Preseptal and orbital cellulitis

Emine Akçay, Gamze Dereli Can, Nurullah Çağıl

Yıldırım Beyazıt Univ. Medical Faculty Atatürk Training and Research Hospital Dept. of Ophthalmology, Ankara, Turkey

ABSTRACT

Preseptal cellulitis (PC) is defined as an inflammation of the eyelid and surrounding skin, whereas orbital cellulitis (OC) is an inflammation of the posterior septum of the eyelid affecting the orbit and its contents. Periorbital tissues may become infected as a result of trauma (including insect bites) or primary bacteremia. Orbital cellulitis generally occurs as a complication of sinusitis. The most commonly isolated organisms are *Staphylococcus aureus*, *Streptococcus pneumoniae*, *S. epidermidis*, *Haemophilus influenzae*, Moraxella catarrhalis and *S. pyogenes*. The method for the diagnosis of OS and PS is computed tomography. Using effective antibiotics is a mainstay for the treatment of PC and OC. There is an agreement that surgical drainage should be performed in cases of complete ophthalmoplegia or significant visual impairment or large abscesses formation.

This infections are also at a greater risk of acute visual loss, cavernous sinus thrombosis, meningitis, cerebritis, endophthalmitis, and brain abscess in children. Early diagnosis and appropriate treatment are crucial to control the infection. Diagnosis, treatment, management and complications of PC and OC are summarized in this manuscript. J Microbiol Infect Dis 2014; 4(3): 123-127

Key words: infection, cellulitis, orbita, preseptal, diagnosis, treatment

INTRODUCTION

Preseptal cellulitis (PC) and orbital cellulitis (OC) are serious infections of the adnexal tissues surrounding the eye. Although they can be seen at any age, children are most commonly affected. If not treated appropriately, they can lead to sight-threatening complications such as acute visual loss and endophthalmitis and life-threatening complications, such as the thrombosis of cavernous sinus, meningitis, cerebritis, and brain abscess. Therefore correct diagnosis and early appropriate treatment is essential.

The purpose of this report is to discuss the predisposing factors, clinical findings, microbiologic data, complications, and efficacy of treatment in PC and OC in children.
PATHOGENESIS AND CLASSIFICATION

Periorbital inflammation is classified according to the severity and its location. The orbital septum divides two parts which the soft tissues of the eyelid (preseptal space) from those of the orbit (postseptal space) (Figure 1). PC is the infection of preseptal space usually originates from trauma, or primary bacteremia. In OC cases, the infection is localized in the postseptal space and usually occurs as a complication of sinusitis. Generally ethmoid sinusus are predominating as the most common origin. Although it is penetrated by the neural and vascular structures, the orbital septum preserves entering of the infectious agents to the back of the orbit. The veins which drain the orbit, maxillary and ethmoid sinuses and periorbital tissues create an anastomotic network that lack a valve. Hence the venous system allows the spread of infection from one place to another leading to the cavernous sinus involvement. The infection can spread from the transition artery of the ethmoid and frontal bones.

Etiology

Preseptal cellulitis is generally seen in children especially those that are 3–7 years old. Bacteremia has been reported in approximately 80% of children diagnosed with periorbital cellulitis. H. influenzae has been associated with preseptal cellulitis in children below the age of 4 years. In 1985 after the introduction of H. influenzae vaccine the microbiological spectrum of bacterial periorbital cellulitis has changed. Recent retrospective studies showed the decreasing incidence of H. influenzae in periorbital cellulitis. Currently S. aureus and Streptococcus species are the predominating microorganisms as the cause of PC. Among the etiologic agents causing preseptal cellulitis in children older than 4 years, S. aureus, S. epidermidis, S. pneumoniae, mixed anaerobic-aerobic bacterial flora seem to be the leading microorganisms.

Clinical findings and diagnosis

Preseptal cellulitis is clinically characterized by erythema, edema, and/or warmth of the periorbital tissues. High fever, fatigue and loss of appetite are determined especially in children. Clinical signs of orbital soft tissue involvement are not visible in PC.

Preseptal cellulitis diagnosis is made by clinical examination and it is the most valuable thing in the differential diagnosis of PC. Various situations can mimic PC. Some of these are; OC, idiopathic orbital inflammatory disease, thyroid orbitopathy, orbital trauma, allergic contact dermatitis, acute adnexal infections, posterior scleritis, endophthalmitis, granulomatous vasculitic autoimmune diseases and tumoral metastases.

In PC imaging with computed tomography (CT) is based on the clinical examination. If there is afferent pupillar defect, limitation of extraocular movements or pain exists, CT must be carried out. Also if the examination is difficult, CT should be done. Axial and coronal sections of the orbit and sinuses should be fine visualised for diagnosis.

Treatment

The management of PC is mainly based on medical treatment, surgical approach is usually not neces-
sary. The children under 1 year of age should be follow up in the hospital. As the origin of the possible infection might be upper respiratory tract and sinuses, initial empiric antibiotic therapy should cover the flora there. If there is a focal trauma, treatment should include Staphylococcus aureus. Outpatient treatment with first generation cephalosporin, amoxicillin-clavulanic acid or ceftriaxone is suitable for mild cases of older children. If there is no response to the treatment in 48-72 hours, intravenous therapy must be applied. In young children and severe cases, intravenous treatment and close observation in hospital is required. Using the second or third generation cephalosporins and penicillinase-resistant penicillins is important. If anaerobes plus S. aureus is suspected clindamycin + cephalosporin treatment can be an option. Chloramphenicol can be used in patients allergic to penicillin. An additional one day follow up will be suitable after achieving clinical improvement within 48-72 hours of antibiotic therapy. The total treatment must be completed 14 days with oral antibiotics. If the eyelid abscess is present, drainage of the abscess has to be done as well.12

