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Cross Sectional Study Of Radiological Features Of Acute Invasive Fungal Sinusitis At Tertiary Referral Hospital.

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ABSTRACT

This retrospective study aimed to investigate the computed tomography (CT) and magnetic resonance imaging (MRI) features of rhino-orbital acute invasive fungal sinusitis (AIFS) in 40 patients with histopathologically confirmed cases. Conducted at ESIC Medical College Sanathnagar, a tertiary referral hospital, the study comprehensively reviewed CT and MRI scans to delineate the imaging characteristics of AIFS. The findings underscored the limitations of relying solely on imaging for a definitive diagnosis of fungal sinusitis. Instead, the study emphasized the complementary role of imaging in conjunction with clinical examination, emphasizing the need for a multidisciplinary approach to enhance diagnostic accuracy. While imaging provided valuable insights into the extent of the disease, the study concluded that a holistic evaluation combining clinical and imaging findings is essential for a comprehensive understanding of rhino-orbital AIFS. This holistic approach ensures a more accurate diagnosis and facilitates informed decision-making in the management of this potentially serious condition.

Keywords: Acute Invasive Fungal Sinusitis, Imaging Characteristics, Multidisciplinary Approach.

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INTRODUCTION

20% of the human population are affected by rhinosinusitis and it's a inflammatory disorder of nose and paranasal sinuses [1]. Hora proposed the classification of invasive and noninvasive variants of fungal sinusitis in 1965 [2]. McGill³ reported the fulminant variant of fungal rhinosinusitis in 1980 when he detected rhinocerebral fungal infection. Fungal rhinosinusitis can be divided into invasive FRS and non-invasive fungal sinusitis and Invasive fungal sinusitis further classified into chronic IFRS, granulomatous IFRS, and acute (fulminant) IFRS.¹

Acute invasive fungal sinusitis is a rapidly progressive infection that is having mortality rate of up to 18%. Acute invasive fungal sinusitis is most commonly seen in immunocompromised persons. Up to 93% of these infections occur in individuals with an underlying malignancy. Uncontrolled Diabetes mellitus is also a predisposing factor. Zygomycetes fungi, including Rhizopus, Rhizomucor, and Mucor species, are the most common infectious fungi in persons with diabetes mellitus. Covid-19 patients seem to be more susceptible to mucormycosis infection due to the over-expression of inflammatory cytokines and impaired cell-mediated immune response. This susceptibility increases with immunocompromised status. Corticosteroids usage in the management of COVID19 have been identified as a potential risk factor for invasive infection, due to the induced reduction of immune function and altered glucose homeostasis. Invasive fungal sinusitis spreads from nose to and paranasal sinuses to the orbit brain and surrounding structures. Orbit can be involved through lamina and nasolacrimal duct. Identification of the changes on CT and MRI can help in making a diagnosis of fungal sinusitis and extent of the disease. MRI provides better visualization of the extent of the disease because of soft-tissue contrast. It shows the involvement of the orbital soft tissue, infratemporal fossa, intracranial structures, and perineural invasion and vascular obstruction better than CT.

MATERIALS AND METHODS

Ethical Clearance

Approved by Ethics Committee, ESIC Medical College Hyderabad.

Inclusion Criteria

All patients presenting to the ENT Department with histologically proven Rhino-Orbital Acute invasive fungal sinusitis.

Exclusion Criteria

Cerebral involvement

This is a retrospective study and a total of 40 patients with invasive fungal sinusitis which are histopathologically confirmed and those who underwent CT PNS and Contrast MRI at our centre with same protocols are identified and selected for this study.

All 40 patients underwent non contrast CT scan of nose and paranasal sinuses and contrast enhanced MRI of nose and paranasal sinuses. Radiologist's opinion was obtained and the radiological findings were analysed.

MRI Nose and Paranasal sinuses imaging including axial, coronal and sagittal T1 weighted, T2-weighted images and fat suppressed post contrast T1 weighted images were taken. MRI imaging was performed using 1.5 T Siemens

RESULTS

Table 1: Demographic Profile

Gender	Number Of Cases	Percentage
Male	26	65%
Female	14	35%

Age Group	Number Of Cases	Percentage
21-30	0	0%
31-40	5	12.5%
41-50	15	37.5%
51-60	16	40%
61-70	3	7.5%
71-80	1	2.5%

Table 2: Clinical Presentation

Symptom	Number Of Cases	Percentage
Fever	30	75
Headache	28	70
Nasal Discharge	22	55
Nasal Congestion	22	55
Facial Swelling	14	35
Facial Pain	16	40
Facial Numbness	9	22.5
Decreased Vision	8	20

