Nepalese Medical Journal, (2021) Vol. 4, 478 - 481

Original Article

Histopathological Examination in the Categorization of Fungal Rhinosinusitis - a Retrospective Study

Sangeetha Kandasamy[1], Megala Chandrasekar[1], Thamilselvi Ramachadran[1]

[1]*Vinayaka Missions Kirupananda Variyar Medical College, Salem, India*

ABSTRACT

Introduction: Fungal Rhinosinusitis is broadly defined as any sinonasal pathology related to the presence of fungi and is increasingly recognized worldwide. This study aimed to assess and ascertain the need for histopathological examination in the management of fungal Rhinosinusitis.

Materials and Methods: This study was performed over two years, from April 2019 to April 2021, in the Department of Pathology, Vinayaka Missions KirupanandaVariyar Medical College and Hospital, Salem. A total of 383 cases of rhinosinusitis/nasal polyps were studied. Histopathological examination and categorization were done and compared with clinical diagnosis.

Results: Only 4/18 cases of acute fungal Rhinosinusitis were correctly diagnosed (22.22%). Nineteen cases of the fungal ball were diagnosed, but none was correctly categorized. Clinical suspicion of fungal sinusitis was present in 10 cases of Rhinosinusitis, which turned out to be chronic Rhinosinusitis in histopathology. In AFRS, fungal elements were overlooked in Hematoxylin and Eosin stained slides and identified only by Grocottmethenamine silver in one-fourth of the cases.

Conclusions: Though clinical diagnosis was made in 86% of fungal rhinosinusitis cases, correct categorization was done only in one-third of cases. CT scan could diagnose 60% of cases, but none was categorized. As treatment depends on the type of fungal Rhinosinusitis, histopathological examination is the gold standard for diagnosing and treating fungal Rhinosinusitis.

Keywords: Fungal ball; Fungus; Grocottmethenamine silver; Rhinosinusitis;

Correspondence:
Dr. Sangeetha Kandasamy, MD
Assistant Professor; Department of Pathology
Vinayaka Missions Kirupananda Variyar Medical College, Salem, India
ORCID ID: 0000-0002-6860-2943
Email: sangeetharangs84@gmail.com

Submitted: 1st November 2021
Accepted: 16th December 2021

Source of Support: None
Conflict of Interest: None

Citation: Kandasamy S, Chandrasekar M, Ramachandran T. Histopathological Examination in the Categorization of Fungal Rhinosinusitis - a Retrospective Study.NMJ 2021;4(2):478-81. DOI 10.3126/nmj.v4i2.41377

INTRODUCTION

Over the last two decades, fungal Rhinosinusitis has been increasingly recognized worldwide. In India, it was considered prevalent in North India but is now reported from other parts of the country.[1]In a significant percentage of cases, the best imaging techniques fail to diagnose and necessitate the use of non-radiological diagnostic modalities accurately. Rhinosinusitis (RS) is "inflammation of the nasal cavity and paranasal sinuses."[2] Clinically, it can be classified based on the duration of symptoms. Acute Rhinosinusitis (ARS) is when symptoms last less than 12 weeks. ARS is further classified based on the duration and presumed etiology as Viral Rhinosinusitis and Acute Bacterial rhinosinusitis. Recurrent acute rhinosinusitis (RARS) is when 4 or more episodes of Acute Bacterial Rhinosinusitis (ABRS) occur in a year.[3,4] When symptoms last longer than 12 weeks, it is called chronic Rhinosinusitis (CRS). CRS is classified based on clinical phenotype[5] as Phenotypes-CRS without nasal polyps and CRS with nasal polyps.

While acute Rhinosinusitis runs a short course and is self-limited, chronic rhinosinusitis has a slow, protracted course & has different etiologies-fungal infections being the primary cause. Fungal Rhinosinusitis (FRS) is broadly defined as any sinonasal pathology

related to the presence of fungi. It accounts for 6 – 12% of all rhinosinusitis cases.[6] First case of fungal sinusitis was reported in 1791.[7]

FRS is commonly classified based on histopathological evidence into invasive and noninvasive diseases. The invasive diseases include acute invasive (fulminant) FRS, granulomatous invasive FRS, and chronic invasive FRS. The noninvasive diseases include: saprophytic fungal infestation, fungal ball, and fungus-related eosinophilic FRS that includes AFRS.[8]

