

Case Report

An Aggressive Psammomatoid Ossifying Fibroma Presenting as a Sphenoethmoidal Mass

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Abstract

Aggressive psammomatoid ossifying fibromas are rare, benign fibro-osseous tumors characterized by the presence of numerous calcified spherules within an actively proliferating connective tissue stroma. They are mainly seen in the sino-naso-orbital region of young individuals. CT scans tend to show a relatively well delineated heterogeneous mass with varying degrees of radiodensity depending on the amount of calcification present. As the name implies, they are prone to aggressive behavior and a high rate of recurrence. We report a case of an aggressive psammomatoid ossifying fibroma presenting as a sphenoethmoidal mass. The relevant histopathological differential diagnoses are also discussed. [*NA J Med Sci.* 2010;3(1):24-27.]

Key Words: *Aggressive Psammomatoid Ossifying Fibroma, Sphenoethmoidal Mass, fibro-osseous lesions*

Introduction

Ossifying fibroma is a well recognized entity of the fibro-osseous lesions. It is classified into 2 types: the conventional/classic type and the aggressive type. The latter is further divided into the aggressive psammomatoid and the aggressive trabecular subtypes.^{1,2} In 1938, Benjamins reported the first case of an aggressive psammomatoid ossifying fibroma (APOF) of the frontal sinus, describing it as an osteoid fibroma with atypical ossification.³ Margo et al. in 1985 introduced the term psammomatoid juvenile ossifying fibroma.⁴ Other names that have been used synonymously include: psammo-osteoid-fibroma;⁵ psammous desmo-osteoblastoma;³ juvenile psammomatoid ossifying fibroma² and juvenile aggressive psammomatoid ossifying fibroma.⁶

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The incidence rate of APOF has not been reported, most likely due to the limited number of published articles. Distinctive features of APOF include a predilection for the sinonasal complex and orbit of young people, an aggressive, infiltrative growth pattern, and a propensity for recurrence.³ When it occurs within the jaws, the maxilla is usually affected more than mandible.³ CT scans of APOF usually show a well-delineated mass demonstrating a mixed radiolucent and radiodense pattern.² The degree of heterogeneity may vary, from entirely radiolucent to multiple radiopacities.¹ A ground glass appearance is also typical of APOF.¹ Histologically, it is characterized by numerous discreet, spherical structures similar to psammoma bodies, embedded within a highly cellular fibrous connective tissue stroma.⁷ Management is usually by complete excision with close follow up because recurrence is common.^{3,6} We describe a case of APOF in the sphenoethmoidal region. The patient had presented with a similar mass in the same region seven years earlier, but was reported as “nonspecific reactive changes”. We present this case to further raise awareness about this rare condition and briefly discuss the relevant histopathological differential diagnoses.

Case Report

A 26-year-old Caucasian female college student presented with a complaint of the worst headache of her life. She stated that the headache had developed earlier in the day while sitting for an examination and she had subsequently ‘blacked out’. She had a past history of anxiety attacks, chronic sinusitis and migraine headaches when she was a child, but indicated that this headache was unusual in its severity and location. It was located around both eyes and in the bilateral maxillary sinus region, rather than the one-sided presentation of past migraines. The pain was excruciating in nature, accompanied by nausea, dry heaves and photophobia. She denied any weakness or numbness of her extremities, recent fever, chills, or difficulty with gait, but admitted to being very anxious and under a lot of stress at school. The patient also disclosed that she had stopped taking her medications paroxetine hydrochloride (Paxil) and pseudoephedrine (Sudafed) a month ago. Instead, she had taken some amphetamine and dextroamphetamine (Adderall) for “more energy” while studying for her exams the night before. She denied any history of cigarette smoking and illicit drug use but admitted to social alcohol consumption. Her past surgical history was significant for the removal of an undetermined neck lesion as a child. She also had sinus surgery seven years ago for the removal of a sphenoethmoidal mass that was diagnosed as “nonspecific reactive changes of bone and soft tissue”.

