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A descriptive study of the patients with orbital complication of acute and chronic sinusitis

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ABSTRACT

Background: This is a descriptive study of all of the patients with orbital complication of acute and chronic sinusitis presented in ENT and Ophthalmology department, Government Medical College Calicut, Kerala from January 2013 to September 2014. The purpose of this study is to evaluate clinical and radiological presentation, outcome of treatment and postsurgical complications of diagnosed case of orbital complications of acute and chronic sinusitis.
Methods: All the patients were subjected to thorough clinical examination, ophthalmological evaluation and radiological evaluation. Computerized tomography of paranasal sinuses both axial and coronal planes, MRI in selected cases, histopathology, fungal culture, a semistructured proforma are the study tools in this study. All the patients in this study received appropriate medical and surgical treatment and done a follow up evaluation at first month and at 3 months.
Results: Preseptal cellulitis is the most common complication in our study. Fungal sinusitis due to uncontrolled diabetes mellitus is the most common condition causing orbital complication in our study.
Conclusions: Strict diabetic control, appropriate surgical and medical management and a vigilant follow up resulted in good outcome.

Keywords: Acute sinusitis, Chronic sinusitis, Preseptal cellulitis, Fungal sinusitis

INTRODUCTION

Bacterial infection of the paranasal sinus is one of the most frequent diseases both in adults and children. Among complications of sinusitis, the one that involve eye and orbit region are the most frequent. Due to close proximity of the orbit with the ethmoid, maxillary, frontal and sphenoid sinuses any sinonasal infections, if not diagnosed early and treated adequately can lead to the spread of infections through the neurovascular foramina via congenital and acquired bony dehiscence and indirectly through the valve less ophthalmic veins draining the sinuses and orbit as a result of thrombophlebitis and embolism. The erosion and destruction of the lamina papyracea, a paper thin bone separating the ethmoid sinus and orbit provide the most common pathway for the contiguous spread of sinus infection to the orbit. It is estimated that complications of sinusitis before the time of antibiotics occurred in 1 for each 5 patients.[1] Today post sinusitis orbital complications are less common, especially because of the ease with which we have image studies that allow for a more accurate and early diagnosis. In 1948 Smith and Spencer introduced a classification for sinusitis complications used in a series of adult patients.[2] In 1970 Chandler et al modified this classification and since then it has been used internationally.[3] According to this classification 5 stages of orbital complications of sinusitis are:

1. *Preseptal cellulitis:* Inflammation does not extend beyond the orbital septum, the site at which the medial orbital periosteal reflection attaches to the medial eyelid at the tarsal plate.
2. *Orbital cellulitis without abscess:* Inflammation extends into tissues of the orbit.
3. *Subperiosteal abscess:* There is abscess formation deep to the periosteum of the orbital bones usually the lamina papyracea.
4. *Orbital abscess:* There is abscess formation within the orbit which has breached the periosteum.
5. *Cavernous sinus thrombosis:* The inflammatory process has extended through the optic foramen into the cavernous sinus which thromboses and possibly progresses to abscess formation.[4]

The purpose of our study is to evaluate clinical and radiological presentation, outcome of treatment and postsurgical complications of diagnosed case of orbital complications of acute and chronic sinusitis.

METHODS

Study design, place and period

This is a Descriptive study conducted in ENT and Ophthalmology department, Government Medical College Hospital, Calicut, Kerala from January 2013 to September 2014.

Selection criteria of the patients

This study conducted among patients admitted with orbital complications of sinusitis. Apart from specific forms of orbital complications, those patients with radiographic evidence of bony erosion of orbit and orbital apex resulting from sinusitis were also included in the study. Ethical approval from the Institution was obtained.

Procedure

All the patients were subjected thorough clinical examination, ophthalmological evaluation and radiological evaluation. Computerized tomography of paranasal sinuses both axial and coronal planes, MRI in selected cases, histopathology, fungal culture, a semi-structured proforma are the study tools in this study. All the patients in this study received appropriate medical and surgical treatment. We did a follow up at first month and at 3 months which included diagnostic nasal endoscopy and ophthalmological evaluation. Data were entered in Microsoft Excel and analysed.

