Periorbital and Orbital Cellulitis: From Presentation to Outcome

Bilge Aldemir-Kocabaş, Adem Karbuz, Halil Özdemir, Ergin Çiftçi, Erdal İnce
Division of Pediatric Infectious Diseases, Department of Pediatrics, Ankara University Faculty of Medicine, *Ankara, Türkiye*

Abstract

Objective: Orbital infections require prompt diagnosis and treatment because of the risk of severe complications. Although preseptal cellulitis and orbital cellulitis are different clinical conditions, they can often be confused or can be seen concomitantly. In this study, we aimed to evaluate all patients diagnosed with these diseases treated in our clinic in order to analyze clinical findings, preferred imaging modalities, treatment choices, and clinical outcomes.

Material and Methods: This retrospective study was performed between January 1999 and January 2013. We evaluated patients who were admitted to the Ankara University Pediatric Infectious Disease Clinic with a diagnosis of preseptal or orbital cellulitis. Clinical and laboratory characteristics of the patients were compared. Significance level was determined as α=0.05.

Results: A total of 71 patients (34 girls, 37 boys) with a diagnosis of preseptal (50 patients) or orbital cellulitis (21 patients) were included into the study. The mean age at diagnosis was 49±37.4 (2-168) months. Waters graphy and/or orbital computed tomography was performed in 27 (54%) patients with preseptal cellulitis and in 18 (85%) patients with orbital cellulitis. Almost all of the patients responded to medical therapy without sequelae, and only 3 of them required surgical treatment additionally. The patients with preseptal and orbital cellulitis were treated successfully with sulbactam-ampicillin (150 mg/kg/day and 200 mg/kg/day, respectively).

Conclusion: We conclude that these infections can be treated without any morbidity and mortality if it is diagnosed early and suitable antibiotic treatment is promptly instituted. Imaging tools can give us detailed information regarding disease involvement, differential diagnosis, and the need for surgical intervention. However, we think that these imaging modalities, such as computed tomography, should be restricted as much as possible because of high-dose radiation exposure risk. *(J Pediatr Inf 2014; 8: 148-52)*

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Correspondence Address:
Bilge Aldemir-Kocabaş, Division of Pediatric Infectious Diseases, Department of Pediatrics, Ankara University Faculty of Medicine, *Ankara, Türkiye*
Phone: +90 312 595 65 39
E-mail: drbaldemir@gmail.com

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Introduction

Orbital infections require prompt diagnosis and treatment because of the risk of severe complications. While preseptal cellulitis is seen more frequently than orbital cellulitis, both are more common in children than in adults. Clinical findings are usually helpful for the diagnosis. However, the currently preferred imaging method is scanning of the paranasal sinus and orbita with computed tomography (CT) for determining the complications. CT is excellent in assessing bone tissue but has a high risk of radiation (1-4).

Orbital infections are still defined as preseptal and postseptal according to the classification of Chandler (1, 2). Orbital cellulitis is an infection that concerns soft tissue behind the orbital septum. The most common predisposing factor is sinusitis, and the causative bacterial agent varies according to the sinusitis etiology (1-4). Causative microbial agents of orbital cellulitis have changed with the development of new vaccination schedules. Blood cultures are generally negative in orbital infections, and it is generally not easy to isolate the agent from the infection side. For this reason, treatment is usually initiated empirically in these patients (1, 5, 6). While some cases of preseptal cellulitis are treated with oral antibiotics, all of the patients with orbital cellulitis should be treated parenterally. The most common causes of

preseptal and postseptal infections are eyelid trauma and acute sinusitis, respectively. For determining the extent of orbital infection and choosing the most appropriate treatment modality, radiological imaging techniques play a critical role. Despite the high sensitivity of magnetic resonance imaging (MRI) in the diagnosis of the abscesses, it is not preferred for evaluating the bone tissue. Thus, CT is the imaging technique of choice in orbital infections. In patients with marked proptosis, limitation of eye movements, decreased visual acuity, or afferent papillary defects develop due to the subperiosteal and orbital abscess. So, urgent surgical decompression must be performed. However, for cases that have small- or medium-sized abscess, mild-to-moderate chemosis, and mild proptosis, surgery is controversial.

In this study, we aimed to evaluate all patients diagnosed with preseptal and orbital cellulitis treated in our clinic in terms of clinical findings, preferred imaging modalities, treatment choices, and clinical outcome.

Material and Methods

This retrospective study was performed between January 1999 and January 2013. We evaluated 71 patients who were admitted to the Ankara University Pediatric Infectious Disease Clinic with a diagnosis of preseptal or orbital cellulitis. Clinical characteristics of the patients were documented from the medical records and computerized database of our clinic. Age at diagnosis, sex, laterality, presence of proptosis, etiology, comorbid diseases, imaging methods, C-reactive protein (CRP) concentration, erythrocyte sedimentation rate (ESR), white blood cell (WBC) count, fever, duration of hospitalization, modality of the treatment (duration of parenteral and total treatment), antibiotic type and dosage, need for surgery, and causative pathogens were evaluated for all of the patients.

