

Preseptal Cellulitis: A Multidisciplinary Perspective on Diagnosis and Treatment

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ABSTRACT

Introduction: Preseptal cellulitis is a common pediatric infection involving the eyelid and anterior orbital tissues, characterized by eyelid erythema and edema. Although most cases respond well to oral antibiotics, delayed diagnosis or inadequate treatment may lead to complications requiring more intensive management. **Case Presentation:** A febrile 7 year-old boy presented with progressive swelling, erythema, and purulent discharge of the right upper eyelid for two weeks despite prior oral antibiotic therapy. Examination revealed marked palpebral edema, tenderness, and a superior eyelid mass without proptosis or limitation of ocular motility. Laboratory findings showed elevated C-reactive protein levels. Orbital CT imaging confirmed preseptal cellulitis without orbital involvement. The patient was hospitalized and treated with intravenous ampicillin-sulbactam. **Discussion:** Preseptal cellulitis most commonly affects children under 10 years old. While mild cases can be managed with oral antibiotics, severe or unresponsive cases require intravenous therapy. The absence of proptosis and preserved ocular motility were key features distinguishing this condition from orbital cellulitis. **Conclusion:** Prompt recognition and timely intravenous antibiotic therapy are crucial in severe preseptal cellulitis to ensure clinical improvement and prevent progression to orbital complications.

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Introduction

Preseptal cellulitis or known as periorbital cellulitis, is an infection in the

eyelid or orbital tissue that is marked by edema and erythema anterior to the orbital septum.^{1,2} This condition is relatively common

in pediatric patients. Literature suggests similar prevalence between male and female, or a slight male predominance.³ Preseptal cellulitis does not cause vision impairment, it has a favorable prognosis with antibiotic therapy alone.^{2,3} However, conditions such as this should not be overlooked as delay in detection, diagnosis and management can progress to a serious complication.

Primarily, prevalence of preseptal cellulitis is approximately 80% patients aged 10 years and below.⁴ As for gender predilection, similar prevalence was observed between males and females, with a slight male predominance.³ The Chandler and Maloney classifications are commonly used to differentiate preseptal cellulitis from orbital cellulitis, with the former relying on clinical and computed tomography (CT) findings to assess the stage of the infection. The Chandler classification remains widely used in clinical practice for staging orbital cellulitis. In contrast, the Maloney classification simplifies the process by categorizing infections as either 'preseptal' or 'postseptal', depending on whether the infection has penetrated the orbital septum. This distinction is based on whether the infection has penetrated the orbital septum, providing a clearer division between infections confined to the eyelid and those involving deeper orbital structures.⁵

Prompt diagnosis is essential to differentiate preseptal cellulitis from orbital cellulitis, as the latter requires more intensive management, including possible surgical intervention. While mild cases of preseptal cellulitis can often be managed with oral antibiotics, severe or non-responsive cases, as seen in this report, require hospitalization and a multidisciplinary approach. This case underscores the importance of early

intervention to prevent progression to more serious orbital infections.

Case Illustration

A seven-year-old boy presented with bleeding and pus from the swollen right upper eyelid for nine hours before admission to our emergency room. At first, patient has no complaint of fever, cough, cold and denied injuries to the eye caused by trauma nor insect bites. However, the patient reported the swelling and redness of the right upper eyelid began two weeks prior to admission alongside with fever and was treated with amoxicillin. Symptoms worsened and the patient received another set of oral antibiotics, an anti-inflammatory agent and chloramphenicol eye ointment, yet no improvement was found.

Visual acuity (VA) of the right eye (RE) was 6/9 uncorrected with pinhole and intraocular pressure (IOP) was 10 mmHg. Eye position was orthophoria and good ocular motility. As seen in **Figure 1**, ophthalmological examination of the RE revealed eyelid edema, spasm, mass on superior eyelid with undulation, tenderness, fistula, and crust of the right eye. There was no proptosis, painful, or limitation of the extraocular movements. Findings were positive only on the RE. Funduscopy examination revealed round optic nerve head with clear margin, cup to disc ratio of 0.3-0.4, and good macular reflex on the RE. LE showed normal results.

