



## Original Research

# Preseptal Cellulitis in Children: A Single-Center Experience

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### Abstract

**Objectives:** Preseptal cellulitis is an infection that affects the palpebra and the periorbital superficial tissue. This study is an evaluation of the clinical findings, treatment, and complications of patients hospitalized with preseptal cellulitis in a single clinic.

**Methods:** The records of 29 patients with preseptal cellulitis who were hospitalized in the Şişli Hamidiye Etfal Education and Research Hospital Pediatric Infection Clinic between November 2012 and November 2017 were analyzed retrospectively.

**Results:** Of the 29 cases, 34.5% (n=10) were female and 65.5% (n=19) were male. The mean age was 61.76±46.95 months, and the mean length of hospital stay was 4.03±2.04 days. Periorbital swelling (72.4%) was the most common cause of complaint at hospital admission, and periorbital hyperemia and edema were observed in 93.1% of the clinical findings. Nine (52.9%) of 17 cases with predisposing factors were sinusitis-related. A blood culture was obtained in 21 (72.4%) cases. Imaging methods were used in 9 (31%) cases to support the diagnosis. All of the patients received broad-spectrum intravenous antibiotic therapy during hospitalization. The mean duration of antibiotic use was 10.10±3.41 days, including after discharge. None of the patients developed complications related to preseptal cellulitis.

**Conclusion:** Preseptal cellulitis is a very common orbital infection, especially in childhood. Although it generally has a good prognosis, it can progress rapidly to the orbita and intracranial structures. An accurate clinical approach and rapid treatment can prevent the spread of infection and avoid serious complications.

**Keywords:** Eyelid; hyperemia; preseptal cellulitis; pediatrics.

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Preseptal cellulitis is a common infection in the anterior of the orbital septum involving the superficial and soft tissue of the palpebra and periorbital region. It may be the result of various predisposing factors, is more common in childhood, and typically has a good prognosis. The orbital septum separating the orbita into the periorbital (preseptal) and orbital (postseptal) spaces serves as a barrier that generally prevents infection and tumor spread from the preseptal area to the orbital area.<sup>[1]</sup> However, preseptal infections that are not diagnosed and treated promptly can cause intracranial complications by crossing the orbital

septum and spreading to the orbita. The orbital complication classifications developed by Chandler in 1970 remain valid: preseptal cellulitis (stage 1), orbital cellulitis (stage 2), subperiosteal abscess (stage 3), orbital abscess (stage 4), and cavernous sinus thrombosis (stage 5).<sup>[1, 2]</sup> In preseptal cellulitis, the eyeball is not involved, no pain with eye movements or loss of vision is seen, and intraocular pressure is not affected.<sup>[3]</sup> It manifests with edema, hyperemia, and pain in the palpebral and periorbital tissue. Although it may easily regress with antibiotherapy, late diagnosis may have serious consequences, including affecting the eyeball

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and vision. Orbital cellulitis is a condition in which the orbital septum does not serve as a barrier and, unlike preseptal cellulitis, involves the eyeball and surrounding tissues (eye muscles, adipose tissue, etc.) and presents with pain upon eye movement. Similarly, it is more common in childhood than in adulthood.<sup>[4]</sup> This study investigated the clinical findings, treatment, and prognosis of preseptal cellulitis patients in a pediatric infection clinic.

## Methods

The records of 29 patients with preseptal cellulitis who were hospitalized in the Şişli Hamidiye Etfal Training and Research Hospital Pediatric Infectious Diseases Clinic between November 2012 and November 2017 were analyzed retrospectively. Age (months), gender, length of hospitalization, admission complaint, clinical features, complete blood count, C-reactive protein (CRP) values, radiology findings, blood culture results, antibiotic use and duration, and prognosis were evaluated. Although the diagnosis of preseptal cellulitis was generally made based on the clinical presentation of the patient, patients who could not open the palpebra and whose eye movements could not be examined were consulted to ophthalmology with a pre-diagnosis of orbital cellulitis.

The statistical analysis of data and calculations of frequency, percentage, and median were performed using the IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY, USA).

## Results

Of the 29 cases examined, 34.5% (n=10) were girls and 65.5% (n=19) were boys. The mean age was  $61.76 \pm 46.95$  months, and the mean hospital stay was  $4.03 \pm 2.04$  days. The most common cause of complaint on admission was swelling around the eye (n=21; 72.4%), followed by redness around the eye (n=17; 58.6%). On physical examination, the most common clinical findings were hyperemia and edema around the eye in 93.1% (n=27) (Fig. 1).

