

Periorbital Cellulitis in Paediatric Emergency Medicine Department Patients

Dear Editor,

Periorbital cellulitis is defined as an infection in front of the orbital septum of the eye and is characterised by development of acute eyelid oedema, tenderness, warmth, chemosis and erythema.¹⁻³ This is a relatively common condition seen in the paediatric population.⁴ Periorbital cellulitis has to be promptly distinguished from orbital cellulitis which is an infection occurring posterior to the orbital septum.^{5,6,7}

Periorbital cellulitis is usually associated with concurrent local pathologies like chalazion, ethmoid sinusitis, dacryocystitis, facial cellulitis, facial or dental surgical procedures, periocular trauma, impetigo and insect bites.^{1,8} A thorough history, meticulous clinical examination and identification of risk factors are paramount in the management of this condition.⁹ Treatment is predominantly medical with initiation of prompt antibiotic therapy and addressing the underlying pathology.²

The aim of this study was to describe the epidemiology, clinical profile and outcome of children with periorbital cellulitis attending the paediatric emergency medicine department. We also wanted to determine the correlation of clinical severity index score¹⁰ with development of complications.

Materials and Methods

This was a single-centre retrospective study based on data collected at the Children's Emergency department at KK Women's and Children's Hospital (KKH), Singapore between 2006 and 2016. The study was approved by the SingHealth Centralised Institutional Review Board (CIRB). The data collection was started by identifying all patients with discharge diagnosis of periorbital cellulitis or preseptal cellulitis from the discharge diagnosis and then recording information on: demography, symptoms, aetiology, clinical signs, treatment, follow-up and return visit.

Clinical severity index score was calculated for all individual patients by a score validated by Linda Vu et al¹⁰ which included systemic features and local features. All categorical variables were analysed using chi-squared test, while for continuous variables, independent t-test was used. Following this, univariate and multivariate logistic regression analyses were performed, with periorbital cellulitis as the primary outcome.

Results

There were 766 patients identified during the study period with periorbital cellulitis. Among these, 614 (80.2%) patients were managed on an outpatient basis with oral antibiotics and 152 (19.8%) patients needed inpatient admission for intravenous antibiotics during the first visit to Children's Emergency. The lowest age in the study group was 1 month and the highest age was 192 months, with a mean age of 45.08 months. The mean severity index score for the study group was 1.52, with the lowest score of 0 and highest score of 13. The mean age of patients requiring inpatient admission (41.30 months) was less than those that were managed on an outpatient basis (46.03 months) (Table 1). However, the mean severity index score was higher for the inpatient group (2.85) when compared to the outpatient group (1.19) ($P < 0.001$). Most patients in the study group were males (53.3%).

In patients who had fever with temperatures less than 39°C, 83% of patients were managed as outpatients when compared to 17% who required inpatient care. On the other hand, there was a higher admission rate among patients with fever more than 39°C, with 61% managed as outpatients and 39% as inpatients, odds ratio 2.92 (1.89-4.52) ($P < 0.001$).

Eye discharge and upper respiratory tract infection (URTI) symptoms were seen in 36.0% and 27.6% of the patients, respectively. A history of antecedent trauma to the eye or face was found in 4.4%, and insect bite to the periorbital area was found in 13.4% of patients; 7.2% of patients had a history of eye disorders like chalazion, blepharitis, periorbital eczema in the past, and 0.9% had a history of sinusitis (past history or current radiological evidence); 1.5% of patients had undergone recent surgical procedures like dental extraction and face laceration repair. Presence of fever of more than 39°C was seen in 11.8% of patients. Bilateral eye periorbital cellulitis was seen in 16.9% of patients. Associated bulbar and palpebral conjunctival erythema was seen in 43.6% of patients. The antibiotics used for outpatient treatment included: co-amoxiclav in 61.6%, amoxicillin in 5.8%, cloxacillin in 7.2%, cephalexin in 5.2% and clarithromycin in 0.3% of patients.

