Orbital Complications of Rhinosinusitis

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Introduction

Anatomical consideration

Microbiology

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Classification

Conclusion
INTRODUCTION

- Rhinosinusitis is inflammation of nasal cavity and paranasal sinuses mucosa.
- Common disorder affecting children and Adults.
- Majority of cases recover uneventfully.
- Serious and potentially life-threatening complications may occur.
INTRODUCTION

- Complications arise when infection spreads into or beyond bony wall of sinuses.
- Results in devastating consequences if they are not promptly recognized and treated.
- Rare as most episodes of ABRS respond to appropriate medical treatment.
Classification of rhinosinusitis complications:

1. Orbital Complications (60-75%)
2. Intracranial Complications (15-20%)
3. Bony Complications (5-10%)
Orbital complications are the most common rhinosinusitis complications in pediatrics and adults.

Most common in children below 7 years.

Most common origin of orbital complication is ethmoiditis, followed by frontal and maxillary sinusitis.
Despite the modern antibiotic therapies applied in the practice of otorhinolaryngology, Orbital complications of sinusitis are still considered a serious threat to essential functions of the eye, including loss of vision, and at worst, life threatening symptoms.
Risk Factors of developing rhinosinusitis complications:

Winter months:

From January through March.

Higher rates of upper respiratory tract infections and acute rhinosinusitis.
INTRODUCTION

- **Age:**
  - **Pediatric populations below 7 years:**
  - Most common populations involved in orbital complications.
  1. Higher rates of upper respiratory tract infections.
  2. Ethmoid sinuses are the most developed sinuses at the time of birth which is in close proximity to the orbit.
Age:

Adolescence and young adults:

Most common populations involved in intracranial complications.

1. Frontal sinuses become visible radiographically around age 5 years and increase in size through puberty which is in close proximity to the brain.
Gender:

- Male gender in intracranial and post-septal orbital complications.
- Gender has not been identified as a risk factor in pre-septal orbital complications.
ANATOMICAL CONSIDERATION

- Main anatomical barriers of spreading the infections into the orbit:
  - **Lamina Papyracea:**
    - Paper-thin bony plate separate ethmoid cells from the orbit.
    - Contains several perforations through which valveless blood vessels and nerves travel.
ANATOMICAL CONSIDERATION
Periorbita:

- Periosteum of the internal orbit and covers the bony orbital walls from the anterior aperture of the orbital cavity back to the cone enveloping the optic canal.
- Only soft tissue barrier between the sinuses and the orbital contents.
ANATOMICAL CONSIDERATION
ANATOMICAL CONSIDERATION

Orbital septum:

- Reflection of the periorbita at the margins of the orbit and attaches into the upper and lower eyelids at the levator aponeurosis superiorly and the tarsal plate inferiorly.
- Lacks lymphatic channels and forms a barrier limiting infections from passing directly through the eyelids into the orbit.
- Forms a boundary between pre-septal and post-septal infections.
Important anatomical spaces related to the orbit:

Sub-periosteal space:
- Potential space lying between the orbital bones and the periorbita.
- Can be fill with blood after orbital fracture or with abscesses when associated with a paranasal sinusitis.
ANATOMICAL CONSIDERATION
ANATOMICAL CONSIDERATION

- **Extra-conal space:**
  - Potential space lying within the periorbital but outside the intermuscular septum.
  - **Contains:**
    - Fat
    - Superior oblique muscle
    - Trochlear nerve (CN IV)
    - Lacrimal and frontal branches of Ophthalmic nerve (V1)
    - Lacrimal gland
ANATOMICAL CONSIDERATION
ANATOMICAL CONSIDERATION

- **Intra-conal (Retro-bulbar) space:**
  - Potential space lying within the periorbital but inside the intermuscular septum.
  - **Contains:**
    - Fat
    - Optic nerve (CN II)
    - Oculomotor nerve (CN III)
    - Abducens nerve (CN VI)
    - Nasociliary branch of Ophthalmic nerve (V1)
    - Ophthalmic artery
ANATOMICAL CONSIDERATION
ANATOMICAL CONSIDERATION

