

ÇOCUKLARDA PRESEPTAL SELÜLİTİN KLİNİK ÖZELLİKLERİ VE TEDAVİ YAKLAŞIMLARI: BEŞ YILLIK DENEYİM

CLINICAL CHARACTERISTICS AND TREATMENT APPROACHES OF PRESEPTAL CELLULITIS IN CHILDREN: A FIVE-YEAR EXPERIENCE

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ÖZET

AMAÇ: Preseptal selülit, genellikle iyi prognozlu olan, çocukluk çağında sık görülen bir enfeksiyondur; ancak tanıda gecikme ciddi komplikasyonlara yol açabilir. Bu çalışmada, preseptal selülit tanısı alan çocuklarda klinik özelliklerin, predispozan faktörlerin ve tedavi yaklaşımlarının değerlendirilmesi amaçlandı.

GEREÇ VE YÖNTEM: Bu retrospektif çalışmaya, Kasım 2019 ile Kasım 2024 tarihleri arasında preseptal selülit tanısı alan 0-18 yaş arası çocuklar dahil edildi. Demografik veriler, klinik bulgular, radyolojik görüntüleme, tedavi yöntemi ve antibiyotik rejimleri incelendi ve analiz edildi.

BULGULAR: Toplam 191 hasta çalışmaya dahil edildi; hastaların ortalama yaşı $5,8 \pm 4,0$ yıl olup, %51,8'i erkekti. En sık başvuru semptomu göz kapağı şişliiydi. Konjonktivit en sık predispozan faktör olup, bunu sinüzit ve böcek ısırıkları izledi. Radyolojik görüntüleme hastaların yarısından fazlasında yapılmış olup, rinosinüzit ile ilişkili olgularda daha sık gerekli olduğu görüldü. Tüm hastalar antibiyotik tedavisi aldı. Ayaktan izlenen hafif hastalığı olan olguların %35,6'sında oral amoksisilin-klavulanat kullanılırken, %64,4'ü hastaneye yatırılarak intravenöz antibiyotiklerle, en sık kombinasyon rejimleri ile tedavi edildi.

SONUÇ: Preseptal selülit öncelikle küçük çocukları etkilemekte ve sıklıkla konjonktivit ile ilişkili görülmektedir. Birçok hasta oral antibiyotiklerle başarıyla tedavi edilebilirken, hastaneye yatırılan olgularda intravenöz kombinasyon tedavisi sıklıkla gerekmektedir. Erken tanı ve uygun antibiyotik tedavisi, olumlu klinik sonuçların sağlanması açısından önemlidir.

ANAHTAR KELİMELEER: Preseptal selülit; çocuklar; predispozan faktörler; tedavi yöntemi; antibiyotik tedavisi.

ABSTRACT

OBJECTIVE: Preseptal cellulitis is a common pediatric infection with a generally favorable prognosis; however, delayed diagnosis may lead to serious complications. This study aimed to evaluate the clinical characteristics, predisposing factors, and treatment approaches in children with preseptal cellulitis.

MATERIAL AND METHODS: This retrospective study included children aged 0-18 years diagnosed with preseptal cellulitis between November 2019 and November 2024. Demographic data, clinical findings, radiological imaging, treatment modality, and antibiotic regimens were reviewed and analyzed.

RESULTS: A total of 191 patients were included, with a mean age of 5.8 ± 4.0 years; 51.8% were male. Eyelid swelling was the most common presenting symptom. Conjunctivitis was the leading predisposing factor, followed by sinusitis and insect bites. Radiological imaging was performed in more than half of the patients and was more frequently required in cases associated with rhinosinusitis. All patients received antibiotic therapy. Oral co-amoxiclav was used in 35.6% of patients with mild disease managed on an outpatient basis, while 64.4% required inpatient treatment with intravenous antibiotics, most commonly combination regimens.

