Subperiosteal Abscess in a Toddler with White Eye

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***Abstract*—** Subperiosteal abscess is a life and vision threatening infection of the orbit and is a common complication of rhinosinusitis in children. A 16-month-old Malay boy presented with progressive swelling of upper and lower lids of the left eye for two days. He had fever with runny nose four days prior to eye symptoms. He was treated as left eye pre-septal cellulitis with intravenous antibiotic. However, on day four of admission, his left eye developed proptosis and urgent contrast enhanced computerized tomography of orbit and paranasal sinus revealed left eye orbital cellulitis complicated with left subperiosteal abscess together with left ethmoidal and maxillary sinusitis. Surgical drainage via functional endoscopic sinus surgery was performed. Postoperatively, the left eye proptosis markedly reduced with resolution of eyelids swelling. Thorough examination with high index of suspicious and interdisciplinary approach in management leading to successful treatment.

***Keywords*—Ethmoiditis, orbital cellulitis, sinusitis, subperiosteal abscess.**

1 INTRODUCTION

Orbital cellulitis is both life and sight threatening condition. It is the inflammation of orbital soft tissue posterior to the orbital septum. Orbital septum is a fascia layer that separated the deep orbital soft tissue from superficial structures. Inflammation anterior to the orbital septum is known as pre-septal cellulitis.

Orbital infection in pediatric group commonly occurs due to acute sinusitis [1]. Its presentation can be mild such as pre-septal cellulitis or progressed to severe ocular complication. If it is treated ineffectively, complications may lead to orbital abscess, subperiosteal abscess, cavernous sinus thrombosis, meningitis, brain abscess, loss of vision and death. Children are more prone to develop intra-orbital and intracranial complications compare to adults with an incidence of 3% [2]. Early antibiotic commencement and surgical drainage is warranted.

This case of left orbital cellulitis complicated with left subperiosteal abscess and sinusitis, illustrates the important of early recognition with interdisciplinary approach which provide successful outcome.

2 CASE PRESENTATION

A 16-month-old Malay boy with no co-morbidity, presented with swelling of the upper and lower lids of the left eye for two days. It was progressively getting worse till he unable to open the left eye. However, there was no eye pain, eye

redness or eye discharge. He had fever with runny nose four days prior to eye symptoms. He became less active and had poor oral intake on the day of presentation. There was no history of insect bite or trauma to the left eye.

On examination, the child was febrile, looked ill and not active. Left eye examination showed mild erythematous and swollen of both upper and lower lids that causing restricted eye opening. However, there was no proptosis with full extraocular muscle movement. The pupil was reactive with absence of relative afferent pupillary defect. There was mild conjunctival hyperemia with no chemosis, and the cornea was clear. Anterior segment and dilated fundus examination were normal. Right eye examination was normal. Initial full blood count showed leukocytosis (29.8 $x10^9$/L) with high C-Reactive Protein (CRP) level with the value of 147.30 mg/L.

The patient was diagnosed as left eye pre-septal cellulitis. He was treated with intravenous cloxacillin 250 mg for every six hours. There was slow improvement with minimal resolution of the eyelids swelling. He was able to open the left eye partially. However, on day four of admission, his left eye was noted to develop proptosis (Fig 1) which was increasing in severity.

Figure 1: Left eye proptosis at day four of admission.

In view the child was not cooperative, only managed to assess the horizontal eye movement of the left eye which was normal and not restricted. Urgent contrast enhanced computerized tomography (CT) of orbit and paranasal sinus was performed and revealed hypodense collection along the inferomedial aspect of the left orbit measured 2.0 x 1.0 x 2.1 cm suggestive of subperiosteal abscess (Fig 2A). The left medial rectus muscle was swollen and displaced superiorly (Fig 2B). The left inferior rectus muscle was also swollen and displaced laterally. Both maxillary and left ethmoid sinuses were fluid filled and opaque. A diagnosis of left eye orbital cellulitis complicated with left subperiosteal abscess, ethmoidal and maxillary sinusitis was made.

This child was co-managed with Otorhinolaryngology (ORL) team. Intravenous cloxacillin was changed to ceftriaxone 500 mg 12 hourly. Functional endoscopic sinus surgery (FESS) was performed. The surgical steps involved incision and removal of ethmoid bone, enlargement of natural opening of middle meatus and penetration of the lamina papyracea.

Intraoperatively, there was congested bilateral nose and the left maxillary sinus ostium was obliterated by oedematous mucosa. Opening of the left maxillary sinus ostium was performed and followed by drainage of fresh and inspissated pus from left maxillary sinus. There was presence of multiple small polyps in maxillary sinus and ethmoid sinus. Minimal pus was drained from left ethmoid sinus. The lamina papyracea was still intact. Upon opening the lamina papyracea, there were fresh and inspissated pus from intra-orbital extraconal inferonasal. Purulent material was collected for culture and sensitivity, however revealed no growth.

At day one post-surgery, the left eye proptosis reduced markedly. Intravenous dexamethasone 10 mg eight hourly was added together with oxymetazoline hydrochloride nasal spray and sea water nasal douching. On day four post operatively, the patient underwent flexible nasal endoscope by ORL team. The procedure revealed a lot of secretions and oedematous mucosa with clearing of pus.

