

Clinical Profile and Treatment Outcomes of Paranasal Sinus Fungal Ball Following Functional Endoscopic Sinus Surgery

D Indraneel Reddy¹, Yaratapalli Himaja^{1*}, G Ramesh Babu², I V Satya Dhanush³

¹Assistant Professor, Department of ENT, Narayana Medical College and Hospital, Chinthareddypalem, Nellore, Andhra Pradesh, India

²Professor, Department of ENT, Narayana Medical College and Hospital, Chinthareddypalem, Nellore, Andhra Pradesh, India

³Senior Resident, Department of ENT, Radhika Rayudu Speciality Hospital, 13-3-32, Gunturvari Thota, Gunturvarithota, Guntur, Andhra Pradesh, India

***Address for Correspondence:** Dr. Yaratapalli Himaja, Assistant Professor, Department of ENT, Narayana Medical College and Hospital, Chinthareddypalem, Nellore, Andhra Pradesh- 524003, India

E-mail: y.himajareddy149@gmail.com

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ABSTRACT

Background: Paranasal sinus fungal ball (PSFB) is a non-invasive fungal infection that predominantly occurs in immunocompetent individuals. Its clinical manifestations often overlap with those of chronic rhinosinusitis, potentially leading to a delayed diagnosis. Computed tomography (CT) is the primary imaging modality, whereas magnetic resonance imaging (MRI) may be useful in selected cases; histopathological examination is used for definitive diagnosis. Functional endoscopic sinus surgery (FESS) is the standard surgical treatment and is associated with favourable clinical outcomes.

Methods: This prospective single-centre study included 82 patients diagnosed with PSFB who underwent FESS during the study period. Demographic, clinical, radiological, microbiological, surgical, and histopathological data were collected. All patients underwent CT, whereas MRI was performed in selected patients when clinically indicated.

Results: Among the 82 patients, females predominated (58.5%). Unilateral nasal obstruction (76.8%) and facial pain or pressure (67.1%) were the most frequent symptoms. The maxillary sinus was the most frequently involved site (76.8%). CT demonstrated unilateral sinus opacification in 95.1% and hyperdense intralesional calcifications in 82.9% of patients. MRI was performed in 32 patients; marked T2-weighted hypointensity was observed in 90.6%. *Aspergillus fumigatus* was identified in 45.1% of patients.

Conclusion: CT and histopathological examination were the principal modalities used for diagnosing PSFB. FESS was associated with favourable clinical outcomes.

Key-words: Paranasal sinus fungal ball; Functional endoscopic sinus surgery; Computed tomography; *Aspergillus fumigatus*; Histopathology

INTRODUCTION

Heliothis armigera is a cosmopolitan, polyphagous insect causing serious damage to, Uttar Pradesh, West Bengal etc. Chemical pesticides are commonly used to protect [1,2].

Paranasal sinus fungal ball (PSFB), also termed a sinonasal fungus ball or mycetoma, is a noninvasive form of fungal rhinosinusitis characterized by the accumulation of fungal hyphae, inspissated secretions, and cellular debris within a paranasal sinus without invasion of the mucosa, submucosa, blood vessels, or underlying bone [1]. Unlike invasive fungal rhinosinusitis, PSFB generally occurs in immunocompetent individuals and has a chronic, indolent course. The maxillary sinus is the most frequently involved site, although the sphenoid, frontal, and ethmoid sinuses may also be affected. *Aspergillus* species, particularly *Aspergillus fumigatus*

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and *Aspergillus flavus*, are the organisms most frequently recovered^[2]. Histopathological demonstration of fungal hyphae without tissue invasion is central to distinguishing PSFB from invasive disease^[3,4].

Non-invasive fungal rhinosinusitis is clinically relevant in India, where geographical variation, environmental exposure, climate, referral patterns, and differences in diagnostic definitions may influence reported frequency. A prospective Indian study of 100 patients with chronic rhinosinusitis identified fungal rhinosinusitis in 30% of participants; fungus ball constituted 46.6% of the fungal rhinosinusitis spectrum, and 56.6% of patients with fungal rhinosinusitis were immunocompetent^[5]. In a population-based study from rural northern India, chronic fungal rhinosinusitis was identified in 0.11% of the general population and in 27.5% of patients with chronic rhinosinusitis; fungal ball accounted for 9.5% of chronic fungal rhinosinusitis, with *Aspergillus flavus* predominating^[6,7]. These data do not provide a single national prevalence estimate for PSFB, but they demonstrate that non-invasive fungal disease represents an important clinical entity among immunocompetent Indian patients.

