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Rhinolithiasis: Clinical Findings, Treatment Approach, and Associated Pathologies: A Single-Center Experience

Rinolitiazis: Klinik Bulgular, Tedavi Yaklaşımı ve Eşlik Eden Patolojiler: Tek Merkez Deneyimi

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ABSTRACT

Aim: To identify the characteristics of rhinolithiasis in terms of its clinical, radiological, and surgical features in the largest case series in the literature.

Material and Methods: A rhinolithiasis series comprising 32 cases that were treated at a single tertiary care center between 2014 and 2019 was reviewed retrospectively. The patients' demographic characteristics, clinical features, rhinolith localization, accompanying sinonasal pathologies, and surgical data were noted. All patients underwent surgery via an endoscopic approach under general anesthesia, and any concomitant sinonasal pathology was treated during the same session. The patients were followed up with endoscopic examinations at the postoperative first and sixth months.

Results: The sample consisted of 19 female (59.4%) and 13 male (40.6%) patients, with a mean age of 35.53±15.06 years. The most common symptoms were nasal malodor (65.6%), nasal congestion (53.1%), and purulent nasal discharge (15.6%). Rhinoliths were located in the right nasal cavity in 17 cases and the left nasal cavity in 15 cases. The most common localization of rhinoliths was between the septum and the inferior turbinate (65.6%). A nidus was detected in only four cases (12.5%), of which three belonged to an ectopic tooth. The most common concomitant nasal pathology was chronic rhinosinusitis (34.4%), followed by septal deviation (25%) and allergic rhinitis (9.4%). Endoscopic rhinolith excision was performed in 17 patients (53.1%), while surgical intervention was required for additional pathologies in 15 patients (46.9%). The most common simultaneous surgical intervention was septoplasty (15.6%).

Conclusion: Rhinolithiasis should be considered in cases presenting with unilateral nasal symptoms that persist or worsen after initial treatment. Since the treatment of rhinolithiasis is surgical excision, the appropriate approach is the preoperative detection of pathologies which require additional surgery that can be simultaneously undertaken with rhinolith excision.

Keywords: Rhinolith, nasal obstruction, rhinolithiasis, nasal malodor, endoscopic surgery

ÖZ

Amaç: Literatürdeki en geniş vaka serisi eşliğinde rinolitiazisin klinik bulgularını, tedavi yaklaşımlarını ve eşlik eden patolojileri tanımlamak amaçlanmıştır.

Gereç ve Yöntemler: Kliniğimizde, 2014-2019 yılları arasında opere edilen 32 rinolitiazis olgusu retrospektif olarak incelendi. Hastaların demografik özellikleri, rinolit lokalizasyonları, eşlik eden sinonazal patolojiler ve cerrahi verileri kaydedildi. Tüm hastalar genel anestezi altında endoskopik yaklaşımla opere edildi ve eşlik eden sinonazal patolojiler eş zamanlı olarak tedavi edildi. Hastalar ameliyat sonrası birinci ve altıncı aylarda endoskopik muayene ile takip edildi.

Bulgular: Hastaların 19'u kadın (%59.4), 13'ü erkek (%40.6) hastalar olup, yaş ortalamaları 35,53±15,06 idi. En sık görülen semptomlar sırasıyla burunda kötü koku (%65.6), burun tıkanıklığı (%53.1) ve pürülan burun akıntısıydı (%15.6). 17 olguda sağ nazal pasajda, 15 olguda sol nazal pasajda tespit edilen rinolitler, yerleşim yeri açısından en sık septum ile alt konka arasında saptandı (%65.6). Üçü ektopik dişe ait olan sadece dört vakada (%12.5) nidus tespit edilebildi. En sık eşlik eden nazal patolojiler ise kronik rinosinüzit (%34.4), septum deviasyonu (%25) ve alerjik rinitti (%9.4). Olguların 17'sinde (%53.1) sadece endoskopik rinolit eksizyonu yapılırken, 15 hastaya (%46.9) eşlik eden patolojiler sebebiyle ek cerrahi müdahale gerekti. En sık yapılan eş zamanlı cerrahi girişim ise septoplasti oldu (%15.6).