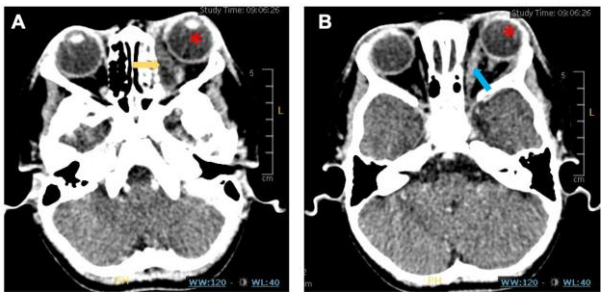

Figure 2: Computer tomography showing subperiosteal abscess at left lamina papyracea (A: orange arrow), swollen left medial rectus muscle (B: blue arrow) and proptosis (A and B: *).

Upon discharge, there was residual proptosis with resolution of eyelid swelling (Fig 3). The extraocular muscle movement of the left eye was

full. He had completed intravenous ceftriaxone for 10 days and intravenous dexamethasone 10 mg for three days. At one week follow-up, there was complete resolution of left eye proptosis with no signs of inflammation of the eyelids.

Figure 3: Left eye proptosis markedly reduced with residual proptosis and resolution of eyelid swelling upon discharge.

3 DISCUSSION

Subperiosteal abscess is serious, life and vision threatening infection of the orbit. It typically occurs in pediatric due to acute rhinosinusitis, but in adults it is usually due to chronic sinusitis. In this case, the patient has upper respiratory infection that led to maxillary sinusitis and ethmoiditis. Besides sinusitis, infection of nasolacrimal systems and dental caries also can lead to infection to the orbital region. Dental caries is very common among preschool children [3] and has a high risk to develop orbital infection.

Subperiosteal abscess is considered rare complication of sinusitis compared to preseptal and orbital cellulitis [4]. Al-Madani et al revealed only 5.6% sinusitis complicated with abscess in their study [4]. Acute ethmoiditis is frequently causing subperiosteal abscess in pediatric [5] as it is well developed at birth in comparing to maxillary and frontal sinus [6]. The lamina papyracea is a thin bone located between ethmoid sinus and orbit. This thin and porous bone consists of numerous preexisting dehiscence and perforating vessels and nerves [7]. Therefore, infection in the ethmoid sinus can easily be transmitted to the orbit [8]. Periorbita is a periosteal layer that lined the orbital side of the lamina. It acts as a barrier protecting the orbit. In the early infection, it forms subperiosteal abscess before spreading into the orbit [9]. Compared to adult, orbital cellulitis is attributed by frontal sinusitis and maxillary sinusitis [10].

Rhinosinusitis and its complication are more prevalent in children compared to adult [4]. Anatomical contiguity of the ethmoid sinus and orbit predispose the orbit to infection. There is multiple direct connection of vein between nose, sinus, orbit and cavernous sinus that may transmit the infection directly [10].

Patient with subperiosteal abscess usually presented with the signs of orbital cellulitis. These include restricted eye movement, proptosis, reduced visual acuity or severe eyelid swelling [11]. Unlike our case, the child presented with fever, eyelids swelling with minimal inflamed eye, non-restricted eye movement and no obvious proptosis at initial presentation. The child was treated medically as pre-septal cellulitis. However, his eye deteriorated to develop proptosis despite on parenteral antibiotic. Proptosis should not be overlooked as it indicates orbital cellulitis or post-septal infection [12].

According to Adamson and Waterfield [12], contrast enhanced CT orbit/paranasal sinus is indicated in patient with proptosis, ophthalmoplegia, severe lid swelling that is impossible to assess the globe and non-resolving fever after 48 hours on parenteral antibiotic. If there are signs of optic nerve compression, brain imaging should be included. CT scan is essential in differentiating between pre-septal cellulitis and orbital cellulitis. A missed diagnosis can lead to blindness and even death due to intracranial infection. CT scan also helps in decision and guidance for surgical drainage [11,13].

All cases suspected of orbital cellulitis should have interdisciplinary team approach which comprised of ophthalmology, pediatrics and ORL. Subperiosteal abscess is indicated for FESS [1] which require expertise from ORL surgeon. Failure of medical therapy with non-improvement of clinical symptoms or vision loss suggest surgical intervention [1]. Quintanilla-Dieck and colleagues [14] described surgical drainage is depend on the volume of abscess, localization of abscess and age of the patient. In medial location, the surgical steps involved incision and removal of ethmoid bone, enlargement of natural opening of middle meatus and penetration of the lamina papyracea like in our case. All cases of orbital cellulitis should receive broad spectrum antibiotic for a total of 10-14 days [15]. In view of non-responding of medical treatment after 48 hours, surgical drainage is justified [14]. In this case report, the patient underwent surgical drainage via FESS and was treated with intravenous ceftriaxone for ten days resulted complete resolution of proptosis.

4 CONCLUSIONS

Rapidly progressing orbital infection secondary to rhinosinusitis can occur in pediatric age group. Thorough examination with high index of suspicious and interdisciplinary approach in management leading to successful treatment.

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ADDITIONAL INFORMATION

Conflicts of interest: The authors have declared that no competing interest exist. There was no financial support and non-financial relationship was received from any organization for the submitted work.

CONSENT

Verbal and written consent was obtained from the parent for publication of this case report and any accompanying images.

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