Rhinolith: A radiographic finding in a dental clinic

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Rhinolith is a calcified mass found within the nasal cavity. This article is a case report of a 51-year-old woman with an unusual radiopaque lesion located in the nasal maxillary antrum cavity. It was asymptomatic and found accidentally on a routine panoramic radiograph. The rhinolith is presented along with the description of its clinical, radiographic (conventional and CT images), and histopathologic aspects. The objective of this report is to describe and discuss the differential diagnosis of the rhinolith with other oral injuries or conditions and to show how important it is for dental practitioners to be aware of their existence. **(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2005;100:486-90)**

A rhinolith is a hard, dense, and usually irregular mass formed in the nasal cavity by the deposition of calcareous salts around an endogenous (ie, teeth, bone fragments, blood clot, mucus, bacteria, leukocytes) or exogenous (ie, fruit seeds, beads, buttons, bits of dirt or pebbles, or remains of a gauze tampon) nucleus.[1-9] These calcareous bodies are occasionally found in the nasal cavity and very rarely in the maxillary sinus (antrolith).[2,10] Most of these nuclei are introduced into the nasal cavity through the anterior portion of the nares, perhaps placed there by a child and often "forgotten about," but they may also enter the nasal cavity posteriorly via the nasopharynx, during the acts of sneezing, coughing, or vomiting.[1,6,7,11] The growth and calcification of these nucleus objects is caused by contact with nasal fluids and salt precipitation on their surface.[1,4,11] Rhinoliths are most often found on the floor of the nose, about halfway between the anterior and posterior portions of the nares.[1] Physical and chemical factors (pH changes, hypersaturation of secretions, infection, and acute or chronic inflammation) as well as mechanical factors (stasis of nasal secretions and alterations of the aerial flow) participate in the calcification process.[2-6] Rhinoliths consist chiefly of calcium phosphate and carbonate, originating mainly from inflammatory exudates but also from nasal mucus and tears.[7,8,11,12] They are almost always single and unilateral, usually spherical, and grey or brownish-black in color.[8,12] These nasal concretions can be surrounded by granulation tissues and debris.[3] Rhinolith symptoms may be localized pain, headache, nasal and facial swelling, nasal obstruction, fever, anosmia, choanal atresia, discharge, and odor, commonly causing a patient to seek medical attention, or they may remain asymptomatic and not be discovered until years later.[1,3,4,7,8,11,12] Erosion of the septum between the nasal cavity and the maxillary sinus may occur, and perforations of the palate have also been reported.[1,7,11] It rarely occurs in association with sinusitis.[1,5,6,11] Radiographic features of rhinoliths usually show dense radiopacities in the anterior maxillary region. Access to their precise localization and dimensions can be limited when using conventional radiographs. Linear, multidirectional, and computerized tomography (CT) have been helpful, since they provide sectional multiplanary images.[1,2,7] Coronal CT scans are very useful when bone perforations are suspected.[1,5]

CASE REPORT

A 51-year-old Brazilian woman arrived at the Centro Goiano de Doenças da Boca, School of Dentistry, Federal University of Goias, for evaluation of a radiopaque image in the nasal cavity and maxillary sinus region, identified in a panoramic radiograph at the undergraduate clinic. There were no symptoms such as nasal stuffiness, obstruction, discharge, chronic infection, or epistaxis. On extraoral examination there was no face asymmetry, nor any sensory disturbance. An intraoral examination showed that the patient was partially edentulous and the her oral mucosa was normal. The diagnosis hypotheses after radiographic examination were retained tooth, rhinolith, or antrolith. A maxillary occlusal radiograph

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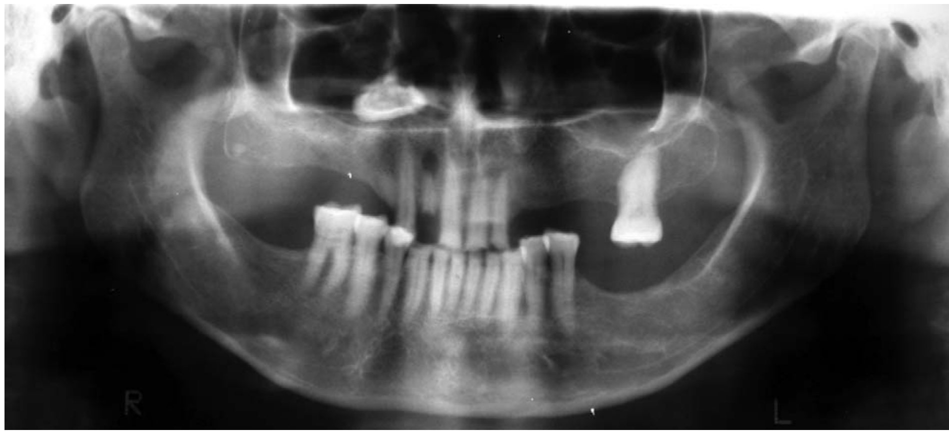

