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Original Research Article

A Prospective Observational Evaluation of Fungal Diseases of Nose and Paranasal Sinuses

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Abstract

Aim: Evaluation of Fungal Diseases of nose and paranasal sinuses in a Rural Tertiary Care Hospital.

Methods: The prospective observational study was conducted in the Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India total 100 patients who had clinical features suggestive of fungal infections of nose and paranasal sinuses were evaluated with standard pro forma-hematological investigations, radiological procedures, immunological procedures, and pathological diagnostics formed part of the armamentarium. Surgical management and follow-up were done.

Results: Out of 100 patients' study, 34% were male and 66 % were female. The majority of cases were in age group between 20 - 40 years. All patients, in our study, have nasal symptoms 100 (100%). They are nasal obstruction, nasal discharge, postnasal discharge, frequent sneezing, reduced sense of smell (hyposmia) or complete loss of smell (anosmia), and nasal bleeding. Ocular symptoms such as proptosis, epiphora, diplopia blurring of vision in our study were 21%. Fungal culture, in our study, showed out of 100 patients,35% are *Aspergillus flavus*, 15 %*Aspergillus fumigates*, 11 % are *Aspergillus niger*, 4 %are *Aspergillus terreus* and 35 were negative. Bilateral disease and involvement of ethmoidal sinus were noted in the majority of cases. Recurrence was observed in 14 % of the cases.

Conclusion: About 100% of our series of 100 cases were histopathologically proven to be allergic *Aspergillus sinusitis*. CT was found to be highly effective for pre-operative evaluation and intraoperative guidance. Nasal polyposis was a concomitant feature in fungal sinusitis.

Keywords: *Allergic fungal* rhinosinusitis, *Aspergillus*, Endoscopic sinus surgery, Fungal culture, Sinonasal polyposis.

Introduction

An estimated 1.5 million fungal species inhabit Earth, with the vast majority poorly described or undiscovered[1] Because fungi are present throughout the environment, human exposure is inevitable

and normal respiration will routinely deposit fungal elements within the nose and paranasal sinuses[2] In most instances, the presence of fungal elements in the nose is of no consequence and will remain unknown to the individual unless elaborate culture techniques are used. In select instances, fungal species can cause sinonasal disease, with clinical outcomes ranging from mild symptoms to intracranial invasion and death. Fungal rhinosinusitis has been categorized primarily based on whether the fungus invades local tissues or not, a characteristic intimately associated with the status of the host's immune system[3] Noninvasive fungal rhinosinusitis includes fungal colonization, fungal ball, and allergic fungal rhinosinusitis (AFRS). Spread of fungus into local tissues characterizes acute invasive, chronic invasive, and chronic granulomatous forms of fungal rhinosinusitis.

The most common site of fungal infection in man is the lungs with or without hematogenous spread to other organs. However, the localized fungal infection can also occur in the upper respiratory tract and is more common than was previously suspected[4,5] Most fungal species which are pathogenic to human cause opportunistic infection and only dermatophytes are transmissible from host to host. The incidence of infections and death due to fungi has been grossly underestimated moreover the list of fungal species capable of producing disease in immune compromised person is increasing rapidly. In an era with AIDS, broad spectrum of antibiotics, cytotoxic drugs and the organ transplantation, fungal infection which affect the nose and the sinus are candidiasis, rhinosporidiosis. Aspergillus, phycomycosis, actinomycosis, coccidioidomycosis, histoplasmosis, cryptococcosis, blastomycosis, sporotrichosis, and nocardiosis. Martin and Berson noted a high incidence in South Africa which they attributed particularly to malnutrition the largest series of case involve[6,8]

In our study, the fungal infections mainly presented with nasal polyps, nasal block, nasal discharge, headache, and proptosis mimicking benign or malignant tumors of the nose and paranasal sinuses

Material and Methods

The prospective and observational study was conducted in the Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India.

