Multiple causes for rhinolithiasis*

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Abstract

Background: Rhinoliths are rare affections of the main nasal cavity and the paranasal sinuses. Initially, as a result of their low incidence, they are often incorrectly classified as calcified tumors in clinical examination.

Methodology: We have identified three cases in our patient population and evaluated the clinical symptoms as well as the pathological findings and the causes of the disease.

Results: Due to their extension and the respective clinical pattern, all masses were surgically removed under endotracheal anesthesia. The histopathological findings comprised an ectopic tooth, a vegetable (most likely a leaf from the garden) as well as a textile foreign body (probably of iatrogenic origin).

Conclusion: Undiscovered foreign bodies of the main nasal cavity are a common cause for the formation of rhinoliths. We have also displayed the respective incidence and the therapeutic options.

Key words: rhinoliths, rhinorrhea, post nasal drip, foreign bodies, chronic rhinorrhea

Introduction

Rhinoliths are rare mineralized and unilateral concretions of the main nasal cavity. They always form around a nucleus. Rhinolith is a word of greek origin that can be translated as "nasal stone" (rhina=nose and lithos=stone). Regarding their origin, a general distinction is made between exogenous (80%) and endogenous causes (20%) [1,2].

The body's own tissue at the center of a mineralized deposit is referred to as endogenous cause. In this case, ectopic teeth, bone fragments, blood clots, etc. can serve as nuclei [3,4]. An overview of possible causes is given in Table 1.
External foreign bodies having entered the main nasal cavity are defined as exogenous causes. Here, cherry stones, stones, biological material (wood splinters, leafs), and iatrogenic material (swabs, compresses, tamponades) can serve as nuclei.
As the underlying event usually lies in the far past (often in childhood) and rhinoliths take many years to form, most patients have no memories of when and how the foreign body entered their main nasal cavity [5,6]. Due to its rather unspecific clinical symptoms, rhinolithiasis can easily be misdiagnosed as chronic sinusitis [7] (Table 2).

The rhinoliths themselves mainly consist of elements of the inflammatory exudate, the nasal discharge, and the lachrymal, such as calcium carbonate or magnesium carbonate, as well as phosphates and oxalates [8].
Many different chemical and physical factors such as pH-value, acute or chronic infections, amount and composition of the nose secretion, temperature, and position influence the consistency and growth speed of the rhinoliths and therefore the aeration and nasal airflow [6,9].

Most rhinoliths can already be identified in clinical examination via anterior rhinoscopy [10]. Surgical extirpation under local or endotracheal anaesthesia after respective imaging (X-ray, computed tomography) is considered the method of choice and the best preventative measure to avoid further complications.

Table 1. Endogenous and exogenous causes of rhinolithiasis.

Endogenous Causes	Exogenous Causes
Ectopic teeth	Insects
Benign tumors e.g. hemangioma, osteoma, enchondroma, dermoids, chondrosarcomas	Vegetable foreign bodies e.g. fibers, leaves, small branches, seeds
Malign tumors e.g. chondrosarcomas, osteosarcomas	Glass splinters e.g. after traffic collisions
Bacterial infections e.g. *Treponema pallidum, Mycobacterium tuberculosis*	Iatrogenic causes e.g. swabs, compresses, tamponades
Fungal infections e.g. aspergillosis	Small stones
Calcified polyps	Bits of food after vomitus (entering via the choanae)
Local inflammatory reactions e.g. Wegener's granulomatosis	Toy parts
Rhinitis Sicca	
Bone or cartliage fragments e.g. after trauma or surgery	
Blood clots	
Allergic rhinitis	

Table 2. Clinical symptoms of rhinolithiasis.

Clinical symptoms
Nasal breathing obstruction
Epistaxis
Cephalgia
Epiphora
Facial swelling
Anosmia
Dentalgia
Fetid rhinorrhea (unilateral)
Ozaena
Chronic sinusitis
Dacryocystitis
Fever

Materials and methods

An extensive medical record research between 2009 and 2011 lead to the detection of three cases of rhinolithiasis among the patient population at the Clinic and Policlinic of Otorhinolaryngology / Head and Neck Surgery, University of Bonn. Hence, we retrospectively evaluated the respective medical files and described the clinical symptoms, the course of the disease, and the pathological findings.

Ethical considerations

In this retrospective study, no patient-identifying data were used: according to German legislation, no ethical approval was required.

Results

Case 1

The first case is a 59-year-old female patient who presented with a perennial unilateral nasal obstruction as well as yellowish retrograde rhinorrhea (post-nasal drip). She reported an increased susceptibility to infections and recurring cephalgia as well as 6 or 7 sinusitises per annum which required antibiotic treatment. The patient was referred to us for her first paranasal sinus surgery.

