



MR IMAGING OF RHINO-ORBITAL-CEREBRAL MUCORMYCOSIS IN POST COVID PATIENT: CASE SERIES

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ABSTRACT

Rhino-orbital-cerebral Mucormycosis also known as orbital zygomycosis. It is a life-threatening deadly complication in post covid patient presenting as pathological involvement of nasal cavity and paranasal sinuses with extension into orbital cavity and intracranial compartment as a result of fungal infection caused by fungi in the order Mucorales, mainly *Rhizopus oryzae*.

MATERIAL AND METHOD We present a case series of 5 patient who were biopsy/culture proven invasive rhino cerebral Mucormycosis in post covid-19 patient who were reviewed on MR imaging.

MR imaging were recovered from PACS in PMCH Patna and the data was analyzed.

RESULT Involvement of para nasal sinuses with adjacent fat standing was present in 100%, orbital involvement was seen in 80%, intracerebral involvement was seen in 60%, mastoiditis was present in 40% of the patient selected in our case series.

CONCLUSION MR imaging is helpful in early diagnosis when there is involvement of nasal, paranasal sinus and varying degree of orbital and cranial extension and associated with varying complication.

KEYWORDS : Mucormycosis, Paranasal sinuses, Retroantral space and Extra and Intraconal fat.

INTRODUCTION

Increased incidence of morbidity and mortality seen in post covid successfully treated patient due to emerging incidence of fungal infection in immunocompromised. Fungal infection is caused by saprophytic fungi belonging to the genera Mucorales and class zygomycetes commonly known as mucormycosis or black fungus. [1,2]

It basically affects those who are immunocompromised as it is an opportunistic infection which gets a sustainable environment in patient who are diabetic, post covid and long-term corticosteroid treatment. [3]

The patient of Mucormycosis initially present with fever, nosebleed, nasal discharge and formation of crusting. [4]

The disease starts with the involvement of sinuses, nasal cavity, orbit and its content and ultimately involve CNS via direct invasion i.e early osseous erosion, Angio invasion causing thrombosis and tissue necrosis and peri neural spread. [5]. The fungal infection can be non-invasive or in early stage i.e., confined to para nasal sinuses presenting as mucosal enhancement, mucosal thickening and invasive sinusitis where there is marrow edema and erosion in the wall of paranasal sinus causing osteomyelitis and inflammatory changes in the adjacent fat plane and collection in surrounding soft tissue resulting in phlegmon. [6]

MATERIAL AND METHODS

In this case series of 5 patient with imaging findings of acute invasive Rhino-Cerebral-Mucormycosis who had positive histopathology, culture on Sabouraud dextrose agar, KOH mount of the scrapings obtained from the turbinate of the infected patient. These patients were retrospectively evaluated for clinical signs and symptoms.

The MR imaging was done in GE health care machine which is made up of ultra-compact, active shielded superconducting magnet of 1.5 tesla magnetic field strength. Convention spin echo sequences in axial T1, T2 and FLAIR, coronal and sagittal T2, post contrast axial, sagittal and coronal T1 sequences, axial DWI and ADC sequences, T2 GRE sequence. Special sequences such as T2 fat sat coronal and axial scan were taken for better delineation of para nasal sinuses and adjacent soft tissue. For sagittal scan of orbit planning was

done on axial plane parallel to optic nerve and T2 sagittal and post contrast T1 scan was taken.

CASE 1

MR imaging of brain, PNS and orbit of a 45-year male with history of COVID-19 1 month back. The patient was on steroid during the treatment with uncontrolled RBS and had type II diabetes mellitus. On imaging B/L maxillary sinusitis was present (right > left) appearing hyperintense on T2 and FLAIR sequence. Inflammation was seen in B/L retro antral and premaxillary fat plane (right > left). The retroantral inflammation on right was very extensive involving the pterygoid muscle. Post contrast enhancement of the mucosal surface with non-enhancing part of right middle turbinate was seen suggestive of necrosis. Mastoiditis was noted in right mastoid air cells. B/L ethmoid, sphenoid and right frontal sinus was involved. Edema was noted in both frontal lobe and right anterior temporal lobe with abscess formation in B /L frontal lobe measuring 4.8x2.9 on right and 3.3x1.3 on left. The peripheral rim of the abscess and intracavitary projection was showing restricted diffusion and marginal blooming was present. Extension of the infection in right orbit was present. Inflammation of both extra and intraconal fat was present, extraocular muscle were inflamed and bulky leading to proptosis of globe. Optic neuritis was present.