More frequent occurrences of fungal infections in the last few years are because of the expansion of at-risk populations (e.g., immunocompromised individuals like Diabetes, HIV) and the use of different treatment modalities (e.g., Immunomodulatorsfor autoimmune diseases, chemotherapy for malignancies)that result in more prolonged survival of these patients[9]. Patients present with different clinical manifestations: nasal symptoms, including nasal obstruction, semisolid nasal crust, and nasal discharge, or more dramatic complications, which may be ocular and intracranial. However, the clinical examination can provide a clue to the subcategories of fungal Rhinosinusitis. Tissue examination provides more accurate categorization.

Certain radiological appearances are characteristic for certain forms of fungal Rhinosinusitis, yet there is a significant percentage of cases wherein the best imaging techniques fail to clinch the diagnosis and warrant the use of non-radiological diagnostic modalities.[10] A positive fungal culture neither confirms the diagnosis nor does a negative culture exclude it. Hence, this study was done to assess and ascertain the need for histopathological examination in the management of fungal sinusitis.

MATERIALS AND METHODS

This study was performed over two years, from April 2019 to April 2021, in the Department of Pathology, Vinayaka Missions KirupanandaVariyar medical college &hospitals, Salem. A total of 383 cases of rhinosinusitis/nasal polyps were studied. All clinical cases of fungal rhinosinusitis proved by the histopathological study were included. Cases of Rhinosporidiosis presenting as nasal polyps, clinically suspected cases of Rhinosinusitis that turned out to be neoplasms (Inverted papilloma, Juvenile Angiofibroma, Malignancies) were excluded from the study. All consecutive cases received during the study period were included.

A semi-structured questionnaire was prepared and used for data extraction. Clinical examination, CT diagnosis of the patients, Histopathology examination by hematoxylin and eosin stains (Categorization given in table 1 was followed), and Gomori'smethenamine silver stains were carried out, and the diagnosis arrived at by each method were compared.

Data were entered into SPSS software version 16, and the required analysis was done.

RESULTS

Clinical diagnosis of fungal sinusitis was made correctly in 39 out of 45 cases (86.66%). 4 out of 18 cases of AFRS were correctly diagnosed clinically (22.22%). Nineteen cases(19/22) of the fungal ball were diagnosed correctly. All three cases of acute invasive FRS were correctly diagnosed clinically. Clinical suspicion of fungal sinusitis was present in 10 cases of Rhinosinusitis, which turned out to be chronic Rhinosinusitis in histopathology (Table 1). Ten cases of fungal sinusitis were misdiagnosed as a polyp, and six cases were misdiagnosed as malignancy. None of the fungal sinusitis cases was correctly categorized by CT scan. (Table 2). Comparison of HPE with clinical diagnosis showed a sensitivity of 86.66% & specificity of 97.04% with positive predictive value and negative predictive value of 79.59% and 98.20% respectively. Correct diagnosis of FRS was made with CT scan in 19 out of 45 cases (42.22%), and suspicion of FRS was given in another 9 cases (20%). Comparison of HPE with CT scan showed a sensitivity of 62.2% and specificity99% with 93.54% of positive predictive value and 93.17% of negative predictive value.

Table 1: Comparison of clinical diagnosis with histopathological diagnosis

AFRS		Histopathological diagnosis					Total
		AFRS	Fungal ball	Granulomatous FRS	Acute invasive	Saprophytic colonisation	
Clinical diagnosis	AFRS	4	5	0	0	0	9
	Acute invasive	0	0	0	3	0	3
	No categorization	13	14	0	0	0	27
	Diagnosis missed	1	3	1	0	1	6
	Total	**18**	**22**	**1**	**3**	**1**	**45**

Table 2: Comparison of CT scan diagnosis with histopathological diagnosis

AFRS		Histopathological diagnosis					Total
		AFRS	Fungal ball	Granulomatous FRS	Acute invasive	Saprophytic colonization	
Radiological Diagnosis	Diagnostic of FRS	6	11	1	1	0	19
	Suspicious of FRS	3	4	0	2	0	9
	Diagnosed as polyp	8	2	0	0	0	10
	Diagnosed as malignancy	0	5	0	0	1	6
	Not done	1	0	0	0	0	1
Total		**18**	**22**	**1**	**3**	**1**	**45**

Gomori'smethenamine silver stain (GMS) was performed in all cases of clinically suspected FRS. In all cases of the fungal ball (Aspergillus; fig. 1), acute invasive (Mucormycosis; fig. 2), and chronic granulomatous FRS (fig. 3). HE stain could demonstrate the presence of fungus and GMS was confirmatory. In AFRS, HE stained sections could identify the fungus in 14 out of 18 cases. In the remaining 4 cases, only GMS could demonstrate the fungi.

