A Ten Year Retrospective Review of Orbital Complications Secondary to Acute Sinusitis in Children

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SUMMARY

Acute sinusitis is most often a mild self-limiting disease. However, it may progress into severe and life threatening complications. One of the commonest being orbital complication of which visual loss is a direct consequence. In this 10 year retrospective study, the nature of orbital complication, clinical presentation and treatment modalities and outcome seen in children with acute sinusitis in a tertiary referral institute were reviewed. Of six patients, there was a case of preseptal cellulitis, 4 cases of subperiosteal abscess and one case of orbital abscess. Periorbital swelling was a common presenting feature. In 5 cases this was associated with proptosis with one case of impending optic nerve compression. The value of computed tomography and opthalmological examination as a component in the management plan is highlighted. All patients were treated with intravenous antibiotics but evidence of abscess collection warranted urgent surgical drainage in 5 patients, 3 being endoscopic drainage while external approach was done for the remaining 2 patients. Thus a child exhibiting orbital complication of acute sinusitis, prompt diagnosis and treatment is essential in obtaining the best outcome for the child.

KEY WORDS:
Acute sinusitis, Orbital complication, Children, Management

INTRODUCTION

Acute sinusitis is a common disorder affecting children and it often manifests as a prolongation or complication of an upper respiratory tract infection. Whilst in most instances the majority of children recover uneventfully, serious and potentially life-threatening complications involving the orbit and intracranium may occur. Orbital complication accounts for 74 - 85% of complications arising from acute sinusitis and usually this is secondary to acute ethmoidal sinusitis. The pathogenesis of the orbital complication may be as a result of extension of infection from osteitic bone destruction, congenital or acquired bony defects, or via thrombophlebitis of the communicating veins and is associated with potential serious sequelae such as blindness and can be potentially life-threatening. Chandler described a widely accepted classification of orbital complications of acute sinusitis in 1970. We report our experience with the diagnosis and treatment of children admitted with orbital complication of acute sinusitis over 10 years at Universiti Kebangsaan Malaysia Medical Centre, Kuala Lumpur.

MATERIALS AND METHODS

We retrospectively reviewed the medical records of all patients below 18 years of age admitted to the Otorhinolaryngology ward, Universiti Kebangsaan Malaysia Medical Centre from 1997 to 2007 for the management of orbital complication secondary to acute sinusitis. The records were evaluated for age, gender, type of orbital complication, symptoms, predisposing factors, antibiotics prior to admission, imaging studies, medical and surgical management instituted, culture results and follow-up information. The Chandler classification was used to group the presentations.

RESULTS

There were 8 patients identified however only 6 had retrievable medical records. Amongst the 6 cases, there were 3 female patients and 3 males whose age ranged from 3 to 17 years with a mean of 8 years. There was a case of preseptal cellulitis, 4 cases of subperiosteal abscess and 1 case of orbital abscess. All 6 patients presented with fever, periorbital swelling and proptosis. In one patient these were accompanied by reduced vision and alteration in colour perception signifying impending optic nerve compression.

In 4 patients there was preceeding history of upper respiratory tract infection, and in one patient the predisposing factor identified was of dental origin with a history of dental pain which progressed to cheek and periorbital swelling with proptosis. Allergic rhinitis was an identifiable cofactor in 2 of the patients. Swimming was noted to be a possible predisposing factor in 2 of our cases since their symptoms worsened following the activity (Table I). Three out of six patients received a course of pre-hospital antibiotics. Only 4 out of 6 of our patients were known to have been vaccinated with Haemophilus influenza b (Hib) vaccine.

All patients had mandatory opthalmological assessment and contrast enhanced computed tomography scan imaging of the brain, orbits and sinuses were performed - 2 were done elsewhere. The computed tomography scans confirmed the diagnosis of the various nature of orbital complications seen in our patients with the presence of pansinusitis (Fig 1 and 2).

