ORIGINAL ARTICLE

PRESENTATION AND MANAGEMENT OF ALLERGIC FUNGAL SINUSITIS

Kalimullah Thahim, Mahboob Afzal Jawaid and M. Saleem Marfani

ABSTRACT

Objective: To assess the presentation of allergic fungal sinusitis and describe the line of management in our setup. **Design:** Descriptive study.

Place and Duration of Study: Study was conducted in Otorhinolaryngology Department, Dow Medical College and Civil Hospital, Karachi, from January 2004 to January 2005.

Patients and Methods: Culture and sensitivity / fungal stain proven 20 cases of allergic fungal sinusitis were selected for the study, irrespective of age and gender. Data including age, gender, socioeconomic status, signs, symptoms, laboratory findings (especially Immunoglobulin E and eosinophil count) and imaging studies (Computed Tomography and /or Magnetic Resonance Imaging) were noted for the study. Pre and postoperative medical treatment, surgery performed, follow-up; residual/recurrence disease and revised surgery performed were also recorded.

Results: In this series, allergic fungal sinusitis was a disease of younger age group with an average age of 20.75 years with male dominance (70%). Poor socioeconomic status (80%), allergic rhinitis (100%) and nasal polyposis (100%) were important associated factors. Nasal obstruction (100%), nasal discharge (90%), postnasal drip (90%) and unilateral nasal and paranasal sinuses involvement (60%) were the commonest presenting features. Aspergillus (60%) was the most common etiological agent. In all cases (100%), increased eosinophil count and IgE levels were present. Orbital (20%) and intracranial (10%) involvement were also seen. Surgical management was preferred in all cases. Functional endoscopic sinus surgery in 90% cases and lateral rhinotomy in 10% cases were performed. Recurrence / residual disease was seen in 20% cases.

Conclusion: In this series, allergic fungal sinusitis was seen in immunocompetent, young males, belonging to poor socioeconomic status, suffering from allergic rhinitis and nasal polyposis, presenting with nasal obstruction, nasal discharge and postnasal drip. Functional endoscopic sinus surgery was the most important problem solving procedure while lateral rhinotomy was reserved for extensive disease.

KEY WORDS: Sinusitis. Allergic fungal sinusitis. Fungal sinusitis. Aspergillus sinusitis. Polyposis.

INTRODUCTION

Chronic Hypertrophic Sinus Disease (HSD), usually presents clinically with nasal polyposis and histopathologically as an edematous sinonasal mucosal inflammatory infiltrate of plasma cells, small lymphocytes, and eosinophils.¹⁻³

Allergic Fungal Sinusitis (AFS) is an increasingly recognized type of chronic, recurring HSD. It is a non-tissue-invasive fungal process, representing an allergic/hypersensitivity response to the presence of extramucosal fungi within the sinus cavity.

The combination of nasal polyposis, crust formation and sinus cultures yielding Aspergillus was first noted in 1976 by Safirstein,⁴ The term "allergic fungal sinusitis" was introduced by Robson and colleagues in 1989.⁵

Currently, it is postulated that the pathophysiology of allergic fungal sinusitis (AFS) is similar to that of allergic bronchopulmonary fungal disease (a term replacing allergic

Department of Otorhinolaryngology and Head and Neck Surgery, Dow University of Health Sciences, Dow Medical College and Civil Hospital, Karachi.

Correspondence: Dr. Mahboob Afzal Jawaid, B-13, Block-A, Al-Hira Masjid Street, Kazimabad, Model Colony, Karachi-75100. E-mail: docmahboob@yahoo.com,

Received February 23 2006; accepted December 06, 2006.

bronchopulmonary aspergillosis). Manning and colleagues⁶ suggested that several interrelated factors and events lead to the development of AFS.

First, an atopic person inhales the fungi (the initial antigenic stimulus). The Gell and Coombs type I (IgE-mediated) and type III (immune complex-mediated) allergic reactions provide an inflammatory response leading to tissue edema.