Patients with PSFB commonly present with unilateral nasal obstruction, facial pain or pressure, headache, purulent nasal discharge, postnasal drip, cacosmia, and reduced smell. These symptoms overlap considerably with chronic rhinosinusitis, and the absence of systemic toxicity or invasive features may contribute to delayed recognition. Consequently, diagnosis requires integration of clinical assessment, nasal endoscopy, imaging, operative findings, and histopathological examination^[4]. Histopathology is particularly important because the distinction between noninvasive fungal colonization and invasive fungal rhinosinusitis depends on demonstrating whether fungal elements have penetrated the mucosa or deeper tissues^[5,6].

Imaging has a central role in identifying PSFB and defining its extent. CT is generally the first-line imaging modality because it provides excellent visualization of the paranasal sinus anatomy and bony walls^[7]. In a typical patient with non-invasive PSFB, CT demonstrates unilateral sinus opacification containing

hyperattenuating fungal material, often with punctate or irregular calcific foci, associated mucosal thickening, and chronic sinus-wall sclerosis or remodelling. These features reflect the dense fungal concretions and chronicity of the process^[8].

CT and MRI should be regarded as complementary rather than interchangeable examinations. In the present cohort, CT was performed in all 82 patients and demonstrated unilateral opacification in 95.1% and hyperdense intralesional calcifications in 82.9%. MRI was obtained in 32 patients when CT findings were equivocal or when orbital, skull-base, intracranial, or neoplastic extension was suspected. Marked T2-weighted hypointensity was observed in 90.6% of MRI examinations^[9]. This low signal is characteristic of fungal concretions and has been attributed to dense dehydration and paramagnetic elements such as iron and manganese. MRI is particularly valuable for soft-tissue characterization and for assessing possible extension beyond the sinus, whereas CT is superior for evaluating calcification, sinus-wall sclerosis, remodelling, and focal bony change^[10]. Thus, the value of MRI in PSFB lies not in replacing CT but in answering specific questions that CT may not adequately resolve.

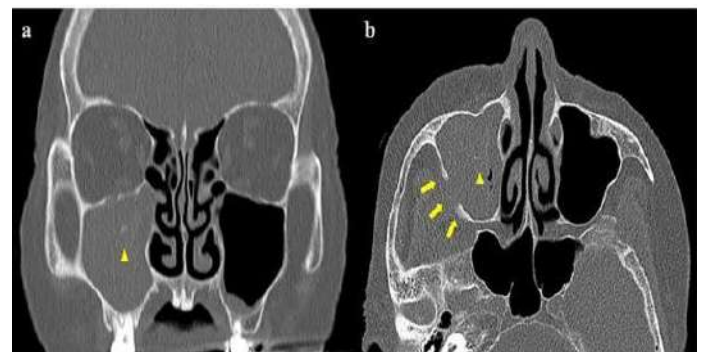


Fig. 1: Computed tomography scan showing soft-tissue shadows with calcification (arrowhead) on the right maxillary sinus with partial bone thickening and bone erosion (arrow) in the posterior wall of the maxillary sinus

Functional endoscopic sinus surgery (FESS) is the preferred treatment for symptomatic PSFB. The objective is complete removal of the fungal debris, restoration of sinus ventilation and drainage, and preservation of healthy sinonasal mucosa^[11]. Adequate surgical clearance is generally sufficient in uncomplicated non-invasive disease, and routine systemic antifungal

therapy is not usually required^[12]. The present study was therefore designed to describe the clinical, radiological, microbiological, histopathological, and surgical characteristics of PSFB and to evaluate clinical outcomes following FESS in an Indian tertiary-care setting.

MATERIALS AND METHODS

Research Design- This prospective single-centre study was conducted in the Department of Otorhinolaryngology at a tertiary-care teaching hospital in India. A total of 82 consecutive patients with a confirmed diagnosis of PSFB who underwent FESS during the study period were included. The study protocol was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants.

Inclusion Criteria- The study included 82 consecutive patients with a confirmed diagnosis of PSFB. Patients of all ages and both sexes who underwent FESS and had complete clinical, radiological, operative, and histopathological records were eligible for inclusion.

