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Visual Complications of surgeries for Rhino-Orbital Mucormycosis in patients previously infected with COVID 19 in a Tertiary Eye Care Centre in Central India – A Case Series

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Abstract
Purpose *– To report a case series of eight patients presenting with decrease or sudden loss of vision after surgery for Rhino-orbital mucormycosis who were previously infected with Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) confirmed COVID-19.* ***Method*** *–We analysed visual complications and causes of decrease or loss of vision in nine eyes of eight patients undergoing surgical interventions. Detailed ophthalmic examination was done. Patients were analysed for clinical features, findings of nasal endoscopy, laboratory and radiological investigations, surgical intervention and visual complications.* ***Result*** *-Age ranged from 40 to 70 years. Ophthalmic examination revealed compressive optic neuropathy, partial and total optic atrophy as main causes of post operative decrease in vision, other causes being central retinal artery occlusion (CRAO) and branched retinal vein occlusion (BRVO).* ***Conclusion****- Post operative decrease in vision was most commonly found after FESS surgery in patients of 40-50 years aged males, most common cause being partial optic atrophy.*

Keywords- *Rhino-orbital mucormycosis, Optic nerve injury, Optic nerve compression, Functional Endoscopic sinus surgery, COVID 19, Mucormycosis*

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I. INTRODUCTION

Amidst pandemic of COVID-19 disease, patients are acquiring secondary infections like mucormycosis known as black fungus disease. Mucormycosis is an invasive opportunistic fungal infection rapidly affecting patients with past history of COVID-19. It is characterised by infection of paranasal sinuses and nasal cavity. It is rare fulminating opportunistic fungal infection that spreads rapidly, hence prompt diagnosis and treatment are necessary to avoid high rate of morbidity and mortality.[1]Treatment involves multi-drug therapy with corticosteroids, antibiotics, saline irrigation, mucolytics and decongestants. When medical therapy is unsuccessful, Functional Endoscopic Sinus surgery (FESS) may be recommended for symptom improvementand/or it may be followed by endoscopic debridement and orbital decompression to prevent visual loss.[2] Major complications of FESS have been reported which includes intraorbitalhemorrhage, optic nerve damage, extraocular muscle damage, cerebrospinal fluid leak, orbitalinjuries, meningits.[3,4,5]Optic nerve damage may occur during operations involving ethmoid and sphenoid sinuses.[4,7] Injury to the optic nerve may result in immediate or delayed blindness.[2,8]

II. METHODS

This is a non-interventional observational study of patients with past history of RT-PCR confirmed COVID-19 disease. It involves evaluation of patients coming to department of Ophthalmology and Otorhinolaryngology with symptoms of headache, nasal blockage, proptosis, eyelid swelling. They were radiologically, microbiologically and histopathologically diagnosed with Rhino-orbital Mucormycosis with or without orbital and cerebral involvement. Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) scan of PNS, brain and orbit were obtained to assess the extent of disease. Patients were admitted, treated medically and were operated by single senior Otorhinolaryngologist. Primary FESS and endoscopic debridement was done. Repeat endoscopic debridement and orbital decompression was done in few patients.

Patients having normal or same vision pre and post operatively were excluded. Pre and post operative ophthalmic evaluation was done which included measurement of best corrected visual acuity (BCVA), anterior

segment examination, intra-ocular pressure and fundus examination. Causes of decrease or loss of vision after surgical intervention were assessed.

III. RESULTS

Nine eyes of eight patients were included of which six were males and two were females with age ranging from 40-70 years, average age being 55 years. Pansinusitis was found in four patients. Multi-sinus involvement was seen in other four patients. Intra-orbital extension was seen in five patients.

Three patients underwent primary surgery for mucormycosisviz two patients underwent endoscopic debridement with orbital decompression and one patient underwent bilateral endoscopic debridement. Five patients underwent both primary and secondary surgery. Orbital decompression was done in six patients with no improvement in vision.

Pre-operative visual acuity in all nine eyes was more than or equal to 6/60. Post-operatively, none of the eye had visual acuity ranging from 6/6 to 6/18. One patient each had visual acuity ranging from 6/24 to 6/60, <6/60 to 3/60 and <3/60 to 1/60. Six eyes of five patients had visual acuity ranging between 1/60 to no perception of light. One patient had bilateral loss of vision.

Post-operatively, three eyes had partial optic atrophy. One eye each had total optic atrophy, CRAO and BRVO. Three eyes had compressive optic neuropathy.