The resulting obstruction of sinus ostium, which may be accentuated by anatomic factors such as septal deviation or turbinate hypertrophy, results in stasis within the sinuses. This creates an ideal environment for proliferation of the fungus, further increasing the opportunity for allergic reactions. The eventual product of this process is allergic mucin, the material that fills the involved sinuses of patients with AFS. The diagnostic feature of allergic fungal sinusitis is "allergic mucin," an eosinophilic or basophilic mucoid material with embedded eosinophils, sloughed epithelial cells, cellular debris and charcot-leyden crystals imparting distinctive laminated "tidewater" appearance. Thick fungal debris and mucin having carbohydrate-rich glycoprotein develop in sinus cavity.⁷ The accumulation of this debris obstructs the involved sinuses, propagating the process.

The Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) findings in AFS are important for diagnosis. Karachi is a temperate region city with high humidity, which is a favorable condition for fungal growth. The aim of this study was to assess the presentation of allergic fungal sinusitis and describe the line of management in our setup.

PATIENTS AND METHODS

Culture and sensitivity/fungal stain proven 20 cases of allergic fungal sinusitis were selected for the study, conducted from January 2004 to January 2005, irrespective of age, gender, socioeconomic status and geographical origin.

Non-probability sampling technique was adopted in this descriptive type of study.

Study was conducted in Department of Otorhinolaryngology and Head and Neck Surgery, Dow Medical College and Civil Hospital, Karachi. Data including name, age, gender, address, socioeconomic status, signs and symptoms, labs (especially IgE and eosinophil count) and imaging studies (CT and / or MRI) were recorded on a performa.

Surgery performed, pre-operative and postoperative treatment, follow-up (weekly for first month and then monthly for at least 8 months), residual disease (within 6 months of surgery) and recurrence of disease (after 6 months of surgery), and revision surgery for residual / recurrent disease was also recorded.

Statistical software SPSS-10.0 was used for data analysis. Ratio (M:F) for gender distribution and mean \pm SD for age distribution. Frequencies and percentage were computed to present all categorical variables like socioeconomic status, imaging findings, clinical features and treatment given to the patients.

RESULTS

Twenty cases of allergic fungal sinusitis were evaluated, 90% were between 2nd and 3rd decade of life, (Table I). Maximum age was 34 years and minimum 11 years. Mean age was 20.75 years (SD \pm 6.52) and median age was 19.5 years. Male (70%) to female (30%) ratio was 7:3. Majority of patients (80%) belonged to lower socioeconomic status.

Histopathological analysis showed Aspergillus (60%) as most common fungus type, while in remaining 40% cases, allergic mucin was seen but no fungal spores identified.

On CT scan, double density sign was seen in 8 cases (40%), while orbital involvement was noted in 20% cases and intracranial extension in 10% cases (Table I). Due to financial constraint, MRI was done in only 4 cases (20%) having intracranial and / or orbital involvement.

Nasal obstruction was the most common feature seen in all cases (100%), while nasal discharge (90%) and postnasal drip (90%) were the next most common findings (Table II).

Among the extra nasal /PNS involvement (Figure I), proptosis (20%), telecanthus (20%) and facial disfigurement (20%) were the most common features.

Increased Eosinophil count (100%) and increased IgE level (100%) were the most common lab- findings.

Unilateral involvement of nose and PNS were seen in 60% cases.

Nasal polyps and allergic rhinitis were found in all cases

(100%).

All cases were managed surgically, 90% treated with FESS (Functional Endoscopic Sinus Surgery) and only in two cases having extradural, intracranial and orbital involvement, lateral rhinotomy was performed (Table II).

Recurrence / Residual disease was seen only in 2 cases (in 8 months) and functional endoscopic sinus surgery performed (Table II).

Table I: General characteristics and CT scan findings of AFS.			
General Characteristics	NO	%	
AGE GROUPS			
Upto 10 years	00	00	
11 to 20 years	12	60	
21 to 30 years	06	30	
31 to 40 years	02	10	
> 40 years	00	00	
Mean age 20.75 years (SD±6.52) and			
Median age19.5 years			
SEX			
Male	14	70	
Female	06	30	
SOCIOECONOMIC STATUS			
Higher*	00	00	
Middle**	04	20	
Lower***	16	80	
CT SCAN FINDINGS			
Unilateral involvement of nose and PNS	12	60	
Bilateral involvement of nose and PNS	08	40	
Asymmetry of two sides of sinuses	06	30	
Double density sign	08	40	
Orbital Involvement	04	20	
Intracranial extension	02	10	

* Higher > Rs. 10000 /= per person / month. **Middle Rs. 5000/= to 10000/= per person / month.

