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Pediatric nasal orbital cellulitis in Shenzhen (South China): Etiology, management, and outcomes

Pan Hongguang*, Li Lan, Wu Zebin, Chen Guowei

Department of Otolaryngology, Shenzhen Children's Hospital, Shenzhen, Guangdong, China

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ABSTRACT

Objectives: The study aimed to investigate the clinical characteristics, diagnosis, and treatment of orbital cellulitis in children in Shenzhen, China, and to improve the experience of antibiotic therapy for the treatment of orbital cellulites.

Methods: This retrospective study reviewed data from 20 children admitted to Shenzhen Children's Hospital between January 2009 and December 2013, with a diagnosis of nasal orbital cellulitis, severe enough to warrant hospitalization. Thirteen subjects (65%) were male and 7 (35%) were female. The median age was 3.5 years (2 months–7.2 years). The relationship between serum C-reactive protein (CRP), white blood cell count, and length of hospitalization were analyzed. The patients were categorized into 2 groups according to treatment: Those treated with a combination of cefoperazone plus sulbactam sodium vs. those treated with other antibiotic treatment regimens.

Results: Levels of serum CRP (29.8 ± 22.0 mg/L) at the time of admission were positively correlated with length of hospitalization (6.3 ± 4.1 days, $r = 0.46$, $P < 0.05$). The length of time necessary for CRP levels to return to normal range after admission (3.4 ± 1.8 days) was also significantly correlated length of hospitalization ((6.3 ± 4.1)days) ($r = 0.81$, $P < 0.01$). The hospital days whose CRP can be decreased to normal within 3 days (4.3 ± 1.7 days) after antibiotic treatment were significantly shorter than the others (9.1 ± 5 days) ($t = 2.61$, $P < 0.05$). The length of hospitalization (4.3 ± 1.9 days) for patients ($n = 12$) receiving combined cefoperazone and sulbactam sodium antibiotic treatment was significantly shorter than the length of stay (9.3 ± 4.7 days) for those patients ($n = 8$) treated with other antibiotic regimens ($t = 2.83$, $P < 0.05$). Bacterial pathogens were identified in 4 patients (20%), including 3 cases of *Staphylococcus aureus* and 1 case of Streptococcus anginosus. Acquired methicillin-resistant *Staphylococcus aureus* (MRSA) were found in the three pus cultures.

Conclusion: Early efficient antibiotic treatment over the first three days may shorten the course of nasal orbital cellulitis and potentially prevent the formation of orbital abscesses. Clinical factors that were significantly related to patient recovery included improved clinical signs and normalization of blood CRP levels. Our results also indicate that combined cefoperazone and sulbactam sodium is effective and should be recommended for the treatment of pediatric orbital cellulitis.

1. Introduction

Orbital cellulitis is an acute suppurative inflammation of orbital soft tissue, found mostly in children. The infection is characterized by acute onset with rapid progression and is accompanied by fever 、cough and other symptoms. When treated ineffectively, the clinical complications of orbital cellulitis in the pediatric population may include cavernous sinus thrombosis, meningitis, frontal abscess, and osteomyelitis, loss of vision and death. The most common predisposing factor for orbital cellulitis in children is paranasal sinus disease [1,2]. Although widespread use of antibiotic therapy has reduced the rate of serious complications, a critical need remains to improve our ability to identify, diagnose, and effectively treat this life-threatening illness. We sought to reduce the incidence of serious complications and improve antibiotic treatment efficacy by analyzing the clinical features of orbital cellulitis in children admitted to our hospital in Shenzhen, China.

* Corresponding author. Department of Otolaryngology, Shenzhen Children's Hospital, Yitian Road 7019, Shenzhen, Guangdong, China.
E-mail address: 1481717890@qq.com (P. Hongguang).

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2. Materials and methods

Approval for this study was obtained from the Shenzhen Children's Hospital. We conducted a consecutive review of patients, admitted to our hospital with a diagnosis of orbital cellulitis from 2009 to 2013. Medical records, including radiographic studies of 20 cases of nasal orbital cellulitis were collected. All cases were diagnosed by clinical symptoms, physical signs, laboratory examination (routine blood cultures and measurement of blood CRP levels), and radiographic imaging (computed tomography (CT) scan and type B-ultrasonography). Data that were collected included gender, medical history, drug used before admission, time of year for onset of infection, distribution of different years, clinical complications, bacterial cultures, etc. Outpatients diagnosed with a non-serious orbital cellulitis were not included in this study.

