Periorbital and Orbital Cellulitis in Children. A retrospective study

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Abstract

Background
Periorbital and orbital cellulitis can be a acomplicated disease in children and may lead to vision loss. Sinusitis is a universal predisposing factor, in particular ethmoid sinusitis. External eye infections, trauma and dental abscesses may be contributing factors. *Staphylococcus aureus* remains an important pathogen, and poses problems particularly with increasing drug resistance. We aim to report the clinical, demographic and microbiological profile of children with periorbital and orbital cellulitis. We also analyzed the risk factors for positive bacterial cultures among children with periorbital and orbital cellulitis from a tertiary care center.

Method
This was a retrospective chart review of children (1 month – 15 years) with a discharge diagnosis of periorbital and orbital cellulitis, from July 2009 to June 2014 in the department of Paediatrics, Aga Khan University Karachi. Clinical and demographic feature and laboratory data were collected and analyzed. Risk factors of positive blood cultures were also analyzed.

Results
The medical records of 34 children with a discharge diagnosis of orbital or periorbital cellulitis were reviewed. It was found that most of the children (n=18; 53%) were younger than 5 years of age. Most affected were males (n=21; 62%). The left eye was involved in most of the cases (n=14, 41%). The main presenting complaints included pain, redness around the eyes and fever. Eyelid infection was found to be the most common etiological factor predisposing to periorbital /orbital cellulitis (n=7, 21%). Young age remains the main risk factors for bacterial positivity.

Conclusion
Periorbital and orbital cellulitis are a relatively rare the in children. Periorbital cellulitis if treated well can prevent orbital complications. *Staphylococcus aureus* is the main pathogen and sinusitis remains the main risk factors.

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Periorbital, orbital cellulitis, Children, Sinusitis

Introduction
Periorbital cellulitis occurs mostly in children younger than 5 years of age and is almost three times more common than orbital cellulitis.[1,2] It is also called preseptal cellulitis because the infection arises anterior to the orbital septum which is a layer of fibrous tissue that begins from the periosteum of the skull and continues into the eyelids. Periorbital tissues may become infected in two ways: trauma or primary bacteremia.[3] Etiologically, it is seen as an extension of infection from sinuses surrounding the orbit. Ethmoid sinus is the most common source of orbital infection because a very thin septum separates it from the orbit. In acute sinusitis, *Streptococcus pneumoniae* and *Haemophilus influenzae* are the predominant causative organisms whereas anaerobes are the commonly found organism for chronic sinusitis.[4-6]

Children usually present with either history of recent sinusitis, upper respiratory tract infection or trauma. Mostly non-ophthalmological manifestations are common, however, its extension may lead to ophthalmological manifestations (i.e., proptosis, pain and restriction of extraocular movement, conjunctivalchemosis, decreased vision and elevated intraocular pressure). Computed Topography (CT) of orbits and sinuses are essential to identify etiology and rule out involvement of the eye.[7,8] Microbiological identification of pathogens is difficult; as theyield of bacterial blood culture remains low and pus culture requires surgical intervention. Hencebroad spectrum antibiotics are essential.[5]

Orbital cellulitis patients presents with orbital signs such as proptosis, pain, and loss of vision. The presence of orbital signs concurrently with signs of acute sinusitis helps in ruling out periorbitalcellulitis.[4-6,9] However, it is recommended that imaging such as MRI is used to confirm the diagnosis. We aim to review the clinical presentation and management of children presenting with periorbital and orbital cellulitis and the risk factors for positive bacterial cultures among children with periorbital and orbital cellulitis in our tertiary care center at Aga Khan University, Karachi.

Methods
We retrospectively reviewed the medical records of all children

(1 month – 15 years) with a discharge diagnosis of periorbital and/or preseptal and orbital cellulitis at the Aga Khan University Karachi, during the period from July 2009 to June2014. Cases were identified using discharge records for preseptal, periorbital cellulitis and orbital cellulitis with International Classification of disease (ICD-10) 373.13 and 376.01 respectively.