*** Lower < Rs. 5000/= to 10000/= per person / month

Table II: Clinical features / treatment.			
Clinical features/treatment	NO	%	
NASAL SIGNS / SYMPTOMS			
Nasal obstruction	20	100	
Nasal discharge	18	90	
Post-nasal drip	18	30	
Semisolid nasal crust	06	30	
Hyposmia / anosmiass	08	40	
EXTRANASAL AND PARANASAL SINUSES			
SIGNS / SYMPTOMS			
Facial pain	2	10	
Proptosis	4	20	
Telecanthus	4	20	
Headache due to Intracranial involvement	2	10	
Sudden loss of vision	0	00	
Facial disfigurement	4	20	
TREATMENT			
Pre-operative medical treatment	20	100	
Functional endoscopic sinus surgery	18	90	
Lateral rhinotomy	02	10	
Postoperative medical treatment	20	100	
Residual / recurrent disease	02	10	
Revised functional endoscopic sinus surgery	02	10	



Figure 1: Extra nasal/PNS involvement, proptosis, telecanthus and facial disfigurement.



Figure 2: Double density sign, orbital involvement and intracranial extension on CT scan.

DISCUSSION

Allergic Fungal Sinusitis (AFS) is a recently recognized noninvasive disease that accounts for approximately 07% of all chronic sinusitis, requiring surgical management.⁹

This study described the frequency of condition, and highlighted the management of the AFS to minimize the complications and recurrences.

Tremendous research work has been done internationally and lot of published material is available on sinonasal pathologies associated with fungus but still our local (Pakistani) literature on the subject is scanty and we need a lot of research work in this regard.

In this study, majority of patients were immunocompetent young males with a mean age of presentation in the third decade (20.75 years, SD \pm 6.52) and 90% were between 2nd and 3rd decade of life, which is similar to studies reported in international literature, ¹⁰⁻¹³ Our findings also simulate in this regard with local researchers. The average mean age in the study of Mian et al.¹⁴ was 24 years while lqbal et al. ¹⁵ found it to be 18 years. According to Akhtar et al.¹⁶ most of his patients

fell into 2nd, 3rd and 4th decades.

With male preponderance, gender distribution in our study was 7:3, which is compatible with most of the local studies¹⁴⁻¹⁶, while in contrast Rashid et al.¹⁷ showed female preponderance. Nasal obstruction, nasal discharge/postnasal drip, hyposmia/ anosmia, facial pain, proptosis and headache were the main presenting features in this study and all the researchers and workers have a consensus over it. The findings in both local and international literature are more or less same with insignificant difference in frequencies of the symptoms.10,14-17 Aspergillus was found in 60% (12 cases), which was much higher than reported in western studies.^{18,19} As in 40%, no fungal spores were identified in allergic mucin, comparable to study from Southern United States, highlighted the importance of surgical sinus fungal culture and inability to accurately identify fungal genus or species in AFS from allergic mucin histopathology alone.20 Many local and international studies^{10,13-16,21} also mentioned Aspergillus as commonest organism. Rashid17 also found one case of candidiasis in their series of fungal sinusitis, while internationally fungi in dermatiaceae (black) family (Curvularia, Bipolaris, Alternaria, Exserohilum) are considered responsible in the majority of cases.

Increased IgE level was seen in all cases, which was also higher than reported in other studies.^{18,22,23} Total IgE values generally remain elevated in AFS and taken as reasonable indicator of disease activity but AFS can occasionally present with normal total serum IgE.