Fig 1. Panoramic radiograph showing a radiopaque image with heterogeneous ovoid aspects superimposed on the region of the right nasal cavity and maxillary sinus, above the apex of the canine, with mainly irregular contours.

Fig 2. Lateral maxillary occlusal projection showing the heterogeneous radiopaque image with ovoid aspects located in the region of the right nasal cavity (*thin black arrows*) (*broad white arrows:* maxillary sinus).

Fig 3. Posteroanterior projection showing the ovoid mixed image, located in the right nasal cavity, close to the floor (*arrowhead*).

and a posterior/anterior projection (PA) were obtained to identify the localization of the radiopacity (nasal cavity or maxillary sinus).

The panoramic (Fig 1) and maxillary occlusal (Fig 2) radiographs showed a heterogeneous ovoid image, predominantly radiopaque, with areas of lesser radiopacity in its central portion. It was located in the region of the right maxillary sinus and nasal cavity, above the apex of the canine, presenting a relationship with the floor and sidewall of the nasal cavity, measuring approximately 2 cm along its long axis, and it had mainly irregular contours.

The PA projection (Fig 3) showed that the predominantly radiopaque image was located in the nasal cavity, close to the floor.

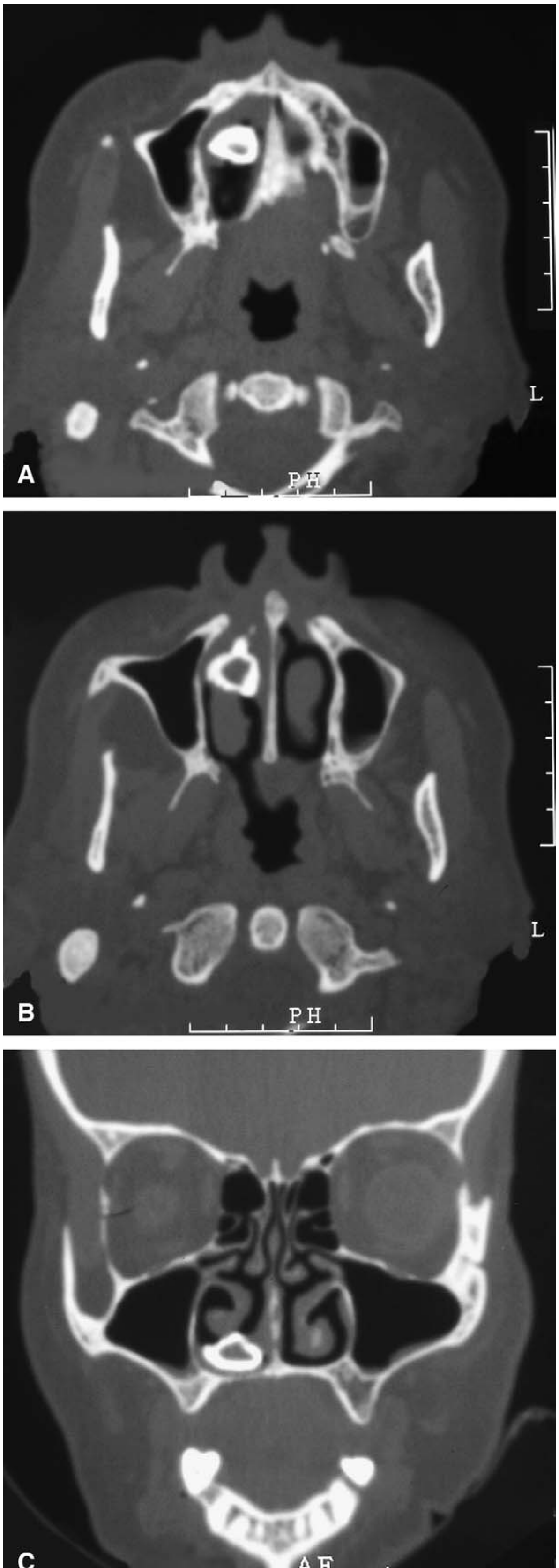

Fig 5. Macroscopic view of the sectioned specimen showing a dark brown ovoid mass with a laminated surface appearance surrounding a central white nucleus.