Sonuç: Burun tıkanıklığı ile başvuran ve başlangıç tedavisinden sonra semptomları devam eden veya kötüleşen olgularda rinolitiazis akılda tutulmalıdır. Rinolitiazis tedavisinin cerrahi eksizyon olması sebebiyle, uygun yaklaşım eş zamanlı cerrahi girişim gerektiren sinonazal patolojilerin preoperatif tespit edilmesi ve rinolit eksizyonu ile aynı seansta bu patolojilerin de tedavisidir.

Anahtar Sözcükler: Rinolit, burun tıkanıklığı, rinolitiazis, nazal kötü koku, endoskopik cerrahi.

INTRODUCTION

Rhinoliths are hard, dense, calcified masses in the nasal cavity caused by the deposition of inflammatory, nasal, and lacrimal secretions by accretion around an endogenous nidus (ectopic tooth, blood clots, bone fragments, and epithelial debris) or an exogenous nidus (fruit seeds, beads, pebbles, buttons, batteries, or plastic material) (1-7). Surrounded by a hard capsule, these mineralized masses are typically unilateral. Over time, the accumulation of calcium, iron, phosphorus, and magnesium around the nidus may increase the size of the rhinolith, and chronic inflammation in the mucosa with which it comes into contact may cause mucosal erosion. Although the duration, localization, and size of rhinoliths vary, the most commonly observed symptoms are nasal obstruction, purulent nasal discharge, nasal/oral malodor, epistaxis, anosmia, facial pain, and headache (1,4-8). In addition, asymptomatic cases can be incidentally detected during a routine otolaryngological examination or on a panoramic radiograph taken due to dental problems (6). Although this rare entity can affectindividuals of all ages, it peaks in childhood and adolescence (1,4).

Due to the presentation of rhinolithiasis with unilateral symptoms, it may be misdiagnosed as other diseases and conditions that cause unilateral nasal obstruction, such as septum deviation, nasal polyposis, rhinosinusitis, allergic rhinitis, and nasal cavity tumors (1,3,4,9-12). A nasal examination is generally sufficient to detect rhinoliths, but a careful nasal endoscopic examination has very high value in the differential diagnosis of rhinolithiasis and other nasal pathologies.In addition, paranasal computed tomography (CT) is also used in the differential diagnosis with the above-mentioned nasal cavity pathologies and appropriate treatment planning (4,6,8,11). Paranasal CT also contributes to surgical planning in specific cases. The treatment of rhinolithiasis is surgical excision via an endoscopic approach under local or general anesthesia.

Rhinolithiasis is a rare entity, and most publications in the literature are in the form of case reports, except for a few case series. The purpose of our study is to identify the characteristics of rhinolithiasis in terms of its clinical, radiological, and surgical features in the largest case series in the literature.

MATERIAL and METHODS

In this study, we evaluated a rhinolithiasis series consisting of 32 cases at a single tertiary center between 2014 and 2019. The patients' demographic characteristics, clinical features, rhinolith localization, accompanying sinonasal pathologies, radiological features, and surgical data were collected retrospectively. Anterior rhinoscopy was performed in all cases, and bilateral nasal cavity were evaluated endoscopically. All patients, except for five children under 16, were evaluated using paranasal sinus CT scans preoperatively. In all cases, rhinoliths were removed with or without additional procedures for accompanying sinonasal disease under general anesthesia using 0° rigid endoscopy. All patients were examined on the seventh day postoperatively and followed up with nasal endoscopy for one to six months postoperatively to determine if residual or recurrent disease was present. Rhinoliths with an anterior localization that could easily be excised in outpatient conditions without requiring endoscopic interventions were not included in the study.

Statistical Analysis

Statistical analyses were performed using IBM SPSS for Windows, version 23.0 software (IBM Corp.; Armonk, NY, USA). Descriptive statistics were given as mean±standard deviation and median (minimum-maximum). Categorical variables were presented as percentages (%) and numbers (n).