Methodology

After taking informed consent detailed history was taken from the patient or the relatives if the patient was not in good condition. The technique, risks, benefits, results and associated complications of the procedure were discussed with all patients. A total of 100 patients who had clinical features suggestive of fungal infection of nose and paranasal sinus were evaluated using a standard pro forma and underwent the following investigate procedures systematically as and when needed.

Investigations

Hematological Investigations **c**omplete with hemogram, blood sugar level, serum electrolyte, serum protein, blood grouping, etc., were done as preliminary investigations to assess the general health condition as well as to rule out any underlying disorders.

Relevant X-ray of the nose and paranasal sinuses was taken for all patient and those who were provisionally diagnosed as fungal granulomas were subjected to CT scanning of the nose, paranasal sinuses, and brain with contrast enhancement studies.

The clinical diagnosis of nasal fungal infection, which was confirmed using microbiological tests by the Consultant Microbiologist. Thereafter, the Consultant ENT directed the patient to the principal investigator for administration of tests within the ENT department.

Endoscopic Sinus Surgery

Postoperatively patients were advised to come for regular follow-up. The nasal douching was given to every patient for the 5th post-operative day after the first post-operative endoscopic examination and cleaning. Patient was treated by beclometasone aqueous nasal spray, antihistamine, and vitamins.

The patients were requested to come for follow-up on the 15th post-operative day for endoscopic examination and cleaning and whenever possible thereafter (usually once in a month). The patient with allergic *Aspergillus sinusitis* did not require antifungal therapy. Antifungal therapy was given based on the type of fungal infection and its invasiveness (mucormycosis).

Results

Table 1: Age/sex/incidence N=100

Age	**Incidence**		
	Male (%)	**Female (%)**	Total
Below 20	6	11	17
20-30	10	23	33
30-40	14	27	41
Above 40	4	5	9
Total	34	66	

Out of 100 patients' study, 34 were male and 66 were female. All of them were racially Indians. There were more female than male in this study (Table 1). Females in this study formed 66 % of total number of cases. The majority of cases were in age group between 30 - 40 years (Table 1).

Table 2: Clinical symptoms N=100

Symptoms	**Number of patients**	**%**
1. Nasal Nasal obstruction Nasal discharge Postnasal Discharge	100	100
2. Headache	71	71
3. Ocular Proptosis Epiphora Diplopia Ophthalmoplegia	21	21

All patients, in our study, have nasal symptoms 100 (100%). They are nasal obstruction, nasal discharge, postnasal discharge, frequent sneezing, reduced sense of smell (hyposmia) or complete loss of smell (anosmia), and nasal bleeding. Ocular symptoms such as proptosis, epiphora, diplopia blurring of vision in our study were 21% table-2.

Table 3: Histopathology and fungal culture N=100

Causative organism	**Number of patients**	**%**
Aspergillus flavus	35	35
Aspergillus fumigates	15	15
Aspergillus niger	11	11
Aspergillus terreus	4	4
No growth	35	35

A. flavus: Aspergillus flavus, A. fumigatus: Aspergillus fumigatus, A. niger: Aspergillus niger, A. terreus: Aspergillus terreus, Histopathology showed all cases were *Aspergillus*

Fungal culture, in our study, showed out of 100 patients. 35 are *Aspergillus flavus*, 15 *Aspergillus fumigates*, 11 are *Aspergillus niger*, 4 are *Aspergillus terreus* (Table 3).

Table 4: CT scan of nose and sinus N=100

Sinus involvement	Number of patients	%
Maxillary sinus	80	80
Ethmoidal sinus	76	76
Frontal sinus	46	46
Sphenoidal sinus	54	54
All sinuses	30	30
Orbital	16	16

Table 5: Unilateral/bilateral comparison study N=100

Sides of nose and sinuses	Number of patients	%
Right	14	14
Left	17	17
Unilateral	31	31
Bilateral	70	70

Table 6: Complications N=100 (BY A disease process)

Complication	Number of patients
Intraoperative hemorrhage	10
Cerebrospinal leak	Nil
Synechiae	31
Periorbital ecchymosis	11