Nine (52.9%) of the 17 cases with predisposing factors were found to be caused by sinusitis. Three (10.3%) cases were caused by a dental abscess, 2 (6.9%) by an insect bite, and 1 (3.4%) by trauma. One patient (3.4%) had a history of simultaneous trauma and sinusitis. One patient (3.4%) had a vesicular varicella infection at the time of admission to the hospital with a rash that included the periorbital area. Blood cultures were obtained from 21 (72.4%) of the patients. One (3.4%) demonstrated *Streptococcus oralis* growth; the predisposing factor in this case was a dental abscess. The remainder revealed no bacterial growth. Computed tomography (CT) was performed in 24.1% (n=7)

of the cases (Fig. 2). CT and magnetic resonance imaging (MRI) were performed in 1 case. In 69.1% (n=20), no radiological imaging method was used.

The mean white cell count of the patients was  $13.306.5 \pm 5896.5/\text{mm}^3$ , the mean polymorphonuclear leukocyte count was  $7216.5 \pm 4664.7/\text{mm}^3$ , and the mean CRP value was  $40.85 \pm 61.26$  mg/L. A total of 89.7% (n=26) of the cases received 200 mg/kg/day intravenous ampicillin-sulbactam, and single dose intravenous ceftriaxone of 80 mg/kg/day was administered to 3 (10.3%) patients. Fever de-



**Figure 1.** A case of preseptal cellulitis with edema and hyperemia in and around the orbita.



**Figure 2.** Computed tomography image of the same patient.

veloped and the clinical condition deteriorated in 1 ceftriaxone patient and 40 mg/kg/day intravenous vancomycin was added to the treatment. One patient received intravenous ampicillin-sulbactam treatment for just 2 days due to a voluntary discharge from the hospital. The remaining 28 patients (96.5%) were discharged with oral ampicillin-sulbactam antibiotic therapy. The mean duration of antibiotic use was  $10.10 \pm 3.41$  days, including after discharge. None of the patients developed complications related to preseptal cellulitis (Table 1).

**Table 1.** Demographic characteristics, complaints, clinical findings, predisposing factors, laboratory investigations, and radiological methods used

Preseptal cellulitis patients (n=29)	
Age (months) (min-max)	61.76 $\pm$ 46.95 (3-177)
Gender, (%)	
Female	10 (34.5)
Male	19 (64.5)
Presenting complaint, (%)	
Swelling around the eye	21 (72.4)
Redness around the eye	17 (58.6)
Fever	6 (20.7)
Discharge in the eye	2 (6.9)
Eye pain and headache	2 (6.9)
Warmth around the eye	1 (3.4)
Other	6 (20.7)
Clinical findings, (%)	
Periorbital hyperemia	27 (93.1)
Periorbital edema	27 (93.1)
Fever	4 (13.8)
Periorbital temperature increase	3 (10.3)
Discharge	2 (6.9)
Other	4 (13.8)
Predisposing factors, (%)	
Sinusitis	9 (31)
Dental abscess	3 (10.3)
Trauma	1 (3.4)
Insect bite	2 (6.9)
Othera	3 (10.3)
Laboratory findings	
White blood cell	13306.55 $\pm$ 5896.53
PNL	7216.55 $\pm$ 4664.75
CRP	40.85 $\pm$ 61.26
Radiology, (%)	
CT	7 (24.1)
CT+MRI	1 (3.4)
No imaging	20 (69)

<sup>a</sup>Varicella infection, coexistence of sinusitis and trauma; CRP: C-reactive protein; CT: Computed tomography; MRI: Magnetic resonance imaging; PNL: Polymorphonuclear leukocyte.

## Discussion

Preseptal cellulitis is a condition that can progress rapidly when the diagnosis is delayed or treatment cannot be initiated, and can progress with complications. In childhood, preseptal cellulitis is seen more frequently than orbital cellulitis. A prompt differentiation is necessary due to the different treatment protocols and prognosis. Liu et al.<sup>[5]</sup> found that preseptal cellulitis was 71.3% more common than orbital cellulitis. Demir Öcal et al.<sup>[6]</sup> also reported that preseptal cellulitis (81%) was seen more than orbital cellulitis (19%). Acute sinusitis is common among the predisposing factors. In our study, 31% of the cases with a predisposing factor were caused by sinusitis. In the study published by Liu et al.,<sup>[5]</sup> skin lesions (pustules, rash, hordeloum, chalazion, etc.) were found to be the most common cause. Other predisposing factors include dental abscess, insect bite, chickenpox, and trauma.<sup>[5, 6]</sup> In our study, chickenpox was the predisposing factor in 1 case. A common disease in childhood, chickenpox can be a predisposing factor for preseptal cellulitis due to disruption of skin integrity.<sup>[7]</sup> Demir Öcal et al.<sup>[6]</sup> determined a mean age of preseptal cellulitis was 5.43 years, and Berk et al.<sup>[8]</sup> reported a mean of 4.29 years. In our study, the mean age was 5.14 years (61.76 $\pm$ 46.95 months), which is consistent with the literature.