- **Intra-conal (Retro-bulbar) space:**
  - Potential space lying within the periorbital but inside the intermuscular septum.
  - **Contains:**
    - Fat
    - Optic nerve (CN II)
    - Oculomotor nerve (CN III)
    - Abducens nerve (CN VI)
    - Nasociliary branch of Ophthalmic nerve (V1)
    - Ophthalmic artery
Pathways of orbital involvements:

Thrombophlebitis:

- Main pathway of orbital complications.
- Superior and inferior ophthalmic veins are valveless, allowing direct communication between the nose, ethmoid sinuses, face, orbit, and cavernous sinus.
- Thrombophlebitis interferes with the venous drainage of the orbital contents.
Direct extension:

Ethmoid sinusitis can extend through the thin lamina papyracea or through congenital, surgical, or traumatic dehiscence of lamina papyracea.
Microbiology of orbital complications:

- Orbital complications are polymicrobial (75%)
- Streptococcus species and Staphylococcus aureus are the most common causes of both orbital and intracranial complications of rhinosinusitis.
- Immunocompromised patients are susceptible to atypical pathogens and fungus with development of invasive infections.
<table>
<thead>
<tr>
<th>Condition</th>
<th>More common</th>
<th>Less common</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute sinusitis (children)</td>
<td><em>Streptococcus pneumoniae</em>, <em>Haemophilus influenzae</em>, <em>Moraxella catarrhalis</em>, and other <em>Streptococcus</em> species</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Anaerobic organisms</em> and <em>Staphylococcus aureus</em></td>
<td></td>
</tr>
<tr>
<td>Acute sinusitis (adults)</td>
<td><em>S. pneumoniae</em>, <em>H. influenzae</em>, other <em>Streptococcus</em> sp., and anaerobic organisms</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>M. catarrhalis</em> and <em>S. aureus</em></td>
<td></td>
</tr>
<tr>
<td>Orbital complications of sinusitis</td>
<td><em>Streptococcus viridans</em> (including <em>Streptococcus milleri</em> group), <em>S. aureus</em>, and <em>S. pneumoniae</em>; these infections are commonly polymicrobial</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Anaerobic organisms</em> (especially <em>Bacteroides</em> sp., <em>Peptostreptococcus</em>, and <em>Eikenella</em>), other <em>Streptococcus</em> sp., <em>H. influenza</em>, and other gram negative bacilli</td>
<td></td>
</tr>
</tbody>
</table>
 DIAGNOSTIC TOOLS

- **Blood tests:**
  - For base line analysis:
    - CBC, ESR, CRP.
    - Leukocytosis was seen in 50% only of patients with orbital complications.

- **Blood culture:**
  - Indicated in patients with intracranial complications and more severe orbital complications.
  - Overall positive blood cultures 2.7–6%.
Nasal endoscopy with middle meatus culture:
- Should be done for all patient presenting with rhinosinusitis complications.
- Blind swabs of nasal cavity are not recommended due to its contamination by normal colonizing bacteria.
- Endoscopically-directed middle meatus cultures are well correlated with cultures obtained by direct maxillary sinus aspiration.
DIAGNOSTIC TOOLS

- Cultures can be obtained with a sterile swab or utilizing suction into a sterile trap device.
- Helps to direct the antibiotic coverage to specific microorganism.
Table 1. Summary of the culture results of case series of orbital sepsis

