Original article

Frequency of Fungal Infection in Histopathological Sections of Patients Undergoing Functional Endoscopic Sinus Surgery for Sinonasal Disease

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ABSTRACT

Background: Fungal rhinosinusitis can occur in different sinonasal conditions. It seemed to be present in 1-18% of these patients. Due to the warm and humid environment of the sinonasal cavity, combined with underlying nasal conditions such as chronic sinusitis and nasal polyposis, these patients are at risk of developing fungal infections. The objective of this study was to find out the frequency of fungal infection in histopathological sections of patients who had underwent functional endoscopic sinus surgery for sinonasal diseases.

Methods: A retrospective clinical record review study conducted at the Department of Ear, Nose, and Throat (ENT) of Shifa Foundation Clinic and Shifa International Hospital from August 2018 to January 2024. Total 304 patients who underwent functional endoscopic sinus surgery (FESS) over a period of 6 years, with diagnosis of sinonasal disease established through clinical evaluation and imaging studies prior to surgery, and histopathology reports generated from surgical specimens obtained during the surgery. The surgical specimen was prepared as per the recommendation of the microbiology department of the institutions. The data was analyzed in SPSS to find the frequency of fungal infections.

Results: Out of 304 subjects, 62.5% were male and 37.5% female. The study analyzed histopathology reports of patients diagnosed with various nasal and sinus conditions. The most common diagnosis was inflammatory nasal polyps 222 cases (73%), followed by fungal infection with 21 cases (6.9%) and acute on chronic inflammation 20 cases (6.6%). The results indicate a high incidence of inflammatory conditions in the nasal and sinus regions.

Conclusion: This study provides fungal infiltration is detected in moderate samples obtained during functional endoscopic sinus surgery.

Keywords:

Sinusitis, Paranasal sinus diseases, Mycoses, Nasal polyps.

INTRODUCTION

Functional endoscopic sinus surgery (FESS), as opposed to endoscopy which is a diagnostic procedure, has evolved into a widely accepted and effective treatment option for patients suffering from sinonasal disorders such as acute and chronic sinusitis, nasal polyps, and neoplasms.[1] Moreover, FESS has emerged as a common procedure performed by rhinologists worldwide.[2]

ARTICLE INFO

Article History

Received: 20.05.2024, | Accepted: 10.04.2025

Conflict of Interest: The authors declared no conflict of interest exists.

Funding: None

Citation: Umar MA, Jawad A, Mushwani M, Iftikhar S. Frequency of fungal infection in histopathological sections of patients undergoing functional endoscopic sinus surgery for sinonasal disease. J Fatima Jinnah Med Univ. 2025; 19(1): 7-11.

DOI: https://doi.org/10.37018/PMDT2542

Although fungus infection is frequently detected in This surgery is often recommended for the patients suffering from persistent and symptomatic inflammation of the sinus mucosa, and a considerable number of patients undergo this procedure each year for this purpose.[3], individuals receiving FESS for the treatment of sinonasal illness,[4] a collection of illnesses collectively referred to as sinonasal diseases when any region from the nasal cavity and the paranasal sinuses are affected. These ailments include mucosal inflammation, sinusitis, nasal polyps, and nasal tumors.[5] Nasal congestion, discharge from the nasal cavity, trouble breathing through nose and facial pressure or pain are few symptoms that could be present. The option of medicines like application of topical steroids and antibiotics, as well as surgical management like removal of tumors or nasal polyps, are both viable forms of treatment.[6] FESS is a minimally invasive surgical technique for treating chronic sinusitis, tumors and a range of disorders affecting the nasal cavity and paranasal sinuses. Additionally, issues with the sinuses that drain into the nose are also treated with it.[7]

Numerous research results indicate that between 2% to 20% of FESS patients have fungal infections. Fungal infections grow more commonly in patients with impaired immune systems.[8]

Though *Aspergillus fumigatus* is the most common type of fungal species, other fungi can also cause sinus infections. The symptoms of fungal sinusitis include difficulty breathing through the nose, facial pain or pressure, and nasal congestion. In extreme cases, the infection could spread to the brain, resulting in potentially fatal complications.[9]

The objective of this study was to find out the frequency of fungal infections in histopathological sections of patients who had underwent functional endoscopic sinus surgery for sinonasal diseases.

SUBJECTS AND METHODS

It was a retrospective clinical record review and it obtain the histopathology reports of all the patients who underwent functional endoscopic sinus surgery (FESS) from August 2018 to January 2024 by using the Shifa Foundation Clinic and Shifa International Hospital clinical record. After approval of Institutional Review Board (IRB) of the hospital, a total number of 304 patients records with aged range 8-78 years and sinonasal disease were included. Patients who underwent conventional procedures for chronic rhinosinusitis (CRS) and nasal polyposis were excluded. A consecutive non-probability sampling technique was used to gather the data.