Complications
Meningitis is the most important complication of PC especially in children who have H. influenza cellulitis secondary to bacteremia.15

ORBITAL CELLULITIS
Orbital cellulitis is a serious infection of the posterior tissues to the orbital septum. Serious complications such as intracranial abscess, meningoitis, carotid artery occlusion, cavernous sinus thrombosis, and visual loss can be observed.16 It leads to a more severe infection than PC. The most common underlying factor for its development is a preceding ethmoid sinusitis and the microbiology of OC and abscess tends to reflect the underlying sinus infection and pathology.6 As the medial part of the orbit is very thin and due to its porous structure infections can extend easily to the neighborhood structures.16 Furthermore, venous system itself may one of the other reason of the spreading of the infection as the lack of valve system of venos system in this reagon.16 Also there are some exogenous and endogenous causes of OC. Blunt or penetrating trauma of the orbit, the surgery of orbital and periorbital, structures and dental procedures are some examples for exogenous causes.16 Septisemi and endophtalmitis are the examples for endogenous causes of OC.16

Chandler proposed a clinical classification which separates the orbital complications of acute sinusitis into 5 groups (Table 1).17

<table>
<thead>
<tr>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1: Preseptal cellulitis</td>
</tr>
<tr>
<td>Group 2: Orbital cellulitis</td>
</tr>
<tr>
<td>Group 3: Subperiosteal abscess</td>
</tr>
<tr>
<td>Group 4: Intraorbital abscess</td>
</tr>
<tr>
<td>Group 5: Cavernous sinus thrombosis</td>
</tr>
</tbody>
</table>

Etiology
Group A beta-hemolytic streptococci, Staphylococcus aureus, Streptococcus pneumoniae, H. influenzae, M. catarrhalis, other streptococcal species, and anaerobic microorganism are the microorganisms which are responsible for OC in pediatric patients.18,19 In the pre-H. influenzae type B vaccine era, H. influenzae type B was the predominant organism isolated in children with positive blood cultures; it represented 15% to 82% of all isolates depending on the patient population.20 Today, Streptococcus species are the leading microorganisms responsible for the OC.20 Recent studies demonstrate that Staphylococcus and Streptococcus species are the most common pathogens of the pediatric OC. In some population methicillin-resistant Staphylococcus aureus is the increasing species responsible for pediatric OC.21

Clinical findings and diagnosis
Clinical findings of OC are pain, vision loss, restricted motility, exophthalmus, proptosis and diplopia (Figure 2A).12 Vision loss can be a seen as a complication of involvement of optic nerve and retina due to orbital compartment syndrome, vascular infiltration, mass effect and optic neuritis.18

Because of lack of orbital signs and symptoms in preseptal cellulitis, this diagnosis can easily be excluded. Myotic OC, neoplasms thyroid eye disease (Graves ophthalmopathy) and idiopathic orbital inflammation should be considered in the differential diagnosis of bacterial OC. Systemic autoimmune congenital and traumatic disease can also mimic OC.16

After clinical examination, complete blood count, blood cultures and computed tomography
should be performed for clinical staging. Contrast agents should be used during CT imaging if it is possible. Because it can increase the sensitivity and specificity of diagnosis of OC. Postseptal inflammation may be diffuse or localized in bacterial OC. In abscess formation localized involvement can be seen intra or extracranial region. Subperiostal abscess formation is an other complication which originates between the bone and periorbita. CT images shows localized inflammation in this abscess formation.²²

**Treatment**

The proper use of antibiotics is crucial in the treatment of PC and OC. Improvement can be achieved in clinical signs (Figure 2B). The general acceptance of *S. pneumoniae*, *S. aureus*, other streptococci, and non-spore-forming anaerobes as the main causative agents indicates the most appropriate antibiotic regimen. It is reasonable to use ampicillin-sulbactam for the initial empiric therapy. Other options may include nafcillin for *Staphylococcus* or *Streptococcus* species. Clindamycin can be used for *S. pneumoniae*, *S. aureus*, and anaerobes, and cefotaxime for Gram negative organisms, nontypeable *H. influenzae*, Moraxella, and resistant pneumococci. Most experts recommend that children younger than 12–15 months with signs of systemic illness can be follow up in the hospital for parenteral therapy. In patients with OC, intravenous ampicillin-sulbactam therapy for initial 24–48 hours seems reasonable, keeping in mind that this regimen may require reevaluation.²³ Surgical drainage followed by antibiotic therapy is mainstay in the presence of subperiosteal or intraorbital abscess.²³

**Complications**

Systemic or local complications of OC were reported in the literature. Ocular complications may include corneal disease, retinitis, uveitis, exudative retinal detachment, optic neuropathy, endophthalmitis, and globe rupture. A motility defect, intracranial disease, cavernous sinus thrombosis, meningitis, sepsis, brain abscess are some of the catastrophic complications of OC which can lead to death.³,⁴,⁸,¹⁶,¹⁹,²²,²⁵

**CONCLUSION**

Cellulitis of the orbital region in children, localized in front of the orbital septum, is a disease with a low risk of complications, provided that the patients are subjected to proper medical treatment. However, the possibility of an extension of the inflammation in the retroseptal area makes multidisciplinary management necessary in order to achieve cure and minimize risk for an adverse visual defect. OC can cause serious ocular and neurological complications.²⁶ Timely and appropriate use of imaging modalities, antimicrobial therapy and surgery can lead to better outcomes.²⁷

**REFERENCES**