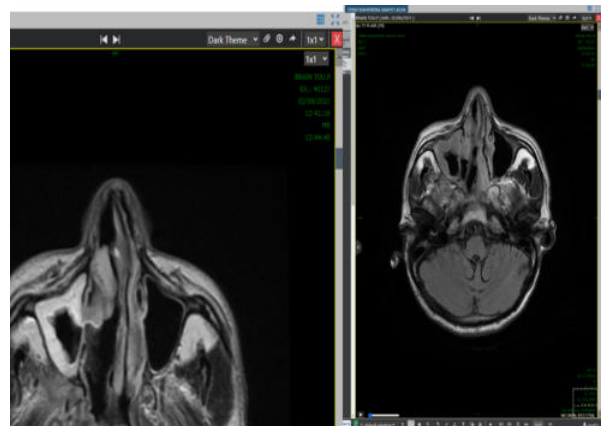


Figure 1: (a) T2 and; (b) FLAIR images showing Bilateral maxillary sinusitis (right > left) showing hyperintensity and mucosal thickening.

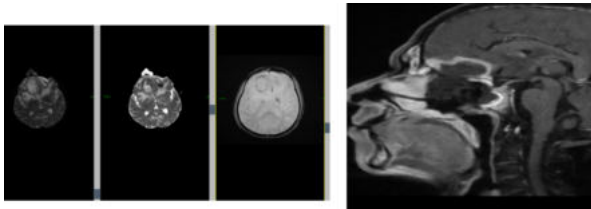


Figure 2: (a) Fungal abscess in both frontal lobe showing restricted diffusion in the periphery and intracavitary projections on DWI and ADC sequence and blooming on GRE sequence. (b) Non enhancing middle turbinate due to necrosis and appearing as black turbinate.

CASE 2

A case of post covid-19 45-year male having history of type II diabetes mellitus and was on steroid therapy during the course of treatment. However, his RBS was under control as he was on regular insulin. On MR imaging hyperintensity was seen in B/L maxillary sinus(right>left) suggestive of fungal sinusitis as there was retro antral fat inflammation which was more on left with involvement of pterygoid muscle. Sinusitis was also noted in B/L ethmoid and sphenoid sinus. Involvement of right orbit was seen i.e., inflammation of extra and intraconal fat and diffuse involvement of all the extraocular muscle leading to proptosis of the globe. On T2 fat sat images inflammation was more prominent due to suppression of adjacent fat. At M1 segment of right MCA focal dilatation of vessel with flow void on T2WI and contrast enhancement on T1 post gadolinium contrast was seen suggestive of aneurysm due fungal infection leading to weakening of wall. There was hyperintensities along the convexities in parietal region suggestive of subarachnoid haemorrhage and intraventricular haemorrhage was also noted with fluid- fluid level seen in B/L lateral ventricle and the dependent fluid was showing blooming. Infarct was noted in right hippocampal region and posterior limb of internal capsule.

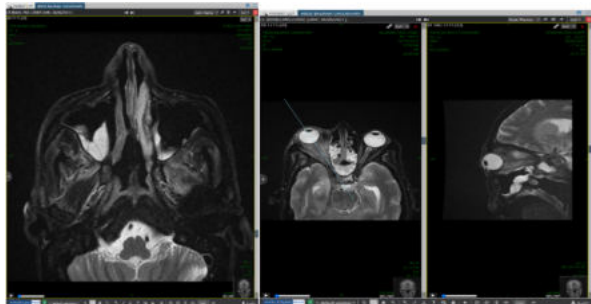


Figure 3: (a)Hyperintensities in both maxillary sinus with inflammation of retroantral fat and pterygoid muscle; (b) Inflammation is seen in extra and intraconal fat and extraocular muscles of right orbit causing proptosis.