Statistical analysis was performed using a commercially available statistical package (SPSS for Windows, version 17.0; SPSS Inc., Chicago, IL, USA). Quantitative data were expressed as mean ± SD or median (range) where appropriate. We used student t-test for parametric assumptions and Mann-Whitney U-test for nonparametric assumptions. For comparison of categorical data, chi-square test was used.

Results

A total of 71 patients (34 girls, 37 boys) with a diagnosis of preseptal or orbital cellulitis were included in the study. The female/male ratio was 0.92. The mean age at diagnosis was 49±37.4 months. There were no significant differences between the patients with preseptal and orbital cellulitis in terms of sex and age at diagnosis (p=0.75 and p=0.23, respectively). Five patients had comorbid diseases (non-Hodgkin lymphoma, Fanconi hypoplastic anemia, rickets, recurrent acute pyelonephritis, and operated meningomyelocele).

Fifty (70.4%) of these 71 patients were diagnosed with preseptal cellulitis, and 21 (29.6%) patients were diagnosed with orbital cellulitis. All of the patients presented with complaints of eyelid swelling, redness, and warmth. Clinical findings were left-sided in 38 (53.5%) and right-sided in 29 (40.8%) of 71 patients. Also, 4 patients (5.6%) had bilateral involvement. Proptosis was seen in 16 (76.2%) patients, whose diagnosis (orbital cellulitis) according to the clinical findings was subsequently confirmed with orbital CT imaging. The remaining 5 (23.8%) patients who had no proptosis were diagnosed with orbital cellulitis, according to the orbital CT findings. Two patients had pain with eye motions. Restriction of eye movements was detected in 4 patients.

While only one imaging method, Water's graphy, was performed in 20 patients with preseptal cellulitis, 3 patients had Water's graphy and orbital CT together, and 4 patients had only orbital CT. On the other hand, in patients with orbital cellulitis, only Water's graphy was performed in 3 patients, only orbital CT was performed in 5 patients, and both imaging methods were used in 10 cases (Table 1).

Sinusitis was found in 18 (85.7%) of 21 orbital cellulitis patients and in 22 of 50 (44%) preseptal cellulitis patients as an etiological factor, which was statistically significant (p<0.001). Other factors that we detected in the etiology of preseptal cellulitis were conjunctivitis (8 patients), dental abscess (4 patients), trauma (3 patients), eyelid abscess (2 patients), chickenpox (2 patients), insect bite (1 patient), and bacteremia (1 patient) (Table 2). Maxillary sinusitis was the most commonly detected type of sinusitis in our patients. The distribution of the types of sinusitis is shown in Table 3.

We demonstrated group A beta hemolytic streptococci from the throat culture of 1 patient, from the nasal swab culture of 1 patient, and from the dental abscess drainage culture of 1 patient. *Pseudomonas aeruginosa* (1 patient), *Streptococcus pneumoniae* (1 patient), and *Haemophilus influenzae* (3 patients) were obtained from the conjunctiva cultures. We also isolated *S. pneumoniae* and *H. influenzae* in blood cultures of 1 patient with orbital cellulitis and in another patient with preseptal cellulitis, respectively.

The analysis of median values of acute phase reactants was as follows: CRP: 46 (1-339) mg/dL, WBC:

12.800 (1700-34.600)/mm^3, and ESR: 54 (2-130) mm/h. The mean body temperature of the patients at admission was 37.4±0.9°C. There were no significant statistical differences between the patients with preseptal and orbital cellulitis in terms of acute phase reactants (CRP, WBC, ESR) and body temperature values (p = 0.26, p = 0.47, p = 0.21, and p = 0.82, respectively).

The mean duration of hospitalization was 6.7±4.2 days, and the mean total therapy duration was 15.9±5.8 days. Total duration of treatment was 14.2±4.6 days for preseptal cellulitis and 19.7±6.6 days for orbital cellulitis (p<0.001). The duration of hospital stay was 5.5±2.7 days for preseptal cellulitis and 9.4±5.3 days for orbital cellulitis (p<0.001) (Table 4). Sixty-seven of 71 patients (94.4%) were treated with sulbactam-ampicillin (SAM) therapy.

Table 1. Preferred radiological imaging techniques of the patients at diagnosis

	Preseptal cellulitis Patients (n)	Orbital cellulitis Patients (n)
Waters graphy only	20	4
Waters graphy and orbital CT	3	10
Orbital CT only	4	5
No imaging	23	3
Total	50	21

Table 2. Etiological factors in preseptal cellulitis

Etiological factor	Patients (n)
Sinusitis	22
Conjunctivitis	8
Dental abscess	4
Trauma	3
Eyelid abscess	2
Chickenpox	2
Insect bite	1
Bacteremia	1
Undetermined	7
Total	50

Table 3. Affected paranasal sinuses of the patients with preseptal and orbital cellulitis

Sinus	Patients (n)
Maxillary	15
Maxillary+Ethmoid	13
Maxillary+Ethmoid+Sphenoid	6
Maxillary+Ethmoid+Frontal	1
Ethmoid	5
Total	40