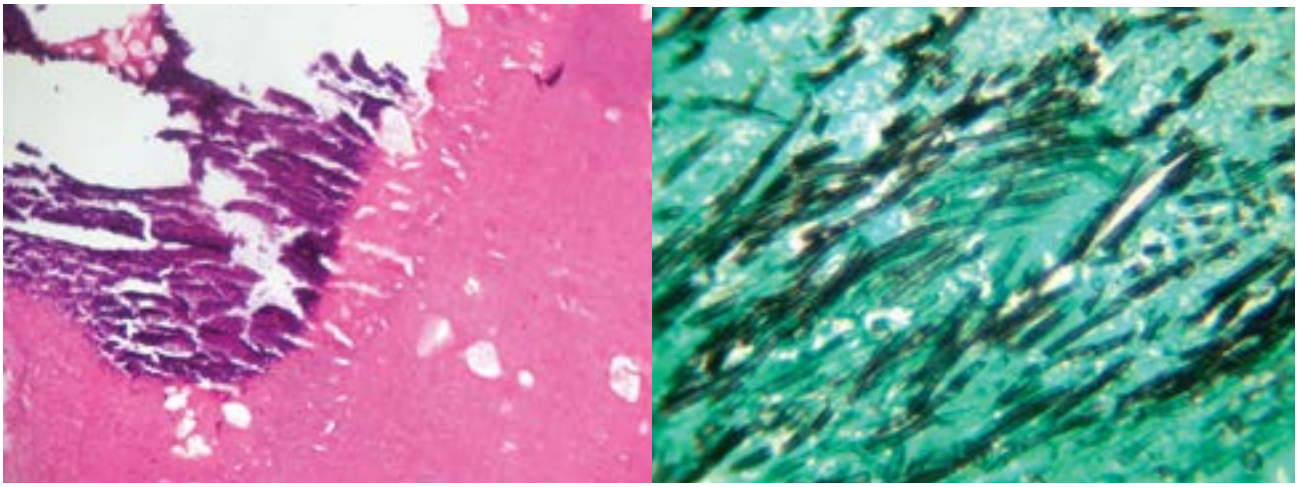

Figure 1: Aspergillus fungal ball with calcification (H&E and GMS Stain). H&E showed tangled fungal filaments surrounding the central basophilic calcification which is highlighted in the adjacent GMS stain (X400).

