



ORIGINAL RESEARCH PAPER

Otorhinolaryngology

THE ROLE OF NASAL ENDOSCOPY IN PATIENTS OF MUCORMYCOSIS

KEY WORDS: Mucormycosis, COVID 19, Diagnostic nasal endoscopy, FESS

Dr Shivanshu Gupta	Post Graduate Department of ENT M.G.M. Medical College and M.Y.H. Hospital, Indore (M.P.)
Dr Yamini Gupta	Professor and HOD Department of ENT M.G.M. Medical College and M.Y.H. Hospital, Indore (M.P.)
Dr Jagram Verma	Associate Professor Department of ENT M.G.M. Medical College and M.Y.H. Hospital, Indore (M.P.)
Dr Ankita Kujur	Post Graduate Department of ENT M.G.M. Medical College and M.Y.H. Hospital, Indore (M.P.)
Dr. Krishna Valecha	Post Graduate Department of ENT M.G.M. Medical College and M.Y.H. Hospital, Indore (M.P.)
Dr. Rakhi Kaushik	Post Graduate Department of ENT M.G.M. Medical College and M.Y.H. Hospital, Indore (M.P.)
Dr. Deepak Kumar Mahawar	Post Graduate Department of ENT M.G.M. Medical College and M.Y.H. Hospital, Indore (M.P.)
Dr. Roli Vachhani	Post Graduate Department of ENT M.G.M. Medical College and M.Y.H. Hospital, Indore (M.P.)

ABSTRACT

Objective: The Rhino-orbital- cerebral infection is the most typical presentation of mucormycosis where there is an invasion of the fungal infection from paranasal sinuses to orbit and brain(6, 11). Extension of the disease leads to vascular thrombosis, including the cavernous sinus and other cerebral vessels due to fibrin reaction and Mucor thrombus formation. Nasal Endoscopy aids in the early detection and management of the disease (8). This study aims to study the signs and symptoms of patients with mucormycosis and the role of nasal endoscopy in early diagnosis. **Subjects And Methods:** A Prospective study was conducted on 150 patients of age 20-90 years attending ENT OPD and admitted under the Department of otorhinolaryngology at a tertiary care center in Central India. Subjects with or without Covid 19 infection, comorbidities like diabetes and hypertension and patients on steroids were selected for nasal endoscopy. Patients with benign or malignant lesions of nasal cavity and post operative cases of FESS for mucor were excluded. **Results:** In our study, majority patients were from the 5th decade followed by the 6th. In the classification system designed on the basis of endoscopy findings, majority were in Group B(42%) followed by Group C (28.7%). Maxillary sinus was found to be the most common sinuses involved as seen in the MRI of 110 patients. Out of 150 patients, debridement was done in 74 patients. **Conclusion:** In our study, we have concluded that diagnostic nasal endoscopy aids in early diagnosis and management of mucormycosis. The grading system makes the management of the large number of patients easier. Appropriate time, treatment and resources can be given to the required patients. All patients after this management protocol stood well and were successfully discharged with only 8% mortality rate.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by newly discovered novel severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2). A wide range of bacterial and fungal co-infections may exist and may be associated with preexisting morbidity (diabetes mellitus, hypertension), protein calorie malnutrition, etc. (1). Additionally, the widespread use of steroids/monoclonal antibodies against COVID-19 may lead to the development/exacerbation of pre-existing fungal diseases (2). During coronavirus disease pandemic, the prevalence of paranasal mucormycosis is on the rise, probably due to systemic immune alterations due to Coronavirus infection (3). Alterations in innate immunity associated with COVID-19 may be due to reduced number of T lymphocytes, CD4+T helper, and CD8+T cells(4) Based on anatomic localization, mucormycosis can be classified as one of six forms: (1) rhino-orbital-cerebral mucormycosis (ROCM), (2) pulmonary, (3) cutaneous, (4) gastrointestinal (GI), (5) disseminated, and (6) mucormycosis of uncommon sites. There are various diagnostic modalities for the suspicious Mucor infection namely MRI PNS+ Brain + Orbit, wet KOH mount, Biopsy etc.(7).

of the nasal mucosa is the most consistent finding (8). Main clinical findings include the black necrotic eschar tissue with underlying purulent exudates with an unpleasant odor (9). In high risk suspected patients, surgeon while performing nasal endoscopy should carefully inspect the common sites for mucormycosis, which includes middle turbinate, palate and inferior turbinate. Here we describe the approach for the management of the disease based on the Nasal Endoscopy that optimize the line, time and appropriate management to people in this epidemic.

