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Frontal sinolith

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Abstract
We report on a case of an endogenous frontal sinolith and a literature review of classification and use of the terms rhinolith, and sinolith.

Key words: Frontal sinus

Introduction

Stones within the paranasal sinuses and maxillary sinuses are a rare but well recognized phenomenon. These calcareous collections are exogenous in nature if the nidus for calcification originates outside the body and endogenous if they arise around normal or abnormal body tissues found in or around the sinus region. The original description of these calcified bodies was rhinolith (Polson, 1943), however this term was refined to antrolith, a stone within a sinus as a distinct entity (Bowerman, 1969). No stone in any paranasal sinus other than a maxillary antrolith has been reported. We describe an endogenous frontal sinolith which we believe to be the first reported case of a true sinolith.

Case report

A 48-year-old man was referred to the Department of Otolaryngology, Head and Neck Surgery, University of Aberdeen in March, 1997. The patient had presented to medical out-patients one week earlier with exopthalmos and suspected left dysthyroid orbitopathy. An urgent computed tomography scan (CT) revealed an extensive ethmoidal mass filling much of the nasal cavity with destruction of the medial wall of the left orbit and erosion of the medial rectus. The lesion extended superiorly through the floor of the anterior cranial fossa and suspected involvement of the inferior part of the left frontal lobe. An opacity within the frontal sinuses was noted on CT and thought to be due to sinus obstruction rather than the presence of tumour within the sinus itself. Biopsies taken from the nasal cavity and the left ethmoid sinuses revealed a poorly differentiated squamous carcinoma and the patient was started on a six-week course of radiotherapy.

Following radiotherapy repeat CT scan showed that the tumour mass had reduced significantly but the frontal sinuses remained abnormal and a boney fragment was reported in the left frontal sinus (Figure 1). Endoscopic biopsies of ethmoid, orbit and skull base showed no evidence of persistent tumour and the patient was discharged to out-patients for follow-up.

Four months later the patient developed palpable bi-lateral neck and left parotid lymphadenopathy which were found to be positive for squamous cell carcinoma. A magnetic resonance image (MRI) was indicative of persistent tumour thus bi-lateral functional neck dissections, a left subtotal parotidectomy and left medial maxillectomy were performed. Frozen sections from the primary site were negative, however a 2 × 2 cm stone was removed from the left frontal sinus during the operation (Figure 2).

Histopathological examination of the stone demonstrated a calcified body of lamellar structure covered in oedematous but normal respiratory epithelium (Figure 3). No evidence of malignancy or exogenous foreign body was found suggesting that the stone was indeed a true endogenous sinolith. Recovery following surgery was unremarkable.

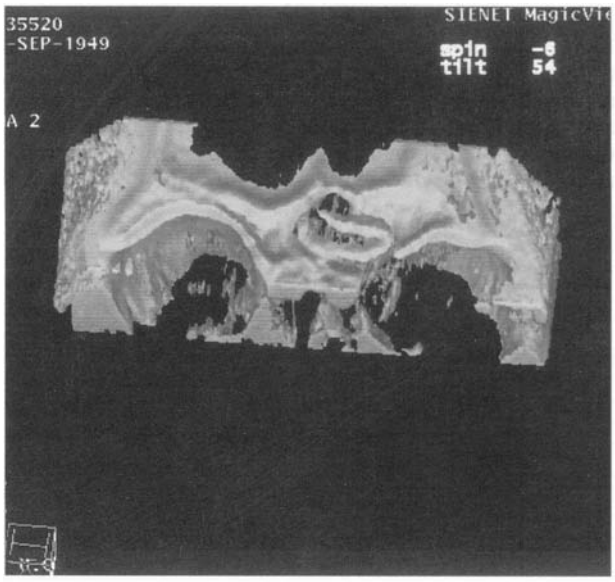

FIG. 1
3D CT reconstruction demonstrating structure of sinolith.

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FIG. 2
Excised sinolith measuring 2 cm × 2 cm.

Discussion

In his study of 1943 Polson defined the rhinolith as the result of complete, or partial, encrustation of an intra-nasal foreign body, usually of exogenous, but occasionally endogenous origin. Bowerman then added the introduction of the antrolith as a separate entity in an attempt to clarify the varied terminology and classification of calcified bodies found in relationship to the maxillary sinus (Bowerman, 1969). Reports of further cases of antroliths have reinforced this idea (Harbin and Weber, 1979; Damm and Ziegler, 1985; Irish *et al.*, 1990; Cohen *et al.*, 1991).