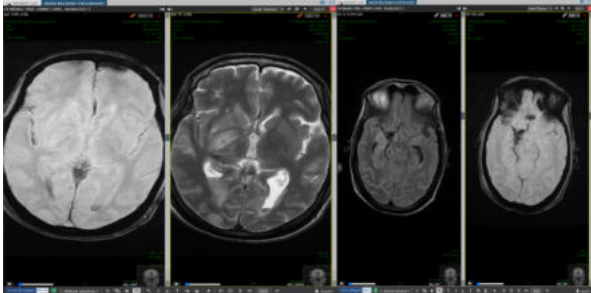


Figure 4: (a)Aneurysm seen at M1 segment of MCA with subarachnoid and intraventricular haemorrhage ;(b) Infarct seen involving right hippocampus and posterior limb of internal capsule.



Figure 5: T1 post gadolinium contrast enhancement of right MCA aneurysm is seen.

CASE 3

A plain MR study of brain, PNS and orbit of 40-year-old male with history of covid-19, 2 months back. The patient had past medical history of type II diabetes mellitus and was given steroid treatment. Fungal sinusitis involving left maxillary sinus and inflammation of retroantral fat and pterygoid muscle on left was seen. Sinusitis involving both ethmoid and frontal and left sphenoid sinus was present. Both orbits were normal in this case. Left side mastoiditis was present. Left sided cavernous sinus thrombosis appearing hyperintense on T2/ FLAIR sequence and loss of flow void from C2 to C5 segment of ICA i.e., from petrous to cavernous segment. Left side MCA, ACA and distal part of ICA appear normal.

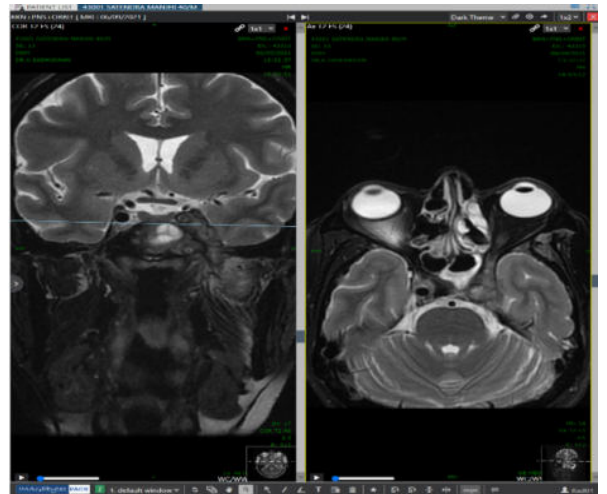


Figure 6 :Left side cavernous sinus thrombosis and loss of flow void in Left ICA due to extension of fungal infection from left maxillary sinus via the pterygoid venous plexus into cavernous sinus via vascular invasion.

CASE 4

A case of 40-year-old male who had COVID-19, 2 month back. Previous history of type II diabetes mellitus was not documented but during the illness his RBS was in range of 200-300 which came below baseline with subcutaneous injection of regular insulin. The patient was given steroid during the treatment. Fungal sinusitis was given in B/L maxillary sinus (right>left) and inflammation of retroantral fat and pterygoid muscle was noted (right>left) which

appeared hyperintense on T2 fat sat images .Inflammation was seen B/L premaxillary soft tissue extending upto periorbital soft tissue causing orbital cellulitis. Sinusitis was also seen in B/L ethmoid, sphenoid and frontal sinus. Inflammation of extra and intraconal fat and extraocular muscle of right orbit with restricted diffusion seen along the right optic nerve on DWI/ADC sequence due to perineural invasion causing optic neuritis.

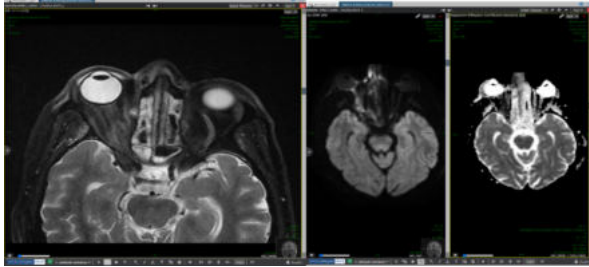


Figure 7: (a)Inflammation seen in right extra and intraconal fat and extra ocular muscles with; (b) optic neuritis and orbital cellulitis due to invasive mucormycosis.

