



**ORIGINAL RESEARCH PAPER**

**Radio-Diagnosis**

**ORBITAL CELLULITIS WITH SUBPERIOSTEAL ABSCESS SECONDARY TO ACUTE SINUSITIS - A CASE REPORT**

**KEY WORDS:** Orbital cellulitis, orbital/ subperiosteal abscess, proptosis, orbital emergency

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**ABSTRACT**

Orbital infection is an ophthalmological emergency as it can lead to blindness and intracranial spread. Imaging is needed to determine the extent of the infection, to detect complications and predisposing factors as well as for surgical planning. We report a case of a 7 year old boy who presented with a short duration history of nasal discharge, headache, fever with swelling and redness over the left eye. On local examination, the child had edema and erythema over the left eyelids, proptosis and painful restricted movements of the left eye. Imaging revealed extensive pansinusitis, marked axial proptosis of the left globe, marked stranding of the preseptal and orbital fat and a peripherally enhancing subperiosteal collection with central restriction in the extraconal space along the left orbital roof (Stage III Chandler classification of orbital infections).

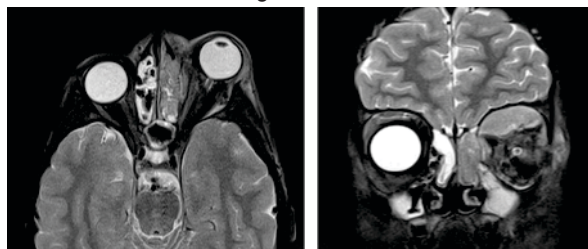
**INTRODUCTION**

**Orbital emergencies** fall into four major categories: infection, trauma, vascular disease, and inflammation; of which **infections** account for the major percentage of cases. **Orbital cellulitis** is a sight-threatening and potentially life-threatening condition which requires urgent imaging to assess the anatomic extent of disease, including postseptal, cavernous sinus, and intracranial involvement; evaluate for sources of contiguous spread, such as with sinusitis or trauma; and identify orbital abscesses that require exploration and drainage. For orbital imaging in the acute setting, computed tomography is the first-line modality, with magnetic resonance imaging playing an important secondary role.

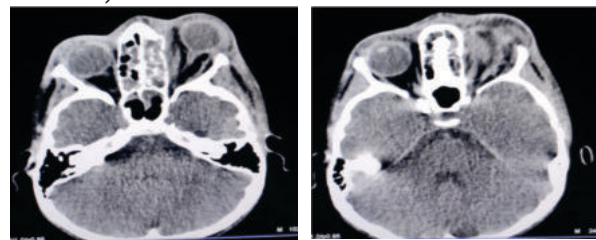
**Case Presentation**

A 7 year old boy presented with a history of nasal discharge and headache of 4 days duration followed by the development of 101°F fever with swelling and redness over the left eye. The child had difficulty in opening the left eye. On local examination, the child had edema and erythema over the left eyelids, proptosis and painful restricted movements of the left eye. Visual acuity was maintained. Laboratory work-up revealed a total leucocyte count of 12450/μL showing neutrophilia. CT and CE-MRI of the orbit were performed that revealed extensive pansinusitis, marked axial proptosis of the left globe, marked stranding of the preseptal and orbital fat and a peripherally enhancing subperiosteal collection with central restriction in the extraconal space along the left orbital roof (Stage III Chandler classification of orbital infections).

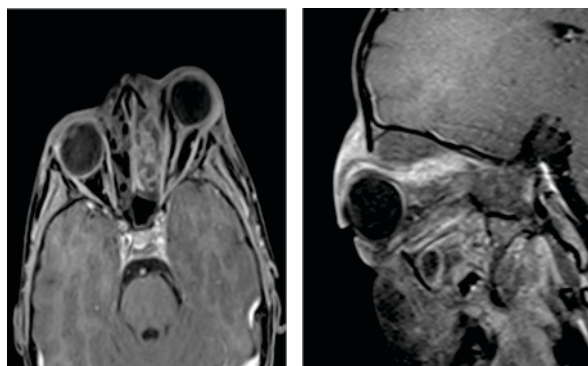
Proptosis Of Left Eyeglobe And Bilateral Etmoid And Sphenoid Sinusitis. (b) Axial NECT Orbit Image Showing Soft Tissue Thickening Involving The Extraconal Space Along Left Orbital Roof With Stranding Of Orbital Fat.



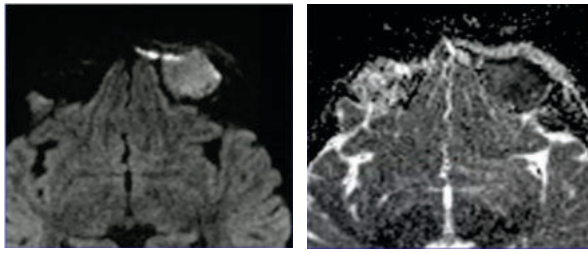
**Figure 2:** (a) Axial And (b) Coronal T2 Weighted Fat-suppressed Images Showing Axial Left Proptosis, Fat Stranding Involving Preseptal And Orbital Connective Tissues S/o Periorbital And Orbital Cellulitis, Collection In The Extraconal Compartment Of Left Orbit Along Its Roof Causing Inferior Displacement Of Superior Rectus And Levator Palpebrae Superioris Muscles, Collection In The Left Ethmoid Air Cells And Hyperintense Mucosal Thickening Involving The Visualised B/1 Maxillary, Sphenoid And Right Ethmoid Air Cells S/o Sinusitis.



