ORIGINAL ARTICLE

# COMPLICATIONS OF NOSE AND PARANASAL SINUS DISEASE

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**Background:** Diseases of nose and paranasal sinuses can complicate to involve the orbit and other surrounding structures because of their close proximity. These diseases are usually infective or can be neoplastic in origin. **Method:** All the patients presenting in ENT or Eye Departments of Ayub Teaching Hospital during the one year study period who had complicated nose or paranasal sinus disease were included in the study. A detailed history and examination followed by CT scanning and laboratory investigations to assess the type and extent of the disease, was carried out. **Results:** Infections were the most common cause of complicated sinus disease 11 (75%). The rest of the 4 (25%) cases were tumours. 12 (80%) of the cases presented with proptosis. In 1 of these 12 cases, there was complete blindness. In 2 (13%) of the cases there was only orbital cellulitis. Two of these patients had facial swelling and 2 had nasal obstruction and presented as snoring. Two patients presented with history of weight loss and these patients had malignant tumour of the paranasal sinuses. One patient presented with early signs of meningitis. In 1 case subperiosteal scalp abscess (Pott's puffy tumour) was the only complication noted. **Conclusion:** Nose and paranasal sinus diseases can complicate to involve mostly the orbit, but sometimes brain, meninges and skull bones can also get involved.

**Keywords:** Paranasal sinuses, orbital complications, complicated sinus disease, Pott's puffy tumour

## INTRODUCTION

Nose and paranasal sinuses are involved in a variety of diseases. These diseases are both infective and neoplastic. The infectious agents can be viral, bacterial or fungal. Sinusitis is a common condition. Serious complications of sinusitis, though less common since the advent of antibiotics, do occur. These include periorbital or orbital cellulitis, intracranial abscess or meningitis, subperiosteal scalp abscess 'Pott's puffy tumour', osteomyelitis, and cavernous sinus thrombosis. Similarly tumours involving the nose and paranasal sinuses can extend into the surrounding areas resulting in complications.

The orbit lies lateral to the ethmoid labyrinth and superior to the maxillary sinus. Orbit is a fixed bony cavity which is open only anteriorly. The proximity of the eye to the nose, paranasal sinuses and skull base makes it vulnerable to be involved in the diseases of this area.[1] Among infective diseases, bacterial and fungal sinusitis can extend into the orbital cavity easily. Gross polyposis can cause significant widening of the intercanthal distance.[2] Frontoethmoidal mucoceles can expand and can displace the globe after eroding into the orbit.

Tumours of paranasal sinuses are very much prone to involve the orbit. Among the benign tumours, osteomas and inverted papillomas might present as proptosis. But usually malignant tumors of the paranasal sinuses erode the orbital walls and present with orbital complaints.

Iatrogenic orbital trauma may occur during nasal and paranasal sinus surgeries, such as polypectomy, Caldwell Luc's operation, ethmoidectomy and antral lavage.

There are different orbital complications which are encountered in our clinical practice. The patient may present with proptosis of the eye. Young patients present with orbital complications more commonly[3], which can range from preseptal cellulitis and subperiosteal abscess and can go upto cavernous sinus thrombosis.

Complications involving structures other than the orbit are comparatively rare.[4] These include intracranial extension and bony erosion. Usually they present along with the orbital complications but may in rare cases occur as an isolated complication.

To assess for the type and extent of the disease we do radiological assessment of our patients. Different techniques available are plain X-rays, CT scanning, MRI scanning and ultrasound examination. Among these CT scanning of the nose and paranasal sinuses is the most useful.[5] It shows both the extent of the disease and the type of pathology involving the sinuses. In addition to these, the bony erosion can also be assessed quite accurately with CT scan.

Treatment is usually surgical. In a few cases of early preseptal cellulitis, antibiotics might resolve the condition completely. In most of the other pathologies we have to resolve to one of the surgical options along with the medical treatment.