RESULTS

Of the 32 cases, 19 were female (59.4%) and 13 were male (40.6%). The mean age of the patients was 35.53±15.06 years (median, 37 years), and the mean duration of symptoms was 22.78±14.92 months. The majority of the patients were aged 20-50 years, with only five being under 18 (15.6%). The most common symptom was nasal malodor (65.6%), followed by nasal obstruction (53.1%), purulent nasal discharge (15.6%), pain (12.5%), and epistaxis (9.4%). Seven patients had a history of foreign bodies in the nose, and a further seven had a history of nasal surgery due to other nasal pathologies. Rhinoliths were located in the right nasal cavity in 17 cases (53.1%) and in the left nasal cavity in 15 cases (46.9%). The most common localization of rhinoliths was between the septum and the inferior turbinate (n=21, 65.6%). In addition, rhinoliths were detected between the middle concha and the septum in four cases (12.5%), in the maxillary sinus in four cases (12.5%), in the vestibule in two cases (6.3%), and in the sphenoid sinus in one case (3.1%) (Table 1).

The patients were also evaluated in terms of their accompanying nasal pathologies. Chronic rhinosinusitis was detected in 34.4% (n=11), nasal septum deviation in 25% (n=8), allergic rhinitis in 9.4% (n=3), septum perforation in the contact area of the rhinolith in 6.3% (n=2), and a nasal polyp and vestibulitis in 3.1% (n=1). In addition, adenoid vegetation was observed in two pediatric cases (Table 2).

The diagnosis of chronic rhinosinusitis was made based on the European Position Paper on Rhinosinusitis and Nasal Polyps 2020 guidelines (13). Rhinoliths were present on the opposite side of the deviation in seven of the eight patients with nasal septum deviation. In five patients with nasal obstruction, a septoplasty was performed simultaneously with rhinolith excision. Endoscopic sinus surgery was undertaken with the excision of rhinoliths in two patients with nasal polyps and chronic sinusitis. Since two of the pediatric patients had adenoid vegetation and obstructive symptoms, adenoidectomy was performed together with rhinolith excision in these cases. In four cases with rhinoliths at the base of the maxillary sinus, maxillary sinoscopy was performed with the Caldwell-Luc approach to reach the rhinoliths (Table 2). All these cases also had findings of maxillary sinusitis on the preoperative paranasal CT. In the histopathological evaluation of rhinolith materials excised from the maxillary sinus, a nidus of ectopic tooth origin was detected in two cases. In the six-month follow-up of the patients, no recurrence was detected.

DISCUSSION

Rhinoliths are calcified masses located in the nasal cavity that develop over years, usually around a nidus. This nidus is generally considered to be of exogenous origin, consisting of foreign bodies previously overlooked in the nose (11,14). In a study examining 28 cases of rhinoliths, Akkoca et al.

Table 1: Demographic data of the patients.

Characteristics		Findings (n=32)
Age groups, n (%)	<20 years	5 (15.6)
	20-50 years	22 (68.8)
	>50 years	5 (15.6)
Gender, n (%)	Female	19 (59.4)
	Male	13 (40.6)
Side, n (%)	Right	17 (53.1)
	Left	15 (46.9)
Previous surgery, n (%)	Present	7 (21.9)
	Absent	25 (78.1)
Symptoms, n (%)	Nasal malodor	21 (65.6)
	Nasal obstruction	17 (53.1)
	Nasal discharge	5 (15.6)
	Facial pain	4 (12.5)
	Epistaxis	3 (9.4)
Rhinolith localization, n (%)	Nasal septum/inferior turbinate	21 (65.6)
	Nasal septum/middle turbinate	4 (12.5)
	Maxillary sinus	4 (12.5)
	Sphenoid sinus	2 (6.3)
	Vestibule	1 (3.15)

Table 2: Accompanying nasal pathologies and additional surgical procedures.