Among the 614 patients managed on outpatient basis, 155 (25.2%) returned to the emergency department due to progression or non-resolution of symptoms after 48 hours. Of these, 51 (8.3%) patients were admitted for inpatient

Table 1. Outcomes of Periorbital Cellulitis Treated in Emergency Department Compared to Age and Severity Index Score

Variables	Yes/No	n (%)	Mean	Standard Deviation	95% CI for Mean		Minimum	Maximum	P Value
					Lower Limit	Upper Limit			
Inpatient admission									
Age									
	No	614 (80.2)	46.03	36.15	43.16	48.89	1	186	0.164
	Yes	152 (19.8)	41.30	42.26	34.52	48.08	1	192	0.164
Severity index score									
	No	614 (80.2)	1.19	1.863	1.05	1.34	0	11	<0.001
	Yes	152 (19.8)	2.85	2.656	2.42	3.28	0	13	<0.001
Complications									
Age									
	No	719 (93.9)	44.59	37.33	41.85	47.32	1	192	0.146
	Yes	47 (6.1)	52.79	38.98	41.34	64.23	1	175	0.146
Severity index score									
	No	719 (93.9)	1.45	2.07	1.30	1.60	0	11	<0.001
	Yes	47 (6.1)	2.66	2.85	1.82	3.50	0	13	<0.001
Return visit to emergency department									
Age									
	No	611 (79.8)	47.29	38.74	44.21	50.36	1	192	0.001
	Yes	155 (20.2)	36.43	30.49	31.58	41.26	1	186	0.001
Severity index score									
	No	611 (79.8)	1.47	2.16	1.30	1.64	0	11	0.191
	Yes	155 (20.2)	1.72	2.11	1.39	2.06	0	13	0.191

CI: Confidence interval

care. Further to that, 317 (51.6%) patients who were managed as outpatients, had no resolution of symptoms during follow-up in the ophthalmology clinic. Among these, 156 (25.4%) patients needed inpatient admission. Hence, overall inpatient admission rate among patients managed as outpatients was 46.8%. The main complication seen in patients with periorbital cellulitis was the development of eventual orbital cellulitis (6.1%). The mean age (52.8) and mean severity index score (2.6) was higher for patients who developed complication during treatment for periorbital cellulitis ($P = 0.1$ and <0.001 , respectively) (Table 1). Among the patients who had return visits to the emergency department, mean age was lower (36.4) ($P = 0.001$), but the severity index scores were similar (Table 1).

Upon univariate regression analysis, among patients who had no resolution or progression of symptoms with oral antibiotics, history of bites and fever $>39^{\circ}\text{C}$ were risk predictors (Table 2). Trend risk predictor was fever $>39^{\circ}\text{C}$. Upon multivariate regression analysis, history of bites and fever $>39^{\circ}\text{C}$ persisted to be risk predictors (Table 2).

Discussion

Majority of the patients in our cohort were managed on an outpatient basis with oral antibiotics. The mean age of the patients reported in our study was higher than

previously reported.⁷ The male predominance in our group of patients is similar to that reported previously.¹¹ The mean severity index for patients requiring inpatient admission for treatment was higher than those managed on outpatient basis. Comparable results have also been observed in a previous study.¹⁰ Patients who had fever with temperatures of more than 39°C had a higher rate of inpatient admission. Antecedent trauma to face was found only in a minority of patients but this places emphasis on close follow-up patients with facial trauma especially periocular trauma for the development of periorbital cellulitis.² The rate of occurrence of insect bite as a predisposing factor in our patients was low when compared to previous studies.⁷ The presence of predisposing factors like sinusitis, URTI, past eye disorders like chalazion, blepharitis, periorbital eczema and recent surgical procedures were low in our study as compared to previous studies.^{3,11,12} The presence of bilateral eye involvement in patients with periorbital cellulitis has been described in literature and there was bilateral periorbital cellulitis in 16.9% of our patients.^{3,13}

Majority of our patients received oral co-amoxiclav for the treatment on an outpatient basis. The infection was caused mainly by *Staphylococcus aureus* and *Streptococcus pyogenes*.⁹ The antibiotic of choice should have anti-beta-lactamase activity and be able to cover both *Staphylococcus aureus* and *Streptococcus pyogenes*.^{9,14}