Clinical examination showed a whitish putrid secretion in the right inferior meatus with a septum deviation to the same side as well.

Presurgical computed tomography revealed a radiopaque mass with calcified edges in the lower left meatus (size: 1,5 x 1,3 x 0,8 cm) as well as a partially shaded left maxillary sinus (Figure 1).

Two solid foreign bodies were intraoperatively removed. Histopathological evaluation revealed a tissue-like foreign body.

Case 2

The second case deals with a 44-year-old female patient who had been suffering from unilateral rhinorrhea for two or three years in spite of a conservative treatment when she came to us.

Clinical examination via 30°-endoscopy and anterior rhinoscopy showed a whitish, calcareously thickened mass in the inferior nasal concha area. Initially, a biopsy was perfomed under local anesthesia to exclude a malignant tumor. It showed a calcium-encrusted mass with an inner texture of, most likely, vegetable origin.

Computed tomography disclosed an ossified mass in the right inferior concha area.

The rhinolith was removed using videoendoscopy under endotracheal anaesthesia. A solid and whitish calcified mass covered with mucus was revealed intraoperatively (Figure 2). During the attempt of an in-toto removal, it broke into four pieces, which

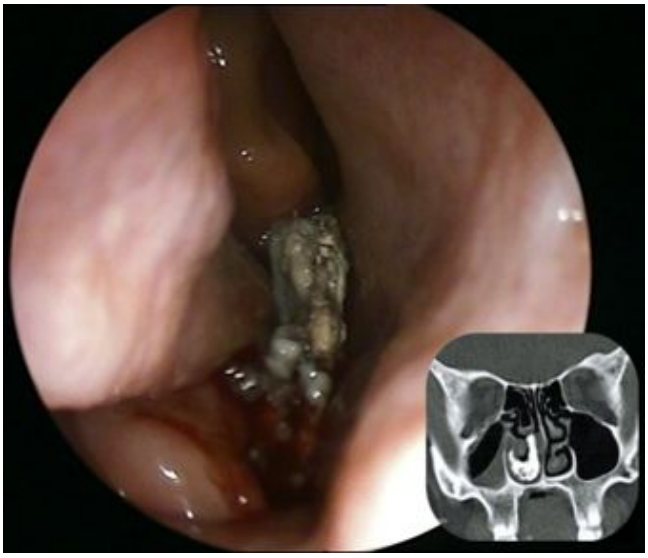

Figure 1. Case 1: endoscopic view (nasal cavity, foreign body, tissue) and CT scan.

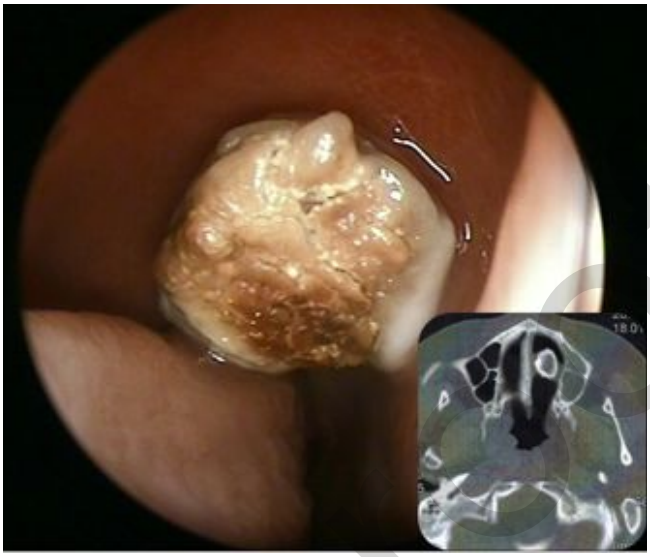

Figure 2. Case 2: endoscopic view (nasal cavity, foreign body, vegetable) and CT scan.

could, nonetheless, be completely removed. The final histopathological finding revealed a bone-hard mass (size: 1,6 x 1,6 x 0,5cm) suspected to be a vegetable foreign body.

Case 3

The third patient presented with chronic perennial sinusitis. He reported nasal breathing obstruction (right > left) and whitish-yellowish rhinorrhea as well as frontal cephalgia. No paranasal sinus surgery had been done. Clinical examination showed a low-grade nasal polyposis and abundant whitish-yellowish discharge. A computed tomography was performed, which revealed a long, nodular calcification in the lower right nasal concha area and led to the suspicion of an osteoma. During operation via stiff endoscopy, a rhinolith of 1,0 cm size could be found in the right lower meatus as well as a second rhinolith of approximately 2 cm in diameter. The histopathological finding revealed two fragments of a bacterially colonized ectopic tooth Figure 3).

