HK J Paediatr (new series) 2009;**14**:275-278

Case Reports

Orbital Cellulitis Complicated by Subperiosteal Abscess in a Neonate with Ethmoiditis

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Abstract Orbital cellulitis is extremely uncommon in neonates. We report a 28 day old baby who presented with sudden onset of fever, red and swollen right eye. The child had symptoms of nasal stuffiness 2 weeks prior to this presentation. Physical and laboratory findings were suggestive of orbital cellulitis. The baby was started on systemic broad spectrum antibiotics. Despite 48 hours of antibiotics, the fever continued and the orbital signs worsened. Computer tomography scan, revealed a subperiosteal abscess along the medial orbital wall associated with ethmoid sinusitis. Surgical drainage of the subperiosteal abscess was followed by resolution of the clinical condition. Majority of children aged 2 and younger respond well to conservative treatment and no surgical intervention is required, but in our case though the causative organism was sensitive to many antibiotics, there was no response to systemic antibiotics. Immediate surgical drainage was followed by rapid resolution of the condition.

Key words Complications; Ethmoid sinusitis; Orbital cellulitis; Subperiosteal abscess; Treatment

Introduction

In children 60%-80% of orbital infections originate from the sinuses.[1,2] Acute sinusitis remains the major cause of orbital inflammation. In more than 90% of cases orbital cellulitis is secondary to sinusitis.[3] Orbital septum is a fibrous layer, beneath the muscular layer in the eye lid, connecting the tarsus to the orbital periosteum. It acts as a barrier separating the lids from the orbit. Peri-orbital infections are classified as preseptal cellulitis and orbital cellulitis. Preseptal cellulitis involves the soft tissues of the eyelids in front of the septum and orbital cellulitis involves the soft tissues of the orbit behind the orbital septum. Orbital cellulitis occurs in the following situations: (1) spread of infection from adjacent structures most commonly paranasal sinuses, but also from the lacrimal sac, stye, dental infections and facial infections; (2) direct inoculation of the orbit from penetrating ocular trauma or ocular surgery like eyelid, strabismus and retinal detachment surgery; and (3) haematogenous seeding from bacteraemia.

The medial orbital bone is thin, called lamina papyraceae. The combination of a thin bone, presence of numerous foramina for neurovascular passage, naturally occurring congenital and bony dehiscences and valveless venous anastomosis allows easy communication of infective material between the ethmoid sinuses to the subperiosteal space.[4] The most common location of subperiosteal abscess

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Received June 4, 2009

is the medial orbital wall, as the periosteum here is loosely attached to the underlying bone. Intraorbital extension of subperiosteal abscess (SPA) or localisation of diffuse orbital cellulitis can result in orbital abscesses.[5] Orbital cellulitis is extremely uncommon in neonates and not more than 10 cases are reported in the literature. We are reporting a neonate with orbital cellulitis complicated by SPA, which failed to respond to conventional management.

Case Report

A 28 day old baby boy was seen in the emergency department with 3 day history of fever, redness and swollen right eye. There was also yellowish discharge from his right eye. He has had symptoms of nasal congestion 2 weeks before the presentation. His parents deny any insect bites, trauma, and skin infection of the face and excessive tearing of the eyes prior to this presentation. Ante-natal, peri-natal and post-natal history was not significant.

On physical examination the child was irritable, lethargic, crying and not feeding well. The body temperature was 39.6°C, heart rate 206/min, respiratory rate 36/min and his body weight was 4.4 Kg. There were no meningeal signs. The infant was seen moving all his limbs freely during examination. There was enlargement of the right preauricular and submandibular nodes; however there was no generalised lymphadenopathy and the rest of the physical findings were normal.

On eye examination there was marked proptosis, swelling and erythema of both upper and lower eyelid of his right eye, purulent discharge, conjunctival congestion and chemosis. The cornea was clear. Pupil on the affected side reacted briskly to light. The globe was pushed down and out. Ocular motility was however difficult to assess. The left eye was normal.

