

## ORIGINAL ARTICLE

## ORBITAL INVOLVEMENT IN SINONASAL DISEASES

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**Background:** Orbital involvement in sinonasal diseases can present as proptosis, ophthalmoplegia or even as blindness due to optic nerve damage. There are a number of sinonasal diseases which can involve eyes. The purpose of this study was to enlist diagnoses of all the patients with sinonasal disease, in which orbit was also involved unilaterally or bilaterally and to analyse the management strategy and final outcome in all the cases. **Methods:** Hundred consecutive patients having orbital symptoms along with sinonasal complaints that presented in ENT department of Shaikh Zayed federal postgraduate medical institute were included in our prospective study. CT scan and/or MRI were done in all the cases and ophthalmological consultation was done. Patients with sinonasal complaints without clinical involvement of orbit and those with primary orbital pathology were excluded from our study. Final diagnosis was made after histopathological confirmation. **Results:** A total of 37% of the patients were diagnosed to be having "Allergic fungal rhinosinusitis" 17% had "mucormycosis", 16% had "chronic invasive fungal sinusitis". Other pathologies identified were Nasopharyngeal CA (4%), Squamous cell Ca (4%), cavernous sinus thrombosis (3%), Adenocarcinoma (3%), Angiofibroma (2%) fibrous dysplasia (2%) and Acute complicated Rhinosinusitis (2%) Following rare pathologies were identified in only one patient each. These included Lymphoma, Osteoma, and Rhabdomyosarcoma, Transitional cell carcinoma arising from inverted papilloma, Hemangiopericytoma, Spindle cell sarcoma, Pituitary adenoma, Giant cell sarcoma, malignant undifferentiated tumour, plexiform neurofibroma and sinonasal tuberculosis. Most common orbital symptom was proptosis. Eighty-one patients had proptosis followed by 23 patients with diplopia, 22 patients with ophthalmoplegia, 16 patients with visual loss and 15 patients with ptosis. **Conclusion:** Orbital involvement in most of the sinonasal diseases indicate extensive and aggressive nature of the pathology and many of these, even if they are not malignancies are difficult to treat. This is especially true for acute fulminant and chronic invasive fungal rhinosinusitis.

**Keywords:** Sinonasal; Orbital; Proptosis; Rhinosinusitis

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## INTRODUCTION

It is not uncommon for orbit to be involved in sinonasal diseases, due to its close proximity to nose and paranasal sinuses. Orbital complications of acute rhinosinusitis are well recognized and described in text books.<sup>1</sup> There are many other conditions related to nose and paranasal sinuses, in which eyes get involved either unilaterally or bilaterally. Some of these can result in loss of vision and even can be life threatening. Early diagnosis and prompt treatment is necessary in these cases. Sometimes, orbital symptoms are predominating in patients with sinonasal pathology. Rarely visual disturbance or proptosis is the sole complaint of such patients.<sup>2</sup>

Purpose of our study was to enlist diagnoses of all the patients with sinonasal disease, in which orbit was also involved unilaterally or bilaterally. Diagnosis of the aetiology was based on histopathological confirmation supported by clinical, laboratory, and radiological evidence. Management strategy and final outcome in all the cases was also analysed.

## MATERIAL AND METHODS

Hundred consecutive patients having orbital symptoms along with sinonasal complaints that presented in ENT department of Shaikh Zayed federal postgraduate medical institute were included in our descriptive cross-sectional study. The sample size was estimated by using 95% confidence level 9% margin of error with expected frequency of 28.57.<sup>4</sup> After detailed history and examination, rigid nasal endoscopy with 2mm Hopkins rod was done under local anaesthesia in cooperative patients in the outdoor department. In other cases endoscopic evaluation was done under general anaesthesia during relevant surgical intervention, for example during biopsy taking in suspicious lesions. Ophthalmological consultation was done in all the cases, either in the outdoor department or after admission. Proptosis was measured with simple plastic ruler method. Vision was checked, extra-ocular muscle movements were noted and status of optic disc on both sides was observed in every case. CT scan and/or MRI were done in all the cases to see the radiological evidence of orbital involvement. Patients with sinonasal complaints without clinical

evidence of orbital involvement were excluded from our study. Final diagnosis was made after histopathological confirmation. The specimen for histopathology was acquired either at the time of initial biopsy or during the definitive surgical management of these patients, if indicated.