The patients with preseptal and orbital cellulitis were treated successfully with SAM (150 mg/kg/day and 200 mg/kg/day, respectively). Fifteen of 21 patients with orbital cellulitis had a CT scan. The complication rate was 10% in our patients (n=7). In 1 patient with orbital cellulitis sepsis, disseminated intravascular coagulation occurred, and osteomyelitis of the ethmoid bone was seen in another patient during follow-up. We detected a subperiosteal abscess (SPA) in 3 patients, a subparaseptal abscess in 1 patient, and osteomyelitis of the ethmoid bone in 1 patient. None of them required surgery according to the first CT. But, 3 patients with subperiosteal abscess underwent ear, nose, and throat (ENT) surgery for ethmoidectomy and drainage because of the progression of the clinical findings and ongoing fever during the following days. The decision of the surgery was made according to the second CT scan in these patients. One patient with preseptal cellulitis had an eyelid abscess and underwent plastic and reconstructive surgery for drainage. Other cases of orbital cellulitis were consulted by the ENT department, but no surgical operation was proposed. They were treated medically with SAM successfully. None of the patients had a side effect associated with SAM treatment, and all of the patients were discharged from the hospital without any sequelae or morbidity.

Discussion

Sometimes, it is difficult to differentiate preseptal cellulitis and early-stage orbital cellulitis on the basis of the physical examination findings. Because the connective tissue content of the eyelids is very weak, in the event of inflammation, mild proptosis can not be recognized, due to the significant edema around the eyes. As a conventional practice, it is recommended that these patients should be treated as orbital cellulitis, and CT imaging should be performed to confirm the diagnosis (2, 3). Orbital CT with contrast is the imaging method of choice for orbital infections. By virtue of the superiority of demonstrating bone tissue, it is preferred to MRI (6). However, use of this imag-

Table 4. Comparison of patients with preseptal and orbital cellulitis

	Preseptal cellulitis	Orbital Cellulitis	P
Number of patients, (%)	50 (70.4%)	21 (29.6%)	
Sinusitis n, (%)	22 (44%)	18 (85.7%)	0.001
Duration of total treatment (day)	14.2±4.6	19.7±6.6	0.001
Duration of hospitalization (day)	5.5±2.7	9.4± 5.3	0.001

ing method should be restricted because of the high radiation risk, especially in children. Thus, it seems to be reasonable not to perform CT scanning as a routine diagnostic test at the diagnosis for all patients, but it should certainly be performed in patients who have a toxic appearance and restricted and painful eye movements and in those who give poor response to medical treatment within 48 hours.

We observed subparaseptal and subperiosteal abscess formation associated with orbital cellulitis in 4 of 21 patients (20%). This rate was lower than in other studies. Seltz et al. (7) observed subperiosteal abscess in 47% of 94 patients diagnosed with orbital cellulitis. Similarly, in a review by Fanella et al. (8), this complication rate was reported as 31.5%. Also, while 21% of the patients in their study required surgical intervention, only 14% (n=3) of our patients who did not respond to the antibiotic treatment underwent surgical operation. However, the low complication rate in our study may be attributed to the relatively low number of patients in our study. On the other hand, methicillin-resistant *Staphylococcus aureus* has not been a common etiological agent in our country yet. That is why we could get a quick response to SAM therapy in orbital infections.

In our study, similar to previous studies, sinusitis was the most common cause of orbital cellulitis. Unlike other studies (7, 9, 10), the most commonly affected sinus was the maxillary sinus, with a rate of 87.5%. However, data on the microbial agents for preseptal and orbital cellulitis are limited. Blood cultures are often negative, and obtaining samples from the infected areas is generally difficult. For this reason, similar to other studies, data on the causative pathogen are limited in our study, too.

According to a prospective study by Garcia et al. (11), the response rate to medical therapy for radiographically suspected subperiosteal abscesses (SPAs) was 93% in children under 9 years of age. Ryan et al. (12) reported that they managed 450 patients with periorbital cellulitis successfully without any complication. Also, two-thirds of the patients with suspected SPA were treated medically. So, most patients with SPA (less than 10 mm in size) can be treated successfully without surgery. In our study, the patients with a diagnosis of preseptal cellulitis were treated with 150 mg/kg/day of SAM, and orbital cellulitis cases were treated with 200 mg/kg/day of SAM successfully. If proptosis could not be evaluated due to marked eyelid edema, SAM was given in high doses, such as 200 mg/kg/day. Additionally, surgical intervention was required in 4 patients (ethmoidectomy and drainage in three patients with subperiosteal abscess and drainage of eyelid abscess in a patient with preseptal cellulitis).

Conclusion

In conclusion, periorbital cellulitis and orbital cellulitis are common in the pediatric age group, and infections can usually be treated without any morbidity and mortality in cases of early diagnosis and prompt suitable antibiotic treatment. Imaging methods can give useful information regarding disease involvement, the differential diagnosis, and the need for surgical treatment in the course of disease. However, we think that CT should be restricted as much as possible because of high-dose radiation exposure risk.

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