Table 3: Status Of Diabetes

	Number	Percentage
Diabetic	28	70%
Non Diabetic	12	30%

COVID Affected	31	77.5%
Non Covid Affected	9	22.5%

Table 4: Sinuses And Areas Involved

Name Of The Sinus	No Of Cases	Percentage
Maxillary	40	100%
Ethmoid	40	100%
Frontal	24	60%
Sphenoid	17	42.5%
Premaxilla	7	17.5%
Infratemporal fossa	7	17.5%
Orbit	22	55%
Pterygopalatine fossa	11	27.5%

Table 5: CT Features

CT Feature	Number	Percentage
No enhancement	13	32.5
Mild enhancement	23	57.5
Heterogenous	4	10
Bony erosion	8	20
Mucosal thickening	40	100

Table 6: MRI Features

MRI Feature	Number	Percentage
T1 W signal Hypointense	40	100
T2W signal Isointense	20	50
T2 W Heterogenous	15	37.5
T2 W Hyperintense	11	27.5
Central non enhance with rim enhancement	4	10

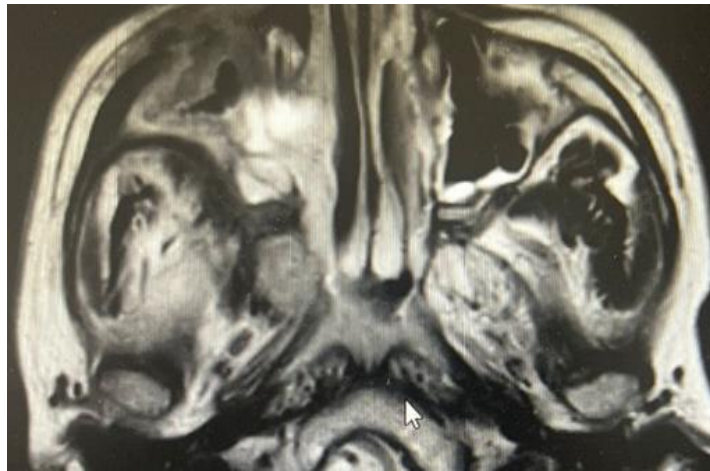
Picture 1: T2 Patterns in mucormycosis. T2 MRI showing hyperintense pattern involving the maxillary sinus.



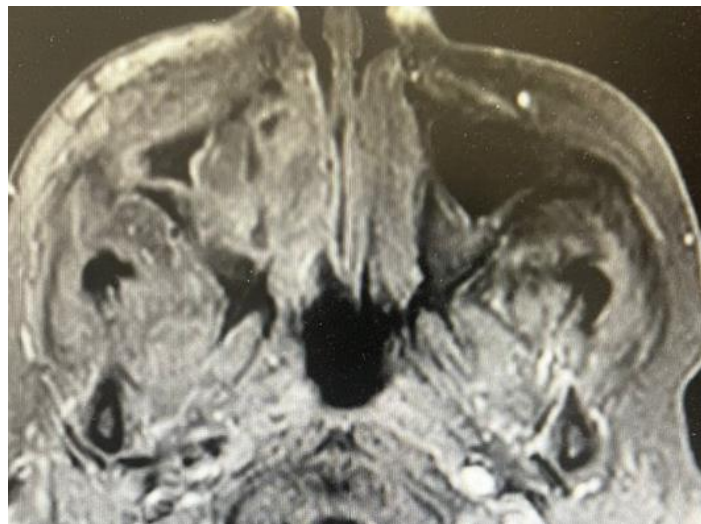
Picture 2: T1 Patterns in mucormycosis. T1 MRI showing hypointense pattern involving the maxillary sinus



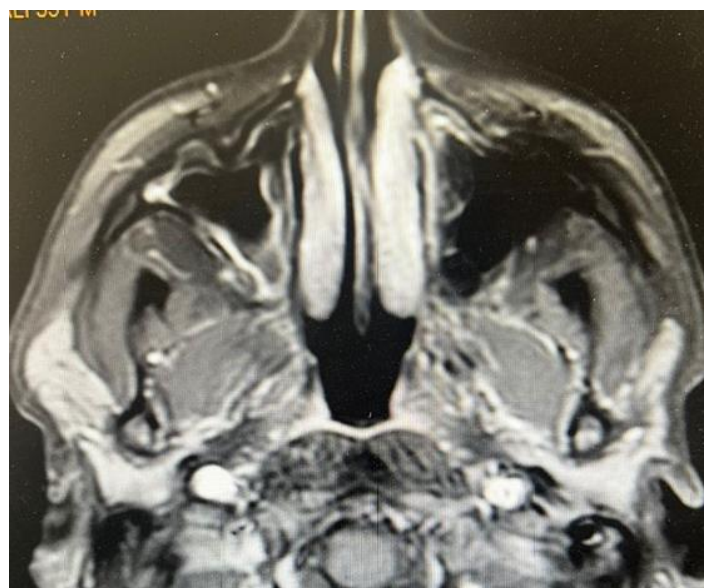
Picture 3: T2 MRI showing Heterogeneous pattern involving the maxillary sinus