Table 7: Follow-up and recurrence

Number of cases	Month of follow-up	Number of recurrences
25 cases	18 months	10
50 cases	12 months	4
25 cases	6 months	-

Discussion

The fungal diseases of the nose and paranasal sinuses encompass not one disease entity but a multitude of an entire spectrum of different diseases. We have studied different disease causes, namely allergic *A. sinusitis* (100 cases). Although the treatment of these diseases is vastly different, the presentation and clinical features are quite similar and thus they could be studied together. we have attempted to study these diseases under the common heading highlighting the important difference whenever required[9,11]

The majority of cases in our study were between the age group of 20-40 years. They constitute 74% of a total number of cases. This was followed by the age group below 20 years who constitute 17 % total number of cases. This compares favourably with these studies. In our study, there was a clear female preponderance numbering 66 out of 100 cases (66%) and male 34 out of 100 (34%) reported data by Woman *et al*. showed female preponderance with allergic *A. sinusitis* in our study was 65% female ratio. This corresponds well with the previously mentioned study.

All patients in our study had nasal symptoms. The nasal symptoms included nasal obstructions, nasal discharge frequent

sneezing, reduced smell (hyposmia) complete loss of smell (anosmia), and nasal bleeding. The next most common symptom was a headache was seen in 70% of our patient. The next most common symptoms were ocular symptoms such as epiphora, diplopia and blurring of vision comprising about 21%. Various other studies showed that the common symptoms in allergic *A. sinusitis* are chronic nasal obstruction and postnasal discharge[12,13] These findings compare favourably with our studies.

In our study, out of 100 patients, all 100 patients presented with nasal polyps, fungal mass (100%). The ocular sign such as proptosis diplopia and ophthalmoplegia was seen 21%.

A total of 100 different fungal diseases have been reported in fungal sinusitis. *Aspergillus*, ubiquitous fungus of the class ascomycetes is the most commonly encountered fungus in the environment and is the most common species encountered in fungal sinusitis generally and presumably in allergic fungal sinusitis. The latter is largely based on histopathological finding of fungi with morphologic features similar to *Aspergillus* and not on the basis of culture documentation. In our series 100% of fungal sinusitis was histopathologically proven to be aspergillus. In our study shows 100% allergic *A. sinusitis*. Klossek *et al*. in his case series of 100 cases documented that 94% were histopathologically proven allergic *A. sinusitis* various other organisms have reported as pathogens in allergic *A. sinusitis* caused by different fungi. *Bipolaris specifera* B, Australians, *Aspergillus*, *Alternaria* and *Curvularia lunata*. The identification of these fungi may be related to the improved ability of microbiology laboratories to identify the diverse hyphae with variation in the conical pores[14,15]

In our study, all the cases of allergic *A. sinusitis* were sent for the fungal culture. In all the cases the material sent for culture were fungal mass taken from the infected sinus cavity. out of 100 cases 65 were culture positive for aspergillus and remaining 35 were negative .out of 65 percent 35 are *Aspergillus flavus*, 15 *Aspergillus fumigates*, 11 are *Aspergillus niger*, 4 are *Aspergillus terreus*. Rhinomucormycosis was no present in our study in histopathological examination.

In our studies, no other species of fungi was identified either on the HPE or cultural examination. All the patients in this series underwent CT scan preoperatively, magnetic resonance imaging (MRI) scan was not considered due to the high-cost factor and relatively low amount of extra information in cases of fungal diseases of nose and paranasal sinus.

All patients in our series with allergic *A. sinusitis* demonstrated areas of high alteration centrally within involved sinus by CT. These areas corresponded to surgical findings of thick allergic mucin. Some cases demonstrate a starry sky pattern of material, which appeared to be calcium densities on bone windows. CT scanning has been very useful in defining the full extent to the disease. *A. sinusitis* often has a mixture of high and low-density areas within the sinuses. Bone windows allow a very accurate assessment of possible invasion.