Exclusion Criteria- Patients with invasive fungal rhinosinusitis, allergic fungal rhinosinusitis, sinonasal malignancy, previous sinonasal surgery performed at another institution, incomplete clinical records, or inadequate follow-up were excluded.

Procedure- The hospital electronic medical record system was used to review clinical records. Data extracted included demographic characteristics, presenting symptoms and symptom duration, medical comorbidities, endoscopic findings, CT and MRI findings, sinus involvement, intraoperative findings, fungal culture results, histopathological findings, surgical procedures, postoperative complications, recurrence, and duration of follow-up. Preoperative non-contrast CT of the paranasal sinuses was performed in all patients. MRI was performed in selected patients with suspected orbital, skull-base, or intracranial extension and in those with inconclusive CT findings. T1- and T2-weighted signal intensities and contrast enhancement were assessed. The surgical objective was to establish adequate drainage of the involved sinus and achieve complete clearance of fungal debris while preserving normal sinonasal mucosa. Fungal culture and histopathological examination of the excised tissue were performed.

Routine postoperative systemic antifungal therapy was not administered because all patients had non-invasive PSFB. Postoperatively, patients received saline nasal irrigation and underwent endoscopic debridement when required, with subsequent follow-up in the outpatient department.

Outcome Measures- The outcome assessment evaluated the effectiveness and safety of surgical management of paranasal sinus fungus ball (PSFB) using complementary clinical, endoscopic, radiological, microbiological, and histopathological parameters. The primary outcome was postoperative clinical resolution, assessed by improvement or disappearance of nasal obstruction, facial pain or pressure, headache, nasal discharge, postnasal drip, impaired smell, and recurrent rhinosinusitis symptoms. Endoscopic evaluation assessed sinus ostium patency, residual fungal material, discharge, mucosal inflammation, crusting, granulation tissue, synechiae, and recurrent disease. Radiological outcomes, particularly CT findings, evaluated sinus clearance, aeration, residual fungal concretions, mucosal thickening, calcifications, bone changes, and recurrence. Microbiological assessment included fungal and bacterial cultures, organism identification, mixed growth, and culture-negative results, interpreted alongside clinical and radiological findings. Histopathology, when available, documented fungal elements and inflammatory or necrotic changes to support diagnosis and outcome assessment.

Post-operative complication and follow-up assessment- Postoperative complications were recorded throughout the follow-up period, including bleeding, infection, persistent purulent discharge, excessive pain, nasal obstruction, delayed healing, crusting, synechiae, persistent or recurrent sinus inflammation, and orbital, visual, or cerebrospinal fluid complications, when present. The onset, severity, duration, treatment required, and outcome of each complication were documented, including any need for medication, hospitalization, or surgical intervention. Recurrence of PSFB was assessed based on the return of symptoms, recurrent fungal debris or characteristic radiological findings, and microbiological or histopathological evidence when available. The time to recurrence and any need for revision surgery were recorded.



Revision surgery was documented when required for residual or recurrent disease, inadequate sinus drainage, anatomical obstruction, persistent symptoms, or complications. Follow-up assessments included clinical symptoms, endoscopic findings, complications, and evidence of residual or recurrent disease. Radiological, microbiological, and histopathological findings were recorded when available. Overall treatment success was determined using clinical improvement together with endoscopic and radiological clearance, absence of recurrence, and absence of need for further surgery. Patients lost to follow-up were documented, with outcomes based on the last available assessment.

Statistical Analysis- IBM SPSS Statistics version 26.0 was used for statistical analysis. Normally distributed continuous variables were expressed as mean $\pm$ standard

deviation, whereas non-normally distributed variables were expressed as median and interquartile range. Categorical variables were expressed as frequencies and percentages. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate. Continuous variables were compared using the independent-samples t-test or Mann-Whitney U test, as appropriate. A two-sided p-value <0.05 was considered statistically significant.

RESULTS

The demographic characteristics and clinical presentations of the patients are presented in Table 1. Unilateral nasal obstruction and facial pain or pressure were the most common presenting symptoms. PSFB most frequently involved the maxillary sinus (76.8%), followed by the sphenoid sinus (12.2%).

