

Assessment of Bacterial Infection in Patients Operated for Complications of Chronic Fungal Rhinosinusitis

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ABSTRACT

Aim: To study bacteriology in operated patients diagnosed with chronic fungal rhinosinusitis.

Duration of Study: One year (March 2016 to February 2017)

Study Setting: Department of ENT, Mayo Hospital, Lahore

Study Design: Cross sectional prospective

Sample Size: 50 patients

Method: All patients with CRS with suspected fungal infection on radiological investigations were included in study after informed consent. Different surgical procedures like, FESS, Caldwell luc, Transantral ethmoidectomy and External ethmoidectomy done to treat the complications of fungal rhinosinusitis. Samples from sinus secretions collected for fungal staining, aerobic and anaerobic culture peroperatively. Those patients who were fungal staining positive were included in this study and bacteriology documented for each case after culture report. Those patients who were fungal negative were excluded from study.

Results: In chronic fungal rhinosinusitis aerobic bacteria were involved in more than half of patients. Eighty two percent patients of fungal rhinosinusitis were suffering from bacterial infection and only eighteen percent were negative for any bacterial infection. *Haemophilus influenzae* were most common aerobic bacteria suffered 22 % out of 50 patients diagnosed with fungal rhinosinusitis. *Proteus mirabilis* affected least (02%) patients. Anaerobic bacteria, *Peptostreptococcus* spp and *Fusobacterium* each were found in four percent of patients.

Conclusion: Chronic fungal rhinosinusitis is a polymicrobial phenomenon. While treating fungal rhinosinusitis concurrent bacterial infection should be investigated and treated accordingly. While dealing fungal infection post operatively, bacterial infection should be kept in mind and measures should be taken to prevent recurrence of disease.

Keywords: Fungal rhinosinusitis, bacterial infection, secretion, ethmoidectomy

INTRODUCTION

The term 'Sinusitis' refers to a group of pathologies characterized by inflammation of the paranasal sinuses mucosa. As inflammation of the nasal mucosa nearly always involves the sinuses mucosa so now 'rhinosinusitis' is a preferred term accepted by clinicians and researchers¹. Rhinosinusitis which lasts for at least 12 consecutive weeks is termed as chronic rhinosinusitis².

It is now commonly accepted that rhinosinusitis is one of the leading causes for frequent visits of an individual for medical care. Rhinosinusitis leads to high medical costs because of these frequent visits to healthcare facilities. These costs include office visits, diagnostic tests such as laboratory, radiological investigations or cultures; antibiotics or other pharmaceutical preparations and management of

complications. In US each year Americans make 645,000 emergency and 13 to 18 million office visits for chronic sinusitis³. NAMCS data shows that in year 1985, 1989 and 1992 there is increasing trend of office visits for rhinosinusitis⁴.

Bacteriologically, rhinosinusitis has temporally two different stages, acute and chronic. *Streptococcus pneumoniae* (20-45%) and *Haemophilus influenzae* (22-35%) are the predominant organisms in acute bacterial rhinosinusitis in adults population^{5,6}, while *Streptococcus pneumoniae* (30-43%), *Haemophilus influenzae* (20-28%) and *Moraxella catarrhalis* (20-28%) are the main pathogens in acute bacterial rhinosinusitis in children⁷.

Staphylococcus species (55%) and *Staphylococcus aureus* (20%) are commonly involved in chronic rhinosinusitis⁸. Some studies have shown in their research work a high prevalence of Enterobacteriaceae organisms, anaerobes and Gram-negative bacteria^{9,10}.

Fungi are normally found almost everywhere as spores in nature, similarly they can be isolated from

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the nasal cavities of majority of normal people but it is necessary to distinguish between noninvasive and invasive fungal rhinosinusitis in sinus mucosa¹¹.

A range of acute and chronic fungal rhinosinusitis manifestations are described in literature. Several fungi are supposed to be responsible for these pathologies including Mucor, Curvularia, Alternaria, Scedoporium and Aspergillus¹.

