

# Paranasal Sinus Fungus Ball: Retrospective Analysis of 37 Patients

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## Abstract

**Objective:** The aim of this study was to evaluate clinical characteristics and surgical outcomes of paranasal sinus fungus ball.

**Material and Methods:** We retrospectively examined clinical records including clinical presentations, radiologic findings, management, and outcomes of fungus ball who underwent functional endoscopic surgery for treatment between 2008-2019. The patients demographic data, clinical presentations, radiological findings and surgical outcomes were analysed.

**Results:** The patients ages ranged between 30 and 76 years, mean age was 55.2. Most common symptoms were headache and facial pain. On computed tomography, the most common finding was sclerosis in bony walls of the sinus (78.3%). Magnetic resonance imaging revealed a marked low intensity on T2 weighted images in all cases (100%). All patients were treated with functional endoscopic sinus surgery.

**Conclusion:** Fungus ball should be considered in patients with unilateral nasal symptoms and unexplained headache and facial pain. Endoscopic sinus surgery is the treatment of choice in all cases.

**Keywords:** Fungal rhinosinusitis, fungus ball, endoscopic sinus surgery

## INTRODUCTION

Fungal rhinosinusitis (FR) has invasive and noninvasive forms. The invasive form is of further three types: acute invasive FR (fulminant), granulomatous invasive FR, and chronic invasive FR. Similarly, noninvasive forms are three types: saprophytic infection, cork ball, and allergic FR. The invasive forms are frequently seen in people who has immune system insufficiency, noninvasive forms can be seen in individuals with normal immune system (1).

The fungal ball is formed by the noninvasive accumulation of the fungal hyphae in a sinus. There is no invasion of the sinus mucosa in the fungal ball. Mycetoma is also called aspergilloma. It has been observed that approximately 10% of patients who had sinus operation had FR (2, 3).

The aim of this study was to investigate the clinical features of patients with the paranasal sinus fungus ball.

## MATERIAL AND METHODS

A total of 47 patients who were operated with the diagnosis of a fungal ball between 2008 and 2019 were retrospectively evaluated. The diagnosis was made through histological examination of the specimens. Of the 47 patients, 37 were histopathologically diagnosed as fungal ball; the study was performed on these 37 patients. Patients' age, main symptoms, localization of the fungal ball, radiological findings, and postoperative results were evaluated. Paranasal sinus computed tomography (CT) was performed in axial and coronal planes for all patients, and paranasal sinus magnetic resonance imaging (MRI) was performed for 32 of 37 patients. The patients were followed for 6 months postoperatively, and successful result was defined as having adequate sinus ostium clearance postoperatively 6 months.

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**Table 1.** Clinical presentation of patients with paranasal sinus fungal ball

Variables		n (%)
Gender	Female	23 (62%)
	Male	14 (38%)
Symptom	Headache	27 (70%)
	Facial pain	9 (24%)
	Postnasal discharge	6 (16%)
Sinus localization	Maxillary sinus	25/37 (67.5%)
	Sphenoid Sinus	12/37 (12%)
Histopathology and Culture Study	<i>Aspergillus flavus</i>	7/37 (18.9%)
	<i>Penicillium chrysogenum</i>	1/37 (0.2%)

**Table 2.** The radiological findings of the patients with paranasal sinus fungal ball

Radiological findings		n (%)
CT findings	Increased sclerosis in the sinus wall	(29/37,78.3%)
	Hyperdense areas in sinus	(25/37, 67.5%)
MRI findings	Hypointensity in T1 sections	100%
	Significant hypointensity in T2 sections	100%

CT: computed tomography; MRI: magnetic resonance imaging

**Figure 1.** Coronal paranasal sinus computed tomography: heterogeneous opacification within the right sphenoid sinus and thickening of the sinus wall