METHODS

Type Of Study: Prospective study

Sample: 150 patients.

Duration And Place Of Study: The study was done from April 2021 to June 2021 in the Department of ENT, Tertiary care center in central India.

Inclusion Criteria

Patient between age 20 and 90 years admitted in the hospital giving consent for nasal endoscopy. Patients with or without Covid-19 Positive infection, with symptoms like headache, vision abnormality, facial pain, facial weakness, nasal obstruction, nasal discharges suggestive of mucormycosis.

Nasal Endoscopy showing change in the normal appearance

Patients with comorbidities like Diabetes, Hypertension, Renal and Liver pathology and those who had steroids therapy, tocilizumab or remdesivir treatment during Covid 19 infection. Immuno-compromised state only due to Covid-19 infection

Exclusion Criteria

Patients <20 and > 90 years of age and having benign and malignant lesions of Nasal cavity, those who were operated for FESS prior to study and with comorbidities.

Data Collection

All patients were subjected to Nasal Endoscopy with 0 degree 4mm Nasal telescope and were classified into 5 categories on the basis of the finding and were subjected to Magnetic Resonance Imaging (MRI) brain, orbit and paranasal sinus . Routine blood investigation were done and patients were taken for Functional Endoscopic Sinus Surgery (FESS) with Nasal Cavity Debridement. Sedation was given to all patients. Biopsy were sent for histopathological examination in operated patient. A unique and novel classification system to segregate and triage the patients based on nasal endoscopy findings was made.

RESULTS

Among 150 patients, there were 112 (74.7%) male and 38 (25.3%) females, that is 3:1 ratio. There were 46(30.7%) patients reported from 5th decade of life among 150 patients which was maximum followed by 6th decade having 40(26.7%), 7th decade having 31(20.7%), 4th decade having 16(10.7%), 3rd decade having 6 (4%) and least were from 9th decade 2(1.3%) (table 1).

The Novel classification System for Nasal Endoscopy that was used in the study as described earlier, in Group A there were 3(2%) patients which was minimum who reported, maximum patients were in Group B having 63 (42.0%) followed by Group C - 43 (28.7%), Group D - 25 (16.7%) and Group E - 16 (10.7%) (Table 2) patients.

In Group A none of the patient had neither eyes nor palate involvement was seen while in Group B out of 63 patients 5 (8%) patient had isolated eyes , 4(6.3%) had isolated palate while 1(1.6%) had both eyes and palate involvement is seen. In Group C out of 43 there are 9(21%) patient had isolated eyes , 5(11.6%) had isolated palate while 3(7%) had both eyes and palate involvement is seen. In 25 Group D patients there are 12(48%) patient had isolated eyes , 3(12%) had isolated palate while 5(20%) had both eyes and palate involvement is seen. In 16 Group E patients there are 5(31.2%) patient had isolated eyes , 4(25%) had isolated palate while 7(43.8%) had both eyes and palate involvement is seen (table 3).

The MRI PNS out of 150 patients shows the involvement of Maxillary sinus in 11 q 0 patients , shows the common sinus to be involved, ethmoid sinus was involved in 93 patients, sphenoid sinus in 65 patients and frontal sinus least involved in 30 patients. The sinus involvement in MRI PNS in different 5 grades is shown in Table 5.

The 74 patients out of 150 were operated for nasal cavity debridement and Functional Endoscopic Sinus Surgery (FESS). In Group A none of the patients were operated, Group B 16(25.4%) out of 63 patients , Group C 17(39.5%) out of 43 patients while in Group D and Group E 100% that is 25 and 16 patients respectively were operated.

Out of 150 patients, 122(81.3%) were covid infected and remaining 28 (18.7%) were non covid infected. In 150 patient , 133(88.7%) had diabetes mellitus, out of which 81(54%) had past history of diabetes mellitus and 52(34.7%) were newly diagnosed diabetes mellitus post covid 19 infection.

DISCUSSION

Mucormycosis is caused by fungi in the order Mucorales. The spores invade the nasal mucosa forming angioinvasive

hyphae that cause infarction of the involved tissue. Invasion occurs with spread to the maxillary sinuses and subsequent orbital spread through the ethmoid sinuses. Extension of the disease leads to vascular thrombosis. The morbidity and mortality rate of mucormycosis is high, and death can occur within as little as 2 weeks. Thus, early detection and treatment are important factors in the resulting disposition of the patient with a substantial increase in mortality. Nasal Endoscopy aids in the early detection and management of the disease (8).