Physical examination revealed no obvious facial asymmetry or other abnormalities. A CT scan of the head ruled out intracranial bleeding. Instead, it demonstrated the presence of a benign-appearing, heterogeneous expansile mass involving the posterior ethmoid air cells (**Figures 1A-1C**). The mass measured 4.2 cm (antero-posterior) x 2.8 cm (transverse) x 2.7 cm (craniocaudal). It involved the bony nasal septum, tuberculum sellae, left anterior clinoid process and was starting to erode the anterior cranial fossa. The

lesion was more pronounced on the left side with involvement of the orbital apex and early encroachment of the optic foramen on that side. There was also evidence of previous surgery in that region. Additional findings included the presence of bilateral maxillary sinusitis and a small retention cyst on the right side. Endoscopic resections were carried out. Fragments of lesional tissue removed from both maxillary sinuses and the left sphenoid sinus were submitted to pathology for microscopic examination.



Figure 1. CT scan revealed a heterogeneous mass with central tissue density situated within the posterior ethmoid cells. This mass partially involved the nasal septum, sphenoid and orbital floor regions. **1A** and **1B**: Axial images; **1C**: Coronal image.

Pathological Findings

The gross specimen consisted of multiple pink-gray fragments of mucosa and soft tissue, some of which appeared hemorrhagic. These were admixed with fragments of bone and cartilage. Histologic examination of right maxillary tissue was consistent with maxillary sinusitis. The left maxillary and left sphenoid sinus contents revealed the presence of numerous laminated spherules forming psammoma body-like structures. Some of these ovoid spherules resembled osteoid or lamellar bone, while others were concentric and deeply basophilic, resembling cementum. Irregular, immature, woven bone trabeculae, many with osteoblastic rimming, were intermixed with these psammoma body-like structures. A few normal, mature bone

trabeculae were found, located especially towards the periphery. The intervening fibrous stroma was highly cellular, consisting mainly of spindle shaped fibroblasts with tapered nuclei. Focal areas of the stroma appeared myxoid in nature and were associated with large, dilated vascular spaces containing red blood cells. Other histologic findings included a few scattered giant cells and a patchy distribution of dense chronic inflammatory infiltrate. Normal respiratory-type epithelium with pseudo-stratified ciliated columnar cells was also present. A diagnosis of APOF with chronic sinusitis was made (**Figures 2A-2C**). Since the surgery (1 year ago), the patient has suffered some bouts of chronic sinusitis, but there has been no tumor recurrence.

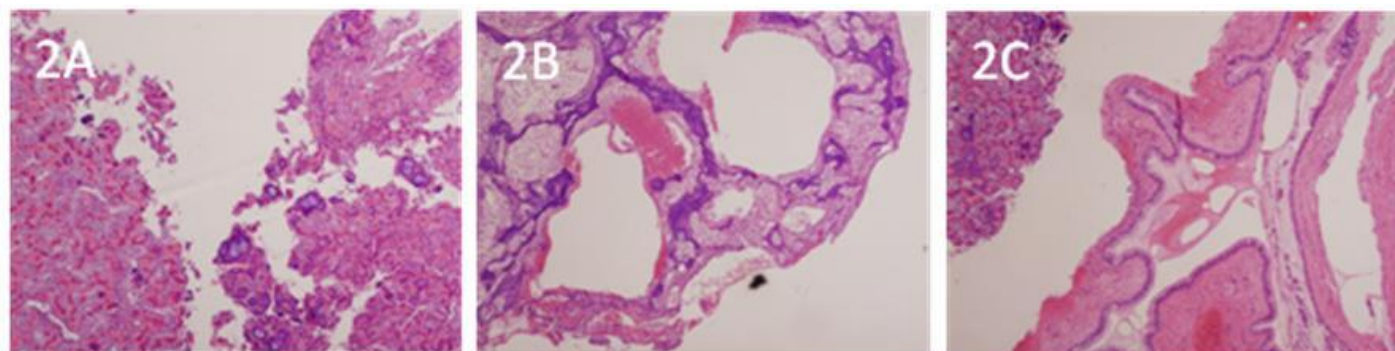


Figure 2. Aggressive psammomatoid ossifying fibroma (APOF) presenting as a sphenothmoidal mass. **2A**: APOF showing osteoid, irregular woven bone and concentric, laminated, basophilic cementicle-like structures within a highly cellular connective tissue stroma. **2B**: APOF showing focal myxoid and aneurysmal-like areas. **2C**: APOF and surrounding respiratory-type mucosa with pseudostratified ciliated columnar epithelium.