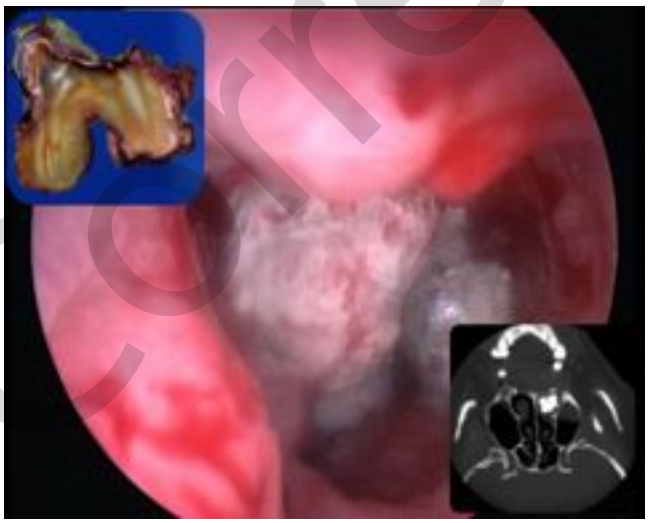

Figure 3. Case 3: endoscopic view (nasal cavity, foreign body, ectopic tooth) and CT scan and after extraction saw-cut.

Healing process

The symptoms of the three patients were completely regredient after a surgical removal of the rhinoliths. The layers of calcification reached to 0,1 cm in thickness and the rhinoliths were sized between 1,0 and 2,3 cm. Their surface structure varied significantly.

Discussion

Rhinoliths are rare mineralized concretions mainly originating from foreign bodies entered in childhood. As the underlying event often lies in the far past, patients usually cannot remember it [11].

This is one of the reasons why foreign bodies of the main nasal cavity must always be removed immediately. Besides acute side-effects, general ignorance and a concrete lack of knowledge about the symptoms can lead to rhinolithiasis in the long term. According to Polson (1943, n = 495), rhinoliths occur significantly more often in women [11].

Apart from ulcerations of the mucous membrane, perforations of the hard as well as the soft palate are considered the main possible risks of a pronounced rhinolithiasis of the nasal floor [12]. Thanks to modern examination techniques, such complications have become very rare and rhinoliths are usually discovered and treated at a significantly earlier stage [4]. Furthermore, nasal septum perforation and pressure atrophy of the inferior and middle

nasal concha are described as possible complications [13]. Most often, rhinoliths are discovered in the course of routine examinations, e.g. by dentists via orthopantomogram (OPT) [10,14]. They mostly occur in the inferior nasal meatus region [11] but can also be localised in the maxillary sinus (antrolith) [15]. Rhinoliths in the maxillary sinus are not so common and differential diagnosis are for example paranasal sinus fungus balls or solid tumors like osteomas.

To our knowledge, there are no reports about rhinoliths of the other paranasal sinuses. It is assumed that, among other reasons, the lower aeration of the maxillary sinus prevents the secretion from getting sufficiently mineralized [1].

For pre-surgical planning and a reliable anatomical differentiation, a computer tomography (axial, coronal and sagittal) should be performed before extracting the rhinolith. It can also provide first indications about the entity of the rhinolith. In case of suspected malignant causes, the surgical procedure can thus be adjusted [10,16-18].

The microscopic or endoscopic removal of small well-differentiated rhinoliths of the anterior nasal cavity can be performed under local anaesthesia. Nevertheless the extirpation of the rhinolith can be difficult because of the size and the incrustation. Bleeding can occur and complications like septal perforation can occur, because of the trauma made on the septum. Therefore general anaesthesia is usually required instead of local anaesthesia as well as in cases of suspected malignant causes, erosion of the nasal septum or the paranasal sinuses.

Conclusion

Rhinoliths are rare, nevertheless they should be a differential diagnosis of unilateral nasal obstruction or symptoms of single sided chronic sinusitis. The pre-surgical planning requires computer tomography, and general anaesthesia should be preferred during removal of the rhinolith.

Authorship contribution

TS: Provided the conception and design, data analysis and interpretation, and manuscript writing, and editing. MJ: Partial manuscript writing. KWGE: Conception and partial manuscript writing, and data analysis.

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Conflicts of Interest

No potential conflicts.

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