CONCLUSIONS: Preseptal cellulitis primarily affects young children and is often associated with conjunctivitis. While many patients can be successfully treated with oral antibiotics, intravenous combination therapy is frequently required in hospitalized cases. Early recognition and appropriate antibiotic management are essential to ensure favorable outcomes.

KEYWORDS: Preseptal cellulitis; children; predisposing factors; treatment modality; antibiotic therapy.

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INTRODUCTION

Preseptal cellulitis refers to infections of the soft tissues anterior to the orbital septum, while postseptal cellulitis refers to infections posterior to the orbital septum. These two infections are more common in children than in adults, and preseptal cellulitis occurs almost three times more frequently than orbital cellulitis (1,2). Preseptal cellulitis can develop as a result of various predisposing factors and generally has a good prognosis. However, in cases where diagnosis and treatment are delayed, preseptal infections can cross the orbital septum and spread to the orbit, causing intracranial complications. The classification of orbital complications developed by Chandler in 1970 remains valid and classifies these infections according to their involvement as preseptal cellulitis (Stage 1), orbital cellulitis (Stage 2), subperiosteal abscess (Stage 3), orbital abscess (Stage 4), and cavernous sinus thrombosis (Stage 5) (2, 3).

There is no gender predisposition for preseptal cellulitis and it is more common in winter due to its association with upper respiratory tract and paranasal infections. Infections of adjacent tissues, such as sinusitis (mostly ethmoiditis), upper respiratory tract infections, dacryocystitis, eyelid lesions such as hordeolum, dental infections, and conjunctivitis, can complicate preseptal cellulitis (1, 4, 5). It can also develop due to direct inoculation of pathogens during skin or orbital trauma, ophthalmologic surgery, animal bites, or skin infections such as impetigo or herpes infection (1, 5).

In preseptal cellulitis, the eyeball is not involved, there is no pain or vision loss with eye movements, and intraocular pressure is not affected. It manifests clinically as edema, hyperemia, and pain in the palpebral and periorbital tissue, and a rapid response to antibiotic treatment is achieved (6). Unlike preseptal cellulitis, orbital cellulitis affects the eyeball and surrounding tissues (eye muscles, fat, etc.), causing pain when the eye is moved (7).

The aim of this study was to evaluate the demographic and clinical characteristics, treatment, modalities, and antibiotic regimens of children with preseptal cellulitis who were managed at a single center over a 5-year period.

MATERIALS AND METHODS

Study design

This retrospective study was conducted in the pediatric clinic of a tertiary hospital between November 15, 2019, and November 15, 2024.

Data collection

Digital medical files of cases aged 0 to 18 years diagnosed with preseptal cellulitis using ICD-9 diagnosis codes between November 2019 and November 2024 were reviewed. Patients diagnosed with orbital cellulitis were excluded from the study. Orbital cellulitis was diagnosed by confirming postseptal involvement with computed tomography (CT) in the presence of signs of orbital involvement such as photophobia, proptosis, painful extraocular movement, ophthalmoplegia, visual disturbance or chemosis. The patients' complaints at presentation, clinical findings, underlying etiological causes, laboratory and radiological findings, treatment modality (Outpatient or inpatient), antibiotic regimens used were examined and relevant data were analyzed.

Ethical Committee

The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Ethics Committee of Afyonkarahisar Health Sciences University (Date: 13 December 2024; Approval No: 2024/526).

Statistical Analysis

IBM SPSS Statistics 22 (IBM SPSS Statistics, Armonk, NY) was used for the statistical analyses. Categorical variables were expressed as percentage distributions and continuous variables were expressed as arithmetic mean, standard deviation (SD), median and interquartile range (IQR). The Shapiro-Wilk test was used to assess the conformity of the data to a normal distribution. Data that do not conform to a normal distribution are expressed as median and IQR, while data that conform to a normal distribution are expressed as mean and SD. When comparing data from two independent groups, the independent groups t-test was used when parametric conditions were met; otherwise, the Mann-Whitney U test was used. The chi-square test and Fisher's exact test were

used to compare percentage distributions of categorical data between groups. A *p* value of <0.05 was considered statistically significant.

