



## Study Of Retinal Findings In Post Covid Mucormycosis Patients

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### Abstract

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### Introduction

The onset of 2<sup>nd</sup> wave of Covid 19 has led to avalanche of Rhino Orbital Cerebral Mucormycosis, otherwise a rare opportunistic infection. Widespread use of steroids and higher antibiotics has led to uncontrolled Diabetes mellitus which is the major contributing factor <sup>[1]</sup>. The most common ocular symptoms are pain, proptosis, chemosis, ptosis, diplopia, ophthalmoplegia and reduced vision <sup>[2]</sup>. This disease being Angio invasive, rapidly spreads to orbital apex leading to cavernous sinus thrombosis →Ophthalmic artery occlusion→ Central retinal artery involvement leading to permanent blindness.

Covid-19 affects by increase in cytokines and impairs cell- mediated immunity with decrease in T-helper (CD4+ T and CD8+ T) cell counts <sup>[3]</sup>. Also, some studies have shown co- relation between elevated D-dimer levels <sup>[3]</sup> . Thus, it leads to coagulopathy, contributing to the development of arterial ischemic changes ultimately leading to ocular decompensation <sup>[4]</sup> .

Also, mucor has higher affinity for angiotensin-converting-enzyme 2 (ACE2), detected in the aqueous humor and the retina in humans <sup>[5]</sup>. Thus, along with COVID 19, Mucormycosis doubles the risk for sight threatening conditions.

Patients with No Projection of rays and projection of light come with retinal ischemia involvement either with Central retinal artery Occlusion or Central

retinal vein Occlusion along with orbital apex or cavernous sinus involvement showing the angioinvasiveness of Mucormycosis infection.

The purpose of this study is to evaluate retinal findings in post covid mucormycosis patients, co- relation between diminution of vision and retinal finding and the most common systemic co morbidity associated in such patients.

### Materials And Method

A retrospective observational analysis was done on 180 patients with Rhino-Orbital-Cerebral Mucormycosis seen by Department of Ophthalmology of Tertiary Health Care Institute.

**Inclusion criteria:** Patients diagnosed with COVID-19 infection and with KOH positive report.

**Exclusion criteria:** Patients whose dilated evaluation was not possible.

### Brief Examination Included:

#### Ocular Examination-

1. Visual acuity on 3 m chart
2. Proptosis measurement
3. Extra ocular movements and ptosis evaluation
4. Ant. Segment evaluation
5. Fundus evaluation by indirect ophthalmoscope

- Special tests like OCT and Fundus photograph (if needed and the patient is stable)

**Systemic Examination -**

- Blood investigations – Renal Function Tests, Blood sugar levels, Serum electrolytes.
- Diagnostic nasal endoscopy and KOH reports

**Radiologically Examination –**

MRI (CONTRAST) Brain with PNS with Orbit with 2mm optic nerve cut

(Serially photographic consent was taken from patients for everyday evaluation)

Systemically – Patients were treated with

- IV Amphotericin – Liposomal/emulsion
- Syrup/ Tab Posaconazole

- Tab Isavuconazole

**According To Sinuses Involvement,**

- FESS /Endoscopic debridement
- Maxillectomy

**Ophthalmic Management –**

- Retrobulbar transcutaneous amphotericin injection (34 patients)
- Exenteration (11 patients)

**Results**

In our analysis of 180 patients, 45 patients were 31-40 years (24%), 64 were 41-50 years (36%), 49 were 51-60 years (27%) and 22 were older than 60 years (13%). 136 patients were male (75%) and 44 were female (25%).

**Table 1: Describes the demographic details including the presenting age of patients to the hospital**

GENDER	No. Of Patients	Percentage
MALE	136	75%
FEMALE	44	25%
TOTAL	180	100%
Age	No. Of Patients	Percentage
30- 40	45	24%
41-50	64	36%
51-60	49	27%
61-70	22	13%
TOTAL	180	100%

**Table No.2- Distribution According to Visual acuity**

VISUAL ACUITY	No. Of Patients	Percentage
No PL	20	11.11 %
Between FC1m-6/60	43	23.89 %
>6/60	117	65 %
TOTAL	180	100 %

Out of 180 patients, Visual acuity in 20 had no PL vision (11.11%), 43 had between FC 1M to 6/60 (23.89%) and 117 had > 6/60 (65%).