All patients received intravenous antibiotics on hospital admission but evidence of abscess collection had warranted surgical drainage in 5 of our patients – three via endoscopic

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Table I: Summary of clinical data in orbital complications of acute sinusitis

Age(years) / Sex	Presentation	Predisposing factor/s	Complications/ Chandler classification	Prehospital antibiotics
3 / M	Periorbital swelling/redness, fever, proptosis, eye discharge	URTI	Left subperiosteal I abscess – Stage III	Amoxicillin-clavulanate
4 / F	Periorbital swelling/redness, fever, proptosis	URTI Swimming	Left subperiosteal abscess – Stage III	No
8 / M	Periorbital swelling/redness, fever, proptosis	Allergic rhinitis	Left subperiosteal abscess – Stage III	No
8 / F	Periorbital swelling/redness, cheek swelling, fever, proptosis, dental pain	Swimming Dental apical abscess	Right preseptal cellulitis – Stage I	Amoxicillin-clavulanate
8 / F	Periorbital swelling/redness, fever, proptosis, diplopia, impaired colour vision	Allergic rhinitis and URTI	Left orbital abscess – Stage IV	Amoxicillin-clavulanate
17 / M	Periorbital swelling/redness, fever, proptosis, visual disturbance	URTI	Right subperiosteal abscess – Stage III	No

Table II: Summary of management outcome of orbital complications of acute sinusitis

Age(years) / Sex	Complications	Medical treatment on admission	Surgical treatment	Pus culture pattern	Outcome / Follow up
3 / M	Left subperiosteal abscess	Cephalosporins Nasal decongestant Nasal douching	Endoscopic drainage	No growth	Full recovery 2 months
4 / F	Left subperiosteal abscess	Cephalosporins and Metronidazole Nasal decongestant Nasal douching	Endoscopic drainage	No growth	Full recovery 6 months
8 / M	Left subperiosteal abscess	Cephalosporins and Metronidazole	External ethmoidectomy	No growth	Full recovery 3 months
8 / F	Right preseptal cellulitis	Cephalosporins and Metronidazole Nasal decongestant Nasal douching	Nil Dental extraction with drainage of periapical abscess	No growth	Full recovery 3 months
8 / F	Left orbital abscess	Cephalosporins and Metronidazole Nasal decongestant Nasal douching	Endoscopic drainage	*Staph. aureus*	Full recovery 3 months
17 / M	Right subperiosteal abscess	Cephalosporins and Metronidazole	External ethmoidectomy	*Staph. aureus*	Full recovery 4 months

approach and two cases drainage was achieved via external ethmoidectomy. The sole case of preseptal cellulitis secondary to dental origin not only received intravenous antibiotics but also underwent dental extraction of the offending tooth with drainage of the associated periapical abscess.

Oral antibiotic therapy was continued for a further 6 weeks following hospital discharge. Only 2 patients had positive culture result of Staphylococcus aureus – each being an equal representative from the three children whom had received antibiotics prior to admission and from the group of 3 children whom had not received prior antibiotics (Table II).

All patients made an uneventful recovery and with absence of morbidity on subsequent follow-up ranging from 2 – 6 months with mean of 3.5 months.

DISCUSSION

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%[1] with the ethmoid sinus being the most commonly implicated. In contrast, a myriad of intracranial complication of acute sinusitis that include meningitis, subdural empyema, intracranial abscess and rarely cavernous sinus thrombosis has been reported to be 13%[2]. It is interesting to note that in third world countries the incidence of intracranial complication was 38.5%[3]. By virtue of the intimate anatomical relationship between the orbit and the surrounding paranasal sinuses, infection from the sinus can gain entry into the orbit via several pathways namely through natural defects present in the bony walls that serve as partitions between the orbital and paranasal compartments, erosion of the sinus walls secondary to bony necrosis that resulted from periosteal ischaemia induced by the increased in intrasinus pressure that occur in acute sinusitis, and via the numerous valveless venous channels that provide a further avenue for extension of infection. 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 overcomed that is 10% incidence of blindness compared to 20% incidence in the pre-antibiotic era[4]. With certainty this emphasizes the need for utmost vigilance and early recognition with prompt management to avoid such an unfavourable outcome.