Table 1: Clinical Presentation and Microbiological Findings of Patients with Paranasal Sinus Fungal Ball (N = 82)

Parameter	n	Percentage (%)
Gender		
Male	34	41.5
Female	48	58.5
Clinical Presentation		
Unilateral nasal obstruction	63	76.8
Facial pain/pressure	55	67.1
Headache	46	56.1
Postnasal discharge	35	42.7
Purulent nasal discharge	28	34.1
Hyposmia/Anosmia	20	24.4
Sinus Localization		
Maxillary sinus	63	76.8
Sphenoid sinus	10	12.2
Frontal sinus	5	6.1
Ethmoid sinus	4	4.9
Culture Study		
<i>Aspergillus fumigatus</i>	37	45.1
<i>Aspergillus flavus</i>	19	23.2
Other <i>Aspergillus</i> spp.	6	7.3
Negative culture	20	24.4

CT findings showed that unilateral sinus opacification was the predominant radiological feature, observed in 95.1% of patients, while complete sinus opacification was present in 89.1%. Hyperdense intralesional calcifications, a characteristic feature of fungal ball, were identified in 82.9% of cases. Bony wall sclerosis or

thickening was observed in 37.8% of patients. In contrast, focal bony erosion (8.5%) and sinus wall expansion/remodelling (13.4%) were relatively uncommon findings, suggesting that destructive bony changes were infrequent (Table 2).

Table 2: CT Radiological Findings in Patients with Paranasal Sinus Fungal Ball (N = 82)

Radiological variable	Finding	Number of patients	Percentage
CT Signs (n = 82)	Unilateral sinus opacification	78	95.1
	Complete sinus opacification	73	89.1
	Hyperdense intralesional calcifications	68	82.9
	Bony wall sclerosis/thickening	31	37.8
	Focal bony erosion	7	8.5
	Sinus wall expansion/remodelling	11	13.4

Among the 82 patients, MRI was performed in 32 patients because CT findings were inconclusive or there was clinical suspicion of skull-base or orbital involvement. MRI percentages were therefore calculated using a denominator of 32. Marked T2-weighted

hypointensity was observed in 2 patients (90.6%), peripheral mucosal enhancement in 2 (84.4%), and iso- to hypointense T1-weighted signal in 2 (75%). No patient demonstrated intracranial or orbital extension or soft-tissue invasion (Table 3).

Table 3: MRI Radiological Findings in Selected Patients (n = 32)

Radiological variable	Finding	Number of patients	Percentage
MRI Signs (n = 32)	Marked T2-weighted hypointense signal	29	90.6
	Iso- to hypointense signal on T1-weighted images	24	75
	Peripheral mucosal enhancement after gadolinium	27	84.4
	Absence of intracranial or orbital extension	32	100
	No soft tissue invasion	32	100

Table 4 demonstrates favourable clinical outcomes following FESS, with 75 patients (91.47%) achieving complete clinical resolution. Three patients (3.66%) experienced recurrence, while no patient required

revision surgery. Postoperative complications occurred in 2 patients (2.44%), and 2 patients (2.44%) received systemic antifungal therapy.

Table 4: Clinical Outcomes Following FESS (N = 82)

Treatment outcome	Number (n)	Percentage (%)
Complete clinical resolution	75	91.47
Persistent/recurrent symptoms	0	0
Postoperative complications	2	2.44
Recurrence of fungal ball	3	3.66
Requirement for revision surgery	0	0
Requirement for systemic antifungal therapy	2	2.44