RESULTS

A total of 27 cases were included in study. All of them were adult patients with majority in the age group 61 to 70. Youngest age was 19 years and eldest was 70 years with a mean age of 54. There were 12 males and 15 females.

Histopathological examination and fungal culture had shown that most common cause in our series is invasive fungal sinusitis. Presenting features of the patients are given (Figure 1).

Out of the 10 patients (37%) with decreased vision 5 patients had unilateral loss of vision of which two patients had no perception of light, one patient had only perception of hand movement and another two patient had visual acuity of 1 meter counting finger .Those patients with unilateral loss of vision had relative afferent pupillary deficit (RAPD). Of these 5 patients with unilateral loss of vision two patients had grade1 RAPD, two patients had grade 2 RAPD and one patient had grade 4 RAPD. Six patients had ptosis (22.2%) (Figure 2).Two patients had numbness of infraorbital area and cheek.

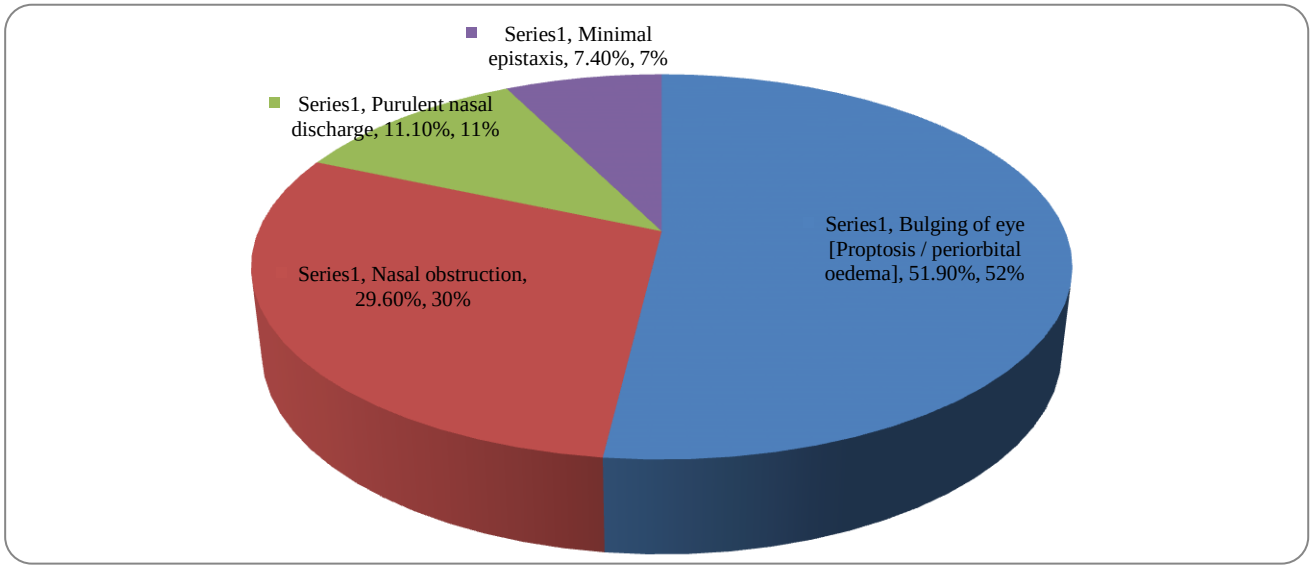

Figure 1: Presenting features.

Sinus involvement is given Table 1. Most common sinus involved was anterior ethmoid (48%) (Figure 3). But anterior sinus involvement alone was present in only one case who was the youngest patient in our study.

Table 1: Sinus involvement.

	Cases
Single sinus	22.22%
Two sinuses	51.9%
Multiple sinuses	26%

Figure 2: Invasive fungal sinusitis presented with ptosis.

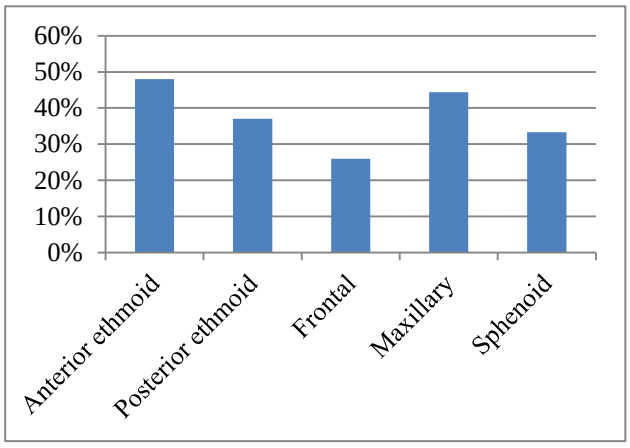

Figure 3: Sinuses involved.