Children with chronic periorbital cellulitis or on periorbital cellulitis treatment or who had had asurgical procedure at the time of admission were excluded. Patients with non-infectious etiologies leading to periorbital swelling and edema were also excluded. Data including medical record number, age in months, gender, antibiotic therapy prior to hospitalization, presenting complaints, laboratory investigations (anemia, leukocytosis (WBC >10,000), thrombocytosis (platelet count >400)); site of eye involvement (right, left or both), management procedure (surgical or medical management), isolated microorganism (bacterial cultures from blood and/or pus culture), duration of antibiotic and disease or procedure related complications were recorded. Statistical analysis was performed by using SPSS software package (version 19.0, SPSS Inc. Chicago. IL). All patients received antibiotic therapy. Continuous variables including age (in months), weight on admission (Kg), duration of presenting illness (i.e., duration of fever and pain) and duration of hospital stay were mentioned in mean and standard deviation; however categorical variables i.e., (gender, sinuses involvement and discharge disposition) were mentioned in frequency and percentages.

Results

A total of 34 children were discharged with adiagnosis of periorbital cellulitis fromJuly 2009 to June 2014. Mean age was 69±5 months (Median 59 mo.); eighteen (53%) were five years old (Table 1). Males were predominant (n=21; 62%). Pain and redness around the eye (n=33, 97%) and fever (n=22, 65%) were the major presenting complaints. Only 8 (34%) were on some antibiotics at the time of presentation. The left eye was involved in 41% (n=14), both sides in 35% (n=12) while 8% (n=8) patients had right sided involvement at the time of presentation. Most (n=24, 71%) of the children had an underlying risk factors including sinusitis (n=6, 18%), eyelid infection (n=7, 21%), underlying immunodeficiency (n=8, 24%), underlying malignancy (n=5, 15%), and six had trauma. On eye examination ophthalmoplegia (n=14, 41%), chemosis (n=6, 18%), proptosis (n=5, 15%) and visual impairment in one child were found. Most of the children underwent radiological investigation, CT scan (n=15, 44%) and MRI (N=5, 15%). Radiological manifestations are presented in Table 2. Ethmoidal sinus was the most frequent underlying causeof periorbital cellulitis in children.

Blood cultures were conducted in almost all cases. Duration of treatment varied (median 14 days). Median hospital stay was 5 days. Most of the patients (80%) were followed-up in the clinic for 4-6 weeks. None of the patients developed any complications either during a hospital stay or during follow-up. Table 3 summarizes the microbiological profile of children with periorbital and orbital cellulitis. We performed the risk analysis, however no risk factor was found for positive bacterial culture (table 4).

Table 1: Clinical manifestations of Children admitted with Orbital and Periorbital Cellulitis

Characteristics	n = 34
Male *n,%*	21 (62%)
Age in months *median* *(25th, 50th, 75th percentile)*	59 (16, 59, 108)
WAZ *median* *(25th, 50th, 75th percentile)*	-0.92 (-2.09, -0.92, 0.62)
Total Leukocyte count (10^3 mm^3) *median (25th, 50th, 75th percentile)*	16 (8. 16, 20)
Neutrophils (10^3 mm^3) *median* *(25th, 50th, 75th percentile)*	68 (43, 68, 79)
C-reactive protein *median*	16.23

Table 2: Radiological findings of the children with Periorbital and Orbital Cellulitis

Features	n (%)
Sinusitis	
Frontal	4 (12)
Ethmoidal	11 (32)
Maxillary	8 (24)
Sphenoid	5 (15)
Periorbital swelling	5 (15)
Retro-orbital swelling	2 (6)
Intra-orbital extension	1 (3)
Intra-cranial extension	3 (9)
Mass lesion	2 (6)
Proptosis	4 (12)
Pus collection	1 (3)
Soft tissue swelling	7 (21)
Pre-septal swelling	4 (12)

Discussion

Periorbital cellulitis is rare in children. Most of the children diagnosed were males and less than 5 years of age. Pain, redness and fever were the main clinical features. Left eye involvement was seen in most of the cases; however, younger children presented with bilateral involvement. The ethmoidal sinus was

Table 3: Microbiological profile of children with Periorbital and Orbital Cellulitis

Culture	Microbiological profile	N = 36
Blood	No growth	28
	Streptococcus pneumoniae	1
	Streptococcus milleri& species	2
	Staphylococcus aureus	1
	Pseudomonas aeruginosa	1
	Staphylococcus species	3
Pus	Not done	31
	No growth	1
	Staphylococcus aureus	4

The diagnosis is based on the clinical signs.[10,11]

There was a slight male predominance observed in our study which can possible be explained by that the fact that males are more prone to trauma.