## RESULTS

Male to female ratio in our patients was 51:49. Mean age of presentation was 40.5 years with a range of 8–77 years. Sixty-four patients (64%) had unilateral disease while 36 patients (36%) had bilateral sinonasal disease. Thirty-nine patients (39%) were diagnosed to be having “Allergic fungal rhinosinusitis”. Seventeen patients (17%) had “mucormycosis”, 16 patients (16%) had “chronic invasive fungal sinusitis”.

Other pathologies identified were Nasopharyngeal Carcinoma, Squamous cell Carcinoma, Cavernous sinus thrombosis, Adenocarcinoma, Angiofibroma, Fibrous dysplasia and acute complicated rhinosinusitis. (Table-1)

Some rare pathologies that were also identified, included lymphoma, Osteoma, Rhabdomyosarcoma, Transitional cell carcinoma arising from inverted papilloma, Hemangiopericytoma, Spindle cell sarcoma, Pituitary adenoma, Giant cell sarcoma, Malignant undifferentiated tumour, and plexiform neurofibroma. One patient was diagnosed to be having sinonasal tuberculosis (Table-1).

Most common orbital symptom was proptosis. Eighty-one patients had proptosis, followed by 23 patients with diplopia, 22 patients with ophthalmoplegia, 16 patients with visual loss and 15 patients with ptosis. (Figure-1). It is to be noted that many patients in our study had combination of orbital complications and their symptoms, for example, patients with mucormycosis had maximum number of combinations of orbital signs and symptoms (Table-2).

Different sinonasal signs and symptoms present in our patients are shown in figure-2. All the 39 patients with allergic fungal rhinosinusitis underwent functional endoscopic sinus surgery (FESS). These patients were also prescribed preoperative and postoperative oral prednisolone and Itraconazole. Only one patient with unilateral visual loss and fixed dilated pupil did not improve after the FESS surgery.

All the other patients showed significant improvement in their nasal and orbital symptoms after the surgery. Two patients had unilateral ptosis, which completely recovered after a month of the surgery. Similarly ophthalmoplegia due to paresis of medial rectus muscle in 2 patients also completely improved after the treatment. A total of 56 percent of

patients with Allergic fungal rhinosinusitis had bilateral proptosis. Proptosis was measured, two months after the surgery. It was reduced to normal in 66 percent (26 out of 39) of patients. Pre and post treatment measurement of only one side was taken in all the patients with bilateral proptosis. The side with more proptosis and only one side was taken so that all the results of the study can be compared uniformly including those with unilateral proptosis

Emergency surgical debridement through lateral rhinotomy was performed in 14 patients with mucormycosis.<sup>3</sup> patients could not undergo such surgical debridement due to their serious comorbidities that did not warrant general anaesthesia. These 3 patients later on died because of the fulminant nature of their disease.<sup>8</sup> patients out of 14 with mucormycosis had unilateral total visual loss with fixed dilated pupil. Two of them, which include those who later on died, developed bilateral proptosis during the course of their disease. Ophthalmoplegia was noted in 6 patients with mucormycosis. This was absolute ophthalmoplegia with frozen eyes in contrast to partial ophthalmoplegia due to medial rectus muscle involvement seen in patients with allergic fungal rhinosinusitis.