His WBC was 28.0 x 10^3/mcL (28.0 x 10^6/L), neutrophils 56%, lymphocytes 44%, Hgb 13.4 g/dl (134 g/L) and platelet count was 512 x 10^3/mcL (512 x 10^3/L). Values for electrolytes, BUN and creatinine were normal. Gram stained smears of the nose and conjunctiva swabs showed gram positive cocci. Peripheral blood smear was normal.

The clinical diagnosis of orbital cellulitis was made based on physical findings of high fever, marked swelling and erythema of the lids, conjunctival congestion and chemosis. Our clinical impression was supported by laboratory findings of marked leucocytosis and positive Gram stained smears from the conjunctiva and nose.

The baby was started immediately on intravenous antibiotics which included a combination of IV cefotaxime 220 mg tds and IV oxacillin 220 mg qid. However, after 24-48 hours of IV antibiotics, the fever continued and there was worsening of the orbital signs with increasing proptosis and eyelid swelling (Figure 1). Culture results of conjunctival and nasal swabs revealed *Staphylococcus aureus*, sensitive to pencillin, vancomycin, gentamycin and oxacillin. Blood culture was negative.

An urgent computer tompgraphy (CT) scan was done. The CT picture showed marked proptosis of the right eye with inflammatory signs of the pre-septal and post-septal space confirming our clinical impression. In addition, subperiosteal abscess was detected as an extraconal soft tissue density collection contained within the periosteum of the medial orbital wall, stretching the lateral rectus muscle and displacing the globe laterally (Figure 2). Opacification of the ethmiod sinus suggests sinusitis as the source for the orbital cellulitis.

As there was no response to systemic antibiotics for 48 hours, the SPA and the associated sinus were drained by trans-nasal endoscopy. The pus drained was sent for Gram stain and culture sensitivity. A nasal drain was placed, which was removed on the second post-op day. The post-operative period was otherwise afebrile with reduction of the eyelid

Figure 1 After systemic antibiotics, right eye shows marked proptosis, erythema and swelling of the eyelids with abscess formation. There is also purulent discharge from the conjunctiva.

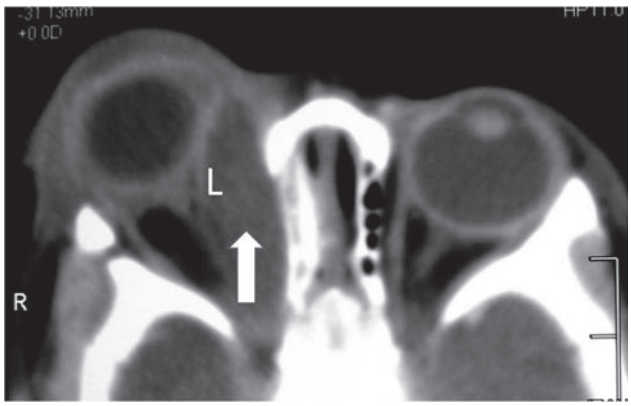

Figure 2 CT picture axial view showing marked proptosis, marked preseptal and postseptal inflammatory signs and a medial extraconal soft tissue density mass of the right eye (arrow). Note there is stretching of the lateral rectus muscle (indicated by letter L) and also lateral displacement of the globe.

swelling. Intravenous antibiotics were continued for 2 weeks followed by oral antibiotics for 2 more weeks. Pus culture showed growth of *Staphylococcus aureus*.