2.1. Clinical management

Important decisions regarding the treatment of study patients included the choice of intravenous (IV) antibiotic and timing of surgical intervention, due to the lack of established guidelines for the timing and duration of antibiotic treatment, dosage, and route of administration. Nutritional support is also required and, the acid–base balance of body water-electrolytes required stabilization in the younger children. Ophthalmologic inflammation should be treated with antibiotic eyedrops, oculentum administration to control inflammation and protect the cornea, and the sinusitis were often treated with intranasal corticosteroids and nasal negative pressure displacement. Differences in the choices of empirical treatment strategies between the different clinical departments (ophthalmology, otolaryngology, and pediatrics) were noted in our hospital. A wide variety of antibiotics that were used for treatment included sodium fusidate, clindamycin hydrochloride, combined piperacillin sodium and sulbactam sodium, combined mezhocillin sodium and sulbactam sodium, cefuroxime sodium, ceftriaxone sodium, ceftazidime, combined cefoperazone and sulbactam, vancomycin, meropenem and metronidazole. The anti-inflammatory drugs dexamethasone and methylprednisolone sodium succinate were often administered. For those patients who formed a nasal vomica (confirmed by CT), abscess drainage was performed in cases ($n = 4$) that were unaffected by pharmacotherapy. However, surgical access for abscess drainage was found to vary: One crossed from the labiogingival groove, one approached from the maxillary sinus and ethmoidal cellules, one opened from the periapical abscess, and one gained access from the infraorbital margin. Bacteria culture and susceptibility testing were also carried out for abscess.

2.2. Statistical analysis

All data were analyzed using SPSS for Windows release 13.0 (SSPS Inc, USA). A Student's t-test was used for between-group comparisons for continuous variables with normal distributions, set $\alpha = 0.05$ as inspection level. A $p < 0.05$ was considered statistically significant.

3. Results

3.1. General information

The age range for our 20 subjects was 2–7.2 years (median age = 3.5 years). Sixteen cases (80%) were associated with protrusion of the eyeball and 13 cases with fever (65%). During the period of hospitalization, the shortest duration of fever was <1 day, and the longest duration was 7 days (median duration = 2 day). The range of length of hospitalization was between 2 and 18 days (median = 5.5 days). The month distribution of children with orbital cellulitis is shown as Fig. 1. The months with the greatest number of cases presented to our hospital were May and September. The year distribution shown in Fig. 2 indicates a marked increase in 2012. For details, see Table 1.

3.2. Etiology

In total, 11 of 20 subjects (55%) had sinusitis confirmed by CT scan. Four of 20 (20%) presented with a nasal and facial skin furuncle, 3 subjects (15%) had an existing upper respiratory tract infection, and 2 subjects (10%) had an odontogenic infection. Four cases were diagnosed with front-orbital cellulitis and 16 with deep-orbital cellulitis. Local symptoms included eyelid swelling and hot pain, exophthalmos, ocular movement limits, conjunctival hyperemia and edema. In this group, all subjects recovered and visual acuity was not affected. Suppurative inflammation of the cavernous sinus suppurative inflammation and intracranial infection were absent.

3.3. Laboratory studies

Laboratory tests included white blood cell (WBC) counts in the peripheral blood and serum levels of CRP. Initial blood chemistry revealed that almost subjects showed abnormally high percentages of white blood cell and neutrophils early onset and elevated CRP. No significant correlations were observed between WBC count ($16.9 \pm 4.1 \times 109$/L) and the length of hospitalization ($r = 0.01$, $p > 0.05$). However, a significant correlation was found between the average serum CRP levels (29.8 ± 22.0 mg/L) and length of hospitalization ($r = 0.46$, $p < 0.05$). A significant correlation was also observed between the length of time necessary for CRP to return to the normal range (3.4 ± 1.8 days) after treatment and the length of hospitalization ($r = 0.85$, $p < 0.01$).

3.4. Microbiologic findings

Four (20%) of the 20 children undergoing surgical procedures had positive bacterial cultures and antimicrobial susceptibility test sent from an abscess (orbital or subperiosteal) and/or sinus. Three cases of *Staphylococcus aureus* and 1 case of Streptococcus anginosus were detected. Evidence of MRSA was detected in three pus

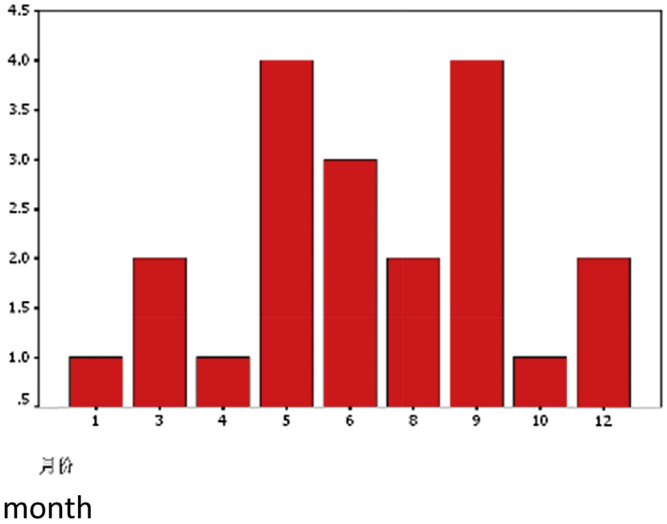

Fig. 1. Month distribution of children with orbital cellulitis in Shenzhen Children's Hospital.