



IMAGING IN RHINOCEREBRAL MUCORMYCOSIS

Radiology

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KEYWORDS

INTRODUCTION:

Corona epidemic has brought many infections to the fore one of these is mucormycosis. It is a fungal disease which occurs in patients with underlying conditions such as diabetes, malignancies, patients who have undergone organ transplantation and patients on long term steroid administration are susceptible to mucormycosis. Infection commonly occurs through inhalation of fungal spores from air. Mucormycosis is not contagious, that is it does not spread from one person to another. Recently, several patients have reported to hospital around the 3rd week after onset of symptoms of COVID-19 with features suggestive of sinonasal disease. It is suspected that the increase in number of cases of mucormycosis in these patients is possibly due to misuse or overuse of steroids that leads to uncontrolled hyperglycemia. Some clinicians have suggested that use of industrial oxygen instead of medical oxygen, unhygienic humidifiers, prolonged ICU stay and unwarranted administration of antibiotics may have predisposed the patients to develop mucormycosis. The diagnosis and treatment is based on imaging by CT Scan and MRI. Here we describe imaging findings in patients of rhinocerebral mucormycosis presenting to department of Radiodiagnosis.

MATERIAL & METHOD:

Nine patients reported to the department of Radiodiagnosis who had recently recovered from COVID-19 and had symptoms suggestive of paranasal or orbit infection. On clinical evaluation, they underwent NCCT PNS and CEMRI as per standard protocol on 40 slices or 128 slice CT scanner as per availability and 3T MRI Scanner.

RESULTS: The Findings on CT and MRI are detailed in table given below.

| Involvement | No. of Cases |
|---------------------------------------|--------------|
| Mucosal thickening of paranasal sinus | 09 |
| Bone thinning and erosion | 09 |
| Small muscle | 09 |
| Orbital fat | 08 |
| Optic nerve | 08 |
| Periorbital soft tissues | 07 |
| Cavernous sinus enhancement | 02 |
| Cavernous sinus thrombosis | 00 |
| Intracranial | 02 |

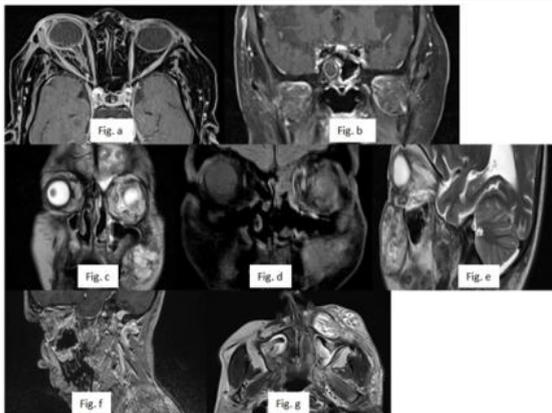


Fig a) Post Gadolinium axial section shows proptosis with enhancement of periorbital soft tissues and perineurium of optic nerve

with fat stranding of orbital fat. **b)** Enhancing thickened mucosa of the maxillary antrum. **c, d, e, f & g)** Involvement of periorbital and infratemporal soft tissue is seen on coronal, sagittal T2 and post gadolinium scans axial.

DISCUSSION:

Physicians have been trying different drugs to treat COVID-19 infection with varying results. Steroids immunosuppressant and some antibiotics have shown significant benefits. However long term use of this therapy has thrown up some unusual side effects. Recently several cases of Rhinocerebral mucormycosis have been diagnosed. Mucormycosis is a commensal and is found ubiquitously.

CT scan and the MRI are the mainstay in the diagnosis and management of rhinocerebral mucormycosis. CT scan may reveal a spectrum of changes as the disease progresses which is very fast. Early changes include mucosal thickening which may be polypoidal in nature. There may be erosions in the sinuses walls. There may be hyperdense foci in the maxillary, ethmoid, sphenoid and frontal sinuses. Enhanced MRI studies will confirm the diffuse mucosal enhancement which may be nodular or polypoidal. Imaging may also reveal non-enhancement of left nasal turbinates (black turbinate sign). The disease spread may involve to other areas like orbit and brain through perineural extension and rectus muscle. The disease may also spread to infratemporal fossa, pterygopalatine fossa and masticator space etc. There may be involvement of vessels leading to angioinvasion. There may be involvement of facial muscles suggestive of necrotizing cellulitis. More precise evaluation of orbit and cerebral involvement can be diagnosed by MRI as MRI has high spatial and tissue resolution.

Involvement of orbital soft tissues can be well seen on MRI. Involvement of orbital apex leads to painful ophthalmoplegia. Extension of infection to cavernous sinus manifests as dural enhancement and can lead to cavernous sinus thrombosis. Intracranial thickening and enhancement is best seen on MRI. Fungal hyphae may spread via skull base foramina and also cause erosion of skull base. CEMRI has the highest sensitivity to assess involvement of orbital apex, cavernous sinus and intracranial spread. Involvement of cavernous segment of internal carotid artery may appear as arterial wall enhancement. ICA thrombosis may occur and predispose the patient to ischemic stroke either by thromboembolic small infarcts or complete occlusion leading to large area ischemia. Fungal hyphae do not enhance however inflammatory reaction surrounding the hyphae enhances. Hence debridement of the abnormal non enhancing soft tissues is to be done. Some of these may not be visible to the operating surgeon under direct vision. This is where MRI has a major role to play to demonstrate spread of fungal infection. Diagnosis of mucormycosis is confirmed on endonasal biopsy and/ or post operative excised tissue.

CONCLUSION:

Mucormycosis is an opportunistic infection caused by mucoral fungus. It is highly invasive and very aggressive infection in immunocompromised and diabetic patients. The incident has markedly increased in patients who recently recovered from COVID-19. Imaging is the basis of defining the extent of the disease. All involved areas need to be excised prior to starting specific antifungal treatment. Hence understanding the imaging findings is vital.

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