

Complications of acute infective rhinosinusitis: experience from a developing country

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ABSTRACT

Introduction: Complications of acute infective sinusitis are a therapeutic emergency. The purpose of this study was to determine the clinical presentation, microbiological pattern, treatment modalities and outcome of patients diagnosed to have acute rhinogenic orbital, intra- and extra-cranial complications from a developing country in Asia.

Methods: A retrospective chart review from October 1999 to January 2004 was conducted.

Results: Among 247 ENT surgical emergencies documented, 13 patients (5.3 percent) were diagnosed to have acute sinusitis with various complications either as in solitary or multiple forms. Orbital complications were the most common (61.5 percent) followed by acute subdural empyema (23.1 percent) and meningitis (15.2 percent). Subdural empyema was the most common intracranial complications. *Staphylococcus* was reported to be the most common offending organism (45.5 percent). Majority of the patients (84.6 percent) had surgical drainage of the affected sinuses, 38.5 percent being endoscopic drainage while external approach was done for those with coexisting osteomyelitis (30.8 percent). Two patients had combined approach, and one patient had post-operative facial paresis. There was no mortality in our series.

Conclusion: Early detection, aggressive medical and prompt surgical treatment by multidisciplinary approach involving ophthalmological, neurosurgical and rhinological procedures, can successfully treat the complications with a significant reduction in the morbidity and no mortality.

Keywords: acute rhinosinusitis, infective rhinosinusitis, rhinosinusitis complications

INTRODUCTION

Inflammation of the paranasal sinus remains one of the most common medical problems⁽¹⁾. The incidence of morbidity and mortality among patients with complications of sinusitis has been reported to range from 5% to 40%^(2,3). With the institution of appropriate antibiotics, better imaging modalities and advancement of surgical intervention, the incidence of intra- as well as extra-cranial complications have steadily decreased^(4,7). However, a high incidence of morbidity and mortality ranging from 3.7% to 11% still occurs, and pose a medical and surgical challenge even in this antibiotic era^(4,8-11).

This article represents a retrospective chart review from Christian Medical College and Hospital Vellore, in the southern part of India. It is a tertiary academic teaching centre with 1,900 beds. The complications of acute infective rhinosinusitis constitute 5.26% of ear, nose and throat (ENT) emergencies in our hospital. The aim of this study is to assess the incidence, clinical presentation, treatment, and outcome of patients admitted with acute rhinogenic intra- and extra-cranial complications. The advantages of combined medical therapy and multidisciplinary surgical intervention are being presented.

METHODS

The records of all patients with various ENT emergencies admitted to Christian Medical College from October 1999 to January 2004, were retrospectively reviewed. Patients with infectious acute rhinosinusitis with intra- and extra-cranial complications were included in this study. The symptomatology, investigations (including imaging and bacteriological reports), treatment, and outcome were recorded.

RESULTS

Among 247 ENT emergencies, 13 patients were diagnosed to have acute sinusitis with intra- and/or extra-cranial complications, either solitary or multiple. There were 11 male patients and two female patients. The age ranged from one year to

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Table I. Complications of acute infective sinusitis: summary of clinical data.

