy that is combined with surgery and endovascular therapy options.[10,20] In the aspect of neurological impairment and hemorrhage, if the intracranial lesions have high risk with surgery, sclerotherapy can be used alone.[6,10,25] Curettage succeeds in halting progression of disease or even causes regression in cranial ABCs, but there is a high rate of recurrence.[10,26] Total surgical removal is the best available treatment option.[10,27–29] Transcranial and endoscopic endonasal skull base approaches can be used. Difficulty of total resection, risk of recurrence, cosmetic problems, difficulty of reconstruction after resection that depends on commonly used transcranial skull base approach cannot be ignored.[1,5,11]

In recent years, endoscopic endonasal skull base approaches advanced to a very important position owing to technological development and increasing experience. Nowadays, anterior, middle, and posterior skull base lesions can be treated with minimally invasive endoscopic endonasal approach. Advantages of this approach include the following: geting through lesions in a physiological way, direct observation of lesions, allowing for total resection of lesions with domination of the whole skull base that is also the origin of lesions, does not cause cosmetic problems, patients are comfortable postoperatively, and reduction of hospital stay. The most important disadvantange of this approach is postoperative cerebrospinal fluid leak. However, with increasing experience and improved methods of endoscopic approach, skull base reconstruction has ceased to be a serious problem based on the very successful results with endoscopic endonasal approach. Bear in mind that, especially as we presented in this report, there is a need for sufficient experience and certain period of training for extented endoscopic endonasal approaches. The endoscopic endonasal approach that we used in this case is less invasive, more efficient, and safer than transcranial approaches. In addition, this approach has less rate of complication at both the preoperative and postoperative period; therefore, it offers better quality of life at postoperative period.

Consequently, ABC involving skull base is very rare, but these lesions should be kept in mind when making differential diagnosis of skull base pathologies. Recently, the endoscopic endonasal approach, which is a minimally invasive method, is highly effective and safe as a treatment choice for skull base pathologies.

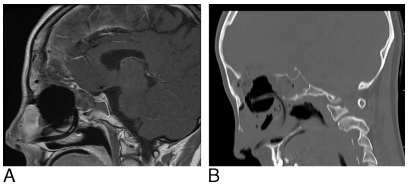

FIGURE 3. Postoperative T1-weighted sagittal MR (A) and sagittal reconstraction paranasal CT (B) show the gross total removal of lesion.

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