**Figure 1:** (a) Axial NECT Orbit Image Showing Marked Axial Proptosis Of Left Eyeglobe And Bilateral Etmoid And Sphenoid Sinusitis. (b) Axial NECT Orbit Image Showing Soft Tissue Thickening Involving The Extraconal Space Along Left Orbital Roof With Stranding Of Orbital Fat.



**Figure 2:** (a) Axial And (b) Coronal T2 Weighted Fat-suppressed Images Showing Axial Left Proptosis, Fat Stranding Involving Preseptal And Orbital Connective Tissues S/o Periorbital And Orbital Cellulitis, Collection In The Extraconal Compartment Of Left Orbit Along Its Roof Causing Inferior Displacement Of Superior Rectus And Levator Palpebrae Superioris Muscles, Collection In The Left Ethmoid Air Cells And Hyperintense Mucosal Thickening Involving The Visualised B/1 Maxillary, Sphenoid And Right Ethmoid Air Cells S/o Sinusitis.



**C** **D**  
**Figure 3.** (a) Axial And (b) Parasagittal T1 Weighted Fat Saturated Post Contrast Images Showing Peripherally Enhancing Collections Along Left Orbital Roof S/o Subperiosteal Collection And Peripherally Enhancing Collections In Left Ethmoid Air Cells. Axial (c) Diffusion Weighted Image And (d) ADC Map Showing Central Restriction Within The Subperiosteal Collection Along Roof Of Left Orbit.

**DISCUSSION**

Infections of the orbit are almost always related to adjacent **sinusitis**, particularly secondary to ethmoid sinusitis in younger children, and of maxillary or frontal origin in older children. Few cases occur due to intra-orbital foreign bodies.

Radiologic evaluation of orbital infections is commonly performed to distinguish anterior periorbital (preseptal) cellulitis from posterior deep (orbital) cellulitis with respect to the orbital septum, which serves as a natural barrier against the spread of infection. The location of the orbital infection has profound clinical implications, with deep orbital infection requiring more aggressive treatment to prevent vision loss and intracranial spread.

On cross-sectional images, **preseptal cellulitis** is characterized by periorbital soft-tissue swelling and stranding anterior to the orbital septum. The clinical course of preseptal cellulitis typically ends with outpatient antibiotic treatment and rarely involves serious complications.

**Orbital cellulitis** is a postseptal soft-tissue infection that involves the contents of the orbit. It typically shows diffuse soft-tissue stranding posterior to the orbital septum and clinical features of proptosis, painful ophthalmoplegia, and vision loss. It generally requires hospital admission with administration of intravenous antibiotics and close monitoring of the patient's vision.

**Chandler classification** is the most commonly used system for dividing the different types of orbital cellulitis:

- **stage I: Periorbital (preseptal) cellulitis** with inflammation and edema anterior to the orbital septum.
- **stage II: Orbital cellulitis** with extension of the inflammation and edema to include orbital contents posterior to the orbital septum.
- **stage III: Subperiosteal abscess**
- **stage IV: Orbital abscess**
- **stage V: Cavernous sinus thrombosis-** development of retrograde phlebitis and coagulation of vascular contents extending up to the cavernous sinus

Complications of orbital cellulitis include orbital and/or subperiosteal abscess, superior orbital vein thrombosis, cavernous sinus thrombosis, meningitis, epidural and subdural abscess, parenchymal brain abscess, optic neuritis/perineuritis and dacryoadenitis.

MRI provides excellent contrast resolution and tissue characterization in the orbit even without administering intravenous gadolinium-based contrast agent. In addition, no ionizing radiation is involved in MRI, making the study particularly useful in pregnancy and pediatric population. The center of the abscess shows restriction of diffusion on

diffusion-weighted imaging (DWI) and demonstration of this finding may obviate the need for intravenous contrast administration in patients who have a contraindication to contrast.

**CONCLUSION**

Unilateral proptosis with acute presentation should raise the suspicion of orbital cellulitis, an **orbital emergency**. Imaging, with MRI being the modality of choice, should include assessment of the anatomic extent of disease including postseptal, cavernous sinus, and intracranial involvement; assessment of optic nerve status; presence of orbital/subperiosteal abscesses; and evaluation for sources of contiguous spread, such as with sinusitis and trauma.

Differential diagnoses include idiopathic orbital inflammatory syndrome, orbital lymphoma and hemangioma, vascular malformations which can be differentiated using clinical history and MRI.

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