Table no 1: Showing pre-operative visual acuity of patients

Preoperative visual acuity on Snellen's Chart	Number of patients
6/18 - 6/6	3
6/60 – 6/18	5
3 metre – 6/60	0
1 metre – 3 metre	0
No PL – 1 metre	0

Table no 2: Case wise details of Pre and post-operative visual acuity, Fundus Findings and Causes of Decrease or loss of vision

Case	Pre-operative visual acuity		Post-operative visual acuity		Post-operative pupillary reaction		Post-operative fundus findings	Causes
	OD	OS	OD	OS	OD	OS		
1	6/24	6/24	6/24	4/60	NSRTL	NSRTL	Slightly pale disc OS	Partial Optic Atrophy OS
2	6/9	6/9	6/12	No PL	NSRTL	RAPD	No significant changes OS	Compressive Optic Neuropathy OS
3	6/24	6/18	PL+ PR inaccurate	6/18	Fixed not reacting to light	NSRTL	Pale optic disc OD	Partial optic Atrophy OD
4	6/60	6/36	FC 2m	6/36	NSRTL	NSRTL	Dilatation of veins. Flame shaped and dot blot hemorrhages with few hard exudates in inferior half of retina OD	Inferior hemiretinal Branched retinal vein occlusion with macular edema OD
5	6/24	6/24	6/24	No PL	NSRTL	RAPD	Severe arteriolar narrowing, pale retina, cherry red spot OS	Central Retinal Artery Occlusion OS
6	6/60	6/60	6/60	No PL	NSRTL	fixed not reacting to light	Totally pale disc OS	Total Optic Atrophy OS
7	6/12	6/18	PL+ PR inaccurate	No PL	NSRTL	fixed not reacting to light	No significant changes in both eyes	Compressive Optic Neuropathy in both eyes
8	6/12	6/12	6/24	6/12	NSRTL	NSRTL	Slightly pale disc OD	Partial Optic Atrophy OD

PL – Perception of light
PR – Projection of rays
NSRTL – Normal size reacting to light
RAPD – Relative Afferent pupillary defect

Case Reports:

Case One

40 year old male came with swelling and pain over left side of face and drooping of left upper eyelid. CT PNS and Orbit showed bilateral pansinusitis along with bony erosion of bilateral lamina papyracea seen with minimal extension into bilateral orbits along their medial walls suggestive of intra-orbital extension. BCVA was 6/24 in both eyes pre-operatively. Patient underwent Bilateral Endoscopic debridement followed by Right partial maxillectomy with Revision Bilateral Endoscopic debridement with Bilateral Orbital Decompression. A month later patient had decrease in vision of left eye (LE). BCVA was 4/60 and fundus showed LE partial optic atrophy.

Case Two

47 year old male came with pain over left side of face. CT PNS and Orbit showed Pansinusitis. Preoperative BCVA was 6/9 in both eyes. Patient underwent Bilateral Endoscopic Debridement. Patient had sudden loss of vision in LE after one day having no perception of light (PL) and relative afferent pupillary defect (RAPD). Fundus LE was normal. He was diagnosed as having LE compressive optic neuropathy.

Case Three

50 year old male came with swelling over right side of face, proptosis, ptosis and chemosis with restriction of ocular movements in right eye (RE). CT PNS and Orbit showed bilateral sphenoid, ethmoid and frontal sinusitis

with multiple small abscess and intracranial extension with perineural spread. BCVA was 6/24 in RE and 6/18 in LE. Patient underwent Right sided FESS. 20 days later he had loss of vision in RE. He had PL with inaccurate projection of rays (PR) and pupil fixed not reacting to light in RE. Fundus revealed RE partial optic atrophy.

Case Four

51 year old male came with swelling and pain over right side of face, proptosis and chemosis in RE. CT PNS and Orbit showed right frontal and maxillary, bilateral ethmoid, bilateral sphenoid sinusitis with erosion of right lamina papyracea, anterior wall of maxillary sinus with intra-orbital extraconal extension of soft tissue into right orbit. BCVA was 6/60 in RE and 6/36 in LE. Patient underwent Endoscopic debridement with Right Orbital Decompression.15 days later patient had decrease in vision of RE. BCVA was finger counting at two metre distance and fundus revealed inferior hemiretinal BRVO and macular edema. Patient had one episode of raised blood pressure in hospital for which he was started on anti-hypertensives.

Case Five

53 year old female patient, a known case of hypertension and diabetes mellitus came with pain in LE and maxillary area, drooping of left upper eyelid. MRI PNS and Orbit showed Bilateralethmoid, sphenoid, frontal and maxillary sinusitis. BCVA was 6/24 in both eyes. Patient underwent Bilateral FESS with Endoscopic debridement. Three days later patient had sudden loss of vision in LE. There was no PL with RAPD in LE. Fundus revealed CRAO in LE. Patient had elevated inflammatory markers including CRP, IL-six, ferritin, fibrinogen and D-dimer.