## MATERIAL AND METHODS

The study was conducted at ENT department of Ayub Teaching Hospital Abbottabad. The study was

conducted for one year from April 2008 to March 2009. A total of 15 patients were included in the study. Their ages ranged from 1 to 75 years with a mean age of 39.13 years. Women were more commonly affected. Men to women ratio was 1:4.

All patients presenting to ENT or Eye Departments during the one year study period with one of the complications of nose and paranasal sinus disease were included in this study. Patients with primary pathology of the eye or some other organ which subsequently involved the nose or paranasal sinuses as a complication were not included in this study.

A total of 7 patients came to ENT Department of Ayub Teaching Hospital with the complaints of nasal problem which had complicated, and a total of 8 patients came to Ophthalmology Department with eye problems who were subsequently diagnosed as having primary disease in the nose or paranasal sinuses. A detailed history was taken with examination, which included a detailed ENT examination and eye examination using a slit lamp. In all of these patients, a CT scan of the nose and paranasal sinuses was performed to assess for the extent of disease and involvement of the orbital cavity. All patients were assessed for any other associated problems, both relating to the primary condition as well as for any other associated disease which might affect the treatment options.

## RESULTS

A total of 15 patients were included, of which (3) 20% were male and (12) 80% were females. Age range was 1–75 years (average age 39.13 years) (Table-1).

Most frequently involved sinus was maxillary sinus (60%) followed by ethmoid (50%). In most of the cases multiple sinuses were involved. Sphenoid sinus was not involved in any of the case of complicated sinus disease.

Both sides were equally affected by the disease. In 2 cases bilateral sinus disease was encountered, and in both these cases fungal infection was found which had also extended intracranially causing blindness. In both these cases neurosurgical team was involved in the treatment of the disease. In the rest of the 13 cases either right or left side was affected.

Infections were the most common cause of complicated sinus disease. Eleven (75%) cases were infectious in origin. Four out of these 11 cases were diagnosed as having fungal sinusitis. The rest of the 25% cases were tumours, both benign and malignant.

Proptosis was found in 12 (80%) cases. One case had complete blindness. But in rest of them only proptosis of varying degrees was noted. Out of these cases 6 (40%) patients had no other signs of any other complication. In 2 (13%) of the cases there was only orbital cellulitis. These cases were of comparatively younger age group. Two of these patients had facial swelling and 2 had nasal obstruction and presented as snoring. Two patients presented with history of weight loss and these patients had malignant tumours of the paranasal sinuses. One patient presented with early signs of meningitis. In 1 case subperiosteal scalp abscess was the only complication noted.

We further classified the patients according to the type of infectious diseases. There were 7 cases of bacterial infection and 4 cases of fungal sinusitis. Fungal infections posed a more serious problem. Only two cases in our study had bilateral sinus disease which was also complicated by intracranial extension. Both these cases were subsequently diagnosed as having fungal infection of the paranasal sinuses.

The patients who had bacterial infection and went into complications were 46.67%. These patients presented with a variety of complications which included periorbital cellulitis, proptosis. On radiological investigation three of these patients were diagnosed as having pyocele of the frontal sinus. But unfortunately these patients never got any treatment until the eye got involved.

We had 4 (25%) patients suffering from tumours. Among these, three were malignant extending into the orbit and only one was a benign which was presenting as facial swelling and proptosis. As the tumours had extended into the orbital cavity we resorted to multimodality treatment. We gave palliative chemoradiotherapy to two of these patients and one underwent surgery followed by radiation. The benign tumour was surgically excised.

Only 2 (13.33%) patients were treated conservatively. The rest of the patients needed some sort of intervention. The treatment option mostly used was external frontoethmoidectomy in 40% patients. Two (13.33%) patients were referred to Neurosurgery Department for clearance of the intracranial disease. One patient underwent incision drainage of the subperiosteal abscess followed by intravenous antibiotics (Table-2).