| No | Age/sex | Sinuses involved | Presentation | Complications | Pus culture pattern | Antibiotics used | Treatment | Outcome |
|----|---------|-----------------------------|--|---|------------------------------------|---|---|-----------|
| 1 | 1/M | Ethmoid | Fever, headache, periorbital swelling, proptosis | Orbital abscess | <i>Staph aureus</i> | Cloxacillin Cefotaxime | Incision and drainage of orbital abscess | Recovered |
| 2 | 2/M | Ethmoid | Periorbital swelling, fever, headache | Orbital abscess | <i>Staph aureus</i> | Cloxacillin Gentamicin | Incision and drainage of orbital abscess | Recovered |
| 3 | 3/M | Frontal, ethmoid, sphenoid | Periorbital swelling, fever | Orbital cellulitis | <i>Staph aureus</i> | C Penicillin | Endoscopic drainage of sinus/orbital decompression | Recovered |
| 4 | 10/F | Frontal, ethmoid | Fever, nasal discharge, periorbital swelling | Orbital abscess | <i>Staph aureus</i> | Cloxacillin, Gentamicin | Endoscopic drainage of sinus/orbital decompression | Recovered |
| 5 | 12/M | Frontal, ethmoid | Headache, vomiting, periorbital swelling | Meningitis, extra/sub dural abscess, orbital cellulitis | <i>Enterobacter, alpha Strepto</i> | C Penicillin Cloxacillin, Cefotaxime | Frontal craniotomy drainage, endoscopic drainage of sinus/ frontal trephination | Recovered |
| 6 | 12/M | Frontal, ethmoid, maxillary | Fever, headache, periorbital/ facial swelling | Facial and orbital cellulitis | <i>Staph aureus</i> | Coamoxiclav, Gentamicin, Cotrimox. | Endoscopic drainage of sinus | Recovered |
| 7 | 14/M | Frontal, ethmoid | Periorbital swelling, fever, diplopia | Orbital abscess | No growth | C Penicillin, Chloramphenicol Metronidazole | Endoscopic drainage of sinus | Recovered |
| 8 | 15/M | Frontal | Fever, headache, vomiting, nasal obstruction | Meningitis, frontal subdural empyema | <i>alpha Strepto</i> | C Penicillin, | Frontoparietal craniotomy drainage | Recovered |
| 9 | 20/M | Frontal, ethmoid | Headache, fever, vomiting, nasal obstruction | Frontal subdural empyema | No growth | C Penicillin | Frontal burrhole drainage, endoscopic drainage of sinus/ septoplasty | Recovered |
| 10 | 23/M | Frontal | Fever, forehead swelling | Frontal osteomyelitis | <i>Enterobacter Staph aureus</i> | Cotrimox. Rifampicin | Frontal craniotomy, debridement | Recovered |
| 11 | 23/M | Frontal, ethmoid, maxillary | Fever, periorbital/ facial swelling, proptosis | Orbital/ facial cellulitis, maxillary osteomyelitis | No growth | C Penicillin, Chloramphenicol Metronidazole | Lateral rhinotomy/ medial maxillectomy, external ethmoidectomy | Recovered |
| 12 | 42/M | Frontal | Headache, vomiting, nasal obstruction | Frontal pyocele | No growth | Coamoxiclav | Endoscopic drainage of sinus | Recovered |
| 13 | 46/M | Maxillary, ethmoid | Headache, fever, periorbital swelling, proptosis | Orbital abscess, maxillary osteomyelitis | <i>Prevotella, Bacteroides</i> | C Penicillin Chloramphenicol Metronidazole | Lateral rhinotomy/ medial maxillectomy, external ethmoidectomy | Recovered |

M: male, F: female, *Staph*: *Staphylococcus*, *Strepto*: *Streptococcus*, C: Crystalline.

46 years, with mean age of 17.15 years. There were six patients of paediatric age group (less than 12 years) and seven were adults. The most common presenting symptom was fever (84.6%), followed by orbital and/or facial swelling (76.9%) (Table I). The most common complication diagnosed was orbital infections. Eight patients (61.5%) presented with either orbital cellulitis or developed orbital abscess (Fig. 1). Three patients (23.1%) presented with subdural empyema as revealed by computed tomography (CT) (Fig. 2) and two patients were admitted with acute pyogenic meningitis. Other

complications (one patient each) included frontal pyocele, frontal osteomyelitis, maxillary osteomyelitis with facial cellulitis (Fig. 3) and extradural abscess. Five patients (38.5%) presented with multiple intra- or extra-cranial complications.

Bacteriological studies were done in all patients (Table I). The organisms were identified and cultured in nine patients (69.2%) and in four patients, there was no growth reported. Among the culture-positive cases, *Staphylococcus aureus* was cultured in six patients (66.6%), *Enterobacter* species in two patients and alpha-haemolytic *Streptococcus* species in

another patient. One patient grew *Prevotella* and another patient grew *Bacteroides*. Four patients showed multiple organisms in the culture. Majority of cases presented with multiple sinus involvement. Frontal and ethmoid sinus were involved in most of

the cases (76.9%). In addition to frontal sinusitis, two patients had maxillary and one had sphenoid sinus involvement. There was no significant intra-operative or post-operative morbidity and no mortality. The total duration of hospital stay ranged from six to 17 days.