One patient with invasive aspergillosis had oroantral fistula (Figure 4) from the floor of left maxillary sinus measuring 14 mm in size. He also had defect in the medial wall, anterior wall and posterolateral wall with soft tissue density in the orbit involving inferior rectus muscle. For the two patients with features suggestive of cavernous sinus thrombosis we had taken MRI also. One of these patients had enlarged cavernous sinus with involvement of cranial nerves traversing through it. One patient with invasive mucormycosis had hemiplegia and MRI of this patient showed thrombosis involving internal carotid arteries in petrosal and cavernous segments.

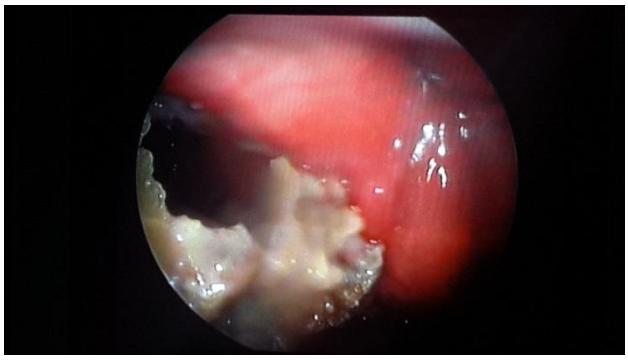

Figure 4: Oroantral fistula with sequestrum.

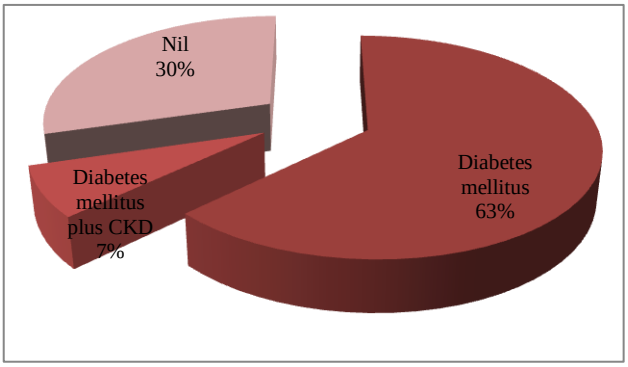

Figure 5: Diabetes mellitus was the most common co morbidity in our study.

In this study 10 patients (37%) were with bone erosion involving bony orbit. Most common complication seen was preseptal cellulitis, 13 patients (48%) whereas cavernous sinus thrombosis was rare (7.4%).

We studied co morbidities of these patients. HbA1C was taken as the measurement of diabetic control. Values ranges from 6.1 to 11.1 with an average of 7.922 and a standard deviation of 1.2135. Chronic sinusitis cases are equally distributed among diabetic patients and those who do not have comorbidities (Figure 5).

All the patients in this study underwent endoscopic sinus surgery tailored to individual cases. Depending upon the preoperative radiological appearance and diagnostic nasal endoscopic findings, extent of surgery was tailored to each of the patients. Four cases with subperiosteal abscess (Figure 6) also underwent endoscopic orbital decompression and drainage of pus. We had confirmed lamina papyracea erosions (Figure 7) in eight patients at the time of surgery. In this study we specially looked for presence of polypoidal mucosa, polyp, pus, cheesy

material and blackish eschar in any of the sinuses (Figure 8). To determine the invasive nature of the fungal sinusitis, mucosa of the sinuses sent separately for histopathological examination.

Figure 6: Subperiosteal abscess and cavernous sinus thrombosis.