Orbital inflammation secondary to acute sinusitis encompasses preseptal cellulitis (stage I), orbital cellulitis (stage II), subperiosteal abscess (stage III), orbital abscess (stage IV) and cavernous sinus thrombosis (stage V) as

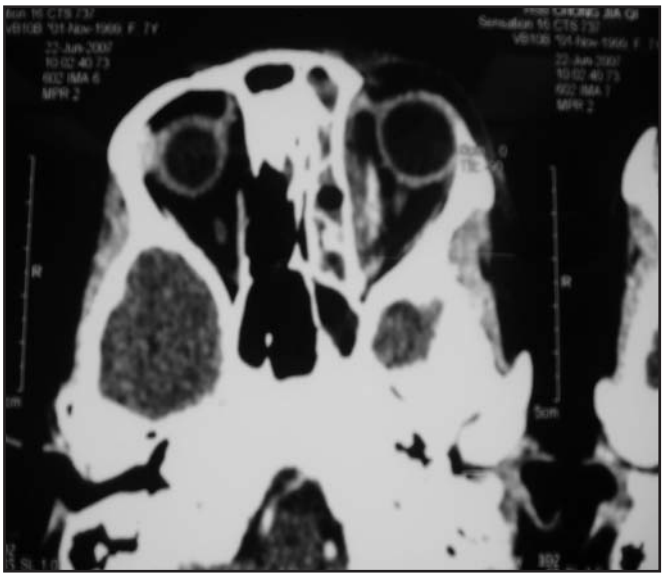

Fig. 1: Left orbital abscess. Axial CT scan of paranasal sinuses and orbit showed soft tissue density within the left orbit pushing the medial rectus laterally in close proximity with optic nerve at orbital apex.

Fig. 2: Left subperiosteal abscess. CT scan showed evidence of abscess with rim enhancement at medial part of left orbit; there was proptosis with periorbital oedema; left maxillary and anterior ethmoid sinuses were filled by soft tissue density.

described by Chandler in 1970[5]. However determining the stages clinically may not be easy particularly in an ill child with a swollen and painful eye. In spite of this an opthalomological examination is mandatory in assessing the presence of diplopia, opthalmoplegia and proptosis as these findings herald the presence of postseptal orbital complication (Chandler's stages II-V) thus mandating urgent radiological imaging. In our series all of the children received prompt opthalmological assessment at the time of their referrals. Computed tomography (both coronal and axial planes) of the orbits, nasal and paranasal sinuses and brain is the gold standard and not only aid in delineating preseptal (Chandler's stage I) and postseptal (Chandler's stage II-V) orbital infections but also serves as a baseline in evaluating the progression of the disease process as well as providing an anatomical road map for surgery when contemplated[6,7].

In this series, small it may be, the predominant predisposing factor for the disease process was upper respiratory tract infection affecting 4 out of 6 children and background allergic rhinitis was identifiable in 2 of the children which is similar as in other literature findings[6]. Swimming may be a possible predisposing cofactor in 2 of our cases confounding their preexisting symptoms following the activity, interestingly this has never been described in the literature. We had also identified a child with preseptal cellulitis and maxillary sinusitis secondary to an apical dental abscess for which extraction and drainage of the offending tooth was performed in addition to the medical therapy instituted. Of interest 4 of six children in our series were vaccinated with Hib vaccine since its introduction in Malaysia. The nature of orbital complications observed in the four children was preseptal cellulitis (1 case), subperiosteal abscess (2 cases) and a case of orbital abscess.

The type of orbital involvement in acute sinusitis rests on the prognosis implication as well as management decisions. The mainstay treatment of preseptal cellulitis is parenteral antibiotics. However in cases of postseptal involvement surgical treatment is warranted in the event of abscess development proven on computed tomography. There have been literature reports on the role of vigorous medical therapy alone for postseptal involvement in selected cases – the selection criteria proposed by Oxford *et al*[8] includes normal vision, absence of opthalmoplegia, intraocular pressure < 20mmHg, proptosis of 5 mm or less and an abscess width of 4mm or less on CT scan. Those with positive ocular findings, worsening of ocular signs or failure to improve after 48 hours of parenteral antibiotics will warrant surgical drainage[8,9,10]. One cannot over emphasized on the critical need of close opthalmological follow-up in those managed medically in assessing disease progression and treatment response.