Table 2. Summary of Univariate and Multivariable Logistic Regression Analysis for Patients Who Had No Resolution or Progression of Symptoms with Oral Antibiotics

Variables	Univariate Analysis		Multivariate Analysis	
	OR (95% CI)	P Value	OR (95% CI)	P Value*
Boy	1.0 (0.8 – 1.4)	0.784	1.1 (0.8 – 1.4)	0.743
Eye discharge	1.0 (0.7 – 1.4)	0.961	0.9 (0.7 – 1.4)	0.925
URTI symptoms	1.4 (0.9 – 1.9)	0.064	1.2(0.8 – 1.6)	0.383
Trauma	0.9 (0.5 – 1.9)	0.814	0.9 (0.4 – 1.9)	0.767
History of bites	0.6 (0.4 – 0.9)	0.014	0.6 (0.4 – 0.9)	0.031
Past eye disorders	0.6 (0.3 – 1.2)	0.199	0.7 (0.4 – 1.3)	0.303
Past sinusitis	1.3 (0.3 – 5.7)	0.757	1.1 (0.2 – 5.1)	0.901
Recent surgical procedures	0.8 (0.2 – 2.8)	0.780	1.0 (0.3 – 3.6)	0.974
Fever >39°C	2.5 (1.6 – 3.9)	<0.001	2.3 (1.5 – 3.7)	<0.001
Bilateral eye periorbital cellulitis	0.8 (0.5 – 1.2)	0.385	0.8 (0.5 – 1.2)	0.332
Conjunctival erythema	0.9 (0.7 – 1.2)	0.622	0.8 (0.6 – 1.2)	0.381

CI: Confidence interval; OR: Odds ratio; URTI: Upper respiratory tract infection

* $P < 0.05$ was considered statistically significant.

In our study, 46.8% of patients managed on an outpatient basis with oral antibiotics had to be eventually admitted due to progression or non-resolution of symptoms after 48 hours. Careful selection of patients for oral ambulatory care is of paramount importance to prevent progression of disease and occurrence of complications. Complications like development of orbital cellulitis, subperiosteal abscess, subacute lid abscess, eyelid necrosis, cicatricial ectropion, retinitis, uveitis, endophthalmitis and optic neuropathy have been described in literature.¹⁵ Extension of disease can result in intracranial complications like cavernous sinus thrombosis or meningitis, sepsis and death.^{3,15} The only complication noted in our patients was progression of the disease resulting in development of orbital cellulitis. Clinical severity index score was significantly higher for patients who eventually developed complications during the treatment.

Univariate logistic regression analysis showed that patients with history of bites and fever of more than >39°C were more likely to have no resolution or progression of symptoms with oral antibiotics. On multivariate logistic regression analysis, history of bites and fever of >39°C persisted to be significant risk predictors. We propose that those patients with these risk factors be admitted for inpatient care for intravenous antibiotics and if this is not feasible, they should have the earliest possible clinical reassessment to evaluate for progression of symptoms.

Limitations

This was a retrospective study design and hence limited by the inherent biases related to the design. Patients were identified based on discharge diagnosis. The presenting

diagnosis may not have been accurate, hence affecting the results and conclusions.

Conclusion

Our study demonstrated 46.8% admission rate for patients with periorbital cellulitis managed with oral antibiotic outpatient care. The clinical severity index score was significantly higher for patients who needed initial inpatient care and those who developed complications later. The use of clinical severity index score on a regular basis in the emergency department could help identify these at-risk patients. The average severity index score of 6 has been found to be highly predictive of the need for intravenous antibiotics by Vu et al¹⁰ previously. Patients with fever of more than 39°C and history of bites should be admitted for intravenous therapy during the initial visit to the emergency department and if this is not feasible, they should have the earliest possible clinical reassessment to evaluate for progression of symptoms. It is pragmatic to have a standardised hospitalwide protocol for the treatment of patients with periorbital cellulitis so that decisions regarding need for intravenous antibiotics, computerised tomography of the orbit, choice of oral antibiotics for ambulatory care and proximity of follow-up can be uniformly taken by the emergency physician and specialists managing the patients.

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