CASE 5

A case of 55 year old female who was tested positive for covid -19 by RTPCR 14 days back and was given moist O2 inhalation at local hospital, she was referred to tertiary care centre PMCH, Patna as the condition worsen .HRCCT chest and MR brain, PNS and orbit was done. Right side fungal sinusitis with extension into retroantral fat and pterygoid muscle was noted. Inflammation in right premaxillary soft tissue was present with pansinusitis. Inflammation of extra and intraconal fat, extra ocular muscles and optic neuritis was present . Neuritis involving right side 2nd and 5th nerve which was showing restricted diffusion on DWI/ADC sequence. Fungal cerebritis involving right cerebellar hemisphere due to peri neural invasion of right 5th nerve was seen. Mastoid air cells were clear.

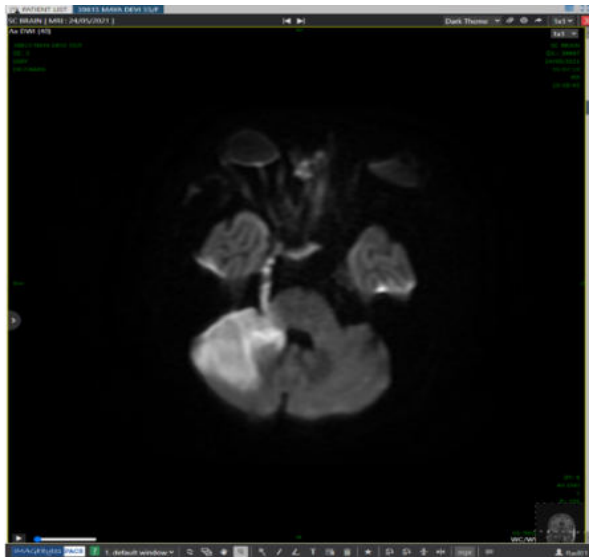


Figure 8: Fungal cerebritis in right cerebellar hemisphere due to perineural spread of infection via right trigeminal nerve and right sided optic neuritis.

DISCUSSION

Mucormycosis is an invasive fungal infection most common form being the rhinocerebral, although it can involve different body organ.[1] It is more common in patients who are immunocompromised and in patient with uncontrolled diabetes mellitus. Patient having hematological malignancy, long term corticosteroid treatment, organ transplantation or on immunosuppressive drug are affected and it is rarely seen in patient having AIDS [5]. The infection is picked up by

inhalation of spores which reaches the nasal cavity and paranasal sinuses from where there is spread of infection to extra sinus site like the orbit via nasolacrimal duct and brain via direct invasion from pterygoid venous plexus draining into cavernous sinus and perineural spread. In the early-stage MR imaging finding are nonspecific like mucosal thickening so radiological and clinical correlation is suggested. In the later/ advanced stage extent of disease involvement and complication associated with it can be diagnosed early with MR imaging [6]. Early involvement of the cavernous sinus can be detected by MR imaging appearing as hypointense on T1 and T2 weighted image and post contrast non enhancing sinuses and enhancement of the Dural wall is seen[7].

In our case study of 5 patient of proven mucor mycosis show the involvement of para nasal sinuses with involvement of maxillary sinus in invariably all of these patient followed by other paranasal sinuses like ethmoid, sphenoid and frontal, from the maxillary sinus there is involvement of retroantral fat plane and extension of the disease into the infra temporal fossa involving lateral and medial pterygoid muscle and then further involvement of masticator space is seen in some of these cases . Intra cranial extension of the fungal infection is via direct invasion by the fungal element and other mode of spread being perineural and perivascular involvement in which no any obvious bony erosion is noted[6].

On T2 WI the fungal element are noted as linear hypointense strands present in the hyperintense collection within the sinuses due to presence of iron and manganese in the fungal element [8].

The invasive fungal/extrasinus involvement can present as inflammatory changes in retro-antral and premaxillary fat and fat stranding in pterygopalatine fossa and extraconal and intraconal fat. Extra sinus complication associate with invasive mucormycosis like orbital cellulitis, cavernous sinus thrombosis and ICA thrombosis can detected by MR imaging[9,10].

CONCLUSION

In our case series of 5 patient invasive fungal sinusitis MR imaging reveals hyperintense signal on T2WI in maxillary sinus with hypointense linear strands and hypointense foci seen within it with suggest it to be fungal hyphae and inflammatory changes seen in retro-antral and pre maxillary fat plane and pterygopalatine fat pad. Various extra sinus complication are seen in our case study like intracerebral abscess, mycotic aneurysm with IVH, infarct, meningitis, cavernous sinus thrombosis, orbital cellulitis, optic neuritis, perineural spread along the 5th nerve.

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