

Risk Factors of Preseptal and Orbital Cellulitis

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ABSTRACT

Objective: To estimate the frequency and major risk factors of preseptal and orbital cellulitis.

Study Design: A cross-sectional analytical study.

Place and Duration of Study: The Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar from July 2003 to December 2006.

Methodology: All consecutive patients between ages 6 and 40 years, admitted to the institute with the diagnosis of preseptal and orbital cellulitis were included in the study. The patients were divided into two groups. Group I included patients with ages 6-16 years and group II with ages 17-40 years. The clinical features, diagnosis and risk factors were entered on a specially-designed proforma. The risk factors included were trauma, insect bite, localized or systemic infection and postsurgical. Odd ratio and p-values were calculated for potential risk factors.

Results: The frequency of orbital cellulitis was 0.1% of total admission. Out of 26 patients, 42.30% patients were in group I and 57 in group II. In group I, insect bite was the most common risk factor identified in 40% of patients with preseptal cellulitis and trauma as a common cause in 50% with orbital cellulitis. In group II, trauma was the leading cause in 50% of patients with preseptal cellulitis and sinusitis as a common cause in 18.1% with those of orbital cellulitis. In both groups the p-values were found insignificant ($p>0.5$). Complications included cicatricial ectropion in 44.4% and orbital abscess in 41.1%.

Conclusion: For preseptal cellulitis, insect bite was the most common cause in group I and trauma was the leading cause in group II. For orbital cellulitis, trauma was important cause in group I and sinusitis in group II.

Key words: Preseptal cellulitis. Orbital cellulitis. Orbital abscess. Subperiosteal abscess. Insect bite. Trauma.

INTRODUCTION

Preseptal and orbital cellulitis range in severity from minor to potentially lethal complications. There are two distinct disorders with different etiologies. Preseptal cellulitis is a more common infectious process limited to the eyelids in the preseptal region, whereas orbital cellulitis represents a more severe but fortunately less common infection of the orbit posterior to the orbital septum with or without its complications like subperiosteal abscess, orbital abscess or cavernous sinus thrombosis or masquerade as cavernous sinus thrombosis.^{1,2} Some cases could not be classified.³

The presentation of preseptal cellulitis is with fever, unilateral tender, red, periorbital and lid swelling. The proptosis is absent with normal visual acuity and ocular movements. In contrast in orbital cellulitis the eyelids are swollen, red and tender. Proptosis and or ophthalmoplegia are present. Optic nerve may be involved in severe cases.

The usual cause of preseptal cellulitis is skin trauma or spread of local or remote infection, whereas the most

common causes of orbital cellulitis are ethmoidal sinusitis, infection from adjacent structures like dacryocystitis, trauma and postsurgical.⁴

The patient with tender and red swollen eyelid presents a complex challenge to the ophthalmologist to correctly diagnose the condition. Knowledge of anatomy and pathophysiology of the orbit and relevant examination and investigations are necessary for accurate diagnosis.⁵

As complications of orbital cellulitis are great, it is important to know the risk factors involved in its causation so that adequate measures may be adopted for its prevention. The purpose of the study was to evaluate the frequency and risk factors associated with orbital and preseptal cellulitis.

METHODOLOGY

It was a cross-sectional analytical study of 26 patients with the diagnosis of orbital and preseptal cellulitis, admitted to Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar, between July 2003 and December 2006. The patients were divided into two groups. Group I with age 6-16 years and group II between 17-40 years. A proforma for entering clinical details was made for this purpose.

All consecutive patients with ages 6-40 years with either preseptal or orbital cellulitis admitted to the institute were included. Patients were assessed for history of

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Received August 31, 2007; accepted November 27, 2008.

trauma, insect bite, systemic or ocular infection or following retinal detachment, lacrimal or orbital surgery. Clinical findings included fever, pain, watery nose, oedema, periorbital and lid swelling, conjunctivitis, visual acuity, extra-ocular movements, pupil and fundus examination.

Exclusion criteria consisted of other inflammatory conditions of the orbit like erysipelas, tendonitis, periostitis, orbital mucocele or pyocele, actinomycosis, trichinosis, mycotic pseudotumor of the orbit and cavernous sinus thrombosis. Thyroid orbitopathy, pseudotumor and orbital rhabdomyosarcoma were also ruled out.

All patients had blood complete, hemogram, c-reactive protein measurement and blood cultures. They also had roentgenographic examination of the paranasal sinuses and orbital ultrasonography. CT scan was done in patients with orbital or preseptal cellulitis, who failed to response to medical therapy to rule out orbital or subperiosteal abscess.

All patients were treated with intravenous antibiotic therapy singly or with multiple antibiotic combination. Outcome measurements were risk factors evaluation like trauma, infection, both localized and systemic, sinusitis and postsurgical.

Proportions and percentages of the outcome variables are explained by categories and explanatory variables. Odd ratio and p-values are calculated for potential risk factors.