In general, only one series in involved with *Aspergillus* most commonly the maxillary sinus. In our study, maxillary sinus 80 is the common involvement. Next ethmoid 76%, frontal sinus 45%, sphenoid sinus 54%, and all sinuses involvement 30%.[16]

In our study, 100 cases were operated by endoscopic sinus surgery. Endoscopic sinus surgery with less morbidity and mortality, clearance was total and recurrence rate is almost minimal in our steady. Even though in our cases, we had no complication acquired in functional endoscopic sinus surgery. Only in 14 cases recurrence was noted. None of the patients developed complication and patient were discharged next day itself. This correlates well with the previous study.

We treated our patient with steroids both topically and systemically. It is our experience that the tropical intranasal steroids alone when taken regularly are effective in preventing recurrence of the disease. However, feels that tropical intranasal steroids and effectively only after a course of oral corticosteroids.

Antifungal agents were not used in any of our cases with allergic *A. sinusitis*. Similar reports have been published by many authors regarding the endoscopic approach is the sole approach in the treatment of allergic *A. sinusitis*. However, some author feels that external approach definitely has its plane in the treatment of this condition especially in cases of orbital (or) intracranial extension of this disease.

Complications of endoscopic sinus surgery have been as major and minor according to the degree of morbidity and treatment needed to prevent permanent serious sequlae. Complications seen in our study includes intraoperative hemorrhage in 10 cases (10%) and no cerebrospinal leak. Pheumocephalus and other reported major complication (Markmay *et al*., 1994) includes orbital hematoma. Loss of vision, diplopia, epiphora, meningitis, brain abscess, and focal brain hemorrhage which were not seen in our study.

Intracranial complication can be prevented by not disturbing the mucosa lying against the roof of the ethmoid sinus. It is also worth remembering that the vertical bony wall of olfactory groove where the middle turbinate attaches to the roof of the ethymoid sinus may be extremely thin and should be avoided. we feel that two other guidelines may help to prevent cerebrospinal fluid leaks.

Instrumentations or suction cannulas should be placed into the nose or sinuses only under endoscopic guidance, The basal lamella should be entered at a point farthest from the roof of the ethmoids posteriorly and inferiorly rather than anteriorly and superiorly.

Intraoperative hemorrhage severe enough to require blood transfusion is rare in our review none of them require blood transfusion. We agree with other reported studies that this kind of preoperative bleeding is mostly from the interruption of the sphenopalatine artery as it courses over the face of the sphenoid sinus, just above the arch of the posterior nasal choanae.

The most frequently encountered minor complication in our study 31% (31 cases) were synechiae. This adhesion was usually seen between the middle turbinate and septum or lateral wall of nose careful handling of the tissue during surgery minimizes the chance of contact between the two adjacent raw surfaces. Careful post-operative cleaning of the sinus cavity will also help in the prevention of adhesion of the 100 patients in our study, 31 had synechiae which were released in the outpatient department, and there was no recurrence.

Periorbital ecchymosis is the next minor complication and a total of 11%. These complications were seen after the endoscopic sinus surgery. This occurs usually due to violation of lamina papyracea. Other studies reported that the violation of the lamina papyracea occurs most commonly with uncinectomy during endoscopic sinus surgery.

Post-treatment endoscopic surveillance is essential for long-term success since recurrent disease is common. Furthermore, the patient symptoms alone are not a satisfactory measure for persistent/recurrent disease.

In this series, 25 of our patients were followed up for a period of 18-month after surgery. 50 patients were followed up for a period of 12-month and another 25 patients followed up for 6 months. We have not lost any patient during the follow-up treatment and proper medication. 12 recurrences were noted within 18 months.

The complete and radical removal of fungal debris and careful regular follow up with intranasal steroids and if required systemic steroids when employed judiciously will result in the best long-term result after surgery[17,19]

Conclusion

About 100% of our series of 100 cases were histopathologically proven to be allergic *Aspergillus sinusitis*. CT was found to be highly effective for pre-operative evaluation and intraoperative guidance. Nasal polyposis was a concomitant feature in fungal sinusitis.

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