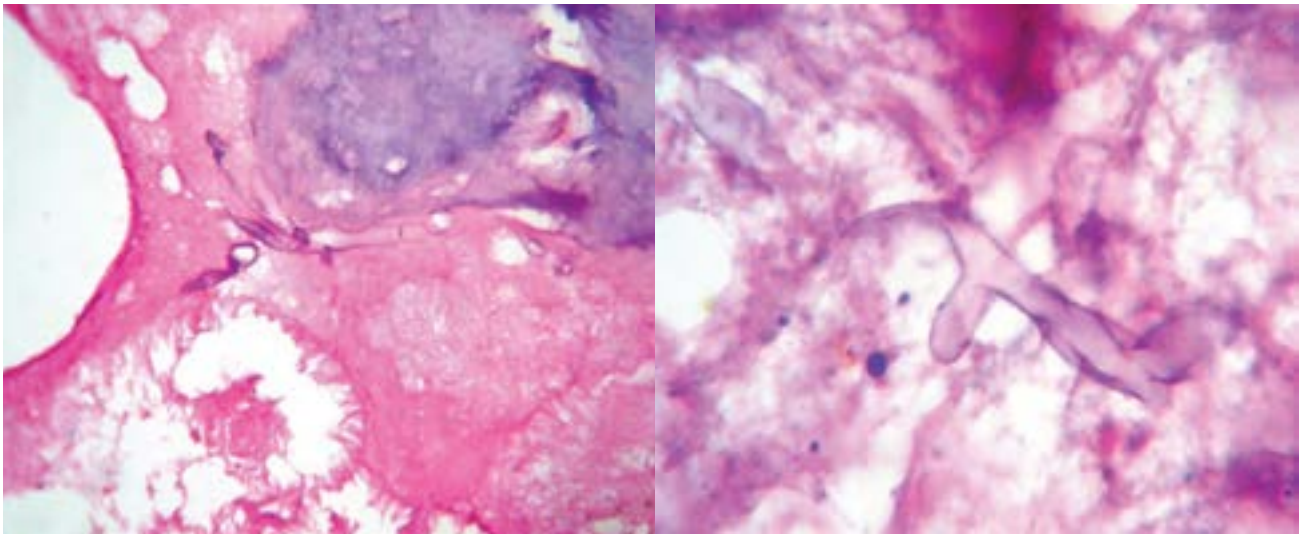

Figure 2: Acute invasive FRS- Mucormycosis is seen adjacent to bone. Photomicrograph showing scattered obtuse-angled broad aseptate fungal hyphae (HE stain; X100 and 400)

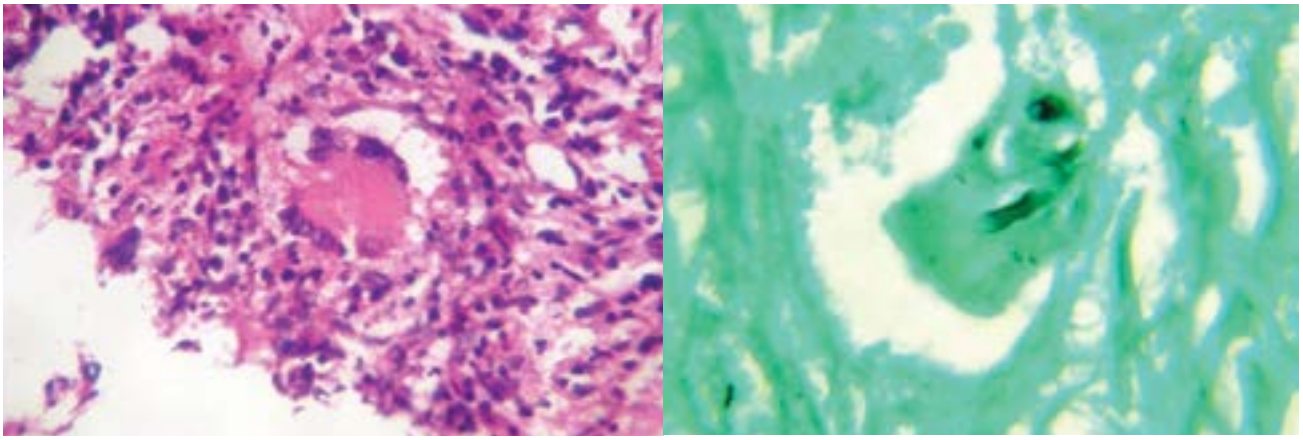

Figure 3: Granulomatous FRS(HE and GMS Stain). Langhans giant cell with engulfed fungal filament surrounded by epithelioid histiocytes and mature lymphocytes.GMS stain highlights the fungal filament within the giant cell (X100 and X400).

DISCUSSION

Though a clinical diagnosis of FRS was made in 86.66%of cases, only 22% of AFRS and fungal ball cases were correctly categorized. All cases of acute invasive FRS were correctly diagnosed because of the characteristic clinical features. A few chronic sinusitis cases were also suspected to be fungal sinusitis clinically, which in histopathology proved to be of non-fungal etiology.

The clinical diagnosis has high Sensitivity and Specificity with the histopathological diagnosis. Similarly, the CT scan has high specificity but low sensitivity with the histopathological diagnosis. Clinical diagnosis of FRS was made in 86% of FRS cases, but the exact categorization was done only in 1/3rd of the diagnosed cases. 60% of FRS cases were diagnosed by CT scan, and others were misdiagnosed as sinonasal polyps and malignancy. None of the cases was categorized by radiology.