Picture 4: T1 W signal Hypointense on axial cuts



Picture 5: T1 Post Contract Axial MRI shows variable intense pattern



DISCUSSION

In the present study patients presented with symptoms of fever, headache, nasal discharge and nasal obstruction, facial pain and facial numbness. Fever is the most common presenting feature, presented in 75% cases and least common symptom is decreased vision in 20% cases. Present study showed that 41-to-60-year age group is most commonly affected and this is similar to the results of Therakathu J et al., [4] who studied a total of 43 patients with invasive fungal sinusitis and found that 40 to 60 age group is most commonly affected.

And in the studies done by Singhal A et al., [5] and Sarkar S et al., [6] showed that 60% to 50% of patients belongs to 40 to 60 age group, respectively.

Males are most commonly affected in the present study and is similar to the results of Therakathu J et al., and Singhal A et al. 5. In the present study the Maxillary sinus and Ethmoid sinus are the most commonly involved sinuses and seen in all cases, followed by frontal sinus in 60% and these findings are correlated to studies by Therakathu J et al., [4], in that study the ethmoid and maxillary were involved in 86% and 79% respectively. In a study by Kondapavuluri S K et al., [7] on sinonasal mucormycosis patients presented with maxillary and ethmoid sinus involvement in majority of the cases.

In the present study CT scan shows no enhancement in 32.5% cases and mild enhancement in 57.5% cases and heterogenous enhancement in 10% cases and bony erosions seen in 20% cases and mucosal thickening is seen in all cases and these findings are correlating with study done by Silverman et al. 8. 80 percent cases has shown no bony erosion though they have extensive fungal disease, it might be due to perivascular invasion of the fungus without destroying the bone [8].

20 % cases shown bony erosion and all the cases in the present study presented with mucosal thickening in any sinus. these findings are similar to gamba et al [9].

MRI shows mucosal thickening in sinuses in early stage of the disease, so clinical suspicion is mandatory for early pick up of this condition. Necrotic mucosa appears as non-enhancing tissue on contrast-enhanced MR imaging. Invasion to the orbit through the Ethmoid sinus.

Imaging is done mainly for the extent of disease,

Upon imaging with MR

T1 W images shows hypointense in all the cases and T2 iso intense soft tissue lesions in (50%) cases and 37.5% cases show T2 heterogeneous soft tissue lesions and T2 hyperintense mucosal thickening (27.5%) cases. MRI post contrast shows Hypointense patterns and Intense enhancement pattern and Heterogeneous enhancement patterns.

Premaxillary, retromaxillary fat, orbital fat stranding is suggestive of invasive fungal infection on imaging.

In a study by Mangal R et al., [10] on rhino-orbito cerebral mucormycosis in 67 post COVID-19 patients, on MRI, they found the mucosal thickening was hypointense on the T1W sequence and various signal intensities on T2W sequence. In the present study, similar findings were demonstrated [11].

Results of this study are well correlated with other studies like Yousem DM et al [12] and Terk MR [13] et al and Middlebrooks EH [14] et al. They also show variable signal intensities on both T1W and T2W images.

Due to necrosis of the nasal mucosal tissue, there will not be any contrast enhancement and on contrast imaging, peripheral mucosal enhancement and central non enhancing lesions can be seen which is termed as black turbinate sign and it is the early finding of mucormycosis on MRI.

In a retrospective review by Seo J et al., [15] 17 of their 23 patients with AIFS demonstrated this radiologic finding. In this study 'black turbinate sign' was seen in four cases in our study.

In the present study orbit is involved in 22 cases that is 55% cases in a study by Jindal G et al, [16] on the Imaging findings in invasive rhino orbito cerebral mucormycosis, they found that orbital invasion was seen in 73.3% of patients, Singhal A. et al., [5] on the study on imaging findings in COVID-19-related rhino-orbital mucormycosis found orbital involvement in 60%. Periantral fat obliteration is a sign of invasion.

The spread of disease from ethmoid to orbital is a feature of AIFRS.

CONCLUSION

In the present study imaging showed different patterns of enhancements and signal intensities. Most of the cases showed extra sinus involvement with different radiological patterns. So imaging alone to diagnose the fungal sinusitis can not be useful and imaging can be a complementary to clinical examination and for to know the extent of disease and route map.

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