Case Six

65 year old male came with proptosis, ptosis and redness in LE. CT PNS and Orbit showed Pansinusitis with involvement of nasal cavity on both sides with involvement of medial and lateral intra and extraconal compartment of left orbit with extension to orbital apex involving intraconal compartment, optic nerve, left medial rectus, superior and inferior oblique. BCVA was 6/60 in both eyes. Patient underwent Bilateral Endoscopic debridement. He had sudden loss of vision in LE after 15 days. There was no PL with pupil fixed not reacting to light in LE. Fundus revealed LE total optic atrophy.

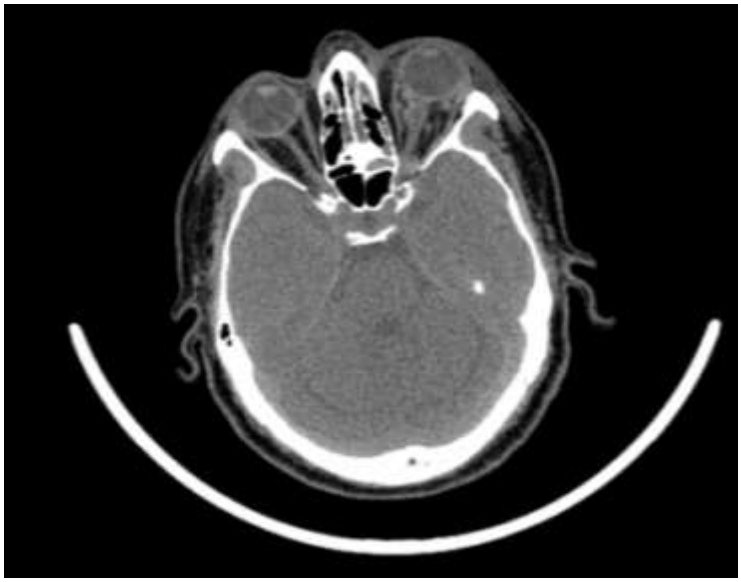
Case Seven

67 year old female came with nasal blockage, headache with no ocular complains. CT PNS and Orbit showed left pansinusitis with right sphenoid sinusitis. BCVA was 6/12 in RE and 6/18 in LE. Patient underwent Bilateral FESS with Endoscopic Debridement. After 2 days she had sudden loss of vision in both eyes. PL was present with inaccurate PR with normally reacting pupil in right eye and no PL and semidilated fixed pupil in LE. Fundus in both eyes was within normal limits. Patient was diagnosed with compressive optic neuropathy in both eyes.

Case Eight

40 year old male came with headache. CT PNS and Orbit showed Bilateral Pansinusitis with no intraorbital extension. BCVA was 6/12 in both eyes. Patient underwent Bilateral Endoscopic debridement. A month later he had decrease in vision in RE. BCVA was 6/24 and fundus revealed RE partial optic atrophy.

Ocular findings in 3 patients post-operatively
1. OD semidilated pupil with congestion and chemosis
2.OS semidilated pupil
3. OS Exotropia