In our series, four (66.7%) of 6 patients presented with subperiosteal abscess in which surgical drainage was indicated, one had orbital abscess that necessitated emergent surgical drainage and one presented with preseptal cellulitis managed with medical therapy alone. Surgical drainage of abscess is afforded either endoscopically or via external approach involving facial incision. During the earlier years at our institution, subperiosteal abscesses were managed via external ethmoidectomy. However with the advent of endoscopy, we have adopted functional endoscopic sinus surgery in providing a quick and safe drainage technique in subperiosteal and orbital abscesses encountered over the last five years. The changing trend seen not only reflects acquisition of expertise but also acknowledgement in the benefits of endoscopic drainage such as avoidance of facial scar as well as hastening the post-operative recovery

period[11,12]. Parenteral broad spectrum cephalosporins alone (given in 6 patients) or in combination with Metronidazole (in 5 patients) were the chosen antibiotics in our practice and on discharge each received oral cephalosporins for 6 weeks. There were only two positive culture growth for Staphylococcal aureus obtained intraoperatively in this series, each a representative of the prehospital oral antibiotics group and non prehospital oral antibiotics group respectively.

The American Academy of Pediatrics (AAA) had made recommendation for indication of antibiotics therapy if a child presented with high fever and purulent nasal discharge for at least 3-4 days to ensure rapid resolution of acute sinusitis and thus avoiding the risk of possible associated orbital or intracranial complications[6]. In our series however, all three children in whom prehospital oral antibiotics had been instituted yet presented to us with preseptal cellulitis, subperiosteal abscess and orbital abscess respectively. The remaining three children in whom prehospital oral antibiotics were not given presented with subperiosteal abscess. This echoes the findings of Sinclair *et al* in which their group of children developed subperiosteal abscess before meeting the AAA guideline criteria for antibiotic treatment which negate the fact that subperiosteal abscess may not be a preventable complication of paediatric acute sinusitis[13].

In conclusion, orbital complication of acute sinusitis in children has a good prognosis when detected early and managed appropriately. Prompt recognition as well as aggressive treatment avoids the potential morbidity of blindness. Parenteral antibiotic is the mainstay of treatment with emergent surgical drainage indicated in the presence of abscess. Opthalmological review and CT imaging are essential components in the management of such cases as these provide additional guidance as to the need for urgent surgical intervention.

REFERENCES

1. Schramm VL, Myers EN, Kennerdell JS. Orbital complications of acute sinusitis: evaluation, management and outcome. Otolaryngol 1977; 86: 221-30.
2. Mortimer S, Wormald PJ, Oliver S. Antibiotic choice in acute and complicated sinusitis. J Laryngol Otol. 1998; 112(3): 264-8.
3. Ali A, Kurien M, Matthews SS, Mathew J. Complications of acute infective rhino sinusitis:experience from a developing country. Singapore Med J 2005; 46(10): 540-44.
4. Williams SR, Carruth JAS. Orbital infection secondary to sinusitis in children: diagnosis and management. Clin. Otolaryngol. 1992; 17: 550-57.
5. Chandler JR, Langbrunner DJ, Stevens ER. The pathogenesis of orbital complications in acute sinusitis. Laryngoscope 1970; 80: 1414-28.
6. American Academy of Pediatrics Clinical Practice Guideline: Management of sinusitis. Pediatrics 2001; 108: 798-808..
7. Vazquez E, Creixell S, Carreno JC *et al*. Complicated acute pediatric bacterial sinusitis: imaging update approach. Curr Probl Diagn Radiol 2004; 33: 127-45.
8. Botting AM, McIntosh D, Mahadevan M. Paediatric pre- and post-septal periorbital infections are different diseases. A retrospective review of 262 cases. Int J Pediatr Otorhinolaryngol 2008; 70: 377-83.
9. Oxford LE, McClay J. Medical and surgical management of subperiosteal orbital abscess secondary to acute sinusitis in children. Int J Pediatr Otorhinolaryngol 2006; 70: 1853-61.
10. Greenberg MF, Pollard ZF. Medical treatment of pediatric subperiosteal orbital abscess secondary to sinusitis. Journal American Association for Pediatric Opthalmology and Strabismus 1998; 6: 351-55.
11. Deutsch E, Eilon A, Hevron I, Haurvitz H, Blinder G. Functional endoscopic sinus surgery of orbital subperiosteal abscess in children. Int J Pediatr Otorhinolaryngol 1996; 34: 181-90.
12. Lusk RP, Pediatric endoscopic sinus surgery. Operative techniques in Otolaryngol – Head and Neck Surgery 2002; 13: 36-40.
13. Sinclair CF, Berkowitz RG. Prior antibiotic therapy for acute sinusitis in children and the development of subperiosteal orbital abscess. Int J Pediatr Otorhinolaryngol 2007; 71: 1003-06.