	Findings (n=32)
Accompanying nasal pathologies*	
Chronic rhinosinusitis	11 (34.4)
Nasal septal deviation	8 (25)
Allergic rhinitis	3 (9.4)
Septal perforation	2 (6.3)
Adenoid vegetation	2 (6.3)
Nasal polyposis	1 (3.1)
Surgical procedures*	
Septoplasty	5 (15.6)
Caldwell-Luc operation	4 (12.5)
Endoscopic sinus surgery	2 (6.3)
Adenoidectomy	2 (6.3)

*Data are presented as n(%)

detected a nidus in only six patients (21.4%) (1). Similarly, in the study conducted by Aksakal, a nidus was detected in six of 23 patients (26.1%) (4). In our series, a nidus was observed in four cases (12.5%), of which three presented with ectopic tooth of endogenous origin and one had a foreign body in the nose. Endogenous substances, such as blood clots and epithelial debris, are probably resorbed over time, and symptoms related to these substances do not occur after rhinolith formation is completed.

In contrast to the literature indicating that rhinolithiasis peaks in childhood and adolescence, in our series, approximately 70% of the cases were adults aged 20-50 years. This difference may be related to our exclusion criteria of rhinoliths that were anteriorly located and could be easily excised under outpatient conditions without requiring endoscopic interventions. On the other hand, the longer the interval between the formation and excision of a rhinolith, the more difficult its excision. Therefore, in anteriorly located and mostly foreign body-associated rhinoliths seen in childhood, timely interventions can provide easier excision and prevent long-term complications.

Similar to other sinonasal pathologies, rhinoliths most commonly present with nasal obstruction. Nasal obstruction was detected in all patients with rhinoliths in a study by Aksakal, while the rate of nasal obstruction was reported to be 71.6% by Akkoca et al. and 71% by Seyhun et al (1,4,14). In our series, the most common symptom was nasal malodor (65.6%), followed by nasal obstruction (53.1%). This difference can be explained by the absence of nasal obstruction symptoms and severe nasal malodor in five cases in the maxillary and sphenoid sinuses in our series. While the presence of rhinoliths in the paranasal sinuses does not cause nasal obstruction, it may cause severe nasal malodor and chronic rhinosinusitis symptoms. If the endoscopic examination reveals no pathology that could explain nasal malodor, the possibility of paranasal sinus pathologies, including the exceedingly rare rhinoliths, should be considered. Apart from nasal obstruction and nasal malodor, rhinoliths can cause purulent discharge, facial pain, epistaxis, and headaches, while they may also be completely asymptomatic depending on their locations (6,11,15,16). At this point, the most important issue to be kept in mind is that this benign disease can be mistaken for other diseases with similar symptoms. Misdiagnosis can result in overtreatment or a delay in appropriate and effective treatment. Therefore, a nasal endoscopic examination should be carefully undertaken for the evaluation of nasal cavity. On endoscopic examination, rhinoliths appear as grayish or brownish-black, hard, immovable, and painful masses on palpation (Figure 1). However, when in doubt or if imaging methods are to be used in terms of differential diagnosis and surgical planning, paranasal CT is the most preferred imaging method. Rhinoliths presents as irregularly circumscribed masses of heterogeneous density, mostly in the inferior meatus (Figure 2) (4,6,17). In cases where rhinoliths have eroded surrounding tissues, septal perforation, the erosion of the lateral wall of the nasal cavity or the walls of the maxillary sinus, and findings of oronasal or oroantral fistulas can also be observed (Figure 3) (18,19).

The most common localization of rhinoliths is between the inferior turbinate and the septum. This area actually corresponds to the internal nasal valve region, which is the narrowest part of the nasal cavity and where foreign bodies are also most frequently detected (1,4,11,14). However, rhinoliths can also have very rare localizations, such as

