

# *Daily Outpatient Intravenous Antibiotherapy for the Management of Pediatric Periorbital Cellulitis*

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Periorbital cellulitis is an infection and inflammation of the soft tissues anterior to the orbit and surrounding the eye. Also known as preseptal cellulitis, it is difficult to distinguish from orbital cellulitis on presentation alone, the latter involving the tissues posterior to the orbital septum. While periorbital cellulitis is considered less serious than orbital cellulitis, unsuccessful treatment can result in severe complications including intracranial infection, abscess, and acute visual loss<sup>1-3</sup>. It is most commonly the result of an acute sinusitis; infection can spread through the ethmoid sinuses, the floor of the frontal sinus, or through the roof of the maxillary antrum. Alternate etiologies include skin trauma, insect bites, conjunctivitis, pre-existing periocular skin infection, and upper respiratory tract infection. Periorbital cellulitis can affect all ages, but it occurs most frequently in children and is largely considered a pediatric illness.

Patients can present to pediatrics, ophthalmology, and otorhinolaryngology. While several studies have developed management guidelines for periorbital cellulitis<sup>4-7</sup>, there is no agreed consensus about whom or how periorbital cellulitis should be managed. The recommended treatment is empirical antibiotic therapy, but controversy persists about the route of administration, type, and duration<sup>8</sup>. As it is difficult to determine the extent and severity of periorbital cellulitis based on physical examination alone, children with periorbital cellulitis are often admitted to the hospital for several days of intravenous (IV) antibiotherapy. However, the decision to admit a patient can be difficult, as it can be inconvenient for both the child and the family, can pose a risk of nosocomial infections, and can incur significant financial costs for the healthcare system. Goldman described predictors of admission in children with periorbital cellulitis and include local ocular symptoms and presence of fever<sup>9</sup>. Treatment is usually transferred to an outpatient basis when symptoms improve, a more convenient and preferred option for patients and their families. Surgery is reserved for complications of periorbital cellulitis including abscesses and failure to resolve on antibiotherapy.

Pediatric outpatient IV treatment has become increasingly common and has been studied in several conditions, such as cystic fibrosis, pneumonia, urinary tract infections, infections of the central nervous system, amongst others<sup>10</sup>. Several studies have examined whether outpatient treatment can replace the need for admission in children with bacterial infections<sup>11-14</sup>. While **studies examining adverse effects and complications of parenteral antibiotic outpatient therapy have shown varied results, most have demonstrated positive patient outcomes and have been found to be safe, effective, feasible, and cost-efficient.**

**Ceftriaxone is a commonly used antibiotic in the treatment of periorbital cellulitis.** A third generation broad-spectrum cephalosporin, its once-daily intravenous administration, broad spectrum of action and established efficacy make it ideal in the outpatient treatment of many serious pediatric infections. As *Streptococcal sp.*, *Staphylococcal sp.*, and *Haemophilus influenzae* (type b) organisms are most commonly isolated from blood and paranasal sinuses or abscesses, ceftriaxone offers coverage of these pathogens. Its use in the outpatient setting was first described in 1991; Bradley<sup>15</sup> demonstrated that **once daily ceftriaxone administered as an outpatient basis in over 200 children with bacterial infections, including 16 cases of periorbital facial cellulitis, did not show an increase in complication rates, nor in treatment failure.** One study by Dagan further emphasize the success of outpatient ceftriaxone antibiotherapy in pediatric infections including periorbital and buccal cellulitis, and mastoiditis<sup>16</sup>. These studies highlight the increasing popularity of outpatient intravenous therapy for non-complicated pediatric infections.

Guidelines for outpatient parenteral antimicrobial therapy have been described by several groups all expressing the importance of close monitoring and follow up. Guidelines by Tice describe the importance of a thorough assessment of the patient's general medical condition, the type of infection, and the child's home situation prior to initiating therapy. Regular clinical and laboratory monitoring, the choice of antimicrobial selection, as well as the use of outcome measures to assure the effectiveness and quality of care are also key components of successful outpatient therapy<sup>14</sup>. This type of therapy must be recognized as distinct from inpatient therapy as these patients have special requirements to ensure treatment success.

Despite a lack of consensus on optimal management, strides have been made in the treatment of periorbital cellulitis within the pediatric population. Howe & Jones put forth guidelines for the management of periorbital cellulitis and/or abscess including admission criteria, management plan and treatment options<sup>17</sup>. Such guidelines discuss the need for admission in almost all patients with periorbital cellulitis, emphasizing mandatory admission in those with ocular symptoms including periorbital swelling, diplopia, reduced visual acuity, abnormal light reflexes or swinging light test, proptosis or ophthalmoplegia, as well as children who are systemically unwell or who show signs of drowsiness, vomiting, headache, seizure or a cranial nerve lesion. Patients treated on an outpatient basis are those with minimal swelling, a normal eye examination, and absence of systemic symptoms; however, patients whose swelling fail to subside within 24 hours are admitted. These guidelines emphasize the importance of distinguishing between periorbital and orbital cellulitis prior to treatment, and thus the need for CT scan of the orbit and sinuses when such distinction is unclear. Consistent with other studies is the recommendation of a broad spectrum cephalosporin, nasal decongestants, and surgical drainage of any abscesses.