Patients with chronic invasive fungal rhinosinusitis had to be managed with intravenous antifungals including Amphotericin B and/ or Voriconazole, followed by long term oral antifungal therapy. These were normal individuals without any comorbidity. They had to undergo surgical debridement to reduce disease load. This was done through lateral rhinotomy/medial maxillectomy approach. One patient with chronic invasive presented with unilateral visual loss, Ptosis and ophthalmoplegia (Figure-6). He had isolated sphenoid sinus disease, which had involved optic nerve. It was confirmed radiologically with MRI (Figure-7). His vision did not improve despite aggressive therapy. Ten patients with chronic invasive fungal rhinosinusitis had proptosis. All of these patients had unilateral disease. Five patients had ophthalmoplegia. It is important to mention here that this ophthalmoplegia was partial and all 5 of them had lateral rectus palsy due to abducant nerve involvement. This was the reason for their diplopia as well (5 patients). Three patients had complete recovery of this lateral palsy after treatment, and 2 showed partial improvement. Ten patients had to receive a second course of antifungal therapy because of the relapse. Three had to go surgery more than once. One patient ultimately developed sinocutaneous fistula as well, which was later repaired. (Figure 8 & 9). One patient had progressive disease despite two surgeries and antifungal treatment and ultimately developed hydrocephalus due intracranial extension of disease.

Out of our 100 patients, 4 were diagnosed as having nasopharyngeal carcinoma. All of them were later referred for chemo radiation after endoscopic biopsy. Presenting symptoms in these patients were diplopia due to cranial nerve palsies (Table-2). Headache and cervical lymphadenopathy were present. The youngest of these patients with nasopharyngeal carcinoma was of 8 years of age.

During our study, we received 3 patients with cavernous sinus thrombosis. Two had acute complicated rhinosinusitis and in one case the patient was suspected to have mucormycosis, though final histopathology could not be done. All three patients later died. They had bilateral proptosis and complete ophthalmoplegia. It is rare for angiofibroma to have orbital signs and symptoms unless it is an advanced tumour. Therefore only two patients with angiofibroma with orbital involvement were included in our study. One of them had intra axial extension into the brain and later died due to cavernous sinus involvement, despite surgical excision of the extra axial component followed by external beam radiation. On presentation he also had diplopia due to paralysis of extraocular muscles along with ptosis (Table-2).

There were 4 patients with squamous cell carcinoma and 3 patients with adenocarcinoma. All of these, except one had total maxillectomy done followed by external beam radiation. One patient with squamous cell carcinoma had unilateral visual loss and ophthalmoplegia and her orbital contents had to be exenterated. The only patient whom we did not operate was the one with adenocarcinoma of maxillary sinus .She had hepatic and intracranial metastatic disease and was referred to oncologist for palliative treatment. Two patients in our study were diagnosed as having complicated acute suppurative sinusitis. Both were initially managed with intravenous antibiotics but later on required surgical intervention because of danger of impending visual loss. One of these patients had diplopia and temporary ophthalmoplegia as well in addition to unilateral proptosis. Orbital decompression was done in both these cases through Lynch –Haworth incision. Other diseases that were seen in our study were some rare tumours (Table-1). These were managed accordingly. One patient was diagnosed as having sinonasal tuberculosis. The patient was started antituberculous treatment.

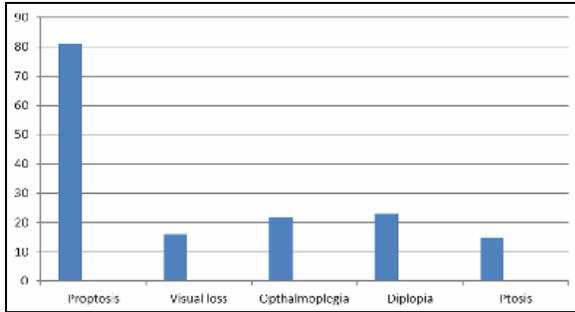
**Table-1: Final histopathology of patients**

Final Histopathology	Percentage
Allergic fungal Rhinosinusitis	39
Mucormycosis	17
Chronic Invasive Fungal Rhinosinusitis	16
Nasopharyngeal CA	4
Squamous Cell CA	4
Cavernous Sinus Thrombosis	3
Adenocarcinoma	3
Angiofibroma	2
Fibrous dysplasia	2
Acute pyogenic rhinosinusitis	2
Osteoma	1
Rhabdomyosarcoma	1
Transitional cell CA arising in Inverted Papilloma	1
Haemangiopericytoma	1
Spindle cell sarcoma	1
Pituitary adenoma	1
Giant cell Sarcoma	1
Tuberculosis	1