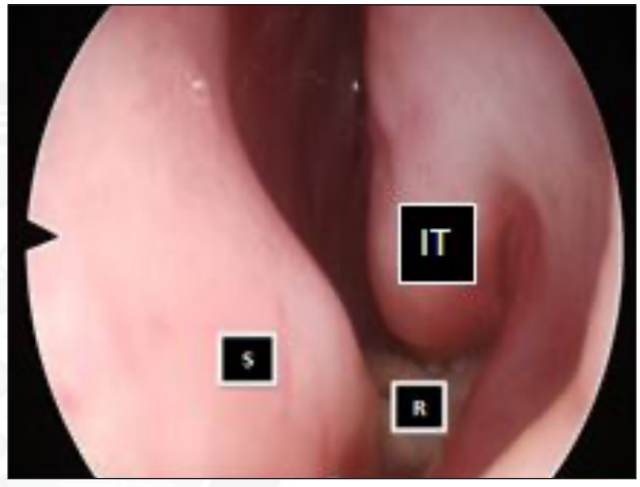

Figure 1: Endoscopic image showing a rhinolith located between the inferior turbinate and the septum.
S: *Septum,* ***IT:*** *Inferior turbinate,* ***R:*** *Rhinolith*

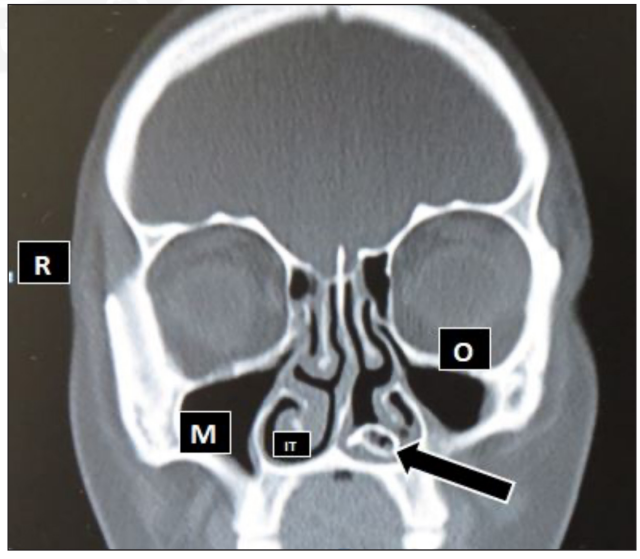

Figure 2: Computed tomography appearance of a rhinolith between the inferior turbinate and the septum on the left side.
R: *Right,* ***M:*** *Maxillary sinus,* ***IT:*** *Inferior turbinate,* ***O:*** *Orbita.*

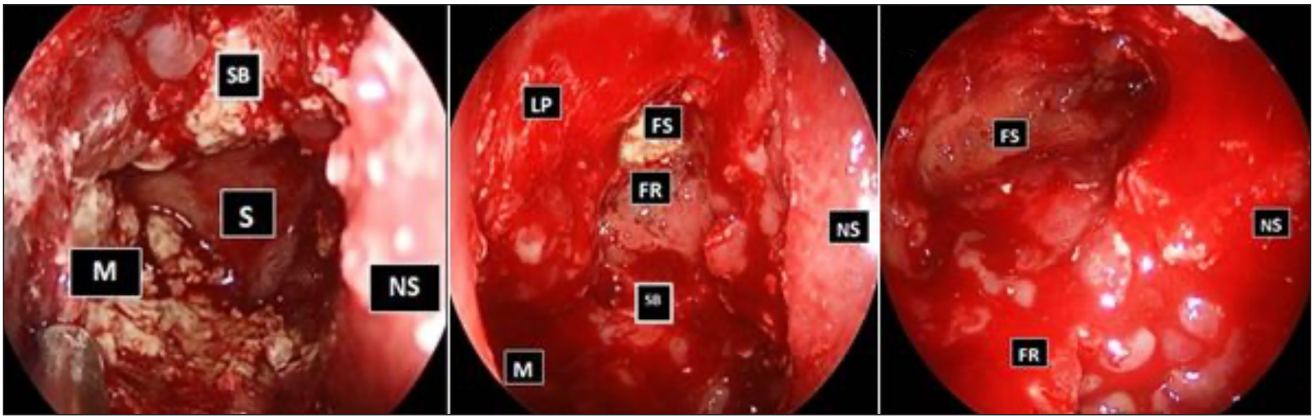

Figure 3: Endoscopic image showing widespread destruction caused by rhinolithiasis intraoperatively.
SB: *Skull base,* ***M:*** *Maxillary sinus,* ***NS:*** *Nasal septum,* ***S:*** *Sphenoid sinus,* ***LP:*** *Lamina papyracea,* ***FS:*** *Frontal sinus,* ***FR:*** *Frontal recess.*