A questionnaire/proforma was designed to collect the demographic generic information of the participating subjects i.e., gender, age, diagnosis and the histopathology reports findings for the functional endoscopic sinus surgery. The study outcomes were presence of fungal infection (septate and non-septate), and/or branching pattern on microscopy.

The obtained data was analyzed using SPSS v 28. The demographic generic parameters like gender, age categories, and diagnosis were expressed as frequencies and percentages. Standard deviation and mean values for the age was also calculated. Chi square test was performed for the qualitative data i.e., diagnosis and histopathology. A p-value ≤0.05 was considered as significant.

RESULTS

Out of 304 patients, 190 males (62.5%) and 114 females (37.5%). The patients mean age was 39.90±14.4 years. Chronic rhinosinusitis (CRS) was discovered to be the most common diagnosis, accounting for 123 cases (40.5%), followed by Nasal Polyps, which accounted for 118 cases (38.8%). Pansinusitis was in 12 cases or 3.9%. These findings were obtained through the application of descriptive statistics as well as frequency analysis (Figure 1).

A chi-squared test was conducted to investigate the relationship between diagnosis-related factors, such as nasal polyps and chronic rhinosinusitis, and age groups. The analysis yielded a statistically significant p-value of 0.001, indicating a significant association between the two variables. These findings suggest that there is a notable difference in the incidence of diagnostic characteristics between younger and older age groups, and that age may be a significant factor in the occurrence of certain sinonasal diseases. Thus, the findings obtained suggest that age should be considered as a possible risk factor for the identification and treatment of these diseases.

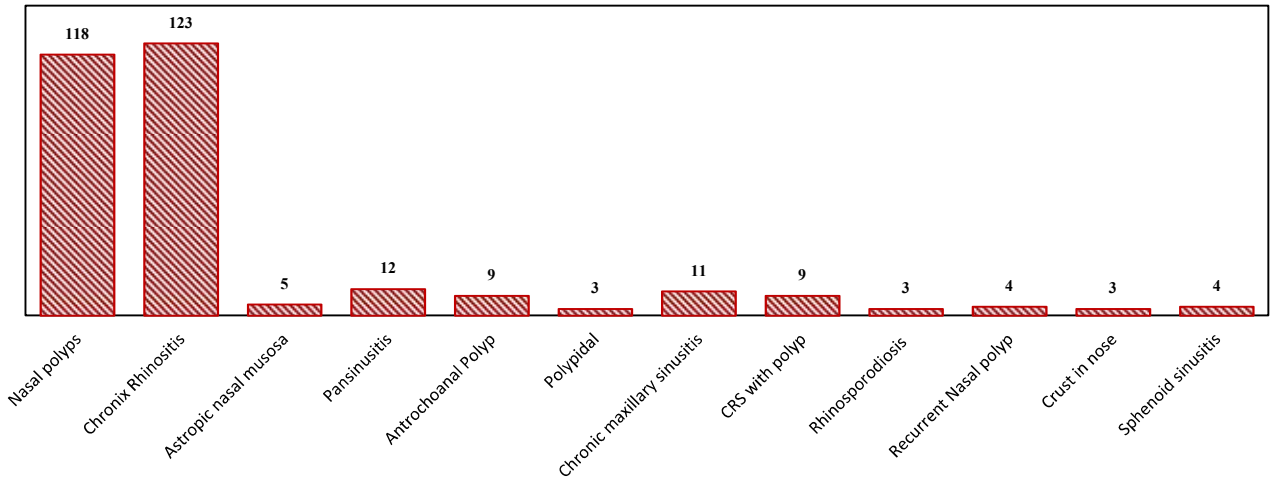

Figure 1: Frequency of the diagnosis.

Table 1: Patients and histopathology data who underwent FESS, n=304.

Diagnosis based distribution,	11-30 year	31-50 year	51-70 year	Total
Nasal polyps	21	56	41	118
Chronic Rhinosinusitis	26	66	31	123
Atrophic nasal mucosa	1	4	0	5
Pansinusitis	6	4	2	12
Antrochoanal Polyp	2	5	2	9
Polypoidal mucosa	1	1	1	3
Chronic Maxillary sinusitis	3	5	3	11
CRS with polyp	0	6	3	9
Rhinosporodiosis	1	2	0	3
Recurrent Nasal polyp	0	2	2	4
Crust in nose	1	1	1	3
Sphenoid sinusitis	1	2	1	4
Total	63	154	87	304
Histopathology based distribution				
Inflammatory nasal polyps	39	120	63	222
Acute on Chronic Inflammation	9	6	5	20
Mild Inflammation	1	2	0	3
Nasopharyngeal carcinoma	1	3	0	4
Polypoidal mucosa	1	2	1	4
Hypertrophic gland & inflammation	2	4	7	13
Inverted papilloma	0	3	0	3
Inflamed sinus mucosa	1	0	0	1
Congestion + fibrosis	1	3	1	5
Mixed inflammatory infiltrate	1	2	1	4
Meningioma	0	3	1	4
Fungus infection (Aspergillus)	7	6	8	21
Total	63	154	87	304

The data from the analysis of these 304 specimens showed the most common finding to be the inflammatory nasal polyp (222 cases), followed with Aspergillus fungus infection (21 cases) and then acute on chronic inflammation (20 cases) as described in table 1. Some patients were diagnosed with other conditions like meningioma, inverted papilloma and nasopharyngeal carcinoma, so these findings highlight the importance of performing histopathological analysis for accurate diagnosis and appropriate management of such cases.