**Table 3: Distribution According to Radiological findings**

FINDING	No. of Patients	Percentage
Orbital apex involvement	77	42.77
Cavernous sinus thrombosis	21	11.66
Others (sinusitis, erosions of walls)	82	45.55
TOTAL	180	100

On radiological examination ,77 (42.7%)patients had orbital apex involvement and 21(11.6%) patients had cavernous sinus thrombosis.

**Table 4: Distribution According to Retinal Findings and co morbidity associated**

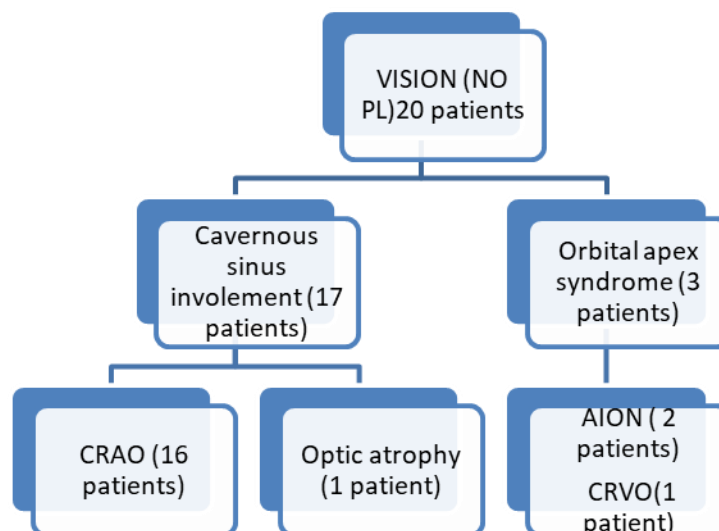
RETINAL FINDING	No. Of Patients	Percentage
Central retinal artery occlusion	19	10.55%
Central retinal vein occlusion	4	2.20%

Anterior ischemic optic neuropathy	2	1.10%
Secondary Optic atrophy	1	0.55%
Diabetic/hypertensive retinopathy	120	66%
Normal fundus	34	20%
<b>TOTAL</b>	<b>180</b>	<b>100%</b>

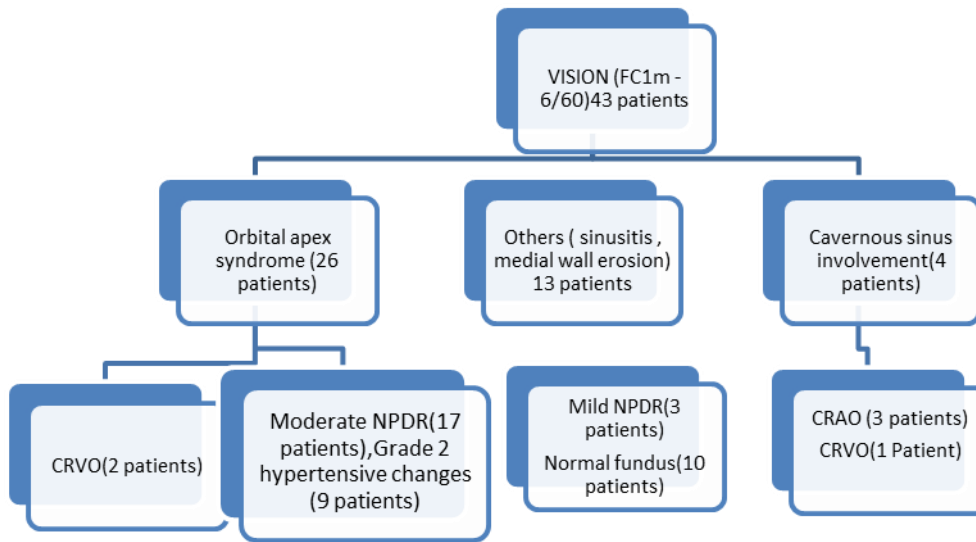
Among them, 100 had Diabetes mellitus (55.5%), 45 had Hypertension (25%) and 35 had Hypertension plus Diabetes Mellitus(29%).

