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**Definition:**

Pediatric orbital cellulitis (POC) is defined as inflammation of the orbital contents posterior to the orbital septum. The degree of orbital involvement is variable, ranging from orbital fat inflammation to abscess formation and potential venous sinus thrombosis seen in severe cases. It is a serious condition that if not recognized and managed appropriately can lead to significant visual and life-threatening complications.

**Incidence:**

Orbital complications are cited to occur from 0.5-3.9% of cases of acute sinusitis. Cases of POC appear to peak during the winter months, mirroring that of acute sinusitis and viral respiratory illnesses. Dell Children's Medical Center sees approximately 10 cases of POC a year, with December and January having the highest frequency.

**Etiology:**

The majority of cases of POC are caused by direct extension of a paranasal sinusitis, with the ethmoid sinus being most commonly involved. Bacteria that have been associated with POC include *Staphylococcus aureus* (MRSA and MSSA), *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Streptococcus milleri* group, *Moraxella catarrhalis*, and anaerobic organisms. Though single isolates occur most frequently, infections can be polymicrobial, especially in older children.

**Differential Diagnosis:**

- Infection
  - Bacterial
  - Fungal
- Idiopathic inflammation
  - Orbital pseudotumor
  - Myositis
  - Sarcoidosis
- Malignancy
  - Retinoblastoma
  - Leukemia
  - Rhabdomyosarcoma
- Trauma

**Guideline Eligibility Criteria:**

Patients >6mo of age with periorbital edema and clinical signs concerning for orbital involvement.

**Guideline Exclusion Criteria:**

- Known or clinically obvious orbital trauma
- Known malignancy or immunodeficiency
- Abnormal orbit or maxillofacial anatomy
- Clinical signs of severe sepsis/shock

### **Diagnostic Evaluation:**

Clinical suspicion is based on exam findings suggestive of orbital involvement and should be evaluated in any patient presenting with periorbital edema and/or erythema.

### **Physical Examination:**

In the presence of periorbital edema and/or erythema:

#### **Mild to Moderate Symptoms**

- Alert, appropriate mental status for age
- Pain with extraocular movements
- Ophthalmoplegia (diplopia)
- Proptosis
- Chemosis
- Conjunctivitis

#### **Severe Symptoms**

- Altered mental status
- Change in visual acuity
- Severe headache
- Pupillary defect (RAPD)
- Bilateral symptoms
- Seizure or history of seizure on presentation

### **Critical Points of Evidence**

#### ***Evidence Supports***

- Initial medical management alone for patients with mild to moderate symptoms<sup>10-17</sup>
- Empiric MRSA coverage based on regional data<sup>1-3,5-9</sup>
- Transitioning to PO antibiotics for completion of therapy once clinical improvement documented for patients with mild to moderate disease<sup>4</sup>

#### ***Evidence Lacking/Inconclusive***

- Use of systemic steroids in routine management of POC<sup>18-20</sup>
- Use of intranasal saline and decongestants in routine management of POC

#### ***Evidence Against***

- Use of routine laboratory tests for assessment of disease severity<sup>3,7,16</sup>

### **Practice Recommendations and Clinical Management**

#### **Imaging**

- CT is the preferred initial imaging modality for diagnosis of patients with suspected orbital cellulitis
- If able, the use of image-guidance protocol for the study can provide valuable intra-operative assistance if needed.
- At our institution, CT Sinus with IV contrast and “1mm axial cuts for image guided surgery including tip of nose and top of skull” is the *recommended initial study* obtained. The orderset provided in the EMR is populated with this descriptor.
- MRI/MRV of the brain to be considered in patients presenting with severe disease or if concerned for intracranial extension or thrombosis.

#### **Surgical intervention**

- Not routinely indicated as part of initial management in patients with mild to moderate disease even in the presence of a subperiosteal abscess. (**Strong recommendation, moderate-quality evidence**) .
- Indicated in patients with severe, vision-threatening symptoms and to be considered in patients not responding to medical management alone.

### Laboratory Evaluation

No laboratory test has been shown to correlate directly with clinical severity on presentation.

Trending laboratory values such as WBC count, CRP may be a helpful adjunct to clinical exam in determining response to therapy.

Blood culture, when positive, can be helpful in identifying causative organisms, particularly in moderate to severe disease. Overall positivity reported between 7-10% of patients with pediatric orbital cellulitis.

Patients on Vancomycin need appropriate monitoring laboratory evaluations including serum creatinine.

### Adjunctive Therapies

Systemic steroids may be beneficial in reducing symptoms of acute sinusitis and therefore may be helpful in symptom management of children with pediatric orbital cellulitis, though there currently is not adequate evidence for their role in this specific disease process.

(Weak recommendation, low-quality evidence)

#### Antibiotics

See Addendum #1 for specific details

- IV Clindamycin + Ceftriaxone is recommended as initial therapy for patients with POC classified as mild to moderate
- IV Vancomycin + Ceftriaxone is recommended as initial therapy for patients with POC classified as severe, failure to improve on initial therapeutic regimen or concern for intracranial involvement.
- Narrow antibiotic coverage if able based on culture results
- ID consultation suggested for patients not responding to initial therapy, patients with severe disease or for assistance with antibiotic directed therapy against specific organism
- Transition to PO antibiotics is recommended based on documented clinical improvement and readiness for discharge (see discharge criteria).
- PO transition to Clindamycin + Augmentin is recommended in patients who demonstrate clinical improvement and in whom no species is identified as the source of infection.
- Total duration of therapy should be 14 days based on recommended treatment for acute bacterial sinusitis.