the nasopharynx, the fossa of Rosenmüller, and maxillary and sphenoid sinuses (10,15,16). In our series, the most common localization was between the inferior turbinate and the septum, consistent with the literature. However, we detected rhinoliths in the maxillary sinus in four cases (12.5%), between the middle concha and the septum in four (12.5%), and within the sphenoid sinus in one (3.1%). In these cases, the possibility of chronic inflammation caused by rhinoliths in surrounding tissues over the years and that of bone destruction in areas such as the skull base and lamina paprycea should be considered, and endoscopic surgery should be performed very carefully. Among our cases, septum perforation was present in two cases (6.3%) in which the rhinoliths were located between the middle concha and the septum. In addition, bone destruction was observed in the lateral nasal wall in a case that presented with widespread destruction (Figure 3).

In our study, the mean duration of symptoms was less (14 months) in patients with rhinoliths on the opposite side of the deviation. When one nasal cavity is obstructed due to septum deviation, nasal obstruction in the other nasal cavity due to a rhinolith leads patients to seek medical help and receive a diagnosis earlier. On the other hand, the presence of a rhinolith on the deviation side makes the diagnosis difficult. In our series, the patient who was found to have a rhinolith on the nasal septum deviation side had persistent complaints for approximately five years. Therefore, especially in patients with persistent or worsening nasal symptoms after initial therapy, rhinoliths should be considered, and clinicians should not hesitate to apply imaging methods when necessary.

Rhinolithiasis may coexist with many diseases affecting the nasal cavity and paranasal sinuses. In addition to performing a differential diagnosis with septal deviation, nasal polyps, chronic rhinosinusitis, allergic rhinitis, and paranasal tumors, which may cause nasal symptoms similar to rhinolithiasis, the possibility of rhinolithiasis coexisting these diseases and accompanying adenoid vegetation in children should also be kept in mind (1,3,4,9-12). Since the treatment of rhinolithiasis is surgical excision, appropriate preoperative evaluation allows determining the need for additional surgical interventions and performing these operations simultaneously with rhinolith excision. In 13 (40.6%) of our cases, additional surgical interventions were applied during the endoscopic excision of rhinoliths. This high rate may be due to the referral of complex cases to our clinic as a tertiary reference center. However, this finding is also very valuable in terms of demonstrating the importance of investigating concomitant nasal pathologies in the presence of rhinoliths.

CONCLUSION

Although rhinolithiasis is a rare condition in the general population, it should be considered in patients presenting with unilateral nasal obstruction, especially malodorous nasal discharge, who do not respond to medical treatment.While a diagnosis of rhinolithiasis can be made by endoscopic examination of the nasal cavity, in appropriate cases, paranasal CT imaging is useful in terms of preoperative surgical planning, the identification of the extent of the destruction that has occurred, and the detection of accompanying pathologies. Since the treatment of rhinolithiasis is surgical excision, the appropriate approach is the preoperative detection of pathologies that require additional surgery and interventions that can be simultaneously undertaken with rhinolith excision. While anteriorly located and small sized rhinoliths can be excised in the outpatient setting, larger rhinoliths accompanied by additional pathologies should be excised under general anesthesia in operating room conditions. Although endoscopic methods are sufficient in most cases, an external approach may be required in some patients.

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None.

Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by **Mehmet Murat Günay** and **Gökhan Toptaş.** The first draft of the manuscript was written by **Güleser Saylam** and **all authors** commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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There is no financial disclosure to declare in this study.

Ethical Approval

This study was approved by the Ethics Committee of Ankara Dışkapı Training and Research Hospital, with the approval number of 101/09 and approval date of 12.28.2020.

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Extremely and externally peer-reviewed.

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