CO-MORBIDITY	No. Of Patients	Percentage
Diabetes	100	55
Hypertension	45	25
Diabetes plus Hypertension	35	20
<b>TOTAL</b>	<b>180</b>	<b>100</b>

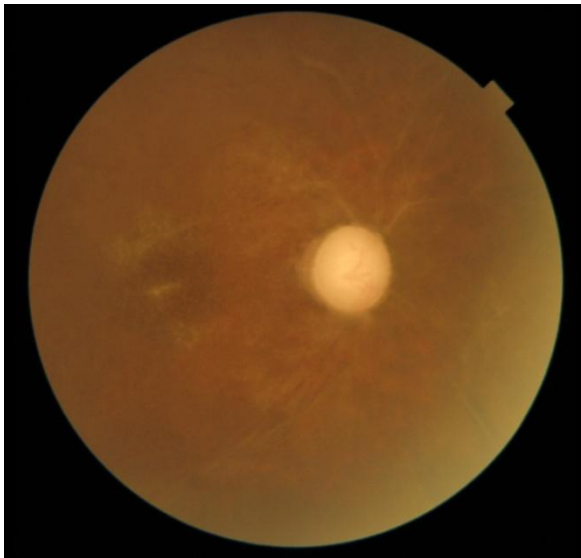
**Co –Relation between vision and retinal finding**



**Co –Relation between vision and retinal finding**



**OPTIC ATROPHY**



**DIABETIC RETINOPATHY**



**Discussion-**

Mucormycosis is aggressive opportunistic infection occurring in the immune-compromised patients. The pathogen is ubiquitous, occurring naturally in the environment, the body surface, and orifices. The spores inoculate the paranasal sinuses and the nasopharynx with subsequent spread to the orbit and intracranial cavity in persons with decreased cellular and humoral defences [7]. The pathogen invades the vascular lamina propounding the inflammation with infarction and necrosis. White *et al.* stated that the

mortality rate among Covid-19 patients with mucormycosis is 53 per cent, while those without mucormycosis have a reduced mortality rate of 31 percent [8]. Along with the COVID-19 infection, this disease causes vision threatening manifestations and can lead to permanent blindness. To evaluate this, a study of retinal findings in such patients was carried out in our institute.

In our retrospective study, 180 patients were included. Out of 180 patients with mucormycosis median age was between 41-50 (36%), with

maximum patients were men 136(75%) and rest 44 patients (25%) were female. This is comparable with other studies in which it is observed that, the mean age of patients was 51.9 years with a male preponderance (71%)<sup>[9]</sup>.

Out of 180 patients, Visual acuity in 20 had no PL vision, 43 had between FC 1M to 6/60 and 117 had > 6/60. Visual loss was observed in 80% of patients, compared with 65% reported by Yohai et al and 25% by Ferry et al<sup>[10]</sup>.

It is observed that patients with COVID-19 are more vulnerable to fungal infection because of the compromised immune system. Due to systemic comorbidities like Diabetes mellitus, mucormycosis potentiates to more severe symptoms. This requires intensive care unit admission or mechanical ventilation. In our study also Diabetes mellitus (55%) was the commonest comorbidity followed by hypertension (25%).

On radiological examination, 77 patients (42.77%) had orbital apex involvement and 21 patients (11.66%) had cavernous sinus thrombosis whereas other patients had findings of sinusitis. The maxillary sinus was the most common sinus involved. In other research, orbital apex was involved in 24.3 per cent of patients, and cavernous sinus thrombosis was seen in 19.5 per cent and sinusitis in 68.2% of patients.<sup>[11]</sup>

Marinho *et al.* have described retinal findings which include subtle cotton wool spots and microhaemorrhages associated with COVID-19<sup>[12]</sup>. Relatively in our study on ophthalmic evaluation, 19 patients had CRAO, 4 patients had CRVO, 2 patients had AION, 1 patient had optic atrophy and 120 patients had incidental vascular findings of diabetic/hypertensive retinopathy.