A CT was requested in order to get a better localization of the lesion and see its relationship with the surrounding anatomical structures. The CT scans (Fig 4) revealed the image of an ovoid structure, with hyperdense edges and a center-posterior portion with soft-tissue density, measuring 1.0 × 1.5 × 1.0 cm, located in the right nasal mucosa between the inferior nasal shell and floor of the nasal cavity, and free of osseous insertions. A clinical and radiographic diagnosis of rhinolith was considered.

The patient was referred for an otorhinolaryngologist evaluation. A videorhinoscopy confirmed the diagnosis of rhinolith, revealing a fibrin layer surrounding it and normal nasal mucosa. Its immediate withdrawal with the help of tweezers was possible. A new panoramic radiograph showed the complete removal of the rhinolith.

The specimen was then submitted to histopathologic investigation, after a decalcification process (in 7% EDTA solution). The macroscopic examination revealed a dark brown ovoid mass of hard consistency, with a laminated surface appearance, surrounding a central white nucleus (Fig 5). The microscopic evaluation disclosed the presence of an amorphous material covered in connective fibrous tissue and few inflammatory cells (Fig 6).

DISCUSSION

Although rhinolith is not a frequent clinical finding, an understanding of this benign entity allows for an early diagnosis and helps to distinguish it from other

Fig 4. Axial (**A**, caudal; **B**, cranial) and coronal (**C**, posterior) CT scans showing a heterogeneous high-attenuation image within the right nasal cavity without associated bone destruction and bows of the nasal septum.

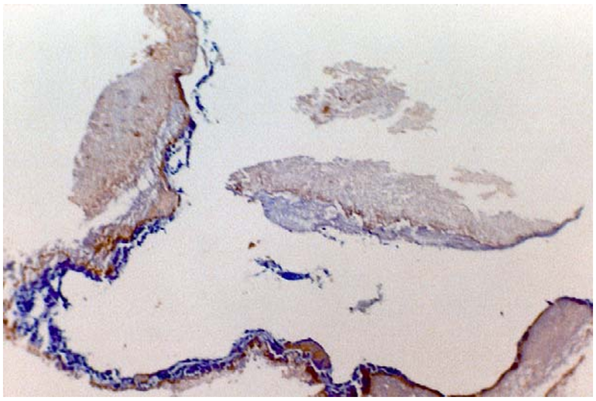

Fig 6. Photomicrography showing the presence of amorphous material surrounded by connective fibrous tissue and few inflammatory cells (hematoxylin-eosin, original magnification ~12.5×).

nasal or sinus lesions. When a radiopaque image with ovoid aspects, whose central area is of lesser radiopacity and is usually located in the region of the nasal cavity and maxillary sinus, a rhinolith should be suspected first.[3,7] However, a calcified nasal mass could also raise suspicions of other pathologic entities such as calcified polyps, odontoma, osteoma, ossifying fibroma and tori. Mesiodens, retained roots, and impacted teeth should not be ruled out either.

Generally, an odontoma will have a radiotransparent zone surrounding it rather than the radiopaque border seen around many rhinoliths.[13] The osteoma usually presents as a dense osteosclerotic mass that occurs more frequently in the frontal sinus, less so in the ethmoidal sinuses, and still less in the maxillary sinuses. It is rarely found in the nasal cavity.[13,14] The ossifying fibroma is a well demarcated mixed lesion of varying configuration and size.[13,14]

When there is bone destruction the differential diagnosis must include osteosarcoma. Extremely rare mixed lesions might include adenomatoid odontogenic tumors, ameloblastic fibro-odontoma, and ameloblastic odontoma.[1,3,4,7,11,12]

The differential diagnosis is done by using radiographic images in association with the clinical features of these lesions. It is important to consider that sometimes it is necessary to use different x-ray techniques for the final diagnosis. Certain aspects must be considered when a differential diagnosis is being established. For instance, a calcified polyp does not show homogeneous density on the image, because this lesion has its origins in inflammatory causes, which provide a mixed image of irregular shape that is not well demarcated.[13]