RESULTS

A total of 191 children diagnosed with preseptal cellulitis were included in the study. The mean age of the patients was 5.8 ± 4.0 years (Median age: 5.0 years, Min: 2 months, Max: 17.7 years), and 51.8% were male.

The most common presenting symptom was eyelid swelling, observed in 90.6% of cases. Fever $\geq 38^\circ\text{C}$ was uncommon and detected in only 3.7% of patients. On clinical findings, periorbital edema was the predominant finding (92.7%), while periorbital hyperemia and periorbital temperature increase were present in 38.2% and 39.8% of patients, respectively. Among predisposing factors, conjunctivitis was the most common (50.8%), followed by sinusitis (16.2%) and insect bites (15.2%).

Laboratory evaluation revealed a mean leukocyte count of $11126 \pm 3937/\mu\text{L}$ (normal range: 4,000–10,000/ μL) and a mean neutrophil count of $6048 \pm 3432/\mu\text{L}$ (normal range: 1,500–7,500/ μL). The median CRP level was 2.4 mg/L (IQR: 0.6–10.0; normal range: <5 mg/L). Radiological imaging was performed in 57.6% of patients. Radiological imaging was performed significantly more often in cases associated with rhinosinusitis (77.4%; *p* = 0.015), whereas it was required less frequently in cases related to conjunctivitis (50.5%; *p* = 0.044). Computed tomography was the most commonly used modality (49.2%), whereas MRI was performed in 5.8% of cases and both modalities in 2.6%. **Table 1** shows the baseline demographic and clinical characteristics of patients.

The comparison of cases in terms of predisposing factors and treatment modality is presented in **Table 2**. All cases with preseptal cellulitis associated with dental abscess (100.0%) required inpatient treatment, and this was statistically significant (*p* = 0.002). In contrast, outpatient treatment was significantly more frequent in cases associated with insect bites (62.1% vs. 37.9%, *p* = 0.002). All patients received antibiotic therapy. Oral antibiotic treatment with co-amoxiclav was administered to 68 patients (35.6%) who

had clinically mild disease and were suitable for outpatient management. Intravenous antibiotics were administered to 123 patients (64.4%) who required inpatient treatment. Combination regimens were more frequently utilized, with cefotaxime plus clindamycin being the predominant combination (28.8%). This was followed by sulbactam-ampicillin plus clindamycin (25.1%). **Table 3** shows the distribution of patients according to antibiotic regimens used.

Table 1: Baseline Demographic and Clinical Characteristics of Patients with Preseptal Cellulitis.

Patients (n=191)	
Demographic characteristics	
Age (years), mean $\pm$ SD	5.8 $\pm$ 4.0
Gender, n(%)	
Male	99 (51.8)
Female	92 (48.2)
Presenting symptom, n(%)	
Eyelid swelling	173 (90.6)
Eyelid erythema	77 (40.3)
Eye discharge	23 (12.0)
Fever ($\geq 38^\circ\text{C}$)	7 (3.7)
Clinical examination, n(%)	
Periorbital edema	177 (92.7)
Periorbital temperature increase	76 (39.8)
Periorbital hyperemia	73 (38.2)
Conjunctival hyperemia	32 (16.8)
Chemosis	13 (6.8)
Predisposing factors, n(%)	
Conjunctivitis	97 (50.8)
Sinusitis	31 (16.2)
Insect bite	29 (15.2)
Dental abscess	14 (7.3)
Trauma	8 (4.2)
Dacryocystitis	4 (2.1)
Laboratory findings, mean $\pm$ SD	
Leukocyte count (/ μ); mean $\pm$ SD	11126 $\pm$ 3937
Neutrophils count (/ μ); mean $\pm$ SD	6048 $\pm$ 3432
CRP (mg/L); median (IQR)	2.4 (0.6–10.0)
Radiology, n(%)	
CT	94 (49.2)
MRI	11 (5.8)
CT+MRI	5 (2.6)
No imaging	81 (42.4)
SD: Standard deviation IQR: Interquartile range	

Table 2: Comparison of Treatment Modality According to Predisposing Factors.