We have tried to develop a new classification system for the condition based on the data available at our center so as to manage the bulk of patients reported for sake of appropriate treatment(16) . According to Novel classification System that we used for Diagnostic Nasal Endoscopy , 42 %(63) patients were in Group B , 28.7%(43) in Group C, 16.7%(25) in Group D, 10.7%(16) in Grade IV while only 2%(3) in Grade 0. Maximum number of patients were in Grade I & II having very mild disease in which progression of disease is slow and can be managed on medical basis with amphotericin B.

The wet KOH mount was only done in Grade 0, I & II and positive patients were operated. In Grade III & IV the fungal appearance was clear in the endoscopy picture therefore wet KOH was not done and all patients were managed surgically.

Eye involvement in mucor is not so uncommon the symptoms can show up anytime and are similar to those of other types of eye infections and can include eye pain, redness, blurred vision, eye discharge, ptosis, swelling, etc. The overall isolated eye involvement in the study was in 157 (21%).

In our study the isolated palatal involvement is seen in 16 (10.7%) patients while overall palatal involvement is 21% of the study population. There were 16(10.7%) patients having both palatal and orbital involvement in which maximum was in group E having 7(43.8%) patients.

This shows that group E are the patient having severe form of disease with complication so are in priority for FESS and debridement as earliest in the epidemic.

On MR imaging, variable intensity within the sinuses on T1- and T2-weighted images is usually seen. In our Novel grading system also Maxillary sinus is commonly involved in all grades and least is frontal sinus.

The most common comorbidity associated with mucormycosis were diabetes mellitus 133(88.7%) patient were associated with it out of which 81(54%) had previous history of diabetes mellitus and 52(34.7%) were newly diagnosed diabetes mellitus post covid 19 infection.

Thus, the covid 19 infection, diabetes mellitus and mucormycosis forms a deadly trio and need early and effective management.

Based on the Grading system the patients were grouped and subjected to FESS and nasal cavity debridement. 100% patients were operated in group D and E, in group A none of the patients were taken and were discharged. In group B and C, 25.4%(16) and 39.5% (17) were operated. This grading system makes the management of the large number of patients easier. Appropriate time, treatment and resources can be given to the required patients. All patients after this management protocol stood well and were successfully discharged with only 8% mortality rate.

CONCLUSION

The Rhino-orbital- cerebral infection is the most typical presentation of mucormycosis where there is an invasion of the fungal infection from paranasal sinuses to orbit and brain. Mucor is associated with high morbidity. Fungal eye infection symptoms are similar to those of other types of eye infections

(like those caused by bacteria) and can include(11) eye pain, eye redness, blurred vision, sensitivity to light, excessive tearing, discharge, ptosis, swelling of eyes, pthsis bulbi (terminal stage).

In our study, the most common comorbidity was diabetes, forming a deadly trio of diabetes, covid and mucor. In our study, in group B and group C, the decision of operating was made on the basis of:

1. Isolated eye or palate involvement
2. Both eyes and palate involvement
3. MRI suggestive of paranasal sinus involvement
4. Wet KOH mount if found to be positive

All patients were treated with early endoscopic sinus surgery for debridement of the infected and necrotic tissue. Additionally, intravenous liposomal amphotericin B and other supportive treatments for COVID-19 were started immediately. Our strategy was to decrease the burden of the fungus in the affected tissues to avoid further spread and associated complications.

Table 1: Age Distribution Of The Study Population (n=150)

Age group (in years)	Total = 150
20-30	6 (4%)
31-40	16(10.7%)
41-50	46(30.7%)
51-60	40(26.7%)
61-70	30(20%)
71-80	10(6.7%)
81-90	2(1.3%)

Table 2: Novel Classification System

Group	Nasal Endoscopy Findings	No. of Patient	% Distribution
A	Normal Nasal Mucosa	3	2
B	Congestion and edematous nasal mucosa	63	42
C	Thick purulent secretion in Middle meatus and Choana	43	28
D	Blackening of Nasal Mucosa	25	16.7
E	Black necrotic eschar tissue with underlying purulent exudates	16	10.7
	Total	150	

Table 3: Eye And Palate Involvement

Classification	Eyes Involvement	Palate Involvement	Eyes And Palate Involvement
Group A	0	0	0
Group B	5(8%)	4(6.3%)	1(1.6%)
Group C	9(21%)	5(11.6%)	3(7%)
Group D	12(48%)	3(12%)	5(20%)
Group E	5(31.2%)	4(25%)	7(43.8%)
TOTAL	31(20.7%)	16(10.7%)	16(10.7%)

