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# Sinolith in the ethmoid sinus

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**Abstract**

We report a case of sinolith in the left ethmoid sinus of a 61-year-old man. The patient complained of nasal obstruction. Computed tomography revealed a small, calcified mass associated with a nasal polyp in the left ethmoid sinus. The antrolith and polyp were removed via endoscopic sinus surgery. Histopathological analysis of the antrolith revealed it to be bone-like in formation. The antrolith was about 1 cm in diameter. Infrared spectroscopy revealed that the antrolith contained protein (45 per cent), calcium phosphate (43 per cent) and calcium carbonate (12 per cent).

**Key words: Antrolith; Ethmoid Sinus; Endoscopic Sinus Surgery; Chemical Analysis**

## Introduction

Antroliths are uncommon calculi that present in the paranasal sinuses.[1] Most antroliths originate in the maxillary sinus. An antrolith presenting in the ethmoid sinus has not been reported in the English literature, to our knowledge.[2] The purpose of this report is to present a case of ethmoid sinolith and to discuss its pathology and treatment.

## Case report

On March 17, 2004, a 61-year-old man presented complaining of an obstruction in his left nasal passage. Nasal examination revealed a nasal polyp. The patient's history was remarkable in that he underwent bilateral nasal polypectomy about 30 years prior to visiting our clinic. Coronal and axial computed tomography (CT) scans showed inflammatory tissue and a 1.0 cm calcified mass in the left anterior ethmoid sinus, adjacent to the left lamina papyracea and skull base (Figure 1).

The patient underwent endoscopic ethmoidectomy following polypectomy to remove the nasal polyp. Subsequent examination of the ethmoid sinus revealed that the antrolith was attached to the polypous mucosa of the lamina papyracea and fovea ethmoidalis (Figure 2a). Using a Freer elevator, we removed the antrolith from the surrounding mucosa by first lifting it away from the lamina papyracea, then from the lateral and upper sides of the ethmoid sinus. The antrolith was finally extirpated without any complications.

Microbiological culture of the ethmoid sinus revealed no fungal infections or tuberculosis. Histopathological examination of the antrolith revealed bone-like formations (Figure 3a). Chemical analysis indicated that the antrolith was composed of protein (45 per cent), calcium carbonate (43 per cent) and calcium phosphate (12 per cent) (Figure 2).

## Discussion

Nass Duce *et al*. previously reviewed 28 cases of sinolith, 26 of which occurred in the maxillary sinus and two in the frontal sinus, but none in the ethmoid sinus.[2] To date, antroliths within the ethmoid sinus have not been reported in the English literature.

Most cases of sinolith occur in the maxillary sinus as a complication of tooth extraction.[3] The close proximity of dental canals to the maxillary sinus may explain why sinoliths occur more prevalently in the maxillary sinus than in any of the other sinuses.

Antrolith pathogenesis is not fully understood.[4] Antroliths are generally classified into two types: those with endogenous origins and those with exogenous origins. Exogenous antroliths originate from foreign bodies, such as paper and pencil, whereas endogenous antroliths typically originate from long term infections of the sinuses.[2] In the review by Nass Duce *et al*., 21 of 28 sinolith cases resulted from sinus infection. In rhinolithiasis, suppuration superimposed on a background of acute and chronic inflammation leads to the concentration of pus and precipitation of salts that ultimately contribute to the formation of rhinoliths.[5] Similarly, poor aeration resulting from pus accumulation and obstruction of pus drainage may be an important factor leading to the formation of antroliths within the sinuses.

In the literature, antroliths have been described as comprising bone fragments, teeth, blood, pus, mucus or fungi.[2] In the present case, we classified the antrolith as a bone fragment because we speculated that it arose from the patient's bone tissue. This was consistent with histopathology results showing that the patient's antrolith possessed characteristics of bone tissue (e.g. bone marrow and osteocytes).