Predisposing factors	Treatment Modality	
	Outpatient (n=69)	Inpatient (n=122)
Sinusitis	14 (45.2)	17 (54.8)
Dental abscess	0 (0.0)	14 (100.0)
Trauma	1 (12.5)	7 (87.5)
Insect bite	18 (62.1)	11 (37.9)
Conjunctivitis	30 (30.9)	67 (69.1)
Dacryocystitis	0 (0.0)	4 (100.0)

Fisher's exact test was applied to variables containing cells with expected frequencies <5 or zero counts.

Percentages are calculated within each predisposing factor for the presence of "yes"

Table 3: Distribution of Patients According to Antibiotic Regimens Used (n = 191).

Antibiotherapy	n (%)
Oral antibiotic regimen	
Co-amoxiclav	68 (35.6)
Intravenous antibiotic regimen	
Cefotaxime + clindamycin	55 (28.8)
Sulbactam ampicillin + clindamycin	48 (25.1)
Vancomycin + cefotaxime	11 (5.8)
Ceftriaxone + clindamycin	6 (3.1)
Cefotaxime	2 (1.0)
Ceftriaxone	1 (0.5)

DISCUSSION

In this study, although the age range of children diagnosed with preseptal cellulitis was wide, the mean age of the cases was found to be preschool age. This finding is consistent with previous studies reporting that preseptal cellulitis is more common in young children (8,9). The higher frequency in this age group has been attributed to poor hygiene and their susceptibility to infections (10-12). No significant gender difference has been reported regarding preseptal cellulitis in the previous literature (10). Okay et al (9). found that 55.4% of the cases in their series were male, while Khodabandeh et al. (8) found that 52.2% were male. Santos et al. (13) also found that it was slightly more common in boys, at 57.1%. In this study, 51.8% of the cases were male, which is consistent with the slightly male predominance reported in the literature.

Patients with preseptal cellulitis frequently experience signs of infection around the eyes, such as edema, redness, and purulent discharge. This is due both to the inflammatory nature of preseptal cellulitis and to predisposing conditions (9, 10, 13). In this study, the most frequent presenting symptom was eyelid swelling and periorbital edema was the most common clinical finding (92.7%), followed by periorbital hyperemia and increased periorbital temperature. Previous studies have similarly found that the most common presenting symptom in children with preseptal cellulitis is eyelid swelling (8,9,10). In our study, fever, as a systemic finding, was also detected as a less frequently observed symptom compared to other studies (8,10).

In this study, the most common underlying factor was conjunctivitis (50.8%), followed by sinusitis (16.2%) and insect bites (15.2%). Underlying causes such as conjunctivitis and insect bites indicate that proximity is a significant route of transmission (14). Although sinusitis is reported as the leading predisposing cause of periorbital infections in most studies (2,8,10,13), one previous report, in line with our findings, identified conjunctivitis as the most frequent underlying factor (14). Our finding may be related to the underdiagnosis of sinusitis cases, due to the fact that approximately half of our cases did not undergo radiological imaging. Unlike in adults, periorbital infections associated with sinusitis in

children are known to be linked to acute ethmoiditis because the frontal and maxillary sinuses develop later, whereas the ethmoid labyrinth is well-developed and pneumatized even in newborns. Furthermore, it has been noted that the lamina papyracea is generally thinner and more porous in children, potentially allowing the passage of hematogenous infections (15).

In this study, when the laboratory findings of the patients were examined, it was found that the mean leukocyte and neutrophil counts, indicating infection, were increased, but CRP levels showed a wide distribution. Although some studies have reported that the presence of fever during hospitalization and high leukocyte count and CRP values are associated with orbital involvement (10,13,16), Kocabaş et al. (17) found no statistically significant difference in mean CRP and leukocyte levels in patients with orbital and preseptal cellulitis.