Table 4: Covid 19 Infection And Diabetes Mellitus Status

COVID INFECTED	TOTAL PATIENT	% DISTRIBUTION
POST COVID INFECTED PATIENT	122	81.3%
NON COVID PATIENT	28	18.7%
PAST HISTORY OF DM	81	54.0%
NEWLY DIAGNOSED DM POST COVID 19 INFECTION	52	34.7%

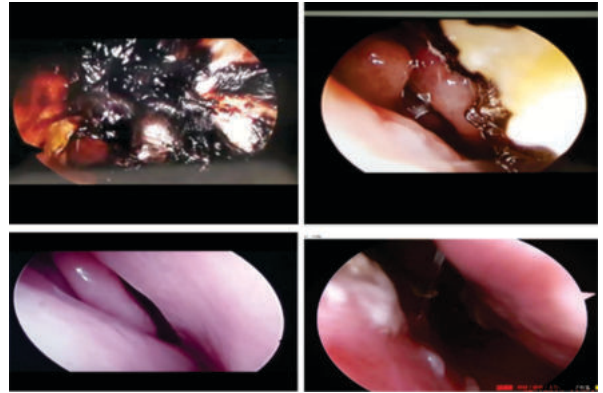
Table 5: Mri Findings In Different Groups On The Basis Of Nasal Endoscopy

SINUSES	Maxillary Sinus	Ethmoid Sinus	Sphenoid Sinus	Frontal Sinus
Group A	1	0	0	0
Group B	26	15	16	1
Group C	42	37	21	8
Group D	25	25	15	11
Group E	16	16	13	10
Total	110(73.3%)	93(62%)	65(43.3%)	30(20%)

Table 6 : Patients Operated In Different Groups On The Basis Of Nasal Endoscopy

	TOTAL PATIENT	NUMBER OF OPERATED PATIENT	% DISTRIBUTION
GROUP A	3	0	0%
GROUP B	63	16	25.4%
GROUP C	43	17	39.5%
GROUP D	25	25	100%
GROUP E	16	16	100%

Figures



REFERENCES

1. International Diabetes Federation. [Jul;2020];<https://idf.org/our-network/regions-members/south-east-asia/members/94-india.html> 2020.
2. Rhino-Orbital Mucormycosis Associated With COVID-19 [Internet]. [cited 2021 Apr 30]. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7599039/>
3. Mehta S, Pandey A. Rhino-orbital mucormycosis associated with COVID-19. *Cureus* 12(9):e10726.
4. Gangneux JP, Bougnoux ME, Dannaoui E, Cornet M, Zahar JR, (2020). Invasive fungal diseases during COVID-19: we should be prepared. *J Mycol Med* 30:100971.
5. Hosseini SMS, Borgheti P. Rhinocerebral mucormycosis: pathways of spread. *Eur Arch Oto-Rhino-Laryngol Off J Eur Fed Oto-Rhino-Laryngol Soc EUFOS Affil Ger Soc Oto-Rhino-Laryngol - Head Neck Surg.* 2005 Nov;262(11):932-8.
6. Garlapati K, Chavva S, Vaddeswarupu RM, Surampudi J. Fulminant Mucormycosis Involving Paranasal Sinuses: A Rare Case Report. *Case Rep Dent.* 2014;2014:1-4.
7. Awal SS, Biswas SS, Awal SK. Rhino-orbital mucormycosis in COVID-19 patients—a new threat? *Egypt J Radiol Nucl Med.* 2021 Jun 22;52(1):152.
8. Singh VP, Bansal C, Kaintura M. Sinonasal Mucormycosis: A to Z. *Indian J Otolaryngol Head Neck Surg.* 2019 Nov;71(Suppl 3):1962-71.
9. Lunge SB, Sajjan V, Pandit AM, Patil VB. Rhinocerebrocutaneous mucormycosis caused by *Mucor* species: a rare causation. *Indian Dermatol Online J.* 2015;6(3):189-192. Doi: 10.4103/2229-5178.156393. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
10. Spellberg B, Edwards J, Jr, Ibrahim A. Novel perspectives on mucormycosis: pathophysiology, presentation, and management. *Clin Microbiol Rev.* 2005;18(3):556-569. Doi: 10.1128/CMR.18.3.556-569.2005. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
11. Symptoms of Fungal Eye Infections | Types of Diseases | Fungal Diseases | CDC [Internet]. 2021 [cited 2021 Aug 5]. Available from: <https://www.cdc.gov/fungal/diseases/fungal-eye-infections/symptoms.html>