Fungal infection in nose and paranasal sinuses may be invasive or noninvasive. Noninvasive variety includes allergic fungal rhinosinusitis and fungal ball. Invasive fungal infection comprises of acute fulminant rhinosinusitis and indolent invasive fungal rhinosinusitis¹².

There is much literature on evidence that, individuals with allergies have higher incidence of acute and chronic rhinosinusitis. Association between acute bacterial rhinosinusitis and asthma has been suggested which may be due to allergic rhinitis¹³.

Available literature studied mostly bacterial or fungal infections separately with no concomitant pathology. As incidence of fungal rhinosinusitis is increasing in world, its detailed study in respect to other infections is necessary to understand exact pathophysiology and combat the emerging health issues. This research is done to study bacterial organisms involved in chronic fungal rhinosinusitis.

PATIENTS AND METHOD

This cross sectional prospective study was conducted in the Department of ENT , Mayo Hospital , Lahore from March 2016 to February 2017. Sample size was 50 patients.

All patients with CRS with suspected fungal infection on radiological investigations were included in study after informed consent. Different surgical procedures like, FESS, Caldwell luc, Transantral ethmoidectomy and External ethmoidectomy were done to treat the complications of fungal rhinosinusitis . Samples from sinus secretions collected for fungal staining, aerobic and anaerobic culture peroperatively. Those patients who were fungal staining positive were included in this study and bacteriology documented for each case after culture report. Those patients who were fungal negative were excluded from study.

RESULTS

In fungal rhinosinusitis aerobic bacteria were involved in more than half of patients. Eighty two percent patients of fungal rhinosinusitis were suffering from bacterial infection and only eighteen percent were negative for any bacterial infection (Table 1).

Fig. Status of microbes

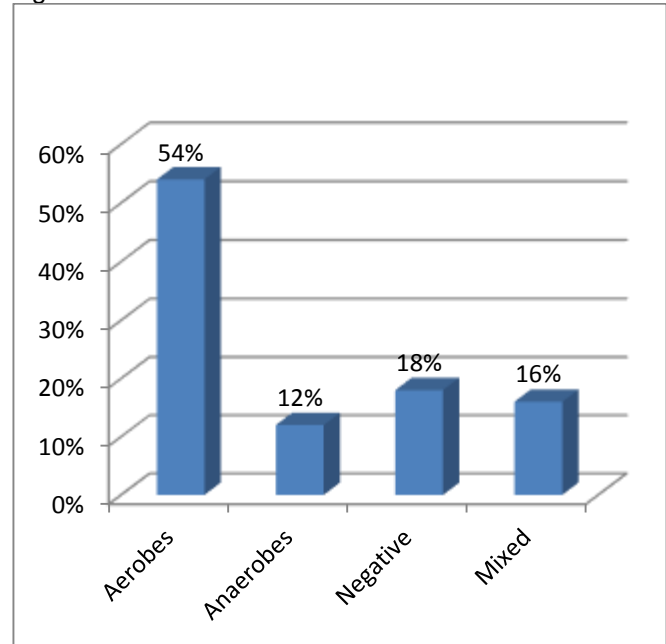


Table 1: Status of microbes

Status of microbes	n	%age
Aerobes	27	54
anaerobes	6	12
Mixed	8	16
Negative	9	18
Total	50	100

Table 2: Detail of microorganisms

Organisms	n	%age
Aerobes		
Haemophilus influenzae	11	22
Staphylococcus aureus	2	4
Streptococcus pyogenes	5	10
Streptococcus pneumoniae	3	6
Pseudomonas aeruginosa	1	2
Proteus mirabilis	1	2
Klebsiella pneumoniae	3	6
Enterobacter aerogenes	1	2
Anaerobes		
Peptostreptococcus spp	2	4
Fusobacterium	2	4
Prevotella	1	2
Bacteroides spp	1	2
Mixed		
Mixed	8	16
Negative	9	18
Total	50	100

Haemophilus influenza was most common aerobic bacteria seen in 22% out of 50 patients diagnosed with fungal rhinosinusitis. Proteus mirabilis was seen in (02%) patients. Anaerobic bacteria, Peptostreptococcus spp and Fusobacterium were found in

overall four percent of patients respectively. Sixteen percent patients were suffering from both aerobic and anaerobic bacterial infection. Nine patients (18%) diagnosed with fungal rhinosinusitis did not show any type of bacterial infection (Table 2).