**Table-1: Age distribution of the patients**

| Age of Patients | No. of Cases | % |
|---|---|---|
| 0–10 Year | 2 | 13.33 |
| 11–20 Year | 0 | 0.00 |
| 21–30 Year | 2 | 13.33 |
| 31–40 Year | 4 | 26.67 |
| 41–50 Year | 2 | 13.33 |
| 51–60 Year | 3 | 20.00 |
| 61–70 Year | 1 | 6.66 |
| 71–80 Year | 1 | 6.66 |

**Table-2: Complications of Nose and Paranasal Sinus Disease**

| Age/ Gender | Sinus involved | Disease | Aetiology | Complications | Treatment given |
|---|---|---|---|---|---|
| 75/F | Frontal (Rightt) | Pyocele | Bacterial infection | Facial swelling, proptosis | Right external frontoethmoidectomy |
| 32/F | Frontal (Left) | Pyocele | Bacterial infection | Proptosis | Left external frontoethmoidectomy |
| 10/M | Maxillary/Frontal (Left) | Sinusitis | Bacterial infection | Snoring, preorbital cellulitis | Conservative |
| 23/F | Maxillary/Ethmoidal/ Frontal (Right) | Fungal sinusitis | Fungal infection | Proptosis | Frontoethmoidectomy |
| 33/F | Ethmoidal (Both) | Intracranial extension of fungal sinusitis | Fungal infection | Meningitis, blindness, proptosis | Referred to neurosurgical department |
| 42/F | Maxillary/Ethmoidal (Right) | Squamous cell carcinoma | Malignant tumour | Weight loss, proptosis | Palliative chemoradiotherapy |
| 1/F | Maxillary (Right) | Fibromyxoma | Benign tumour | Intracranial extension, proptosis | Surgical excision |
| 33/M | Maxillary/Frontal (Right) | Sinusitis | Bacterial infection | Pre-septal cellulitis | Conservative |
| 48/F | Frontal/Ethmoidal (Left) | Pyocele | Bacterial infection | Facial swelling, proptosis | Left external frontoethmoidectomy |
| 59/F | Maxillary/Ethmoidal/ Frontal (Left) | Fungal sinusitis | Fungal infection | Proptosis | Frontoethmoidectomy |
| 22/M | Maxillary/Frontal/ Ethmoidal (Rightt) | Sinusitis | Bacterial infection | Snoring, proptosis | Frontoethmoidectomy |
| 68/M | Maxillary (Left) | Squamous cell carcinoma | Malignant tumour | Weight loss, proptosis | Surgery and chemoradiotherapy |
| 35/F | Ethmoidal (Both) | Intracranial extension of fungal sinusitis | Fungal infection | Proptosis | Referred to Neurosurgery Department |
| 55/F | Maxillary/Ethmoidal (Right) | Squamous cell carcinoma | Malignant tumour | Proptosis | Palliative chemoradiotherapy |
| 51/M | Ethmoidal/Frontal (Left) | Sinusitis | Bacterial infection | Pott's puffy tumour | Antibiotics and incision drainage |

## DISCUSSION

The study showed a clear female preponderance in developing orbital complication. The female to male ratio in our study was 4:1. In a comparable study[6] no such preponderance was noted. The reason being that the female population in our region remains neglected regarding treatment facilities. As a result sinus disease in females is more prone to get complicated before being diagnosed.

Mostly young patients presented with complicated sinusitis. While the elderly patients were those who had some malignancy of the paranasal sinuses invading the surrounding structures. Worldwide, patients presenting with complication of sinus disease are mostly young. Studies have also been carried out in paediatric population for assessment of complicated sinus disease.[3] In one such study it was also noted that patients with isolated orbital complications are younger as compared to the patients who had multiple complications.[2]