This study found that radiological imaging was performed more frequently in cases associated with rhinosinusitis and less frequently in cases associated with conjunctivitis. When the use of imaging methods is evaluated, it is seen that computed tomography (CT) is preferred in approximately half of the patients. This finding can be attributed to the advantages of CT which is a very fast and widely used imaging technique, providing excellent visualization of the bony structure of the orbit while also offering information about soft tissues (18). Okay et al. (9) reported that a higher percentage of cases (84.2%) underwent CT scans in their series. Magnetic resonance imaging (MRI) was used to a more limited extent in our study; this can be explained by the longer imaging time, the need for sedation, and the limited accessibility of MRI in emergency situations (18). Since MRI is more sensitive in evaluating intracranial complications (19), in our clinic, MRI was used to rule out intracranial complications in a small percentage of cases where clinical or CT-based suspicion was present.

Children older than 1 year presenting with mild preseptal cellulitis can generally be managed on an outpatient basis with empirical broad-spectrum oral antibiotics, provided there are no signs of systemic toxicity and under close monitoring (20). Jani et al. (21) reported

that children with mild preseptal cellulitis can be managed safely and effectively by following a structured outpatient strategy and discharge with oral antibiotics, using a combination of specialist consultations as needed. (However, due to potential serious complications (e.g., vision loss, meningitis, and death), up to 51% of children presenting to the emergency department with signs of periorbital infection are hospitalized for further investigation and treatment (22). Present study showed that all cases with preseptal cellulitis associated with dental abscess were treated as inpatients, while cases associated with insect bites were mostly monitored on an outpatient basis.

Considering the predisposing factors for preseptal cellulitis, empirical antibiotic regimens are directed at common pathogens associated with upper respiratory tract infections, particularly *Staphylococcus* and *Streptococcus* species (20). This study demonstrated that approximately one-third of the patients were treated with oral antibiotics, with co-amoxiclav being the only oral regimen used. In a prospective study by Jani et al. (21), co-amoxiclav was administered to 97% of outpatients. In contrast, Santos et al. (13) reported cefuroxime as the most frequently used oral antibiotic, followed by co-amoxiclav. In hospitalized patients, it is recommended to add teicoplanin or clindamycin to ampicillin-sulbactam or ceftriaxone (9).

Öcal Demir et al. (23) also reported that ampicillin-sulbactam-based regimens, either alone or in combination with ceftriaxone, were the most frequently preferred treatments and were associated with favorable outcomes without complications, while Berk et al. [8] similarly observed that ampicillin-sulbactam was used in clinically mild preseptal cellulitis cases and that ceftriaxone, administered alone or with metronidazole in other patients, resulted in no treatment failures. In the present study, intravenous antibiotic therapy was administered to 64.4% of patients requiring inpatient treatment, with combination regimens used more frequently, most commonly cefotaxime plus clindamycin, followed by ampicillin-sulbactam plus clindamycin.

This study has several limitations that should be considered when interpreting the results. First, its retrospective and single-center design may

limit the generalizability of the findings to other settings or populations. Second, radiological imaging was not performed in all patients, which may have led to underdiagnosis of underlying sinusitis in some cases and could have influenced the distribution of predisposing factors. Third, microbiological data were not routinely available, preventing pathogen-specific analysis of antibiotic effectiveness. Finally, treatment decisions were based on clinical judgment rather than a standardized protocol, which may have introduced variability in antibiotic selection and treatment modality.

Preseptal cellulitis in children is generally a benign condition with good outcomes when promptly diagnosed and appropriately treated. Our findings indicate that conjunctivitis is the leading predisposing factor and that clinical severity guides the choice of treatment modality. Oral antibiotic therapy with co-amoxiclav is sufficient for clinically mild cases, whereas intravenous combination regimens are commonly required for hospitalized patients. Awareness of clinical presentation and risk factors, along with timely initiation of appropriate antibiotic therapy, is essential to minimize the risk of progression to orbital or intracranial complications.

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