Some may question, however, whether bone fragments should be included as a category of antroliths. In urology, renal lithiasis and bone metaplasia (false calculi) have been shown to be separate entities.[6] From a pathological viewpoint, the antrolith in our patient may be more accurately classified as bone metaplasia. Kagawa showed that transplantation of urethral tissue into the abdominal rectus induced bone formation in this muscle because it is rich in alkaline phosphate, a

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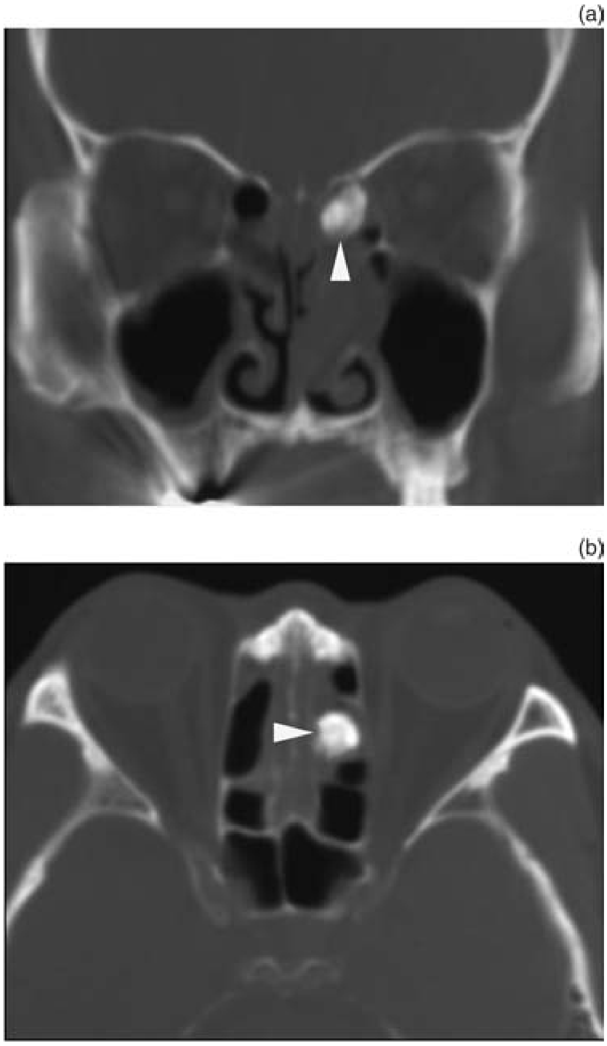


FIG. 1

Computed tomography scans showing an antrolith in the ethmoid sinus. (a) Coronal plane. (b) Axial plane. A dense, calcifying mass is located within the anterior ethmoid sinus (arrowheads).

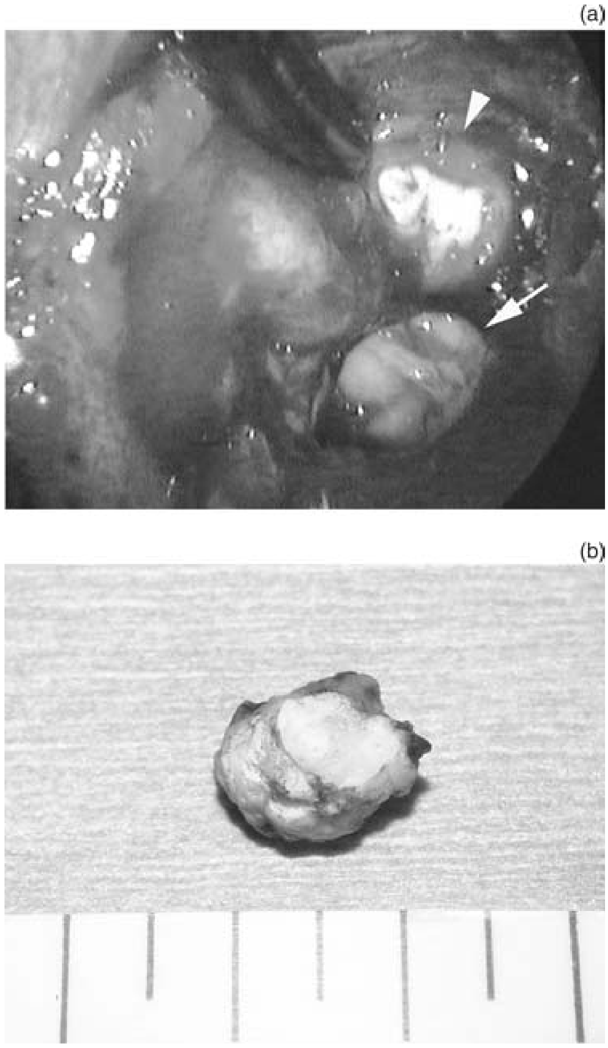


FIG. 2

(a) Photomicrograph taken during endoscopic examination of the patient's nasal sinuses. The antrolith is indicated by the arrowhead; the posterior ethmoid sinus is marked by the arrow. (b) Photomicrograph of the antrolith (approximately 1 cm in diameter).