The panoramic radiograph technique produces a distorted image that could lead to false conclusions about the actual location of a lesion.[15] In the case in question, the lesion within the nasal cavity appeared superimposed on the right maxillary sinus. Because of this distortion, the position of any lesion in this region on a panoramic radiograph must be confirmed by other radiographic studies.[15] Radiographs should include several projections taken from different angles to evaluate the shape and precise location of the object.[1] In this case, PA and maxillary occlusal projections, as well as CT scans, were requested. A CT would be the preferred method of imaging these lesions, owing to CT's sensitivity and specificity for identifying calcification and foreign bodies, both important features of rhinoliths.[11] Also, as a sectional imaging technique, the CT does not have superimposition projections of anatomic structures.[6] However, this test is not essential for the final diagnosis.

The rhinolith pathogenesis is not clear. It is thought that a foreign body incites a chronic inflammatory reaction with the deposition of mineral salts, similar to other types of calculi that occur at different sites in the human body.[3] Kodaka et al[16] in 1994 investigated rhinoliths using scanning electron microscopy and energy-disperse x-ray analysis and found them to consist of deposits of calcium phosphate and magnesium phosphates around a nucleus. Hadi et al[3] showed that chemical analysis done on a stone was positive for calcium and phosphorus but negative for magnesium.

Most rhinoliths are removed anteriorly using a local anesthesia to control pain.[1] If septal or antral perforation has occurred, more extensive surgery may be necessary.[1]

In conclusion, as this lesion has so far been rarely discussed in literature, its recognition, diagnosis, and treatment can generate questions. Knowledge of this entity is important so that dentists can become aware of its existence and also its appearance, because it can be seen on dental radiographs as a radiopaque object in the nasal cavity and may be confused with several pathologic entities that call for more invasive surgical procedures.

REFERENCES

1. Appleton SS, Kimbrough RE, Engstrom HIM. Rhinolithiasis: a review. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1988;65:693-8.
2. Boylan PA. Rhinolith. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1973;36:290.
3. Hadi U, Ghossaini S, Zaytoun G. Rhinolithiasis: a forgotten entity. Otolaryngol Head Neck Surg 2002;126:48-51.
4. Harrison BB, Lamming RL. Case reports. Exogenous nasal rhinolith. Br J Radiol 1969;42:838-40.
5. Meyer JR, Quint DJ. Posttraumatic rhinolith. AJNR Am J Neuroradiol 1993;14:1181-2.
6. Muñoz A, Pedrosa I, Villafruela M. "Eraseroma" as a cause of rhinolith: CT and MRI in a child. Neuroradiology 1997;39:824-6.
7. Pitt SKJ, Routt PGJ. Rhinoliths presenting during routine radiography: two cases. Dent Update 2000;29:505-7.
8. Varley EW. Rhinolith—an incidental finding. Br J Oral Surg 1964;2:40-3.

9. Vink BW, Van Hasselt P, Wormald R. A case of rhinolithiasis in Botswana: a mineralogical, microscopic and chemical study. J Laryngol Otol 2002;116:1036-40.
10. Dutta A. Rhinolith. J Oral Surg 1973;31:876-7.
11. Royal SA, Gardner RE. Rhinolithiasis: an unusual pediatric nasal mass. Pediatr Radiol 1998;28:54-5.
12. Marfatia PT. Rhinolith. A brief review of the literature and a case report. Postgrad Med J 1968;44:478-9.
13. Lumerman H. Odontogenic Tumors. In: Lumerman H, editor. Essentials of Oral Pathology. Philadelphia: Lippincott; 1975. p. 66-77.
14. Shankar L, Evans K, Hawke M, Stammberger H. Radiological aspect of benign inflammatory disease of the paranasal sinus. In: Shankar L, Evans K, Hawke M, Stammberger H, editors. An atlas of imaging of the paranasal sinuses. London: Martin Dunitz; 1994. p. 97-106.
15. Allen GA, Liston SL. Rhinolith: unusual appearance on panoramic radiograph. J Oral Surg 1979;37:54-5.
16. Kodaka T, Debarik S, Yamada M. Scanning electron microscopy and energy-dispersive x-ray microanalysis studies of several human calculi containing calcium phosphate crystals. Scanning Microsc 1994;8:241-56.

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