Staphylococcus remains the most common pathogen. However, causative organism is related to the pathogenesis of infection. Post-traumatic periorbital cellulitis usually is caused by *Staphylococcus aureus* or *Streptococcus pyogenes*. Previously *Streptococcus pneumoniae* and *Haemophilus influenzae type b* were the most common cause of bacteremia and sinusitis, but after the introduction of vaccination they have become less prevalent.[12] Intravenous antibiotics followed by oral antibiotics are the cornerstone of treatment. Surgical management is indicated if there is pus collection or intracranial extension, to prevent long term sequelae.

Table 4:Risk factors associated with positive culture in children with Periorbital and Orbital Cellulitis

	Positive culture N=9	Negative culture N=25	p-value
Gender, Male	5	16	0.65
Infants	5	3	0.01
Laboratory parameters			
Leukocytosis	5	17	0.98
Neutrophilia	7	16	0.44
Thrombocytosis	5	14	0.98
Risk factors			
Otitis media	--	25	--
Sinusitis	2	4	0.64
Eye lid infection	1	6	0.64
Immunodeficiency	1	7	0.40
Malignancy	1	4	0.99

involved in most childrenand. *Staphylococcus aureus* was the most common pathogen identified

Acute sinusitis leading to periorbital cellulitis remains the most common underlying etiology. There may be other more obvious local causes such as a sty or chalazion, spreading conjunctivitis or dacryocystitis.[1,6] It also may result from a breach in the skin caused by superficial trauma, animal bites or local infections. However, systemic signs remain negative. Ethmoidal sinusitis leading to periorbital cellulitis is important as the lamina papyracea is thin (separating the sinus from the orbit). The infection may spread from the sinus into the adjacent orbit. Its extension may collect as a subperiosteal abscess, causing exotropia, proptosis, and restriction of eye movement nasally.

Conclusion

Pre existing sinusitis, male predominance and left eye involvement are the commonest features. *Staphylococcus aureus* remains the main pathogen.

References

1. Clarke WN. Periorbital and orbital cellulitis in children. *Paediatr Child Health* 2004 Sep;9(7):471-2.
2. Gellady AM, Shulman ST, Ayoub EM. Periorbital and orbital cellulitis in children. *Pediatrics* 1978 Feb;61(2):272-7.
3. Paerregaard A, Lund I. [Periorbital and orbital cellulitis in children]. Ugeskr Laeger. 1995 Nov 20;157(47):6576-80.
4. Statham MM, Myer CM. Orbital cellulitis in children. *Pediatr Infect Dis J* 2007 Mar;26(3):276-7.
5. Aabideen KK, Munshi V, Kumar VB, Dean F. Orbital cellulitis in children: a review of 17 cases in the UK. *Eur J Pediatr* 2007

Nov;166(11):1193-4.
6. Jain A, Rubin PA. Orbital cellulitis in children. *Int Ophthalmol Clin* 2001 Fall;41(4):71-86.
7. Juan CM, Chiu CH, Huang YC, Lin TY. Orbital cellulitis in children: clinical analysis of 16 cases. Zhonghua Min Guo Xiao Er Ke Yi Xue Hui Za Zhi. 1995 Jul-Aug;36(4):286-8.
8. Ho CF, Huang YC, Wang CJ, Chiu CH, Lin TY. Clinical analysis of computed tomography-staged orbital cellulitis in children. *J Microbiol Immunol Infect* 2007 Dec;40(6):518-24.
9. Nageswaran S, Woods CR, Benjamin DK, Jr., Givner LB, Shetty AK. Orbital cellulitis in children. *Pediatr Infect Dis J* 2006 Aug;25(8):695-9.
10. Hennemann S, Crawford P, Nguyen L, Smith PC. Clinical inquiries. What is the best initial treatment for orbital cellulitis in children? *J Fam Pract* 2007 Aug;56(8):662-4.
11. Rubinstein JB, Handler SD. Orbital and periorbital cellulitis in children. *Head Neck Surg* 1982 Sep-Oct;5(1):15-21.
12. Cieslak TJ, Rajnik M, Roscelli JD. Immunization against Haemophilus influenzae type B fails to prevent orbital and facial cellulitis: results of a 25-year study among military children. *Mil Med* 2008 Oct;173(10): 941-4.