Discussion

APOF grows slowly but can be locally invasive, destroying structures of the mid-face region, such as the ethmoid, frontal and sphenoid bones, orbital floor and even the cranial base.^{8,9} As a result, patients may present with symptoms such as headaches, facial swelling, nasal obstruction, proptosis and vision problems.^{8,10} Patients are often in their 2nd - 3rd decade of life and share an almost equal gender distribution, with a slight male predominance.³

The specimen submitted for pathologic examination is typically fragmented which may be due to its infiltrative nature.^{3,11} APOFs are characteristically devoid of capsules⁶ and the boundary of the tumor often cannot be assessed microscopically.¹¹ The tissue is dry, pale yellow-white in color, with a friable, cheesy or gritty consistency. On rare occasions, the lesional tissue may appear gelatinous or cystic, showing clear or straw-colored fluid.¹² A constant finding is the presence of numerous small uniform spherules which are composed of mostly osteoid. They are referred to as psammoma-like bodies or psammomatoid ossicles and are usually rimmed by osteoblasts.^{2,6} Some of these spherules often show a darker central core and an eosinophilic periphery of either a thick, non-uniform collagenous rim, or peripheral brush borders. Others show concentric basophilic laminations or resemble cementum.^{2,3,7} Irregular, woven or lamellar bone trabeculae may intersperse within these spherules.^{2,12} The intervening fibrous connective tissue stroma shows varying degrees of cellularity, ranging from loose to highly cellular.^{2,3} Other histologic features of APOF include: foci of loose myxoid tissue, a few mitotic figures, aneurysmal bone cyst-like spaces with red blood cells, and scattered multinucleated giant cells.^{2,6,7,9} Most of these features were present in our case.

The histologic features of APOF overlap with those of several other pathologic entities. Their clinical courses and management vary widely so it is important to make the correct diagnosis. For example: Juvenile trabecular ossifying fibroma (JTOF) may demonstrate the psammoma-like bodies, mimicking APOF; while the distinctive trabeculae pattern of JTOF may appear in APOF.⁹ Other shared features include a cell-rich stroma, focal myxoid change, multinucleated giant cells, aneurysmal bone cyst-like areas^{2,9} and the absence of a capsule.³ JTOF is different from APOF because the trabeculae in JTOF are long and slender, anastomosing with one another, and contain embedded osteocytes. This is often described as a 'paintbrush strokes' pattern.³

Conventional ossifying fibroma (COF) can be difficult to differentiate from APOF or JTOF, because it also contains varying amounts of lamellar and woven bone trabeculae with osteoblastic rimming, psammomatoid calcifications, vascularized stroma and occasional giant cells.^{9,13} However, COFs contain mainly mature lamellar bone trabeculae, exhibit a less active stroma with a storiform pattern, and are often encapsulated.^{9,11,14} Fibrous dysplasia (FD) also enters the differential diagnosis. It also has woven and mature

lamellar bone trabeculae, psammomatoid calcifications and a fibro-cellular connective tissue stroma.⁹ The mature bone trabeculae are usually restricted to older lesions.⁹ The defining features of FD are the discreet, haphazardly arranged woven bone trabeculae that lack osteoblastic rimming,^{8,14} often described as 'Chinese character' pattern. Another distinguishing feature of FD is that the lesional bone trabeculae tend to blend seamlessly into the surrounding normal bone.⁶