In other study, it was attributed that central retinal artery occlusion in seven, endophthalmitis in two, cavernous sinus thrombosis in four, while in others orbital vascular involvement could have been the possible cause for retinal involvement in A Bhansali *et al* study<sup>[13]</sup>

Thus, patients with NO PL had mostly retinal ischemia involvement either with CRAO or CRVO along with orbital apex or cavernous sinus involvement showing the Angio invasiveness of mucormycosis infection. This study suggests the correlation between the vision loss and retinal finding in

the mucormycosis patients along with the cerebral involvement confirming that Rhino-orbital-cerebral mucormycosis is an invasive and often fatal form of mucormycosis occurring in several immunocompromised states including diabetes along with covid-19, which is the most common (60%–81%) predisposing factor.

The Successful treatment of rhino-orbital mucormycosis includes:

- (1) Early diagnosis;
- (2) Aggressive surgical debridement including exenteration, if necessary;
- (3) Establishment of adequate sinus drainage;
- (4) Intravenous amphotericin B;
- (5) Control of the predisposing systemic disease.

### Conclusion

Mucormycosis an aggressive disease presents as a sequelae of Post Covid 19 infection. Haematological abnormalities with risk of thromboembolic phenomenon are known in COVID-19 eventually leading to ocular complications with loss of vision. Also, the control of diabetes and limitation of steroid intake should be considered in high-risk patients. Thus, detection of Rhino Ocular mucormycosis at an early stage, with prompt debridement and systemic therapy can decrease the risk of vascular occlusion thus preventing irreversible blindness.

### References

1. Sharma S, Grover M, Bhargava S, Samdani S, Kataria T. Post coronavirus disease mucormycosis: a deadly addition to the pandemic spectrum. *J Laryngol Otol* 2021;1–6. <https://doi.org/10.1017/S0022215121000992>
2. James C Orcutt, MD, Department of Ophthalmology RJ-10, University of Washington, Seattle WA 98195, USA. *British Journal of Ophthalmology*, 1989, 73, 680-683 Orbital mucormycosis with retinal and ciliary artery occlusions
3. Stef Levolger, MD, PhD, Reinoud P. H. Bokkers, MD, PhD, Jan Wille, MD, PhD, Rogier H. J. Kropman, MD, PhD, and Jean-Paul P. M. de Vries, MD, PhD, Groningen and Nieuwegein, The Netherlands Arterial thrombotic complications in COVID-19 patients 2020;6:454-9
4. Carotid Artery Occlusion by Rhino orbital cerebral Mucormycosis Faisal Al-Otaibi,1