<table>
<thead>
<tr>
<th>Author</th>
<th>Number</th>
<th>Blood culture</th>
<th>Nasal swab</th>
<th>Eye swab</th>
<th>Surgical specimen (abscess/sinus aspirate)</th>
<th>Bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>McKinley</td>
<td>38</td>
<td>2/27</td>
<td>5/6</td>
<td>2/2</td>
<td>22/35</td>
<td>Staph sp 22, Strep sp 13, Haemoph sp 3</td>
</tr>
<tr>
<td>Uzcategui</td>
<td>101</td>
<td>2/88</td>
<td>4/10</td>
<td>26/44</td>
<td>2/2</td>
<td>Staph sp, strep sp, <em>E. coli</em></td>
</tr>
<tr>
<td>Robinson</td>
<td>27</td>
<td>6/10</td>
<td></td>
<td></td>
<td>5/8</td>
<td>Staph sp = Strep sp</td>
</tr>
<tr>
<td>Aabideen</td>
<td>13</td>
<td>0/13</td>
<td>3/13</td>
<td>4/13</td>
<td>18/25</td>
<td>Strep 4, Hi 2, Staph 1</td>
</tr>
<tr>
<td>Ferguson</td>
<td>52</td>
<td>NA</td>
<td>17/29</td>
<td>18/52</td>
<td>18/25</td>
<td>Staph 18, Strep 15, nil 21, others 18</td>
</tr>
<tr>
<td>Oxford</td>
<td>104</td>
<td>4/67</td>
<td>NA</td>
<td>NA</td>
<td>34/36</td>
<td>Strep 23, Staph 12, other 14</td>
</tr>
<tr>
<td>Total (%)</td>
<td>335</td>
<td>8/195 (4%)</td>
<td>35/68 (51%)</td>
<td>50/111 (45%)</td>
<td>81/106 (76%)</td>
<td></td>
</tr>
</tbody>
</table>
DIAGNOSTIC TOOLS

- **CT scan with contrast:**
  - Indicated for all patients with post-septal orbital complications or intracranial complications.

- **MRI with gad:**
  - Indicated mainly for all patients with severe orbital complications or intracranial complications.
Kaplan et al. describe the use of a standardized orbital ultrasound in children in post-septal infection. CT scanning was inconclusive as to whether there was a collection in 4/7 in their series and ultrasound was diagnostic.

**Advantages:**
- Well tolerated by children
- No sedation needed

**Limitations:**
- Operator-dependent
- Inability to visualize the post 1/3 of the orbit
Orbital complications of sinusitis were classified primarily by Hubert in 1937, but it was Chandler who categorized them in 1970, followed by later modifications Moloney.
# Classification of Orbital Complications

Table 1. The most commonly accepted orbital classifications of sinuses

<table>
<thead>
<tr>
<th>Group</th>
<th>Chandler</th>
<th>Moloney</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Inflammatory oedema</td>
<td>Preseptal cellulitis</td>
</tr>
<tr>
<td>Second</td>
<td>Orbital cellulitis</td>
<td>Subperiosteal abscess</td>
</tr>
<tr>
<td>Third</td>
<td>Subperiosteal abscess</td>
<td>Orbital cellulitis</td>
</tr>
<tr>
<td>Fourth</td>
<td>Orbital abscess</td>
<td>Orbital abscess</td>
</tr>
<tr>
<td>Fifth</td>
<td>Cavernous sinus thrombosis</td>
<td>Cavernous sinus thrombosis</td>
</tr>
</tbody>
</table>
CLASSIFICATION OF ORBITAL COMPLICATIONS

Ophthalmic manifestations of paranasal sinus disease: a clinical grading system.

Al Anazy FH¹, Al Dousary SH.

Author information

¹Ear, Nose, and Throat (ENT) Department, King Saud University Medical College, Riyadh, Saudi Arabia. waelamro@hotmail.com
CLASSIFICATION OF ORBITAL COMPLICATIONS

- Clinical grading system encompasses AFRS and CRS.
- **Grade I:** Patients with anatomical disturbance
- **Grade II:** Patients with ophthalmic functional involvement
- **Grade III:** Patients with orbital infection.
- **Grade IV:** Patients with visual impairment.
The cause of the ophthalmic manifestations:

- AFRS in 50%,
- CRS in 36%,
- ARS in 10%,
- Mucocele in 4%.
CLASSIFICATION OF ORBITAL COMPLICATIONS

- Most common ophthalmic manifestation:
  - Proptosis (36%)
  - Orbital infection (26%)
  - Functional involvement (26%)
  - Visual impairment (12%).
The patients underwent functional endoscopic sinus surgery and medical treatment when indicated.