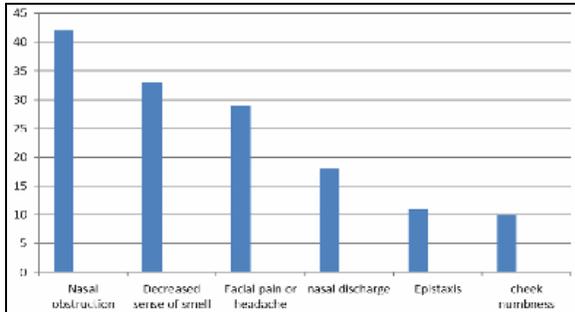
**Table-2: Orbital signs and symptoms presenting in patients with different sinonasal pathologies\***

Diagnoses of Patients	Total No. of Patients	patients with Proptosis		patients with visual loss		patients with Ophthalmoplegia		patients with Diplopia		Patients with Ptosis	
		n	%	n	%	n	%	n	%	n	%
Allergic Fungal Rhinosinusitis	39	37	95	1	3	2	5	4	10	2	5
Mucormycosis	17	14	82	8	47	6	35	8	47	8	47
Chronic invasive Fungal Rhinosinusitis	16	10	62	1	6	5	31	5	31	4	25
Nasopharyngeal Carcinoma	4	1	25	2	50	1	25	2	50	1	25
Squamous Cell Carcinoma	4	4	100	1	25	1	25	0	0	0	0
Cavernous sinus thrombosis	3	3	100	2	67	2	67	0	0	0	0
Adenocarcinoma	3	2	66	0	0	1	33	1	33	0	0
Angiofibroma	2	2	100	0	0	1	50	1	50	0	0
Fibrous dysplasia	2	1	50	0	0	1	50	0	0	0	0
Acute pyogenic rhinosinusitis	2	2	100	0	0	1	12	1	12	0	0
All Other Pathologies	8	5	62	1	12	1	12	1	12	0	0

\*Percentages in this table are overlapping percentages, with possibilities of one patient having more than one symptom leading to combination of orbital symptoms in one group of patients with similar diagnoses



**Figure-1: Numbers of patients presenting with different orbital signs and symptoms**



**Figure-2: Different sinonasal signs and symptoms of patients**



**Figure-3: A patient with Allergic fungal sinusitis having right sided proptosis**



**Figure-4: CT scan of patient in figure 3 showing opacification of paranasal sinuses with right sided intra orbital extension**



**Figure-5: Same CT scan as in figure 4, but on soft tissue settings, showing hyperintense shadows suggestive of fungal infection**



**Figure-6: Patient with left sided isolated sphenoid sinus chronic invasive fungal sinusitis**



**Figure-7: MRI of the patient in figure 6, showing sphenoid sinus disease with involvement of cavernous sinus and left temporal lobe of brain**



**Figure-8: Patient with left sided chronic invasive fungal sinusitis**

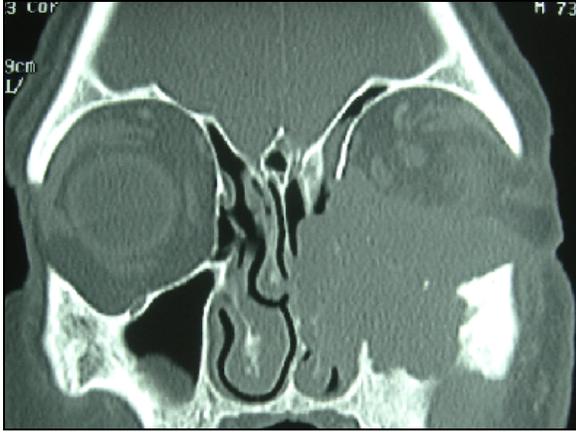


Figure-9: CT scan of the patient in figure 8

## DISCUSSION

Many sinonasal diseases have orbital signs and symptoms. Proptosis or exophthalmos can sometimes be a sign of a sinister pathology, not only primarily of the eyes but also of the other neighbouring structures e.g., that of nose and paranasal sinuses. Bilateral proptosis is many a times manifestation of cavernous sinus thrombosis. Endocrine pathologies e.g. Graves' disease may also give bilateral proptosis.<sup>3</sup>