compound that plays an important role in immature bone formation.[7]

The previous report proposed that this response mimics the inflammatory events (i.e. infiltration of leukocytes) leading to the formation of false calculi that occur when the ureter suffers trauma. These findings explain, to a certain extent, the appearance of ectopic bony tissue following minimal wound trauma, local ischaemia and carcinogenesis.[6]

The genesis of bone metaplasia in our patient was not fully understood because the metaplasia was not continuous with the surrounding ethmoid sinus. We speculate that chronic infection and previous polypectomies stimulated the ectopic bone formation that ultimately caused the deposition of an antrolith in the patient's ethmoid sinus.

Infrared spectrography of the antrolith in this case revealed that it was composed of 45 per cent protein, 43 per cent calcium phosphate and 12 per cent calcium carbonate (Figure 3b). Interestingly, this differs from the chemical composition of maxillary antroliths, which have been shown to be composed of 60–65 per cent calcium phosphate and 6–8 per cent calcium carbonate.[1,8] The fact that the ethmoid antrolith contained less calcium carbonate than typical maxillary antroliths might explain differences in the pathogenesis of antroliths in these two locations.

Another potential cause of endogenous antroliths is fungi, which have been shown to cause antroliths in several cases.[4] In our case, microbiological culture ruled out fungus infection as the origin of the patient's antrolith.

Nasal obstruction and discharge, headache, nasal bleeding, postnasal discharge and facial pain are symptoms typically displayed by patients with maxillary sinus antroliths.[2] The patient described in the present report had nasal obstruction and discharge.

Computed tomography examination is very important prior to surgical removal of an ethmoid antrolith. Computed tomography scans precisely localize the antrolith within the ethmoid sinus, thereby enabling the surgeon to determine the spatial relationship between the antrolith and the surrounding tissues, including the medial part of orbital and skull base bones. In this patient, CT scans revealed that the antrolith was attached to the lamina papyracea bone of the skull base. The CT scans also exposed a bone defect in the lamina cribrosa (Figure 1b). This defect constrained our surgical approach for safe antrolith removal; the antrolith could not be forcibly removed without damaging orbital structures and potentially causing brain injuries. Thus, it was very important

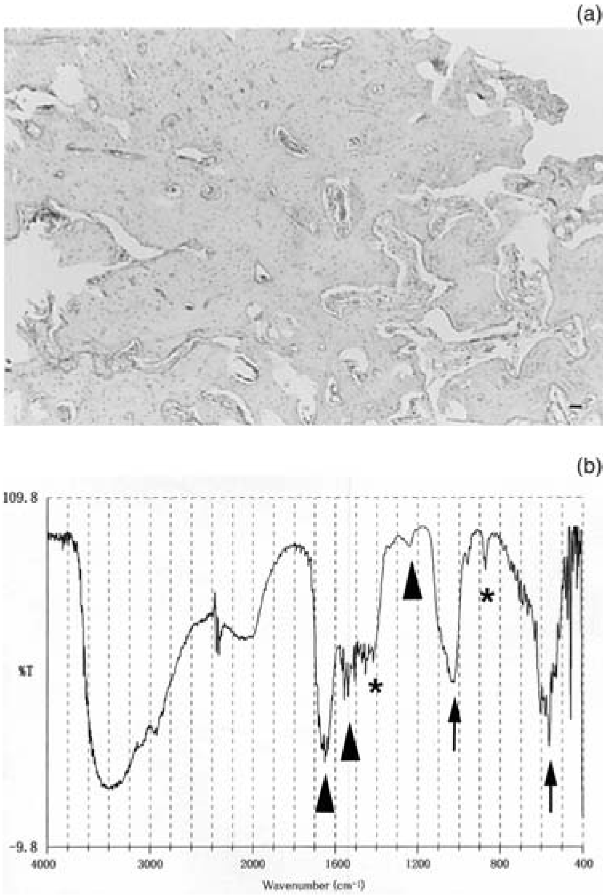


FIG. 3

Histopathological and infrared spectroscopic analyses of the antrolith. (a) Haematoxylin and eosin stained histological section showing bone marrow and osteocytes within the antrolith (bar = 10 μm). (b) Infrared spectrogram showing that the antrolith consisted of calcium phosphate (arrowheads), calcium carbonate (arrows), and protein (asterisks).

to carefully separate the antrolith from the surrounding mucosa with a Freer elevator to prevent injury to delicate brain tissue.

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