RESULTS

During the study period, 23,562 patients were admitted in the institute for various eye pathologies. Orbital cellulitis constituted 26 cases. The frequency was thus 0.1%. Nine patients (34.6%) had preseptal and 17 patients (65.3%) with orbital cellulitis. Male patients were 18 (69.2%) and female 8 (30.7%). Eleven patients (42.30%) were in group I and 15 patients (57%) in group II.

The risk factors identified in group I included insect bite, the most common cause in preseptal cellulitis and trauma, the leading cause in orbital cellulitis as in Table I. The odd ratio and p-values for potential risk factors are given in Table II. No statistically significant difference was found between risk factors of preseptal and orbital cellulitis in this group.

Table III shows important risk factors identified in group II with trauma, an important cause in preseptal cellulitis and sinusitis in orbital cellulitis. The odd ratio and p-values for risk factors were determined. Again, no statistically significant difference was found between risk factors of preseptal and orbital cellulitis as given in Table IV.

All patients were treated with intravenous antibiotics. Complications of preseptal and orbital cellulitis are given in Table V with cicatricial ectropion and orbital abscess, the most common.

Table I: Risk factors of preseptal and orbital cellulitis in children (group I, n=11).

Type of cellulitis	Number of patients	Risk factors	Number of cases	Percentage
Preseptal	5	Insect bite	2	40
		Trauma	1	20
		No risk factor identified	2	40
Orbital	6	Trauma	3	50
		Sinusitis	2	33.3
		Insect bite	1	16.6

Table II: Comparing risk factors for preseptal and orbital cellulitis in children (group I).

Risk factors	Preseptal cellulitis (number of patients)	Orbital cellulitis (number of patients)	Odd ratio	p-value
Insect bite	2	1	1.78	0.424
Trauma	1	3	1.67	0.348
Sinusitis	0	2		

Table III: Risk factors of preseptal and orbital cellulitis in adults (group II, n=15).

Type of cellulitis	Number of patients	Risk factors	Number of cases	Percentage
Preseptal	4	Trauma	2	50
		Post cataract	1	25
		Surgery	1	25
		No risk factor identified	-	-
Orbital	11	Sinusitis	2	18.1
		Non-Hodgkin's	1	9.0
		Lymphoma	8	72.7
		No risk factors identified	-	-

Table IV: Comparing risk factors for preseptal and orbital cellulitis in adults (group II, n=15).

Risk factors	Preseptal cellulitis (number of patients)	Orbital cellulitis (number of patients)	Odd ratio	p-value
Trauma	2	0	-	-
Post cataract	1	0	-	-
Surgery				
Sinusitis	0	2	-	-
Non-Hodgkin's	0	1	-	-
Lymphoma				

Table V: Complications of preseptal and orbital cellulitis.

Category	Complications	Number of cases	Percentages
Preseptal cellulitis (n=9)	Cicatricial ectropion	4	44.4
Orbital cellulitis (n=17)	Orbital abscess	7	41.1
	Panophthalmitis	3	17.6
	Subperiosteal abscess	2	11.7

DISCUSSION

The terms preseptal and orbital cellulitis are used interchangeably, obscuring important differences in their pathogenesis, clinical presentation and appropriate therapy.⁶ Orbital cellulitis is an acute ophthalmic emergency. Delay in initiation of appropriate therapy may cause blindness and lead to life-threatening sequelae such as brain abscess, meningitis or cavernous sinus thrombosis.⁷

Since the potential for complications is great, orbital cellulitis must be recognized promptly and treated aggressively. Orbital cellulitis is a rare condition. In the study by Jackson and Baker, preseptal cellulitis was noted in 71% in contrast to orbital cellulitis, which was documented in 28% patients.⁸ Similarly, higher figures for preseptal cellulitis were reported by Aidan *et al.* and Uy *et al.*^{9,10} In this study, the frequency of orbital cellulitis is 0.1%. The study is the first of its kind to report higher figures for orbital cellulitis. Sixty five point three percent patients were diagnosed as orbital cellulitis and 34.6% with preseptal cellulitis. The exact reason for this is unknown. Probably patients presented only when the disease was serious. Preseptal cellulitis may have been missed and treated elsewhere with antibiotics.

In this study, male patients were 69.2% and female 30.7%. In a study by Negeswaran *et al.* 73% of patients were male.¹¹ Chaudhry *et al.* has given figures of 62.3% male and 37.6% female as found in his study.¹²

The average age of patients with orbital cellulitis was 25.7 years (ranging from 1 month to 85 years) in Chaudhry *et al.* series,¹² while 52% patients were 18 or more years of age in Hodges and Tabbara study.¹³ In this study, 42.3% of patients were between 6-16 years of age and the remaining 57.6% patients were between 17-40 years.