#### Nasal Care

- Generally recommend a consistent nasal care routine for patients who are able to tolerate in order to decrease inflammation and promote sinus drainage. (Moderate recommendation, low-quality evidence)
  - Current preferred regimen would include the following, administered in order listed:
    1. Oxymetazoline - 2-3 sprays in each nostril BID. Maximum duration of therapy: 3 days.
    2. Nasal saline irrigation BID (ok for saline spray if patient too young or cannot tolerate rinse)
    3. Fluticasone nasal: 1-2 sprays in each nostril qDay following nasal saline irrigation.
- Oxymetazoline is not recommended in children <6 years of age due to risk of CNS depression. May consider usage in younger children (>1 year of age) in the inpatient setting with close clinical monitoring.
  - No specified evidence identified for adjunctive decongestant therapies in treatment of pediatric orbital cellulitis. Recommendation based on expert opinion and evidence extrapolated from management of acute sinusitis as POC is most often identified as a complication of such.
- Fluticasone can be utilized in children 4 years of age and older.

### **Systemic Steroids**

- Though not recommended for routine use, can consider systemic steroids in patients with POC classified as Chandler I or II (no abscess) after 24h of IV antibiotics if felt necessary by the care team
  - o Dosing range cited in the literature is typically 1-1.5 mg/kg/day divided BID for 1 week (Weak recommendation, low-quality evidence)

### **Monitoring**

- Patients should be placed with the head of the bed elevated 30°
- Visual acuity and symptom documentation should occur at least BID (photographic documentation preferred).
- Patients should be managed in conjunction with Pediatric Ophthalmology and Pediatric ENT. Oculoplastics may also need to be involved for patients requiring drainage of non-medial abscesses (unable to be drained via sinus surgery)

### **Patient Disposition**

#### **Admission Criteria**

- All patients with evidence of orbital disease should be admitted for initiation of medical management
- Patients with severe symptoms require urgent discussion with Pediatric Ophthalmology and ENT to determine need for immediate surgical intervention

#### **Discharge Criteria**

- Improved periorbital edema (able to fully open eye)
- Afebrile for minimum of 48 hours

#### **Follow-Up Care**

- Patients should have scheduled follow-up with pediatric ENT and pediatric ophthalmology as well as their primary care pediatrician prior to discharge
- Appropriate anticipatory guidance should be given regarding when to return to ED or notify providers prior to discharge

#### **Prevention**

- Patients with recurrent sinusitis should be followed by pediatric ENT to ensure appropriate preventative therapies
- Early recognition of symptoms is key in appropriate diagnosis and intervention to reduce sequelae

#### **Outcome Measures**

- Antimicrobial guideline adherence
- Hospital Length of Stay
- Provider documentation of symptoms
- Readmissions for same diagnosis/failure of outpatient management

## Addendum 1:

### Empiric Antimicrobial Management Recommendation for Pediatric Orbital Cellulitis at Dell Children's Medical Center

#### Severe Disease or Concern for CNS involvement

- **Vancomycin** 15mg/kg IV q6h (max 1000mg/dose)  
*and*
- **Ceftriaxone**<sup>‡</sup> 100mg/kg/day IV divided q12 (max 2000mg/dose)

\*Can also add **Metronidazole** 30mg/kg/day IV divided q8h (max 1500mg/day) for increased anaerobic coverage

#### Clinically Stable Patients with Mild-Moderate Disease

- **Clindamycin** 13mg/kg IV q8h (max 600mg/dose)  
*and*
- **Ceftriaxone** 75mg/kg IV q24h<sup>‡</sup> (max 2000mg/dose)

#### Oral Antibiotic Transition<sup>§</sup>

- **Amoxicillin-Clavulanate**<sup>‡</sup> 90mg amoxicillin/kg/day divided BID (1000mg/dose max)

<sup>§</sup> Treatment duration should be for a total of 14 days as recommended for the management of acute bacterial sinusitis. Adjust antimicrobial coverage based on available culture results if available and needed.

<sup>‡</sup> For patients with a history of Type I reaction or SEVERE adverse reaction to penicillin and/or cephalosporins

documented acceptable substitution includes:

**Levofloxacin** <5 years: 10mg/kg/dose IV q12h (max 750mg/day)  
≥5 years: 10mg/kg/dose IV q24h (max 750mg/day)

*Then*

**Levofloxacin** <5 years: 10mg/kg/dose PO BID (max 750mg/day)  
≥5 years: 10mg/kg/dose PO Daily (max 750mg/day)

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#### Surgical Management

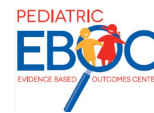
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# GUIDELINES FOR MANAGEMENT OF PEDIATRIC ORBITAL CELLULITIS EVIDENCE-BASED OUTCOMES CENTER



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Approved by the Pediatric Orbital Cellulitis Evidence-Based Outcomes Center Team

## Revision History

Date Approved: April 1, 2016

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**2022 Revisions:** Updated Algorithm and Guidelines. Updated Discharge Criteria - removed "Full or baseline extraocular movements". Practice Recommendations - rephrased from decongestants to Nasal care; added more about saline care. Reviewed evidence for intranasal steroids. Sinus/Nasal Care - Expanded on this topic. Changed wording from "CT Orbits with Contrast" to CT Sinus with IV Contrast".

**2024** - Removed Clindamycin from Oral Antibiotic Transition (in Addendum 1) and shortened treatment duration days to 14 from "14-21".

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