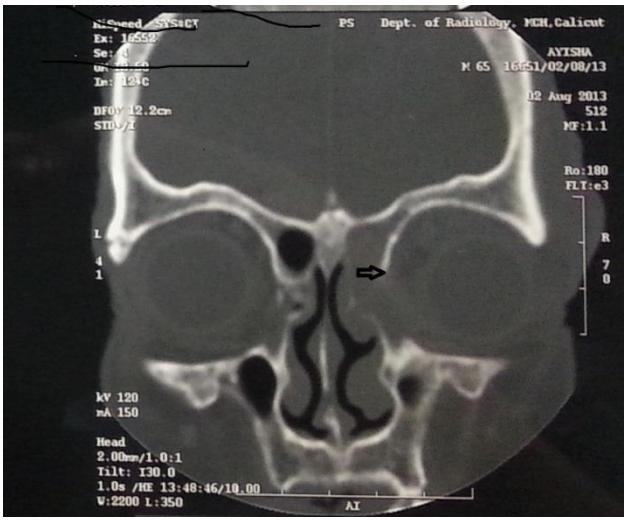

Figure 7: Disease extending from anterior ethmoid to orbit by eroding lamina papyracia.

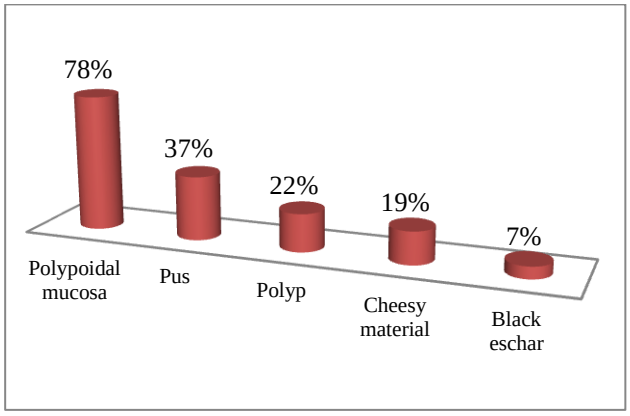

Figure 8: Operative finding.

Out of 27 cases 10 patient had invasive fungal sinusitis (37%), 8 cases had noninvasive fungal sinusitis (29.6%) and 9 cases had chronic non-allergic sinusitis. Fungal culture done for all of the patients. In 33.33% of the patients culture was negative. Nine patients (33.33%) had aspergillus species grown in culture and 8 patients (29.6%) had mucor species and one patient had rhizopus infection. One patient had invasive aspergillosis. Of the ten patients with invasive fungal sinusitis etiology of 8 cases was mucor, one case was rhizopus and one case was aspergillus. Amphotericin B injection for 2 to 6 weeks followed by oral itraconazole was given for 8 patients with invasive fungal sinusitis and the patient with invasive aspergillosis was received injection voriconazole 200 mg 12 hourly followed by oral voriconazole for 3 months. One patient with acute invasive rhizopus sinusitis received injection amphotericin for 3 weeks and oral voriconazole for 4 weeks. Amphotericin was given after adequate hydration and regular monitoring of renal function. Amphotericin B was started at the dose of 1mg/kg body weight and dose was adjusted according to creatinine clearance. Regular monitoring of renal function showed deterioration in renal function in two patients for whom we changed from conventional amphotericin to liposomal preparation. After completing three weeks course of amphotericin in 8 patients with invasive fungal sinusitis, oral itraconazole 200 mg 12 hourly was started and continued for 3 months.

While being admitted in our hospitals we repeated endoscopic debridement for those patients with acute invasive fungal sinusitis. We planned a follow up after one month and 3 months. One of the patients with invasive mucormycosis died in the hospital during the first week of treatment. He had hemiplegia and uncontrolled diabetes resulted in diabetic ketoacidosis. Another patient with invasive mucormycosis expired after 1 month due to unrelated cause. A patient with noninvasive fungal sinusitis died of cardiac disease. So we had 3 month follow-up for 24 patients only. So the mortality rate of our study is 4% and mortality rate of invasive mucormycosis is10%.

During the first follow up at one month and second follow up at three months we had performed diagnostic nasal endoscopy for fungal sinusitis and sinus mucosa was sent for histopathological examination to confirm for absence of fungal hyphae. Three patients had undergone endoscopic debridement 3 times to ensure complete eradication of the debris and black crusts from nose and paranasal sinuses. These procedures were repeated till the histopathological examination ensured absence of fungal hyphae. At the 3 months, HPR of all the eight patients with invasive fungal sinusitis proved negative for fungal hyphae.