Discussion

In all age groups the incidence of orbital cellulitis is high in winter, due to increase incidence of upper respiratory tract infections and sinusitis. The aetiologic agents in orbital cellulitis are predominantly bacterial. However fungal infections have to be ruled out in immunosupressed and diabetic child.[6] In children less than 5 years infections with *Haemophilus influenzae* have to be thought of, as it is the common organism residing in the paranasal sinuses. The other common pathogens in young children *are Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus pyogenes, Streptococcus pneumoniae, and Moraxella catarrhalis*.[7-8] In older children gram negative organism like *Pseudomonas, Klebsiella* and anaerobes like *Peptostreptococcus, Bacteroides, Fusobacterium* are the causative organism. Vaccination against *Haemophilus influenza*e type b (Hib) has drastically reduced the incidence of serious pediatric infections like meningitis and brain abscess, but it is doubtful whether the incidence of orbital cellulitis is reduced as, Hib is not a significant cause of sinusitis.[9]

The clinical presentation in most of the cases is acute with systemic and ocular signs. The systemic findings are fever, malaise, headache and prostration. Ocular finding are proptosis, conjunctival chemosis, reduced and painful extraocular movements, decreased vision and elevated intraocular pressure. Presence of neck rigidity and cranial nerve involvement suggest intracranial spread.

Differential diagnoses include infective and non-infective causes. Preseptal cellulits and dacryocystitis are infective causes and can have similar presentation. Fever may be associated with preseptal cellulitis, but is usually mild. There can also be erythema and marked eyelid swelling. However, proptosis, conjunctival chemosis, painful ophthalmoplegia and vision loss are usually features of orbital celluliits.[5] Dacryocystitis may be associated with fever, erythema and swelling of the eyelids, but the most common location of swelling will be the nasal aspect of the lower lid. Non-infective causes include traumatic, inflammatory, neoplastic, endocrine and systemic. Neoplastic conditions like retinoblastoma, rhabdomyosarcoma, leukaemia, Burkitt lymphoma can cause sudden inflammatory proptosis.

Orbital cellulitis is diagnosed mainly on clinical grounds. The laboratory evaluation should include a complete blood count, blood culture and Gram-stained smears and cultures from the conjunctiva, nose and throat. A marked leucocytosis greater than 15,000/µl with shift to the left is commonly seen in orbital cellulitis. Blood culture and CSF examination should be done prior to administration of any antibiotics. Imaging studies like ultrasound and computed tomography can be done when physical examination is hampered by marked lid swelling, no response to systemic antibiotics, when intracranial complications occur and when surgical intervention is needed.

Untreated orbital cellulitis can lead to serious life-threatening and sight threatening complications. Life-threatening complications are cavernous sinus thrombosis, meningitis, and brain abscesses. Ocular complications are exposure keratitis, optic neuritis, increase intraocular pressure, retinal vascular occlusion, orbital and subperiosteal abscess.

Orbital cellulitis in children is an ocular emergency requiring immediate hospitalisation. Majority of cases can be managed medically and cases not responding to medical therapy can be taken for surgical drainage.

The initial treatment of orbital cellulitis in infants include a high dose of intravenous third generation cephalosporins like ceftriaxone, cefotaxime, or ceftazidime combined with

a pencillinase resistant pencillin like oxacillin and nafcillin. In older children where orbital cellulitis is due to mixed aerobic and anaerobic organisms, the pencillinase resistant antibiotics can be substituted with vancomycin and clindamycin. The intravenous antibiotics are given for 1-2 weeks followed by oral antibiotics for an additional 2-3 weeks.

Surgery is indicated when there is visual loss, optic nerve dysfunction, intracranial complications and poor response to medical treatment. Subperiosteal and orbital abscess can be initially managed by intravenous antibiotics alone. Garcia and Harris advocate a non-surgical management of subperiosteal abscess in the following situations: age less than 9 years; no visual compromise; modest size medial abscess; and absence of intracranial and frontal sinus involvement.[10] Surgical drainage of SPA may be done if the above criteria is not met and in those patients in whom clinical signs fail to improve or worsens following conventional treatment. Otolaryngologist advocate two surgical options for the drainage of SPA: an external approach via Lynch incision and an intranasal endoscopic approach. To conclude orbital cellulitis is an ocular emergency which requires early recognition and immediate management to prevent ocular and life-threatening complications.

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