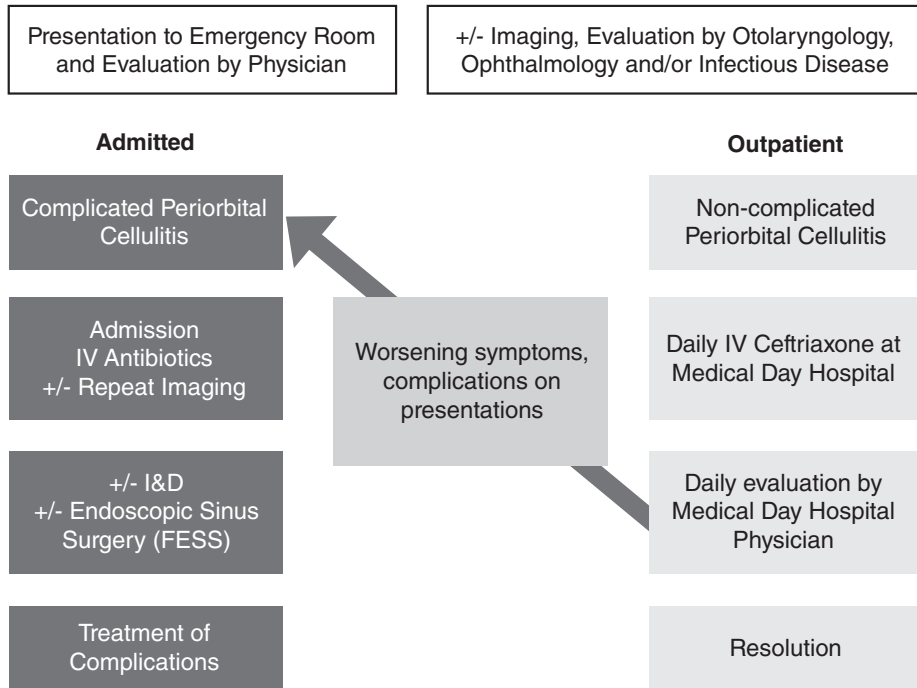
At the Montreal Children's Hospital, children with periorbital cellulitis presenting to the Emergency Room are evaluated by the emergency pediatrician and assessed for a history of or current signs of systemic illness such fever and lethargy. Patients are evaluated for ocular and neurological signs and symptoms. Clin-

ical examination includes a thorough neurological and ophthalmological exams with specific attention to photophobia, blurriness, decreased visual acuity, diplopia, proptosis, impaired range of motion of the affected eye, gait abnormalities, third nerve palsy, loss of the pupillary light reflex, as well as a relative afferent defect, and pain with extraocular movement. Investigations include a white blood cell count, absolute neutrophil count, erythrocyte sedimentation rate, C-reactive protein, and depending on clinical severity, blood cultures are drawn. If complications such as abscess or intracranial infection are suspected, or if there is difficulty in distinguishing between periorbital and orbital cellulitis, a CT scan is often performed; consultation by ophthalmology, otolaryngology and/or infectious disease are requested as indicated. All patients receive their first dose of IV antibiotics, usually ceftriaxone, in the emergency room. A dose of 50-100 mg/kg/day of ceftriaxone is given, up to a maximum of 2 g daily. The choice of antibiotic may depend on the suspected etiology of the cellulitis, for example, if parents report a previous insect bite on the eyelid or a recent history of upper respiratory tract infection. Patients are also treated with saline nasal rinses, nasal corticosteroids and/or topical decongestants if indicated.

Patients who present with complicated periorbital cellulitis such as an abscess (either suspected based on clinical presentation or confirmed by imaging), signs of with systemic disease such as fever and elevated WBC, or those with visual deficits and/or neurological signs are admitted on presentation. Patients with uncomplicated periorbital cellulitis, that is, without signs of severe illness as described above or with small subperiosteal abscesses amenable to antibiotic therapy, are treated on an outpatient basis. **Such patients return to the medical day hospital daily to receive IV antibiotics and to be re-assessed by a pediatrician as well as an otolaryngologist and/or ophthalmologist if indicated. The entire process lasts approximately 30 minutes.** While most patients with uncomplicated periorbital cellulitis improve with ceftriaxone alone, alternatively, outpatient therapy may be modified by the addition of another antibiotic. Repeat imaging may be performed to assess for formation of an abscess if there is deterioration or lack of clinical improvement within 48-72 hours. Patients who fail to improve clinically via an outpatient basis, as well as those with worsening symptoms, are admitted. Surgical intervention is reserved for patients who fail medical management and those with an abscess confirmed on CT imaging and consists of incision and drainage and/or endoscopic sinus surgery. Admitted patients who demonstrate clinical improvement may be transferred to medical day hospital for outpatient therapy. **Following a course of IV therapy, most patients complete their antibiotic treatment with oral antibiotics, amoxicillin-clavulanate being the most common choice due to its broad spectrum and oral bioavailability.** Signs of clinical improvement include, but are not limited to, the absence of swelling and fever. The simplified treatment algorithm used at our institution is shown in **Chart 1**.

In a retrospective study at our center, 102 out of 130 children diagnosed with periorbital cellulitis were treated on an outpatient basis with once-daily IV ceftriaxone. The emergency department pediatrician determined treatment

group after clinical assessment. **The duration of parenteral antibiotics varies depending on clinical response and treatment is usually completed with oral antibiotics once significant clinical improvement has occurred.** Five of 102 patients required admission following failure of outpatient therapy; three patients were admitted for a phlegmon, one patient was admitted for formation of a subperiosteal abscess, and one patient for worsening symptoms despite IV therapy. No patients developed severe visual nor neurological complications (publication of full results pending) (**Chart 1**).



**Chart 1.** Treatment algorithm for outpatient and inpatient management of periorbital cellulitis at the Montreal Children's Hospital

In conclusion, **outpatient IV antibiotic therapy is an effective and safe alternative to admission in select cases of uncomplicated periorbital cellulitis. Ceftriaxone is the usual drug of choice due to its once daily administration and spectrum of activity. Daily follow up by a physician is important to assess symptom progression and efficacy of treatment.**

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