## RESULTS

Of the 37 patients, 23 (62%) were female and 14 (38%) were male. The patient age ranged from 30 to 76 years, with a mean age of 55.2 years. The most common symptoms were headache, facial pain, and postnasal discharge. The fungal ball was most commonly seen in the maxillary sinus (25/37, 67.5%), followed by the sphenoid sinus (12/37, 32.5%). The demographic and clinical characteristics of the patients are presented in Table 1. The most common finding on CT was increased sclerosis in the sinus wall (29/37, 78.3%), while the second most common finding was hyperdense lesion in the sinus (25/37, 67.5%) (Figure 1). On MRIs, hypointensity

**Figure 2.** T1-weighted axial magnetic resonance imaging draws attention to iso- and hypointense lesions

on T1 sections and significant hypointensity on T2 sections were the most common findings (100%) (Table 2) (Figure 2).

The definitive diagnosis was done with histopathology and sinus culture in all cases, and *Aspergillus fumigatus* was the most common pathogen fungus.

Functional endoscopic sinus surgery was the treatment modality used in all patients. During the operation, the affected paranasal sinus ostium was opened with enough width to discharge the sinus. At the end of the operation, the intrasinus saline was pressurized and the fungal hyphae and debris were removed from the sinus.

## DISCUSSION

The paranasal sinus fungal ball is usually seen in women and older patients. In a study conducted by Nicolai et al. (4), the incidence rate in women patients was 73.8% and the mean patient age was 52.7 years. In a large study of 538 cases, Yoon et al. (5) reported a mean age of 58.3 years and the ratio of female/male 2. In our study, in accordance with the literature, female patients accounted for 62% of the total patients, and the mean patient age was 55.2 years.

Although the paranasal sinus fungal ball is most commonly seen in the maxillary sinuses, the sphenoid sinuses are the second most frequently affected regions (6, 7). In our study, the maxillary sinus was found to be the most common affected site (62.5%) and the sphenoid sinus was the secondly affected (37.5%).

Computed tomography (CT) and MRI are the most commonly used imaging modalities. Pathognomonic findings were demonstrated in both imaging modalities. Unilateral sinus infection, increased sclerosis in the sinus walls, and the presence of hyperdense areas in the sinus are the most important findings in CT images. Increased sclerosis in the sinus wall has shown to be the most common radiological finding in CT images (8, 9). However; Yoon et al. (5) reported the presence of hyperdense areas in the sinus to be the most common finding. In our study, in accordance with the literature, the most common CT finding was increased sclerosis in the sinus walls and the second most common finding was hyperdense lesion in the sinus. On MRI, isointense or hypointense lesions are the most important findings on T1 sections and definite hypointensity was the most important finding on T2 sections (10).

The most common pathogen was *Aspergillus flavus* studied on both histologically and culture. *Penicillium chrysogenum* was the secondly common. The sensitivity of detecting pathogenic fungi in culture is low and has been reported to be 20%–30% (2, 11). In our study, pathogenic fungi was detected in the culture of 8 (21.6%) of the 37 patients.

The typical symptoms of the paranasal sinus fungus ball are headache, nasal congestion, and postnasal discharge, with many studies reporting headache and facial pain to be the most common symptoms (4, 12, 13). In our retrospective study also, headache was the most common complaint of the patients.

The current treatment of patients with the fungus ball is to remove of the fungus ball by opening the sinus ostium sufficiently wide through functional endoscopic sinus surgery. It is important to irrigate the sinus with saline and to remove the fungal debris (14, 15). The recurrence rate is approximately 1%-10% and is low in cases in which adequate ostium patency is achieved. Recurrence was observed in only 2 (5.4%) of our 37 cases, and these patients were reoperated.

Thus, patients with unilateral sinus opacification accompanying chronic rhinosinusitis should be considered for the presence of paranasal fungal ball. The opening of sinus ostium via functional endoscopic sinus surgery is the ideal treatment in these patients.

## CONCLUSION

The paranasal fungal ball can also be seen in patients without immune suppression. Treatment of the paranasal sinus with functional endoscopic sinus surgery is to clean the sinuses by enlarging the ostium.

**Ethics Committee Approval:** Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

**Informed Consent:** Informed consent was not taken from patients due to the retrospective nature of the study.

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