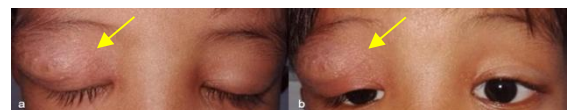


Figure 1.a,b Initial clinical presentation in the emergency room showed a swollen and erythematous right upper eyelid (yellow arrows)

Laboratory examination showed an elevation in the inflammatory panel of C-Reactive Protein and increased Procalcitonin. CT-scan with contrast shown in **Figure 2** revealed cellulitis in the preseptal region of the right orbit involving the superior eyelid, medial canthus, and subcutis of the right temporal region. No intraorbital extensions were seen. Patient was diagnosed with preseptal cellulitis of the right eye with differential diagnosis of abscess and palpebral mass.

The clinical presentation and examination led to an initial diagnosis of preseptal cellulitis of the right upper eyelid. A differential diagnosis of orbital cellulitis was excluded during physical examinations, patients showed smooth extraocular movements. Subperiosteal abscess was not considered as the patient had no history of common cold or sinusitis and no globe deformity. Childhood orbital inflammation, non-specific orbital inflammation, orbital myositis and neoplasms were other probable differential diagnosis. Patient showed a case of preseptal cellulitis.

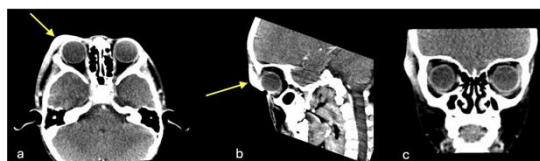


Figure 2. Orbital CT-scan with contrast revealed **a,b)** thickening of the skin-subcutaneous tissue with enhancement after contrast in the right preseptal orbital region, involving the superior eyelid, medial canthus to the subcutaneous temporal region on the right, fat stranding in the subcutaneous fat and periorbital fat; **c)** no abnormalities in the intracranial structures visualized, with mucosal thickening in the right and left frontal sinuses and right and left ethmoid

sinuses. Other paranasal sinuses and air cells show no mucosal thickening.

Patient was admitted for hospitalization, a multidisciplinary approach with consultations to the Pediatric, Otolaryngology and Dentistry department was conducted. General examination from the pediatric and otolaryngology department revealed no emergency findings. From the dentistry department, they revealed there was gangrene in tooth pulp and radix. It is advised for patient to maintain oral hygiene by brushing teeth with chlorhexidine gluconate 0.2% gargle twice a day.

According to ophthalmology department, the patient was prescribed antibiotic regimen of ampicillin-sulbactam 4 x 500mg for five to seven days and paracetamol 3 x 250 mg intravenously. Gentamicin eye drops for the right eye and natrium chloride compressions were also given to the patient. After four days of treatment and 10 doses of ampicillin-sulbactam, an improvement was noted. As seen in **Figure 3**, the patient started showing signs of resolution with a decrease in edema, erythema and size of lesion. Patient was kept under close monitoring and supervision.



Figure 3.a,b) clinically improved condition after receiving intravenous ampicillin-sulbactam

Results and Discussion

Occurrence of preseptal cellulitis is common in children as compared to adults. This case of preseptal cellulitis happened to a boy in middle childhood and has received inpatient care for 4 days, in line with the findings of a retrospective case review by Declan et al. that stated preseptal cellulitis

were generally found in younger patients average of 5-years-old and had 2 days of hospital admission. While older children with an average of 9-years-old required longer inpatient care.⁶

Preseptal cellulitis may arise secondary to upper respiratory tract infections, sinusitis, odontogenic sources, in conjunction with severe conjunctivitis and following a traumatic incident.² The most common causative organisms are gram-positive bacteria, particularly *Staphylococcus aureus* and *Streptococcus* species, including *Streptococcus pneumoniae* and *Streptococcus pyogenes*.⁷ Recent literature has also reported an increasing incidence of Methicillin-Resistant *Staphylococcus aureus* (MRSA) as a causative pathogen in periorbital cellulitis.⁸ In this case, no clear precipitating factor was identified, and the exact microbiological etiology remained unknown.

A thorough understanding the eyelid anatomy is important in distinguishing preseptal from orbital cellulitis, as this distinction is critical in guiding appropriate approach and treatment. Performing physical examination is key to differentiate orbital cellulitis from preseptal cellulitis as well as eliminating differential diagnosis caused from other processes.⁹ The patient did not present with trauma, malignancy, contact dermatitis and allergic reactions. Through physical examination, exhibited no signs of proptosis, painful and limited ocular movements.