DISCUSSION

Fungal rhinosinusitis was once a rare health issue but now there is evidence of increasing incidence even in developed countries. Classification of fungal sinusitis has evolved rapidly in past two decades. Now-a-days literature agreed on five subtypes of fungal rhinosinusitis. Invasive group include, acute invasive, chronic invasive and chronic granulomatous fungal sinusitis whereas noninvasive types include fungal ball (fungal mycetoma) and allergic fungal sinusitis¹⁴. These five subtypes are distinct entities with different clinical presentations and different radiologic features¹⁵. Treatment strategies and prognosis are different for each subtype. Radiologists plays a vital role in diagnosis and guiding clinicians for further appropriate diagnostic techniques¹⁶. Prompt diagnosis and initiation of appropriate management are essential to avoid fatal outcome associated with this condition¹⁷. Fungal rhinosinusitis can lead to complications and their medical and surgical management is necessary soon after diagnosis¹⁸. In our study we found most of patients (82%) are suffering from fungal rhinosinusitis which shows high incidence of fungal rhinosinusitis. Many studies in literature favors this finding^{19,20}.

Previous literature studied fungal and bacterial rhinosinusitis separately^{21,22,23}. As incidence of fungal rhinosinusitis is increasing in the world, its detail study in respect to other infections is necessary to understand exact pathophysiology and combat the emerging health issue.

This study is done to find out about concomitant bacterial infection in fungal rhinosinusitis.

Chronic sinusitis is one of the most common bacterial infections among adults²⁴. *Streptococcus pneumoniae* and *Haemophilus influenzae*, have been the predominant aerobic pathogens recovered from patients with rhinosinusitis²⁵. Our study shows *Haemophilus influenzae* is present in 22% and *Streptococcus pneumoniae* is found in 6 % of overall specimens which are in accordance to literature. When rhinosinusitis becomes chronic, however, these organisms are replaced by a wider variety of both aerobes and anaerobes²⁶. In our study 54% patients were suffering from aerobic and 12% from anaerobic bacteria which are in favor of current literature. Sixteen percent (16%) patients were suffering from both aerobic and anaerobic infection which shows polymicrobial nature of rhinosinusitis.

Literature shows many studies with polymicrobial nature of chronic rhinosinusitis^{24,27,28}. Anaerobes found only in 12% patients, while a study done by Itzhak Brook shows more anaerobic bacteria²⁹. Sterile sinus is term used when no bacterial growth found in culture. A study by Rontal et al found 30% sterile sinuses³⁰. Other studies also included suspected bacterial rhinosinusitis which were found to be sterile on culture^{25,31,32}. We found 18 % free from any bacterial infection but we cannot use the term sterile because our inclusion criteria is fungal positive patients. These studies only investigated bacteria not fungi so sterile sinus is not absolute term until patient was investigated for all possible pathogens of chronic rhinosinusitis. Polymicrobial nature of disease can favor our claim.

CONCLUSION

Chronic fungal rhinosinusitis is a polymicrobial phenomenon. While treating fungal rhinosinusitis concurrent bacterial infection should be investigated and treated accordingly. Further studies should be conducted on its pathophysiology, to rule out the causes of increased incidence of fungal rhinosinusitis, which could be underlying bacterial infection. While dealing with fungal infections post operatively, bacterial infection should be kept in mind and measures should be taken to prevent recurrence of disease.

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