DISCUSSION

The current study sought to determine whether patients treated with FESS for a sinus infection also suffered from fungal infections. Patients' diagnoses, such as nasal polyps, chronic rhinosinusitis (CRS), and antrochoanal polyps, were recorded, as were histopathology report findings (such as inflammatory nasal polyps, acute on chronic inflammation and fungal infection) which shows similar findings with the previous study as well.[4]

The study demonstrates a high relationship correlation between the diagnosis and the findings of the histopathology report, as well as the possibility of a common consequence occurring in patients who have FESS for a sinonasal ailment. The symptoms of fungal sinusitis are similar to other forms of infectious sinusitis. On nasal examination, however, slough can be seen in cases of fungal sinusitis, which has a high diagnostic value. Definitive diagnosis is established to histopathological assessment. Fungal infections are more commonly seen in patients with CRS and allergic fungal sinusitis (AFS), with aspergillus being the most common fungal species identified.[10] This corroborates with our investigation.

Our findings support previous investigations, which revealed that male patients had a higher incidence of CRS than female ones.[11] Furthermore; we discovered that CRS frequently occurs in patients between 31 and 50 years of age, which is in accordance with an earlier study.[12] These findings imply that some demographic characteristics may play a role in the occurrence of CRS and fungus infections and should be taken into account while diagnosing and treating this condition.

Like several other studies our research also showed male preponderance affecting 62.5% cases in comparison to 37.5% being females.[13] However, research conducted in Karachi discovered a female majority of 54.86%,[14] which contradicts our findings.

In the current study patients affected with fungal infection was 6.9% which was way less than the several studies conducted in Pakistan like the research in Peshawar and Karachi where the rate was as high as 46.15% and 40.7% respectively.[4,15] However study conducted in Iran by Backshaee et al showed 9.45% fungal

involvement and Shafick et al in Egypt revealed fungal infestation around 13% which is close to our study.[5,16]

Aspergillus was the most prevalent fungus detected in this research (21 cases). These findings support prior reports that identified aspergillus as most frequently occurring fungal pathogen in patients with sinonasal complaints.[17] Many studies also reported Candida as a second common cause of fungal sinusitis after aspergillus,[18] but our series did not yield any candida species. Eventually, the current study contributes to our understanding of the frequency of fungal infections in patients undergoing FESS as a treatment for sinonasal pathology. Our findings also emphasise the need of classifying thepatients with nasal polyps and CRS as high-risk for fungal infections.

Patients with sinonasal disorders who have fungal infections run the risk of developing several problems, including delayed healing, recurrent or persistent disease, and even intracranial or orbital infections. To avoid these consequences, it is crucial to diagnose fungal infections early and treat them appropriately.[8]

The findings of our study provide precious perceptivity for clinicians when treating patients with FESS surgery and emphasize the need for appropriate preventive measures to reduce the prevalence of fungal infections following surgery. Our study also highlighted the importance of identifying patients with CRS and nasal polyps as high-risk groups for development of fungal infection after surgery.

Surgeons should be wary of presence of fungal infection for FESS cases when carrying out fungal culture for diagnostic purpose and evaluating the results.[19]

Though FESS remains the main surgical option for sinonasal conditions, but antifungal medications should also be considered in cases where fungal infection is proven and confirmed especially in immune-compromised patients.[20]

Further research should be carried out to identify the frequency of various types of fungi in patients undergoing FESS for sinonasal ailments along with their response to different antifungal medications. Additional studies should also target towards the preventive methods and their effect on decreasing the likelihood of fungal infections in these individuals so as to enhance patient health and quality of life

CONCLUSIONS

This study concludes the importance of association between the histopathological findings and diagnosis of sinonasal conditions. The results also confirm the significance of histopathology examination for proper diagnosis and treatment of these ailments. Moreover, it is essential to diagnose fungal infections as soon possible and manage them appropriately to prevent the progression of disease and lower the morbidity.

Author contributions

Mumtaz Ahmad Umar: Conception and design, analysis and interpretation of data, drafting the article, critical revision for important intellectual content, final approval.
Ayesha Jawad: Acquisition of data, conception and design, analysis and interpretation.
Mohibullah Mushwani: Analysis and interpretation of data, proofreading.
Saira Iftikhar: Analysis and interpretation of data, drafting the article.
Farhan Ahmed: Conception and design, analysis and interpretation of data.

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