Rhinoliths and maxillary antroliths are rare but not unusual. Exogenous foreign bodies are a common cause. These are most frequently objects such as seeds, beads and fruit stones (Polson, 1943) but include amongst others buttons (Damm and Ziegler, 1985), and impression materials (Ezsias and Sugar, 1997). Endogenous foci include blood clots (Synder and Feldmann, 1936), dried secretions (Irish *et al.*, 1990) and commonly teeth (Bowerman, 1969). The pathogenesis of stone formation within the sinuses is still not fully understood, although it is known that the presence of a foreign body is not itself sufficient to cause the formation of a stone (Polson, 1943). Suppuration superimposed on a background of acute and chronic inflammation is recognized as leading to the precipitation of calcium and magnesium salts on to the surface of the foreign body. Air currents are thought to be an important factor in rhinolith formation leading to concentration of pus and precipitation of salts (Ezsias and Sugar, 1997). However, obstruction to the free escape of pus may be a more important factor in the formation of antroliths as air flow within the maxillary sinus is limited (Bowermann, 1969; Cohens *et al.*, 1991).

Dystrophic calcification in the area of a tumour treated by radiation is well recognized (Lee and Suh, 1977; Dalinka and Mazzeo, 1985). The lesion in this case is histologically consistent with calcification of damaged sinus tissue secondary to radiation necrosis rather than tumour calcification (Figure 3) although the exact mechanism of calcium deposition remains unknown (Goldstein *et al.*, 1978). Radiation necrosis of the frontal sinus following

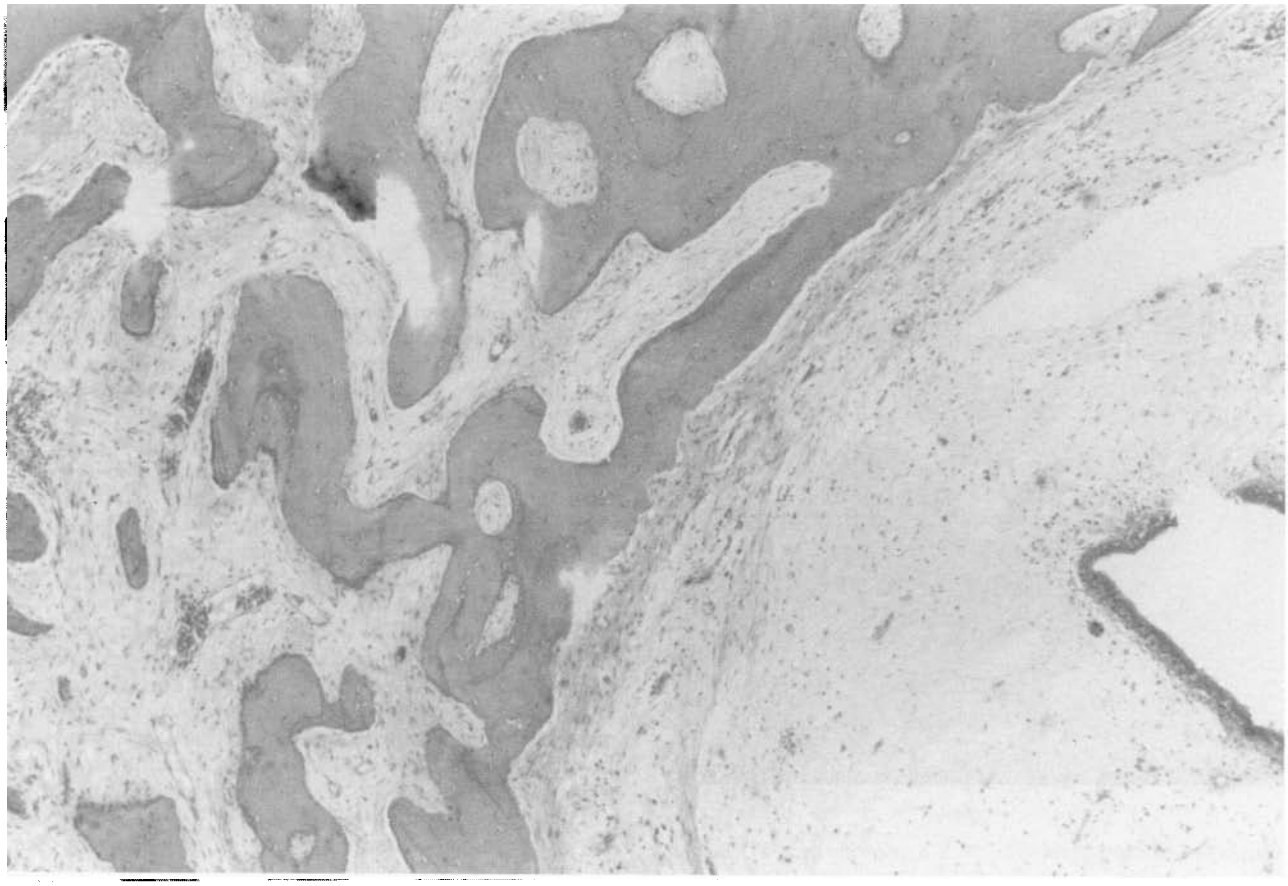

FIG. 3
Photomicrograph showing calcified lamellar structure of sinolith (H&E; × 40).

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radiotherapy with persistent inflammation, suppuration and obstruction of the frontal sinus are likely factors in the aetiology of this true frontal sinolith.

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