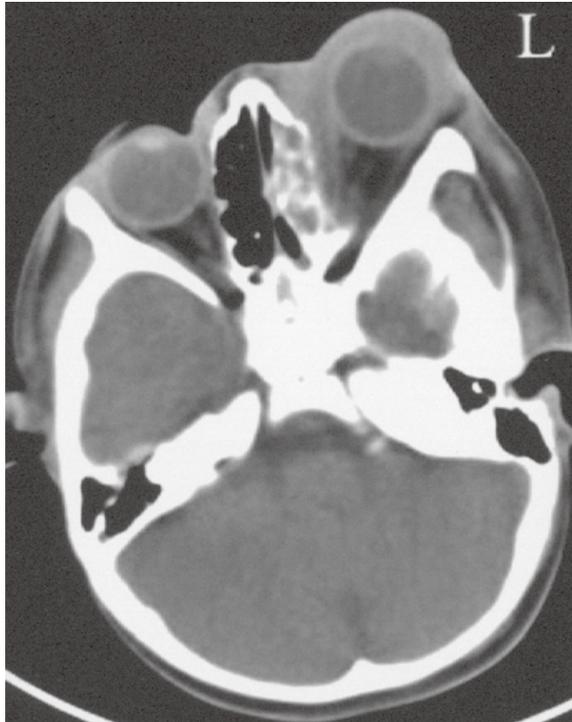


Fig. 1 Axial CT image shows left ethmoid sinusitis with orbital cellulitis.

DISCUSSION

An infection in the sinus can easily spread to the orbit or to the intracranial cavity as these anatomical structures are so closely interrelated. Any bony dehiscence or defect, whether congenital or acquired, can lead to direct spread of infection, occur via neurovascular foramen or through vascularised venous channel⁽⁵⁾. The most common complication in sinusitis is orbital infections followed by intracranial complications, that include meningitis, subdural empyema, intracerebral abscess, epidural abscess and rarely, cavernous or superior sinus thrombosis. Other complications include mucocoele, pyocoele, osteomyelitis, facial cellulitis, and subperiosteal abscess^(4,12).

Chandler et al classified orbital infection into five stages as periorbital cellulitis (stage I), orbital cellulitis (stage II), subperiosteal abscess (stage III), orbital abscess (stage IV), and cavernous sinus thrombosis (stage V)⁽¹³⁾. Most orbital infections respond to medical therapy with broad-spectrum