In this study we included 100 patients and the most common sinonasal pathology that we found was 'Allergic fungal rhinosinosis'. Venugopal M and Sagesh M<sup>3</sup> stated that sinonasal malignancies were the most common pathologies found in their study. Fungal sinusitis was found in only 15.9% of the patients. Yousry Al Sayed<sup>4</sup> in his study on 28 patients found that 9 of his patients had bacterial sinusitis and 8 were diagnosed to be having allergic fungal sinusitis. Samil KS *et al*<sup>5</sup> in their results stated that mucocele was the most common sinonasal disease that presented as proptosis in their patients.

Squamous cell carcinoma was the most common malignancy found among all those who were diagnosed in our study to be having sinonasal malignancies. This is consistent with the study done by CHU Yang *et al*.<sup>6</sup>

Proptosis being the most common symptom in our study is consistent with the findings of Vikas Sinha *et al*<sup>7</sup> and Venugopal M<sup>3</sup>. Diplopia was less commonly seen in these studies, although this was the next most common orbital symptom in our study.(Figure-2). Nasal obstruction being the most common sinonasal symptom (Figure-2) in our study, also is similar to findings of other authors.<sup>3,7</sup>

Allergic fungal sinusitis is a disease most commonly found in immuno-competent patients.<sup>8,9</sup> Sometimes it can cause disfiguring telecanthus and proptosis (Figure 3). In these cases, there is massive polyposis along allergic fungal mucin, commonly called as 'fungal debris' by the otorhinolaryngologists.

Treatment is started after clinical and radiological diagnosis. The treatment includes oral steroids and functional endoscopic sinus surgery (FESS).The cosmetic disfigurement including telecanthus takes some months or years to come back, though proptosis sometimes recovers earlier. Visual loss if present is due to involvement of optic nerve, and one of our patients, who presented with unilateral blindness did not show improvement in visual impairment, even after aggressive treatment. The same was also reported by Iain s Dunlop.<sup>2</sup> The radiological diagnosis is with a plain CT scan, which shows opacification of paranasal sinuses along with expansile effect of disease on the lamina papyracea (Figure-4). The soft tissue films of CT show the hyperintense shadows, suggestive of fungal infection<sup>10,11</sup> (Figure-6). Occasionally MRI is required to rule out intra axial intracranial extension of disease (Figure-8).

Mucormycosis comprises of 17% of all the pathologies in our patients. It is an invasive life threatening disease found in immunocompromised patients.<sup>12</sup> It carries poor prognosis due to underlying debilitated condition of the patient and the aggressive nature of the disease. This was also detected by Biswas SS in their study.<sup>13</sup> Early loss of vision with fixed and frozen eye are the early signs of this disease. Treatment should ideally be started based upon clinical diagnosis sometimes supported by radiological evidence. Emergency surgical debriment is done in our department in all the cases of clinically diagnosed cases of Mucormycosis. Lateral rhinotomy approach is used in all these cases. An important factor in the treatment is control of the underlying disease e.g. diabetes mellitus. In addition, intravenous Amphotericin B is given to all these patients. Bilateral sinonasal involvement is a greave sign, and carries high mortality chances. Infect 2 out of our three patients, who died later on had bilateral disease .It is important to mention here, that none of the recently searched studies on PubMed showed significant number of these patients, who presented with proptosis in ENT departments.<sup>3,7</sup> This is contrary to our findings that 17 percent of our patients had Mucormycosis. One reason for this difference can be lack of awareness about mucormycosis not only among the patients but also among the primary physicians who treat diabetes and this could be reason for late presentation of patients with orbital involvement, and another factor could be poor control of diabetes in patients in this part of world, which obviously is a major contributing factor for development of mucormycosis