- Monirah Albloushi,<sup>2</sup> Hindi Alhindi,<sup>3</sup> and Michael S. Timms<sup>4</sup> Volume 2012, Article ID 812420, 4 pages doi:10.1155/2012/812420
5. Sheth JU, Narayanan R, Goyal J, Goyal V. Retinal vein occlusion in COVID-19: A novel entity. *Indian J Ophthalmol* 2020;68:2291-3.
  6. RHINO-ORBITAL-CEREBRAL MYCOSIS AND CAVERNOUS THROMBOSIS D.M. LII,<sup>2</sup> P.P. SHANG<sup>1</sup>, L. ZHU<sup>3</sup> and G.S. DE HOOG<sup>2</sup> Vol. 12, no. I, 1-10 (2014)
  7. Joshi, S., Telang, R., Tambe, M., Havaldar, R., Sane, M., Shaikh, A....Mave, V. (2022). Outbreak of Mucormycosis in Coronavirus Disease Patients, Pune, India. *Emerging Infectious Diseases*, 28(1), 1-8. <https://doi.org/10.3201/eid2801.211636>.
  8. White et al 29. White PL, Dhillon R, Cordey A, Hughes H, Faggian F, Soni Set al. A national strategy to diagnose COVID-19 associated invasive fungal disease in the ICU. *Clin Infect Dis* 2020. Epub 2020 Aug 29
  9. Sen M, Honavar SG, Bansal R, Sengupta S, Rao R, Kim U, Sharma M, Sachdev M, Grover AK, Surve A, Budharapu A, Ramadhin AK, Tripathi AK, Gupta A, Bhargava A, Sahu A, Khairnar A, Kochar A, Madhavani A, Shrivastava AK, Desai AK, Paul A, Ayyar A, Bhatnagar A, Singhal A, Nikose AS, Bhargava A, Tenagi AL, Kamble A, Nariani A, Patel B, Kashyap B, Dhawan B, Vohra B, Mandke C, Thrishulamurthy C, Sambare C, Sarkar D, Mankad DS, Maheshwari D, Lalwani D, Kanani D, Patel D, Manjandavida FP, Godhani F, Agarwal GA, Ravulaparthi G, Shilpa GV, Deshpande G, Thakkar H, Shah H, Ojha HR, Jani H, Gontia J, Mishrikotkar JP, Likhari K, Prajapati K, Porwal K, Koka K, Dharawat KS, Ramamurthy LB, Bhattacharyya M, Saini M, Christy MC, Das M, Hada M, Panchal M, Pandharpurkar M, Ali MO, Porwal M, Gangashetappa N, Mehrotra N, Bijlani N, Gajendragadkar N, Nagarkar NM, Modi P, Rewri P, Sao P, Patil PS, Giri P, Kapadia P, Yadav P, Bhagat P, Parekh R, Dyaberi R, Chauhan RS, Kaur R, Duvesh RK, Murthy R, Dandu RV, Kathiara R, Beri R, Pandit R, Rani RH, Gupta R, Pherwani R, Sapkal R, Mehta R, Tadevall S, Fatima S, Karmarkar S, Patil SS, Shah S, Shah S, Shah S, Dubey S, Gandhi S, Kanakpur S, Mohan S, Bhomaj S, Kerkar S, Jariwala S, Sahu S, Tara S, Maru SK, Jhavar S, Sharma S, Gupta S, Kumari S, Das S, Menon S, Burkule S, Nisar SP, Kaliaperumal S, Rao S, Pakrasi S, Rathod S, Biradar SG, Kumar S, Dutt S, Bansal S, Ravani SA, Lohiya S, Ali Rizvi SW, Gokhale T, Lahane TP, Vukkadala T, Grover T, Bhesaniya T, Chawla U, Singh U, Une VL, Nandedkar V, Subramaniam V, Eswaran V, Chaudhry VN, Rangarajan V, Dehane V, Sahasrabudhe VM, Sowjanya Y, Tupkary Y, Phadke Y; members of the Collaborative OPAI-IJO Study on Mucormycosis in COVID-19 (COSMIC) Study Group. Epidemiology, clinical profile, management, and outcome of COVID-19-associated rhino-orbital-cerebral mucormycosis in 2826 patients in India - Collaborative OPAI-IJO Study on Mucormycosis in COVID-19 (COSMIC), Report 1. *Indian J Ophthalmol*. 2021 Jul;69(7):1670-1692. doi: 10.4103/ijo.IJO\_1565\_21. PMID: 34156034; PMCID: PMC8374756.
  10. A} Yohai RA, Bullock JD, Aziz AA, et al. Survival factors in rhino-orbital-cerebral mucormycosis: major review. *Surv Ophthalmol* 1994;39:3–22. B} Ferry AP, Abedi S. Diagnosis and management of rhino-orbitocerebral mucormycosis (phycomycosis): a report of 16 personally observed cases. *Ophthalmology* 1983;90:1096–104.
  11. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8438433>
  12. Marinho PM, Marcos AAA, Romano AC, Nascimento H, Belfort R Jr. Retinal findings in patients with COVID-19. *Lancet*. 2020 May 23;395(10237):1610. doi: 10.1016/S0140-6736(20)31014-X. Epub 2020 May 12. PMID: 32405105; PMCID: PMC7217650.
  13. Bhansali A, Bhadada S, Sharma A, Suresh V, Gupta A, Singh P, et al. Presentation and outcome of rhino-orbital-cerebral mucormycosis in patients with diabetes. *Postgrad Med J* 2004;80:670-4.
  14. R Coll Physicians Edinb 2021; 51: 352–8 | doi: 10.4997/JRCPE.2021.407 ORIGINAL RESEARCH PAPER Clinic
  15. “Mucovid-21” Study: Mucormycosis at An Indian Tertiary Care Centre during the Covid-19 Pandemic (sagepub.com)