We had done ophthalmological examination for all patients at the second review and found out that proptosis, ptosis and periorbital oedema subsided for 24

patients. Loss of vision persisted for 3 patients and two of them had invasive fungal sinusitis and one had subperiosteal abscess. All other patients with decreased vision had improved their vision during follow up.

DISCUSSION

This study includes 27 cases of orbital complications resulting from sinusitis. Invasive fungal sinusitis (37%) is the most common cause in our study. Chronic sinusitis (33.33%) and non invasive fungal sinusitis (29.6%) are the other causes. Orbital complication is classified according to Chandler classification. Preseptal cellulitis was the most common complication in our study which was present in 13 patient (48.1%). Subperiosteal abscess (14.8%) and cavernous sinus thrombosis (7.4%) were less frequent. Orbital complication is by far the commonest complication implicated in acute sinusitis in children with a prevalence estimated in the literature to be 74-85% with the ethmoid sinus being the most commonly implicated. [5] Preseptal cellulitis is the most common and least severe complication, and is responsible for approximately 70% of all orbital complications of sinusitis.[6] Nwaorgu et al. in a retrospective review of 90 patients with orbital cellulitis, found sinogenic origin in 57 % patients.[7] Similarly Choudhary et al. in a study of 218 patients of orbital cellulitis, found sinusitis as the most common predisposing factor.[8] In another retrospective study by Saroj Gupta 83.3 % patients presented with orbital cellulites as a complication of acute infective rhino sinusitis.[9]

Age group in our study varied from 19 to 70 years with a mean of 54.85. Majority of the patients had fungal sinusitis which is common in immunocompromised patients. Orbital complications are far more common in children (50 percent under six years) and young adults (76-85 percent under 20).[10] In a retrospective study of orbital complications, Nwaorgu et al reported that the young are more frequently affected in orbital complications of sinusitis.[7] Sinusitis-related orbital infection is the most common cause of unilateral proptosis in children and the third leading cause in adults, behind Graves' orbitopathy and pseudotumor.[11] Children appear to be more prone to orbital complications, probably secondary to the high incidence of acute rhinosinusitis in the pediatric population. Being a tertiary centre majority of our patients were referred cases from peripheral health care. Complications due to acute sinusitis and those cases which do not require surgical intervention would have managed by peripheral health centres. Majority of our cases were acute invasive fungal sinusitis with diabetes mellitus as comorbidity. These factors may explain the age distribution of our series.

Ophthalmological symptoms were common presentation of sinogenic orbital complications. In our study most common ophthalmological symptoms were double vision and bulging of eye. Diplopia was present in 15 patients (55.6%) and bulging of eye was present in 51.9% of patients. Nasal obstruction was present in 8 patients only which constitutes 29.6% of patients. Other nasal symptoms were relatively less frequent in our study. Facial pain was present in 44.5% of the patients. Unfortunately despite the advent of antibiotics and better imaging techniques the distressing morbidity of blindness as a result of orbital complication in acute sinusitis has not been fully overcome that is 10% incidence of blindness compared to 20% incidence in the pre-antibiotic era.[12] In our series there were ten patients with decreased vision, which is 37% of the total patients. Out of these 10 patients 5 patients had unilateral loss of vision (18.5%). They had optic nerve involvements as suggested by relative afferent papillary defect. Out of these five patients 2 patients expired and loss of vision persisted in the rest of the patients and two of them had invasive fungal sinusitis and one had subperiosteal abscess. In a fifteen year retrospective review of orbital complications, Nwaorgu reported that sinogenic orbital cellulitis constituted 57% of the study population (ninety cases) with the left orbit being involved most (55%), while the maxillary sinus had the highest incidence of sinusitis either singly (18%) or combined (65%). Complication of orbital cellulitis was found to be 52%, with no death but 11% became blind due to panophthalmitis. In a two year retrospective study of 12 patients Gupta reported that the most common presenting symptom was diminution of vision (66.6%) followed by proptosis, ptosis (33.3%) and globe displacement (16.6%).[9] The most common orbital complication noted was orbital cellulitis (83.3%). Majority of the patients had multiple sinus involvement. Ethmoid sinus was the most common sinus involved (91.6 %). Surgical intervention was required in 75% of patients. Three patients (25%) were managed conservatively by intravenous antibiotics.