Chronic granulomatous invasive fungal rhinosinusitis is the next most common disease in our study. 16% of our patients were diagnosed with this

problem. In contrast to Mucormycosis, this disease is more prevalent in otherwise normal immune-competent people. All the patients had slowly progressive symptoms, which included proptosis, facial swelling and diplopia (Table-2) and (Figure-7). A total of 16% of Venugopal *et al*'s<sup>3</sup> patients were labelled to be having fungal sinusitis. If all of these cases were those of chronic fungal sinusitis, then these figures are exactly similar to ours. *Aspergillus* is the usual causative fungus, and this is a difficult disease to treat completely.

During the surgery, which is done in many cases for biopsy and excision of maximum diseased tissues, it is normally noted that macroscopically, the fungus has replaced the normal facial tissues with whitish tough fibrous mass. CT scan of such one patient is shown in figure-8. Four of our patients had to undergo more than one surgeries. Postoperatively these patients were given Amphotericin B followed by Itraconazole. One patient showed clinical resistance to above and was given intravenous followed by oral voriconazole. Our observations in these patients with chronic granulomatous invasive fungal sinusitis were somewhat consistent with the findings and results of Halderman *A et al*<sup>14</sup>. Authors in this publication have mentioned that there is no ideal management protocol of these patients. They have recommended oral voriconazole for these patients as according to them it was a safe drug, in comparison to other intravenous more toxic therapeutic agents. In another study, authors have compared Amphotericin B and Voriconazole. They concluded that both had same efficacy, but voriconazole had less side effects.<sup>15</sup> More clinical work and studies need to be done in this aspect.

Two of our patients had isolated sphenoid sinus disease and. Both had lateral rectus palsy, which improved with treatment. One patient also had ptosis (Figures-7 & 8). Lee *DH et al*<sup>16</sup> reviewed cases of sphenoid sinus fungal sinusitis. They divided these cases into acute and chronic. The chronic ones carried good prognosis, and improved with the endoscopic debridement and antifungal treatment.

A total of 15% of our patients were diagnosed with different sinonasal malignancies. Percentage of patients with malignancies in Venugopal *et al*'s study was 27.3%.<sup>3</sup> Squamous cell carcinoma was the commonest of these. This observation is similar to ours as squamous cell carcinoma is the commonest malignancy in our patients (Table-2). The treatment of these patients and also for some other malignancies including adenocarcinoma was total maxillectomy. Only one of these patients had orbital exenteration done, due to the extent of the disease. Eye can be preserved in many cases of sinonasal malignancies, even if the

tumour invades the orbital soft tissues.<sup>17</sup> All the patients with squamous cell carcinoma received post-operative radiotherapy. Patients with sarcoma and adenocarcinoma received neoadjuvant or adjuvant chemotherapy. One patient with adenocarcinoma was referred for palliative care as she had hepatic and intracranial metastasis on presentation.

Two patients in our study had acute complicated pyogenic rhinosinusitis. One had sub periosteal abscess with pus also present beneath periorbital skin. They required surgical drainage and intravenous antibiotics.

Angiofibromas with orbital involvement are usually extensive and both of our patients with angiofibroma had intra-axial intracranial extension and later died, despite extensive surgery after embolization.

There were some other rare pathologies seen in our patients (Table-1) .They were managed accordingly. There were total of seven mortalities among our 100 patients during their initial admission in our department. Four of them were patients of mucormycosis and three were diagnosed with cavernous sinus thrombosis.

## CONCLUSION

Orbital involvement in most of the sinonasal diseases indicate extensive and aggressive nature of the pathology and many of these, even if they are not malignancies are difficult to treat. This is especially true for acute fulminant and chronic invasive fungal rhinosinusitis. Prompt treatment requires early clinical diagnosis in these cases.

## AUTHORS' CONTRIBUTION

ZUSQ: Conceptualization of study, principle investigator, data collection and literature search, data interpretation. SL: Proof reading. SMA: Data analysis and write up

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