The CT scan findings suggested 60% unilateral and 40% bilateral involvement of nose and paranasal sinuses and 40% double density sign (Figure 2), comparable to other studies, showing common multiple sinus involvement and double density sign. It should be noted that double density sign might also be seen with other forms of fungal sinusitis. ^{24,25}

There was 30% asymmetry of the two sides of the sinuses with 20% orbital involvement and only 10% intracranial extension. These findings were due to long-standing growth of polyps and/or accumulation of allergic mucin leading to the formation of mucocele-like cavities, often resulting in bone deformation, remodeling, or even erosion. Despite the bony destruction that occurs, the non-invasive nature of the fungus in AFS leaves underlying mucosa and adjacent soft tissue (dura, periorbita) intact in most cases. These findings are similar to that reported by Marple and Mabry. ²⁶

Recurrence is the main problem in the management of AFS. Current strategies in the treatment of AFS have been developed to control high recurrence rates after sinus surgery.^{18,22,27}

Present strategy in the treatment of AFS to minimize recurrence is removal of antigenic material via complete surgical removal of allergic mucin and debris. One accepted pre-operative medical regimen is to initiate systemic corticosteroid therapy (prednisone 0.5-1 mg / kg / day) one week before surgery to decrease intranasal inflammation. Additionally, pre-operative antibiotics are given to decrease frequency of concomitant postobstructive bacterial sinusitis.

Adequate sinus surgery (as already mentioned) is believed to be the required 1st step in the treatment of any patient with AFS.18.22.27.28

The aims of surgery are: complete removal of all allergic mucin and fungal debris; permanent drainage and ventilation of the affected sinuses while preserving the integrity of the underlying mucosa; and postoperative access to the previously diseased areas.

To achieve those goals, functional endoscopic sinus surgery was performed in 90% of cases and lateral rhinotomy in 10% of cases having intracranial (extra dural) involvement.

Surgery for AFS without postoperative medical management leads to recurrence rates as high as 100%.²⁸ The use of Oral Corticosteroids (OCS) in the postoperative AFS patients had given good results as seen in allergic bronchopulmonary aspergillosis (ABPA). ^{23,28}

As good results of OCS was reported in the above studies, we also administered postoperative corticosteroids for a period of 3-4 weeks and tapered thereafter. Topical steroids was also administered for the 6 months period in AFS patients. Four cases (20%) reported recurrence/residual disease and revised functional endoscopic sinus surgery (Messerklinger Technique-anterior to posterior approach) was done.

Because of potential drug related morbidity, expense and limited available data, there is no established role of antifungal therapy in AFS, though, it is used very effectively in invasive fungal sinusitis.^{18,22,28} Following the advancement in medical therapy of AFS, more emphasis is now placed on immunotherapy and the surgery emphasising on conservative (but complete) endoscopic approach.²⁸

Keeping this study results in view, it is strongly recommended that every case of chronic sinonasal disease should be thoroughly scrutinize with a detailed history, clinical examination and specific investigations like CT scan, IgE level, eosinophil count etc. and the tissue removed surgically should always be subjected to histopathology, fungal staining and fungal culture to identify fungal infection. This finding can change the whole line of treatment both in terms of surgical technique and medical therapy to reduce fatal complications and minimize chances of recurrence.

The present study had the limitations of a relatively small sample size and lacking the long-term follow-up.

CONCLUSION

Allergic fungal sinusitis was seen in young males (immunocompetent) belonging to poor socioeconomic status, suffering from allergic rhinitis and nasal polyposis, presenting with nasal obstruction, nasal discharge and postnasal drip. Functional endoscopic sinus surgery proved to be the most important surgical modality of treatment, while lateral rhinotomy was reserved for extensive disease. Oral and topical steroids in the pre and postoperative period give good results for controlling the recurrence.

References

- Lamblin C, Gosset P, Salez F, Vandezande LM, Perez T, Darras J, et al. Eosinophilic airway inflammation in nasal polyposis. J Allergy Clin Immunol 1999;104:85-92.
- Hamilos DL. Chronic sinusitis. J Allergy Clin Immunol 2000;106: 213-27.
- Berger G, Kattan A, Bernheim J, Ophir D. Polypoid mucosa with eosinophilia and glandular hyperplasia in chronic sinusitis: a histopathological and immunohistochemical study. Laryngoscope 2002; 112: 738-45.