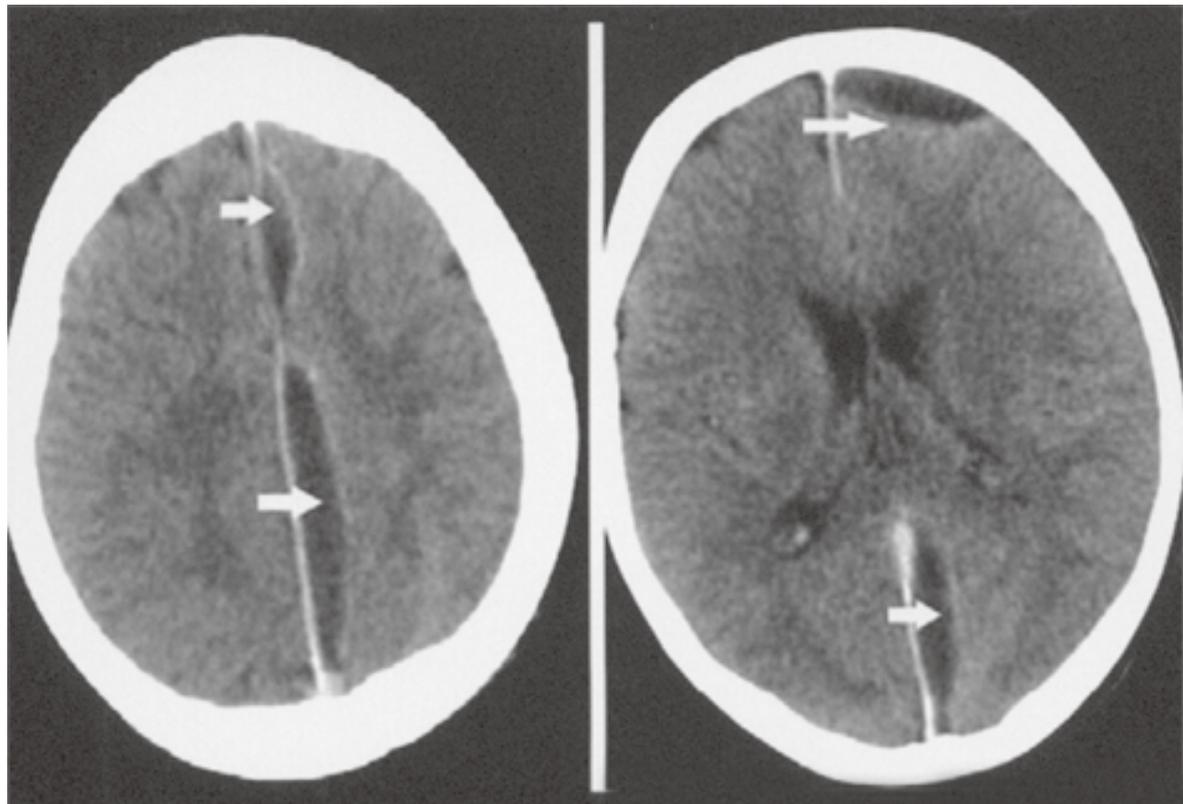


Fig. 2 Contrast-enhanced axial CT image shows multiple interhemispheric and left frontal subdural empyemas (arrows).

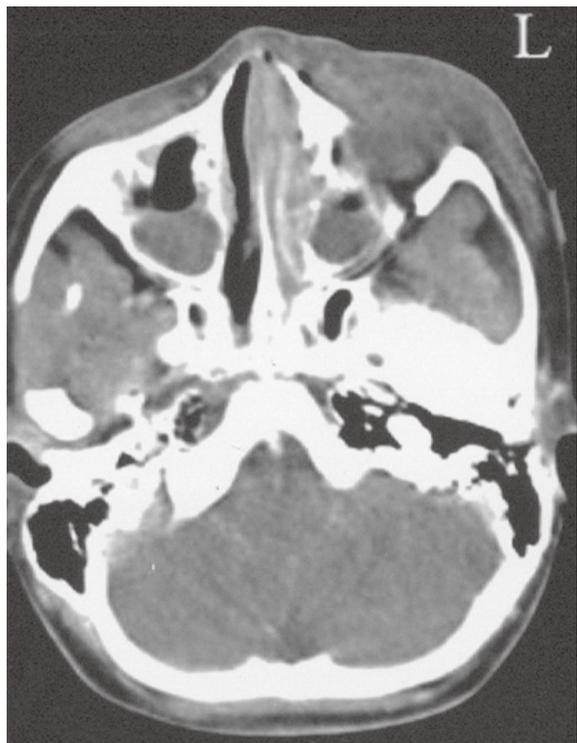


Fig. 3 Axial CT image shows left-sided maxillary sinusitis with osteomyelitis and facial soft tissue swelling

antibiotics and local nasal decongestants⁽¹²⁾. In our study, orbital infections were the most common complications in patients with acute rhinosinusitis, 19.5% of patients presented with orbital preseptal cellulitis and 38.5% patients developed orbital abscess that was successfully drained under antibiotic cover.

Intracranial complications of paranasal sinusitis arise from both acute and subacute exacerbations of chronic rhinosinusitis^(3,14-16). Despite antibiotic therapy, there is a high incidence of morbidity and an estimated 5% to 10% mortality rate that is associated with acute sinusitis having intracranial spread⁽⁶⁾. Meningitis is reported to be the most common intracranial complication and is frequently the result of sphenoiditis or ethmoiditis, and extradural abscess is the second most common complication. The latter almost exclusively occurs in patients with frontal sinusitis. Subdural empyema is a rare infection with a high rate of mortality of about 25 to 35%^(5,17). Intra-cerebral abscess is also an uncommon complication.