Categorizing the disease is extremely important as the type of treatment depends on it.[11] For example, surgical debridement is sufficient for the fungal ball, but postoperative steroid therapy is necessary to prevent relapses in AFRS. Hence, the need for histopathological examination for categorization is apparent.

Fungi are overlooked in H&E because they are sparse, scattered in the abundant mucin, and exhibit degenerative changes in the form of swelling and pale color. So special stains that are sensitive in picking up the fungus should be used. Special stains commonly done for the demonstration of fungi are PAS and GMS. Though PAS works well, it is less sensitive than silver stains as senescent fungal cell walls may not be stained. Its advantage is that it usually permits a better study of the fungus morphology, especially septations, than silver stain. However, these morphological characteristics of the fungus are rarely sufficient to identify the species. For example, *Aspergillus* species is recognized by its septae and 45° angle dichotomous branching hyphae. But other fungal hyphae such as *Scedosporium*, *Fusarium,* and many other rarer fungi may mimic this. Thus, only culture can identify the fungal species with certainty. So methenamine silver was done in all suspected cases of fungal sinusitis. GMS helped diagnose 22.22% of AFRS cases that were not visible in H&E; it was just confirmatory in other categories. Literature reveals AFRS was frequently missed even when typical clinical features were present.[11,12]

Hence, histopathological examination as the diagnosing modality can improve the correct categorization of the condition and aid inappropriate management. The limitation of the current study is its small sample size and single-center experience. Studies with large samples and in multiple centers are recommended in the future.

CONCLUSIONS

Treatment for the different entities of fungal Rhinosinusitis is different. So, categorization is vital. Though a diagnosis can be made clinically or with a CT scan, both methods cannot categorize the disease as accurately as histopathological examination does. Hence, histopathological examination along with GMS is the gold standard for the diagnosis and management of fungal Rhinosinusitis.

REFERENCES

1. Rupa V, Jacob M, Mathews MS, Job A, Kurien M, Chandi SM. Clinicopathological and mycological spectrum of allergic fungal sinusitis in South India. Mycoses. 2002;45(9-10):364-7. Crossref
2. Fokkens WJ, Lund VJ, Hopkins C, Hellings PW, Kern R, Reitsma S, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020. Rhinology. 2020;58(Suppl S29):1-464. Crossref
3. Chow AW, Benninger MS, Brook I, Brozek JL, Goldstein EJC, Hicks LA, et al. IDSA Clinical Practice Guideline for Acute Bacterial Rhinosinusitis in Children and Adults. Clinical Infectious Diseases. 2012;54(8):e72-e112. Crossref
4. Orlandi RR, Kingdom TT, Smith TL, Bleier B, DeConde A, Luong A, et al. International Consensus Statement on Rhinology and Allergy: Rhinosinusitis. Int Forum Allergy Rhinol. 2020;10:665-72. Crossref
5. Stevens WW, Peters AT, Tan BK, Klingler AI, Poposki JA, Hulse KE, et al. Associations Between Inflammatory Endotypes and Clinical Presentations in Chronic Rhinosinusitis. J Allergy Clin Immunol Pract. 2019;7: 2812-20. Crossref
6. Ashim Das, Amanjit Bal. spectrum of fungal Rhinosinusitis; histopathologist's perspective. Histopathology 2009;54:854-9. Crossref
7. Plaignaud M. One case of fungal sinus ball. J Chir Paris 1791; 1: 111-6. Website
8. Chakrabarti A, Denning DW, Ferguson BJ, Ponikau J, Buzina W, Kita H, et al. Fungal Rhinosinusitis. The Laryngoscope 2009;119:1809-18. Crossref
9. Naggie S, Perfect J R. Molds: Hyalohyphomycosis, Phaeohyphomycosis, and Zygomycosis. Clin. Chest Med 2009;30:337–53 Crossref
10. Khattar VS, Hathiram BT. Radiologic appearances in fungal Rhinosinusitis. Otorhinolaryngology Clinics. 2009;1:15-23. Crossref
11. Berrylin J. Ferguson. Definitions of fungal Rhinosinusitis, Otolaryngologic Clinics of North America 2000;33(2), 227-35. Crossref
12. Grosjean P, Weber R. Fungus balls of the paranasal sinuses: a review. European Archives of Oto-rhino-laryngology. 2007;264(5):461-70. Crossref