- 4. Safirstein BH. Allergic bronchopulmonary aspergillosis with obstruction of the upper respiratory tract. Chest 1976; **70**: 788-90.
- Robson JM, Hogan PG, Benn RA, Gatenby PA. Allergic fungal sinusitis presenting as a paranasal sinus tumour. Aust N Z J Med 1989;19: 351-3.
- Manning SC, Vuitch F, Weinberg AG, Brown OE. Allergic aspergillosis: a newly recognized form of sinusitis in the pediatric population. Laryngoscope 1989; 99 (Pt 1): 681-5.
- Brandwein M. Histopathology of sinonasal fungal disease. Otolaryngol Clin North Am 1993; 26: 949-81.
- Zhou B, Liu M, Han DM, Wang ZC, Zhang L, Xian JF, et al. Characteristics of computed tomography of allergic fungal sinusitis. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi 2006;41:493-6.
- Lanza DC, Dhong HJ, Tantilipikorn P, Tanabodee J, Nadel DM, Kennedy DW. Fungus and chronic rhinosinusitis: from bench to clinical understanding. Ann Otol Rhinol Laryngol 2006; **196** (suppl) : 27-34.
- Schubert MS. Allergic fungal sinusitis. Otolaryngol Clin North Am 2004; 37: 301-26.
- Gupta AK, Ghosh S, Gupta AK. Sinonasal aspergillosis in immunocompetent Indian children: an eight-year experience. Mycoses 2003; 46: 455-61.
- Uri N, Cohen-Kerem R, Elmalah I, Doweck I, Greenberg E. Classification of fungal sinusitis in immunocompetent patients. Otolaryngol Head Neck Surg 2003;129:372-8.
- 13. Schubert MS. Fungal rhinosinusitis: diagnosis and therapy. Curr Allergy Asthma Rep 2001;1:268-76.
- Mian MY, Kamal SA, Senthilkumaran G, Abdullah A, Pirani M. Allergic fungal rhinosinusitis: current status. Pak J Otolaryngol 2002;18:36-40.
- Iqbal K, Saqlain G, Jalisi M. Nasal polyposis and fungal sinusitis-efficacy of Caldwell Luc as a therapeutic procedure. Pak J Otolaryngol 1993;9:173-6.
- Akhtar MR, Ishaque M, Saadat Ullah. Aetiology of nasal polyp: a study of 200 cases at Combined Military Hospital, Rawalpindi. Pak J Otolaryngol 2004;20:9-11.
- Rashid D, Ahmed B, Muhammad SM, Hydri AS. Fungal sinusitis. J Coll Physicians Surg Pak 1999;9:381-3.
- Schubert MS, Goetz DW. Evaluation and treatment of allergic fungal sinusitis. I. Demographics and diagnosis. J Allergy Clin Immunol 1998;102: 387-94.
- deShazo RD, Chapin K, Swain RE. Fungal sinusitis. N Engl J Med 1997; 337: 254-9.
- McCann WA, Cromie M, Chandler F, Ford J, Dolen WK. Sensitization to recombinant Aspergillus fumigatus allergens in allergic fungal sinusitis. Ann Allergy Asthma Immunol 2002; 89: 203-8.
- 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: 364-7.
- 22. Schubert MS. Medical treatment of allergic fungal sinusitis. Ann Allergy Asthma Immunol 2000;**85**:90-7.
- Mabry RL, Manning S. Radioallergosorbent microscreen and total immunoglobulin E in allergic fungal sinusitis. Otolaryngol Head Neck Surg 1995; 113:721-3.
- Mukherji SK, Figueroa RE, Ginsberg LE, Zeifer BA, Marple BF, Alley JG, et al. Allergic fungal sinusitis: CT findings. Radiology 1998; 207:417-22.
- 25. Lund VJ, Lloyd G, Savy L, Howard D. Fungal rhinosinusitis. J Laryngol Otol 2000;114:76-80.
- 26. Marple BF, Mabry RL. Comprehensive management of allergic fungal

sinusitis. Am J Rhinol 1998;12:263-8.

- 27. Kuhn FA, Javer AR. Allergic fungal sinusitis: a four-year follow-up. Am J Rhinol 2000;**14**:149-56.
- 28. Marple BF. Allergic fungal rhinosinusitis: current theories and management strategies. Laryngoscope 2001;**111**:1006-19.