Cemento-osseous dysplasias (COD) is another entity included in the histological differential diagnoses of APOF. Although they are known for their thick, curvilinear, acellular bone trabeculae geometrically resembling ginger roots,¹⁵ early lesions show mostly woven bone trabeculae.⁹ The connective tissue stroma can be quite active and may show features such as osteoid, small cementum-like masses, prominent vascularity and hemorrhage.¹⁵ These are features that have all been described in APOF. Psammomatous meningiomas are not part of the fibro-osseous group of lesions. As such they do not produce osteoid and should not be ordinarily included here. Nevertheless, on certain occasions, their histological features can be confusing. This happens when the psammoma bodies are so abundant, that they virtually obscure the whorls of proliferating meningoepithelial cells in the background. In such instances, their histological picture can be pretty convincing as APOF.^{16,17}

Due to the overlapping histological features between these entities, a definitive diagnosis should not be made without taking the full clinical and radiological findings into consideration. Even then, making the distinction can still be tricky because they also share some common clinical and radiological characteristics. For example, all of the entities described above can occur at both extragnathic and gnathic locations, the only exception being COD.¹⁸⁻²⁰ When APOF, COF, PM and FD involve the sinuses or base of skull, their presenting symptoms can be so similar that it may be clinically impossible to tell them apart.^{7,10,14} It has also been reported that there are no foolproof, reliable distinguishing features among fibro-osseous lesions on radiographs, CT scans or MRI.²¹ A more detailed discussion on the differential diagnoses of these entities has been published as a separate paper in this issue of the journal.

Of all the fibro-osseous lesions, JTOF is the most closely related to APOF. They not only share similar histologic features, but also clinical/radiological features, biological behaviour and recurrence rates.⁶ This has prompted their consideration as variations of the same disease, aggressive ossifying fibroma, rather than as two distinct entities. In 2002, El-Mofty sought to set aside that notion, arguing that APOF and JTOF are indeed 2 distinct clinicopathological entities.³ He pointed out that they differ not only in histology, but also age of onset and site of occurrence. Other investigators believe that the site of occurrence of the lesion is more important than the particular variant of ossifying fibromas (OF). They stated that lesions involving the

paranasal sinuses tend to behave more aggressively than those in the mandible. This is probably because the thinner bones in the former pose a less effective barrier to tumor extension.⁹ The controversy exists partly because there is still no consensus on the tissue origin of OF and its subclasses. Various hypotheses have been suggested, including origin from multipotential cells of the periodontal ligament, from mesenchymal blast cells capable of differentiating into cementum-like tissues; or from the loose myxoid stroma typically seen in normal sinonasal tissue.^{6,12} Cytogenetic analyses may hold the key to properly characterizing these lesions by accurately determining their histogenesis. Unfortunately, such studies have been sparse and sporadic in nature. The first documented study (1992) reported that 3 reciprocal translocations with the karyotype 46,XY were detected in the COF of a patient with an established diagnosis of bilateral retinoblastoma.²² Another study reported a different set of cytogenetic abnormalities: the chromosomal deletions involving 2q31-32 q35-36 genes.²³ Other researchers identified recurring chromosomal breakpoints at Xq26 and 2q33 bands in all 3 cases of COF they studied.²⁴

Recurrence rates for APOF have been reported as high as 30-56%.⁶ Complete surgical excision is the treatment of choice,² but is not always feasible given the anatomic features of the sino-nasal region and the infiltrative growth of APOF.³ In our patient, 2 lesions were removed from the same sphenothmoidal region seven years apart. The earlier lesion was signed out as nonspecific, reactive changes showing osteoblastic and osteoclastic activity, intertrabecular fibrosis and old hemorrhage. That notwithstanding, it is tempting to infer that the present lesion may be a recurrent APOF. However, we are unable to confirm this because we were unable to retrieve the slides of the initial lesion.

Another noteworthy aspect of our patient's case is her unique clinical presentation. She experienced the sudden onset of a very severe headache, but she had no facial alterations. On investigation, the lesion was found to be quite extensive as it was beginning to encroach on the optic foramen and erode the anterior cranial fossa. So, a high index of suspicion for APOF should be maintained even in the light of an atypical presentation.

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