In our study, 38.5% of patients presented with intracranial complications. 13 patients showed subdural abscess as the most common intracranial complication followed by extradural abscess and pyogenic meningitis. This is contrary to the 15-year review of 39 patients by Younis et al⁽⁵⁾ where meningitis was the commonest intracranial complication. As the number of patients included in the study was small and the study was conducted

over a shorter period, this could be incidental. Two patients developed maxillary osteomyelitis. One had frontal osteomyelitis and another had a frontal pyocoele, both being rare complications of sinusitis. The occurrence of osteomyelitis secondary to sinusitis ranged from 0.5 to 9%^(1,4). Our study showed a higher incidence of osteomyelitis (15.4%).

The most common organisms reported were *Staphylococcus aureus* and *Streptococci* species^(10,18-20). All patients in our study had aerobic culture and sensitivity of the specimen obtained. Our reports had also revealed *Staphylococcus* and *Streptococci* to be the common infectious organisms. However, in four patients, the sterile cultures recorded could be due to the administration of antibiotic therapy prior to admission in our hospital or an anaerobic infection. The most common offending sinus reported was frontal sinus, followed by ethmoid and sphenoid sinuses⁽⁵⁾. Our study too revealed the same observations. However, it appeared that ethmoid sinusitis was more common in the younger age group while maxillary sinusitis were more affected in the older age group.

Various therapeutic measures include intravenous antibiotics, craniotomy drainage of intracranial abscess, and endoscopic and/or external drainage of affected sinuses^(5,6). Once the diagnosis was made, most of the patients were started on a combination of high-dose intravenous antibiotic therapy comprising Penicillin group of medicines (Crystalline Penicillin, Coamoxiclav and/or Cloxacillin) and Metronidazole. The antibiotic regimen was modified based on the culture and sensitivity reports (Table I).

Most orbital infections respond to medical treatment⁽⁵⁾. With the advent of endoscopy in treatment of sinusitis, the external approach has been less utilised⁽⁵⁾. Endoscopic management of these complications have been reported by Lang et al in one of their ten patient series⁽⁶⁾. This study reported no mortality and post-operative morbidity in four patients (40%). Maniglia et al⁽³⁾, utilised the external approach in all their 19 patients. Among them, there were mortality in four patients (21%) and morbidity in one patient (5.2%).

In our study, one patient (7.6%) had morbidity (post-operative facial paresis) with no mortality. In all patients except two (84.6%), the involved sinuses were treated surgically. Five patients (38.5%) had endoscopic drainage and four patients (30.8%) had external approach for drainage of the affected sinus. Two patients (15.4%) had combined approach. All three patients who had osteomyelitis underwent external drainage of the sinus and debridement of unhealthy bone. Two patients, though

the affected sinuses were treated conservatively by intravenous antibiotics, had incision and drainage of the orbital abscess.

Despite antibiotic therapy, there was a high incidence of morbidity and mortality in patients with intracranial complications ranging from 3.7% to 11% in previous studies^(4,8-11), with that of subdural empyema being 25% to 35%^(5,17). There was no mortality in our series, in spite of subdural abscess being the most common intracranial complication. Early recognition and treatment with the advent of CT has lowered the mortality rate to between 5% and 10%^(8,9).

In conclusion, the complications of acute rhinosinusitis are a therapeutic challenge to the practicing ENT surgeon. As extra- and intra-cranial complications can evolve into fatal infections, they are potentially life-threatening. Immediate attention is critical. CT is an essential investigation in the early recognition and evaluation of sinogenic complications. A high degree of suspicion is mandatory in patients clinically diagnosed to have acute sinusitis that is not responding to conservative antibiotic therapy or the symptomatology masked by inadequate antibiotic therapy.

Broad-spectrum antibiotics and emergency surgical drainage of the affected sinus and the abscess (orbital and intracranial) form the mainstay of treatment. Endoscopic drainage of affected sinus appears to be an effective alternative to external approach in the management of sinusitis with complications as revealed in our study. External approach is indicated in patients with osteomyelitis. Early CT evaluation and appropriate medical therapy with urgent multidisciplinary surgical intervention by ENT surgeons, ophthalmologists and neurosurgeons offer a favourable outcome with no mortality.

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