DISCUSSION

The findings of the present prospective study are consistent with recent literature on PSFB. The predominance of unilateral disease, the frequent involvement of the maxillary sinus, and the occurrence of PSFB in immunocompetent patients are in keeping with published clinical series and consensus recommendations [10]. In the present cohort, females accounted for 58.5% of patients, unilateral nasal obstruction was the most frequent symptom (76.8%), and the maxillary sinus was the most commonly involved site (76.8%). The Indian epidemiological context is particularly relevant. Suresh *et al.* conducted a prospective study of 100 patients with chronic rhinosinusitis and reported fungal rhinosinusitis in 30%; fungus ball accounted for 46.6% of the fungal rhinosinusitis spectrum, and 56.6% of fungal rhinosinusitis cases occurred in immunocompetent patients [11,12]. Chakrabarti *et al.*, in a population-based study from rural northern India, reported chronic fungal rhinosinusitis in 0.11% of the general population and 27.5% among patients with chronic rhinosinusitis; fungal ball accounted for 9.5% of chronic fungal rhinosinusitis cases [12]. These studies demonstrate the clinical importance of non-invasive fungal disease in immunocompetent Indian populations while also showing that reported frequency varies according to geography, environmental exposure, and case definition [13]. The radiological findings of the present cohort reinforce CT as the principal imaging modality. Unilateral sinus opacification was present in 95.1% of patients and hyperdense intralesional calcifications in 82.9%. These findings are characteristic of PSFB and are consistent with prior radiological descriptions of unilateral opacification containing hyperattenuating fungal material, often with calcification and chronic bony change [14,15]. MRI is clinically relevant in orbital, skull-base, intracranial, or neoplastic extension. In the present cohort, no patient demonstrated orbital, intracranial, or soft-tissue invasion on MRI, supporting the noninvasive nature of the disease.

A prospective microbiological study published in 202 provides additional support for the inflammatory and microbial context of PSFB. The study compared sinonasal microbiota and pro-inflammatory cytokine profiles

among patients with PSFB, patients with chronic rhinosinusitis, and healthy controls. 16S rRNA sequencing demonstrated differences in microbiota and cytokine profiles among the groups. However, bacterial co-infection did not appear to significantly influence clinical outcomes following FESS [16]. These findings may provide a potential explanation for postoperative clinical improvement but should not be interpreted as establishing a causal relationship. An Indian case series of isolated sphenoid sinus PSFB described this uncommon presentation in four patients. Headache and retro-orbital pain were prominent symptoms, while CT demonstrated a hyperdense focus in the sphenoid sinus. All patients were successfully treated with endoscopic sphenoidotomy without recurrence. This case series provides further insight into the clinical presentation and management of isolated sphenoid sinus PSFB [17].

Franzese *et al.* reported that PSFB is most commonly diagnosed in older immunocompetent adults and typically presents as unilateral disease [18]. A case report describing simultaneous maxillary and sphenoid PSFB further supports the effectiveness of endoscopic surgical management; the patient was successfully treated by complete endoscopic removal of the fungal material, with no subsequent recurrence. These findings support the effectiveness of FESS for the treatment of PSFB [17].

Therefore, the present findings support a practical diagnostic pathway: unilateral chronic sinonasal symptoms should prompt CT evaluation; characteristic hyperattenuating or calcific material should raise suspicion for PSFB; MRI should be reserved for selected patients with equivocal CT findings or suspected extrasinus extension; and histopathological examination should confirm non-invasive fungal colonization. FESS provides definitive mechanical clearance for symptomatic disease, with routine systemic antifungal therapy generally unnecessary after adequate surgical removal in uncomplicated non-invasive PSFB [18,19].

CONCLUSIONS

The study has concluded that paranasal sinus fungal ball predominantly presented as unilateral maxillary sinus disease, with nasal obstruction and facial pain/pressure being the most common symptoms. CT demonstrated characteristic unilateral opacification and intralesional hyperdense calcifications, while MRI findings further

supported the diagnosis without invasive extension. FESS resulted in complete clinical resolution in 91.47% of patients, with low postoperative complications (2.44%), recurrence (3.66%), and no requirement for revision surgery, supporting its effectiveness as the primary treatment modality.