In our series proptosis was present in 10 in cases (37%) and ptosis was present in 6 (22.2%) cases. Paranasal tenderness was present in 15 patients (55.6%). In a series by Gillespie and colleagues on invasive fungal sinusitis, mucosal abnormalities were seen most commonly on the middle turbinate, followed by the septum, palate, and inferior turbinate. This was consistent with our study also. Anesthetic regions of the face or oral cavity are features of early invasive process and may precede the development of objective changes in the mucosa. We had two patients with numbness in infraorbital area and two patients had erythema over cheek. One patient with mucormycosis had hard palate erosion and black crusts in the nasal cavity mainly in the inferior turbinate. One patient had oroantral fistula. One patient with invasive aspergillosis had lower motor neuron type facial palsy. This non-contiguous pattern of involvement may be explained by the angio-invasive nature of the aspergillus species. In cases of invasive fungal sinusitis only mucosal abnormality may be mucosal pallor and decreased bleeding. Blackish eschar is relatively late finding which suggests underlying necrosis.

In our series CT PNS and orbit was done in all patients. MRI was taken for suspected cases of cavernous sinus thrombosis and intracranial complications. Although the diagnosis of invasive fungal sinusitis cannot be made on the basis of imaging, CT scans are helpful in defining individual variations in sinus architecture and possible periorbital and intracranial spread. Severe unilateral thickening of the nasal cavity mucosa has been shown to be the most consistent finding on CT, suggestive of underlying invasive fungal sinusitis. It has also been suggested that infiltration of the periantral and retroantral fat planes may represent the earliest imaging evidence of acute invasive fungal sinusitis.

In our stud, Lund and Mackay grading system is adopted for demonstrating paranasal involvement. Anterior ethmoid is the most commonly involved sinus in our series (48%). But 51.8% shows involvement of two sinuses. Single sinus involvement is seen in 22.22% of cases.

All cases in our series had received surgical and medical treatment. Endoscopic surgery was tailored to individual patients. Uncinectomy, middle meatal antrostomy, anterior and posterior ethmoidectomy and sphenoidotomy was done in majority of patients. Lamina papyracea erosion was identified in 8 cases. Endoscopic sinus debridement slows the progression of the disease, reduces the fungal load, and provides a specimen for culture and histopathologic diagnosis.[13] Debridement of the involved sinuses or structures is extended until clear bleeding margins are exposed. Medical antifungal therapy for most patients who have acute invasive fungal sinusitis consists of systemic amphotericin B at intravenous doses of 0.25 to 1.0 mg/kg/d to a total dose of 2 to 4 g over six to eight weeks. The use of amphotericin B is limited in some patients secondary to renal toxicity, and they may be candidates for liposomal amphotericin B at a concentration of 3 to 5 mg/kg/d. Liposomal amphotericin, secondary to high cost, is reserved for a clinically proven fungal infection in an immunocompromised host with an elevated serum creatinine (02.5 mg/dL) or progression of fungal disease while on maximum dosage of standard amphotericin. Voriconazole, approved by the Food and Drug Administration in 2002, is more effective than amphotericin B for invasive aspergillus.[14] Voriconazole has been recommended in international guidelines as the primary therapy for acute invasive aspergillosis.[15] For mucormycosis amphotericin B has stood the test of time and continues to be the drug of choice. The optimal duration of antifungal drug administration for chronic invasive fungal sinusitis is controversial, and reports vary widely depending on the severity of the disease from 3 months to more than 15 months. Except blindness all the other symptoms of 24 patients subsided with proper surgical procedures and antibiotic therapy. 3 month follow up showed complete resolution of disease in all patients except loss of vision in 3 patients.

Orbital complication of sinusitis is still a dangerous condition with considerable mortality and morbidity and is associated with immunocompromise. Management of orbital complication requires teamwork of ophthalmologist and otorhinolaryngologist. High index of suspicion, early diagnosis, good glycemic control, aggressive surgical and medical management, reversal of immunocompromise wherever possible and regular follow up are the keystone of management to ensure successful outcome.

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