Aidan *et al.* documented that preseptal cellulitis was associated with sinusitis in 48.5%, to ocular infection in 31.4%, to an infected wound in 17.1%,⁹ while skin lesions in children and dacryocystitis in adults were the most common predisposing factors in the study by Liu *et al.*¹⁴ In the present study, insect bite was identified in 40% children and trauma in 50% as risk factors for preseptal cellulitis in adults. In case of insect bite, the mechanism of infection is a micropuncture of the skin of eyelid leading to entry of microorganisms causing preseptal cellulitis.

In this study, risk factors identified for orbital cellulitis were trauma in 50% and sinusitis in 33.3% in children and sinusitis in 18.1% and non-Hodgkin's lymphoma in 9.0% among the adults. Sinusitis related cellulitis is by far the most common and usually secondary to ethmoidal sinusitis. Post-traumatic orbital laceration usually develops within 3 days of an injury that penetrates the orbital septum. Liu *et al.* and Moloney *et al.*

reported sinusitis as the commonest cause.^{14,15} Similarly, Robinson *et al.* found that 70.3% cases had significant sinus disease and one case was found to have squamous cell carcinoma of the nasal cavity.¹⁶ Chaudhry *et al.* reported sinus disease as the most common predisposing cause in 39.4% followed by trauma in 19.7%.¹² It can also be caused by dental infection and external ocular infection.¹⁷

The most common complication seen in preseptal patients in the present study was cicatricial ectropion in 44.4%. It was found with more severe disease and slow response to treatment, which ended in complications. In comparison and contrast, Uy *et al.* and Sobol *et al.* reported no permanent sequelae in their studies as a result of preseptal cellulitis as the disease resolved with antibiotics in all cases.^{10,18}

Rodriguez *et al.* in a retrospective study of 107 pediatric patients identified orbital cellulitis in 36 patients with 23 subperiosteal abscesses, 3 orbital abscesses and 3 intracranial complications.¹⁹ Shaikh *et al.* has reported orbital cellulitis masquerading as cavernous sinus thrombosis.² In this study, complication of orbital cellulitis included orbital abscess in 41.1%, panophthalmitis in 17.6%, and subperiosteal abscess in 11.7% while cicatricial ectropion was seen in 44.4% of patient preseptal cellulitis. In Uy *et al.* and Sobol *et al.* studies, preseptal cellulitis resolved with antibiotics in all cases with no untoward sequelae.^{10,18}

In the present study, visual acuity improved in 23.5% eyes and 17.6% eyes suffered permanent visual loss because of evisceration for unresponsive endophthalmitis. Chaudhry *et al.* has commented in their study that visual acuity improved in 16.1% and worsened in 6.2% including 4.3% eyes that sustained complete loss of vision, which was attributed to the delay in correct diagnosis and timely intervention.¹² Ferguson and McNab reported no patient with permanent visual impairment other than one case of enucleation for endophthalmitis that had caused orbital cellulitis.²⁰ Liu *et al.* described only one case of permanent ocular motility impairment after removal of the orbital foreign body.¹⁴

In the present study, none of the preseptal cellulitis patients suffered any visual impairment. Similar findings are reported by Uy and Tuano in their report of preseptal and orbital cellulitis in a developing country i.e. Philippines.¹⁰

Optimal treatment of patients with orbital cellulitis depends on how accurately the disease is classified and the appropriateness with which antibiotics and surgery are used to treat the disease. CT or MR scan is the most helpful and useful tool in identifying patients requiring surgical treatment.³ Culture of infected paranasal sinuses or pus from abscesses is most likely to yield positive results.²⁰ In the Rodriguez *et al.* review study

computed tomography identified retroseptal damage in 36 patients with 23 subperiosteal abscesses, 3 orbital abscesses and 3 intracranial complications.¹⁹ Sixty nine percent of the patients were treated with a single antibiotic (cefotaxime, cefuroxime or amoxicillin clavulonic acid) while 31% underwent multiple antibiotic therapy. Only 8.4% required surgery. In Gomez *et al.* study, antibiotics alone were effective in all 97 patients, but 16% required paranasal sinus or orbital surgery.²¹ In this study, orbital cellulitis was managed with intravenous antibiotics initially in all cases. Cefotaxime or cefuroxime alone was used in 52.9%, Benzyl penicillin and gentamicin in 29.4% and Benzyl penicillin and amoxicillin clavulonic acid in 17.6%. Orbit was explored for abscess in 47%, for subperiosteal abscess in 11.7% and 17.6% of patients end up in evisceration. Five point eight percent of patients were put on a combination of systemic steroids and chemotherapy for non-Hodgkin's lymphoma.

In this study, preseptal cellulitis responded to intravenous antibiotics in all cases. The disease was severe enough to end up in cicatricial ectropion in 44.4% for which retroauricular graft was required. A single antibiotic like cefotaxime was used in 55.5% and combination of Benzyl penicillin and gentamicin in 44.4%.

The main limitation of this study was a small sample size.

CONCLUSION

Insect bite is the most common predisposing factor in preseptal cellulitis and trauma for orbital cellulitis in children, whereas in adults trauma is the leading cause for preseptal and paranasal sinusitis for orbital cellulitis.

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