Laboratory investigations may aid in assessment with complete blood count potentially revealing leukocytosis in bacterial infections, while blood cultures are recommended in febrile patients to detect possible bacteremia.¹⁰ Radiological imaging is indicated in selected cases, particularly

when the distinction between preseptal and orbital cellulitis is unclear. Contrast-enhanced CT scan remains the most used modality to delineate the extent of orbital involvement.¹¹ While magnetic resonance imaging (MRI) may serve as an alternative with reduced radiation exposure in pediatric populations.¹²

CT scan is recommended in patients presenting with significant swelling, fever, leukocytosis and lack of clinical improvement within 24 hours of appropriate antibiotic treatment.¹³ In this case, laboratory investigations revealed leukocytosis on complete blood count along with elevated inflammatory markers. CT scan with contrast revealed cellulitis confined to the preseptal region of the right orbit involving the superior eyelid, medial canthus, and subcutis of the right temporal region.

Mild preseptal cellulitis is often treated as an outpatient basis with broad-spectrum oral antibiotics.¹ It is always found to be responsive to antibiotics and anti-inflammatory drugs. Mild cases are treated with oral amoxicillin-clavulanate at 45 mg/kg/dose administered twice daily. In moderate to severe cases, or in patients with poor response to oral therapy, intravenous antibiotics are indicated, such as ampicillin-sulbactam at 50 mg/kg/dose every 6 hours.¹⁴

Demir Ocal et al. explained that ampicillin-sulbactam and ampicillin-sulbactam-ceftriaxone combination treatments were the most preferred and the patients completed the treatment without any complications.¹⁵ In our case, the patient did not respond to any of the antibiotics prescribed and rather the symptoms worsened. Thus, the patient had to undergo hospitalization to receive antibiotic regimen of ampicillin-sulbactam 4 x 500mg

intravenously for four days. This results in clinical improvement which is consistent with the literature.

Children with preseptal and orbital cellulitis typically require hospitalization due to the complexity of managing orbital cellulitis, which necessitates a multidisciplinary approach. This approach involves pediatricians, ophthalmologists, and otolaryngologists to ensure optimal care and prevent complications. In the case presented, referral to ENT and dentistry was indicated early to identify potential sinus and odontogenic sources of infection. Several studies have highlighted the importance of early and coordinated management in these cases.

Stephanie Wong et al. emphasized the necessity of a comprehensive approach in their systematic review of pediatric orbital cellulitis management, while Caldeira Santos et al. reported a 10-year experience demonstrating the value of inpatient care for these infections.^{2,16} Additionally, Anosike et al. discussed the epidemiology and management strategies of orbital cellulitis, reinforcing the importance of timely intervention and multidisciplinary involvement in preventing serious outcomes in pediatric patients.¹⁷

Conclusion

This case exhibits a classic case of preseptal cellulitis, with erythema and edema of the eyelid in a pediatric patient. Patient had no history of trauma, insect bites, upper respiratory infection nor severe conjunctivitis. There was no relief with broad-spectrum oral antibiotics and anti-inflammatory drugs, instead the symptoms worsened and revealed blood and pus discharge from the

swollen eyelid was detected prior to admission. The patient was very responsive to intravenous broad-spectrum antibiotics and within 4 days of hospitalizations, there was a significant improvement in the symptoms.

Variations of a particular disease will never cease to exist. A comprehensive assessment must be conducted to distinguish preseptal and orbital cellulitis. In such cases, prompt identification and management should be addressed to prevent life-threatening complications and improve the patient's quality of life.

Declarations

Statement on the Use of Artificial Intelligence

Generative artificial intelligence tools were used solely to assist with language editing, grammatical refinement, and improvements in the clarity and readability of the manuscript. These tools were not used to formulate the research questions, collect or analyze data, interpret the findings, generate scientific conclusions, or make decisions concerning the research. All AI-assisted content was carefully reviewed, verified, and revised by the authors. The authors take full responsibility for the accuracy, integrity, originality, and final content of the manuscript.

Author Contribution Statement

Carennia Paramita contributed to the conceptualization and design of the study, data collection, literature review, drafting of the manuscript, critical revision and editing of the manuscript, and approval of the final version for publication. Erica Widodo contributed to the literature review, preparation of the initial manuscript, critical

revision and editing of the manuscript, and approval of the final version for publication. Made Susiyanti contributed to the conceptualization and design of the study, preparation of the manuscript, critical revision and editing of the manuscript, and approval of the final version for publication. All authors have read and approved the final manuscript and agree to be accountable for the integrity and accuracy of the work.

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Conflict of Interest

The authors declare that they have no financial, professional, personal, or other conflicts of interest that could have influenced the research, interpretation of the findings, or publication of this article.

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