CRP, one of the acute phase reactants, was accepted as a marker for orbital cellulitis rather than preseptal cellulitis by Liu et al.,<sup>[5]</sup> while Cagan et al.<sup>[9]</sup> did not consider CRP to be a marker for preseptal or orbital cellulitis in their study with 21 patients. In our study, the CRP level was determined to be high in 64.5% of the patients.

Some studies reported that there was no growth observed in blood cultures.<sup>[9, 10]</sup> In our study, 20 (95.2%) of 21 patients who had blood cultures performed had no growth, while *S. oralis* growth was seen in 1 patient with a dental abscess. *S. oralis* is present in the normal microbiota of the mouth.<sup>[11]</sup> We think that the growth in this case was caused by systemic spread due to the abscess. Since the infection is limited to the soft tissue around the eye in preseptal cellulitis, blood culture testing is not necessary unless there is a complication during diagnosis or treatment, or immunosuppression.

CT imaging can be used to support the diagnosis of preseptal cellulitis because it illustrates bone density well. However, it is not recommended for routine use and should be reserved for cases of a toxic appearance or a clinical presentation of orbital involvement, such as pain in eye movements, proptosis etc.<sup>[10, 12]</sup> In our study, CT imaging was performed in 7 cases due to a suspicion of orbital intracranial complications. Intracranial abscess, a complication of acute sinusitis, could not be ruled out clinically and could not be



evaluated clearly by CT in 1 patient; therefore, a cranial MRI was performed.

CT is usually not necessary and carries a high cost and radiation emission. Unless there is a suspicion of orbital complications or no response to antibiotherapy within 48 to 72 hours, it can typically be avoided.

If effective treatment of preseptal cellulitis is not applied, spread to the orbita can be very rapid. Mild infections can be treated as an outpatient with oral antibiotics, while hospitalization and parenteral antibiotics are recommended for other conditions.<sup>[8]</sup> All 29 patients in our study were hospitalized and received antibiotic therapy intravenously. Demir Öcal et al.<sup>[6]</sup> indicated that ampicillin-sulbactam and ampicillin-sulbactam-ceftriaxone combination treatments were the most preferred and that the patients completed their treatment without any complications. Berk et al.<sup>[8]</sup> reported that ampicillin-sulbactam was used in patients with preseptal cellulitis whose clinical findings were not severe, and others were given ceftriaxone alone or in combination with metronidazole with no cases of treatment failure. In our study, ampicillin-sulbactam treatment was initiated empirically in 26 patients due to the prevalence of Staphylococci and Streptococci, and 3 patients received ceftriaxone alone.<sup>[13]</sup> Vancomycin was added to the treatment when a patient developed a fever under ceftriaxone treatment and deteriorating clinical status. All of our patients responded well to antibiotherapy and 28 patients continued their treatment orally after discharge.

It has been reported in some studies that complications such as loss of vision, increased intraocular pressure, ophthalmoplegia, or meningitis may develop.<sup>[1, 5]</sup> No complications were observed in the patients of the present study during hospitalization or in the period after discharge until the follow-up control.

Preseptal cellulitis is a very common orbital infection, especially in childhood. Although it is an infection with good prognosis, it can progress rapidly to the orbita and intracranial structures. An accurate clinical approach and rapid initiation of effective treatment can prevent the spread of infection and potentially serious complications.

## Disclosures

**Ethics Committee Approval:** The study was approved by the Local Ethics Committee.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

**Authorship Contributions:** Concept – N.D.; Design – N.D., A.Ş., B.C.; Supervision – N.D.; Materials – B.C., A.Ş.; Data collection &/or processing – B.C., A.Ş.; Analysis and/or interpretation – B.C., A.Ş.; Literature search – B.C.; Writing – B.C., A.Ş.; Critical review – N.D.

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