CASE 2 - OS PROPTOSIS WITH INVOLVEMENT OF EXTRAOCULAR MUSCLES AND OPTIC NERVE

CASE 3 OD MILD PROPTOSIS WITH INVOLVEMENT OF SINUSES

CASE 4 - OD PROPTOSIS WITH BONY EROSION

CASE 7 OS PROPTOSIS

Table no 3: Showing case wise details

Case	Age in years	Sex	Preoperative BCVA OD OS	Sinuses involved	Name of the Surgery	No of times surgery done	Post-operative Complaints	Post operative day of loss of vision	Postoperative BCVA OD OS	Cause of decreased Visual Acuity
1	40	Male	6/24 6/24	Bilateral Pansinusitis	-Bilateral Endoscopic debridement -Right partial maxillectomy+Revision Bilateral Endoscopic debridement with Bilateral Orbital Decompression	1 1	Diminution of vision OS	1 month	6/24 4/60	OS Partial Optic Atrophy
2	47	Male	6/9 6/9	Pansinusitis	-Bilateral Endoscopic Debridement -Left Orbital Decompression and Suction Clearance	2 1	Sudden Loss of vision OS	1 day	6/12 No PL	OS Compressive Optic Neuropathy
3	50	Male	6/24 6/18	Bilateral sphenoid,ethmoid and frontal sinusitis	-Right side FESS -Endoscopic debridementwith Right Orbital Decompression	1 1	Diminution of vision OD	20 days	PL+ 6/18 PR inaccurate	OD Partial optic Atrophy
4	51	Male	6/60 6/36	Right frontal, right maxillary sinus, bilateral ethmoid, bilateral sphenoid sinus	-Endoscopic Debridement with Right Orbital Decompression	1	Diminution of vision OD	15 days	FC 2m 6/36	OD Inferior hemiretinal Branched retinal vein occlusion with macular edema
5	53	Female	6/24 6/24	Bilateral ethmoid, sphenoid, frontal and maxillary sinusitis	-FESS with Endoscopic debridement -Revision Endoscopic Debridement with Left Orbital Decompression	1	Sudden loss of vision OS	3 days	6/24 No PL	OS Central Retinal Artery Occlusion
						1				
6	65	Male	6/60 6/60	Bilateral ethmoid, maxillary sinusitis	-Bilateral Endoscopic Debridement -Left Partial Maxillectomy with Left Orbital Decompresion	1 1	Sudden loss of vision in OS	15 days	6/60 No PL	OS Total Optic Atrophy
7	67	Female	6/12 6/18	Left pansinusitis with right sphenoid sinusitis	-Bilateral FESS with Endoscopic Debridement -Endoscopic Debridement under GA	1 1	Sudden Loss of vision in both eyes	2 days	PL+ No PL PR inaccurate	Both eye Compressive Optic Neuropathy
8	40	Male	6/12 6/12	Bilateral Pansinusitis	Bilateral Endoscopic Debridement	1	Diminution of vision in OD	1 month	6/24 6/12	OD Partial Optic Atrophy

BCVA - Best Corrected Visual Acuity

IV. DISCUSSION

Mucormycosis is a fungal infection caused by saprophytic fungi living on decomposing matter. The aetiological agent belongs to family Mucoraceae of class Zygomycete. The four most common genera associated with disease in humans are Rhizopus, Absidia, Cunninghamella and Mucor. The most common pathogenic species is Rhizopusoryzae followed by R. microsporus and Absidia corymbifera.[1,9,10,11]

Rhino-orbito-cerebral mucormycosis (ROCM) is a subtype of mucormycosis. This infection develops after fungal sporangiospores are inhaled into the paranasal sinus. The infection can spread to the orbits and cavernous sinuses, thereby extending into the cranial cavity. Early signs and symptoms of ROCM are similar to those of sinusitis and periorbital cellulitis. Patients with a progressing infection have cranial nerve palsies, eyelid swelling, ptosis, conjunctival injection, chemosis, proptosis, restricted eye movement and decreased vision. Symptoms of brain involvement include headache, confusion, hemiparesis and seizures. The mortality rate due to ROCM is very high due to its rapid spread.[1]

Patients came to Otorhinolaryngology and Ophthalmology out patient department with complains of headache, facial pain, numbness around face, decreased vision, periorbital pain and swelling, proptosis, lid edema, congestion, chemosis, conjunctivitis, decreased ocular movement. These patients were radiologically and histopathologically investigated and were diagnosed as Rhino-orbital mucormycosis. All patients underwent CT/MRI scan of paranasal sinuses, orbit and brain. Few patients had no or minimal ocular symptoms with normal vision pre-operatively. Few patients complained of visual loss post-operatively who were found to have optic atrophy.

The loss of vision in post operative period could be due to direct or indirect trauma to optic nerve intraoperatively, obstruction to local blood supplies, or optic nerve compression by retrobulbar hematoma.[2,4,8,12,13]There are many isolated cases of post operative loss or decrease in vision of patients leading to its permanent damage in due course of time. Optic nerve damage is a known and irreversible complication of sinus surgeries yet operative management was essential in above cases to stop rapid angioinvasion and perineural spread of mucormycosis.[6] Also the medical management of mucormycosis had its limitations due to rapid spread of infection, shortage of anti-fungal medications and also its adverse effects. India has recorded a high number of COVID 19 cases followed by high number of Mucormycosis cases creating enormous burden over the health care system leading to non-availability of beds, oxygen, medications. Hence, surgical management was the only way to halt spread of this life threatening disease. Thus, though the vision could not be saved, the lives of the patients were saved. Attempts were made to prevent complete loss of vision by orbital decompression but with little success.

V. CONCLUSION

In our study, post-operative vision loss was most commonly seen in males between 40-50 years of age in patients having pansinusitis. Most common cause of vision loss post-operatively was partial optic atrophy.

Thus, though the vision could not be saved, the primary aim of saving the lives of patients from this life threatening highly invasive fungal infection was achieved meticulously. Also utmost precautions should be taken while operating patients of mucormycosis to prevent trauma to optic nerve.

LIMITATION

The limitation of this case series is that a long follow up of patients could not be done. Also a more elaborate and generalised opinion could not be made due to small sample size.

DECLARATION OF PATIENT CONSENT

Written informed consent was taken from all patients.

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Nil

CONFLICTS OF INTEREST

Nil

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