In most of the cases more than one sinus was involved. In these combinations the sinuses most commonly affected (60%) were frontal and ethmoidal. Almost the same incidence was noted for the ethmoidal sinuses which were involved with the disease in 50% of the cases. These sinuses are closest to the orbital cavity. Moreover, the boundary wall of the ethmoidal sinus is so thin that any infection or tumour can easily erode out of the confines of the sinus and involve surrounding structures. So the infection or the tumour can easily spread into the orbit or intracranially. In children, the frontal sinus is not that well developed and maxillary sinus was noted to be the primarily affected sinus. In a study conducted for orbital complications in children in England, it was noted that the maxillary sinus was the most frequently involved sinus.[7] In a very large scale study carried out in 1997, it was noted that most complicated sinus disease had a combination of sinus involvement, with the maxillary/ethmoid/frontal combination being the most common.[8] Similarly in our study, we noted that most complicated sinus diseases involve more than one sinus.

In our study infection was the most common cause of orbital complications followed by malignant and benign tumours and 73.33% of our cases were caused by infections. Among these, 36.36% were fungal in origin and the rest were bacterial infections. Fungal infections were noted to be more fulminant in their course with a tendency to early invasion and erosion into the cranial cavity. Out of the four cases of fungal sinusitis, 2 (50%) extended into the cranial cavity and one of these patient had unilateral blindness with bilateral proptosis as her presenting features. All of these cases of fungal sinusitis had bilateral disease involving the paranasal sinuses bilaterally. Bilateral spread of disease and complications are rare finding in the international studies as well. They are seen only in the more widespread and aggressive form of the disease.[9] Studies have been carried out to assess for the importance of radiological investigations worldwide and have been found to be very useful in assessing the extent of the invasion of the disease process.[5]

Other cases of paranasal sinus disease invading into the surrounding structures were the neoplasms of the sinuses. We had 4 (26.67%) of the cases in which tumours invaded into the surrounding areas causing complications. Only one of these cases was a benign tumour. The rest of the three cases were malignant tumours. The benign tumour was a congenital tumour, fibromyxoma. The patient was an 11 month old female. The tumour was arising from maxillary sinus and had pushed its way through the cribriform plate into the cranial cavity. Surgery was carried out and there was complete eradication of the disease. Among the malignant tumours, all the three cases were of squamous cell carcinoma. All the patients were above 42 years of age. The tumour arose from maxillary sinus and then extended through the ethmoidal sinus into the orbit causing proptosis. There was a history of weight loss in 2 of these patients. Two of these tumours were not resectable at the time of diagnosis. This is similar to cases seen in other studies in which tumours extending to the orbital cavity are usually unresectable.[4] None of these patients had any intracranial extension at the time of diagnosis.

The complications of paranasal sinus disease are mainly orbital. In our study, only one (6.67%) of the cases had no orbital complication. Rest of the patients had some sort of orbital involvement. Among the complications, we encountered orbital cellulitis in 2 (13%) of the cases. This was the mildest of all and was mostly managed conservatively with intravenous antibiotics. Most of the patients (80%) presented with proptosis. One out of these 12 patients had blindness associated with proptosis. In 6 (40%) cases, proptosis was the only complication of the paranasal sinus disease. In another 40%, the patients had other signs which were facial swelling in 2 cases, intracranial extension in 2 cases and weight loss in 2 cases of malignant disease. Two cases also had complaints of snoring due to nasal obstruction, and one patient who had intracranial extension had early signs of meningitis.

Only one patient in our series did not present with orbital complication. This patient had a subperiosteal abscess of the scalp also known as Pott's Puffy Tumour. This patient had frontal sinus disease which had eroded into the frontal bone. He was subsequently managed with incision and drainage of the abscess and intravenous antibiotics. This is consistent with a study done in Montreal, Quebec in which subperiosteal abscess was the most rare complication noted.[3]

## CONCLUSION

Nose and paranasal sinus disease can complicate by involving surrounding structures. Mostly the orbit is involved but brain, meninges and skull bones can also be involved. Early diagnosis of the type and extent of the disease by CT scan and intervention accordingly can improve outcome of the patient.

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