CONTRIBUTION OF AUTHORS

Research concept – D Indraneel Reddy, G Ramesh Babu

Research design – D Indraneel Reddy, I V Satya Dhanush

Supervision – D Indraneel Reddy, G Ramesh Babu

Materials – D Indraneel Reddy and Yaratapalli Himaja

Data collection – D Indraneel Reddy, I V Satya Dhanush, and Yaratapalli Himaja

Data analysis and interpretation – D Indraneel Reddy and Yaratapalli Himaja

Literature search – Yaratapalli Himaja, I V Satya Dhanush

Writing article – Yaratapalli Himaja, G Ramesh Babu

Critical review – D Indraneel Reddy, I V Satya Dhanush

Article editing – D Indraneel Reddy

Final approval – D Indraneel Reddy, G Ramesh Babu

REFERENCES

- [1] Milutinović V, Trivić A, Čolović-Čalovski I, Milovanović J, Colić S, et al. Clinicopathological and microbiological study of fungal rhinosinusitis treated with endoscopic surgery. *Acta Otorhinolaryngol Ital.*, 2025; 45(2): 100. doi: 10.14639/0392-100X-N2808.
- [2] Kwiatkowska MA, Guzek A, Jurkiewicz D, Patyk I, Pajda B, et al. Microbiological comparison of maxillary sinus rinses in non-odontogenic and odontogenic sinusitis of primarily endodontic origin. *J Clin Med.*, 2025; 14(14): 4880. doi: 10.3390/jcm14144880.
- [3] Nelke K, Morawska-Kochman M, Janeczek M, Małyszczek A, Uranbey Ö, et al. Radiologic evaluation of odontogenic sinusitis and its etiologic factors: lessons learned from a retrospective study with a proposed imaging-guided management pathway. *J Clin Med.*, 2026; 15(10): 3724. doi: 10.3390/jcm15103724.
- [4] Ji J, Roland LT. Invasive fungal rhinosinusitis: current evidence and research opportunities. *Curr Opin Otolaryngol Head Neck Surg.*, 2025; 33(1): 20–30. doi: 10.1097/MOO.0000000000000993.
- [5] Al-Hail N, Shaikh A, Al Saey H. Evaluating the role of sinus surgery on the non-diseased contralateral side in patients with unilateral sinus disease: a systematic review. *Cureus.*, 2025; 17(8): e90160. doi: 10.7759/cureus.90160.
- [6] Saibene AM, et al. Comprehensive management of paranasal sinus fungus balls: a Young-IFOS consensus statement. *Int Forum Allergy Rhinol.*, 2023.
- [7] Kim Y, et al. Sinonasal microbiome and inflammatory profiles in paranasal sinus fungal ball and chronic rhinosinusitis. *Auris Nasus Larynx*, 2024.
- [8] Babu AR, et al. Decoding the complexity: a case series on isolated sphenoid sinus paranasal sinus fungal ball. *Indian J Otolaryngol Head Neck Surg.*, 2024.
- [9] AlGHuneem AA, et al. The simultaneous occurrence of a paranasal sinus fungal ball in maxillary and sphenoid sinuses: a case report and review of the literature. *J Surg Case Rep.*, 2025.
- [10] Franzese C. Fungal sinusitis—Invasive versus noninvasive. *Med Clin North Am.*, 2026.
- [11] Fadda GL, Allevi F, Rosso C, Martino F, Pipolo C, et al. Treatment of paranasal sinus fungus ball: a systematic review and meta-analysis. *Ann Otol Rhinol Laryngol.*, 2021; 130(11): 1302–10.
- [12] Saibene AM, Pipolo C, Allevi F, et al. Comprehensive management of paranasal sinus fungus balls: a Young-IFOS consensus statement. *Int Forum Allergy Rhinol.*, 2023.
- [13] Babu AR, et al. Decoding the complexity: a case series on isolated sphenoid sinus paranasal sinus fungal ball. *Indian J Otolaryngol Head Neck Surg.*, 2024.
- [14] AlGHuneem AA, et al. Simultaneous maxillary and sphenoid sinus paranasal sinus fungal ball: a case report and literature review. *J Surg Case Rep.*, 2025.
- [15] Fokkens WJ, Lund VJ, Hopkins C, et al. European position paper on rhinosinusitis and nasal polyps 2020 (EPOS 2020). *Rhinol Suppl.*, 2020; 29: 1–464.
- [16] Suresh S, Arumugam D, Zacharias G, Palaninathan S, Vishwanathan R, Venkatraman V. Prevalence and clinical profile of fungal rhinosinusitis. *Allergy Rhinol.*, 2016; 7(2): e115–e20. doi: 10.2500/ar.2016.7.0156.



- [17]Chakrabarti A, Rudramurthy SM, Panda N, Das A, Singh A. Epidemiology of chronic fungal rhinosinusitis in rural India. *Mycoses*, 2015; 58(5): 294–302. doi: 10.1111/myc.12314.
- [18]Kim YS, Kim HJ, Kim J, Kim CH. Radiologic characteristics of sinonasal fungus ball: an analysis of 11 cases. *Am J Neuroradiol.*, 2011.
- [19]Seo YJ, Kim J, Kim K, et al. Radiologic findings of sinonasal fungus ball and their diagnostic implications. *Clin Exp Otorhinolaryngol.*, 2012.

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