Urgency of the surgical intervention is proportional to the grade degree.

The outcome in Grades I, II, and III was favorable; the outcome in Grade IV was not favorable.
**PERI-ORBITAL (PRE-SEPTAL) CELLULITIS**

- Infection limited to skin and subcutaneous tissues of the eyelid **anterior** to the orbital septum.
- Inflammatory edema cause the eyelids to swell.
PERI-ORBITAL (PRE-SEPTAL) CELLULITIS

- Most common form of all orbital complications of rhinosinusitis (70%).
- Least severe complication.
- Caused by impaired venous drainage of the ethmoidal vessels that are obstructed by inflammation and pressure.
PERI-ORBITAL (PRE-SEPTAL) CELLULITIS

- **Clinical Presentation:**
  - Unilateral eyelid edema, erythema and tenderness.
  - Small eyelid abscess may encountered.
  - Fever.
  - **No involvement of post-septal structures:**
    - No impairment of visual acuity
    - No chemosis
    - No proptosis
    - No restriction of extraocular muscle movement.
PERI-ORBITAL (PRE-SEPTAL) CELLULITIS

- **Diagnosis:**
  - **CT scan with contrast:**
    - Usually unnecessary in patients with pre-septal infections.
  - **Indications:**
    1. Failure of improvement or worsening of symptoms within 24-48 hours despite medical therapy.
    2. Presence of signs and symptoms of post-septal infection.

- **Findings:**
  - Diffuse thickening of the eyelids.
  - Abscess formation may be seen.
PERI-ORBITAL (PRE-SEPTAL) CELLULITIS
Infection occurs within the orbit proper posterior to the orbital septum.

Orbital contents show diffuse edema with inflammatory cells and fluid, without distinct abscess formation.
Orbital cellulitis is more concerning than pre-septal cellulitis because it can evolve into an orbital abscess.

More severe infections such as invasive fungal sinusitis should be considered in diabetic patients with ketoacidosis and immunocompromised patients.
**Clinical Presentation:**
- Unilateral eyelid edema, erythema and tenderness.
- Fever.
- **Signs of involvement of post-septal structures:**
  - Chemosis
  - Proptosis
  - Pain
  - Ophthalmoplegia might present due to impaired extraocular muscle movement.
- **NO Impairment of visual acuity**
**Diagnosis:**

**CT scan with contrast:**

- Indicated in all patients with post-septal infection.

**Findings:**

- Diffuse thickening of the eyelids.
- Enhancement of edematous extra-conal fat maximally adjacent to the most severely affected sinus.
- Enlargement and enhancement of the adjacent rectus muscle.
- Intra-conal fat may be radiographically normal.
- Discrete abscess should not be encountered.
ORBITAL CELLULITIS
Medical therapy is typically sufficient to adequately treat cases of pre-septal and orbital cellulitis.

**Systemic Broad-spectrum Antibiotics:**

- **Oral antibiotics are appropriate for:**
  - Adults with mild pre-septal cellulitis and when daily follow-up is ensured to rule out developing signs and symptoms of orbital cellulitis.
TREATMENT OF PRESEPTAL & ORBITAL CELLULITIS

- **IV antibiotics are appropriate for:**
  - All pediatric patients.
  - Adults with severe pre-septal cellulitis.
  - Adults with mild pre-septal cellulitis but daily follow-up can’t be ensured.
  - All adults with orbital cellulitis.
No standard rules on the type of treatment in adults or children because of the great decline in culture-positive isolates.

Empirical antibiotic treatment should be targeted to the most common pathogens including Staphylococci and Streptococci and Anaerobes.

**IV:** Clindamycin + Ceftrixon (Levo/Ciprofloxacin)

**Oral:** Clindamycin
TREATMENT OF PRESEPTAL & ORBITAL CELLULITIS

- **Aggressive local care to improve sinus drainage:**
  - Normal saline irrigation
  - Topical steroids
  - Topical decongestants

- **Supportive measures:**
  - Warm compresses
  - Elevating the head of the bed.
Systemic Steroids

- One retrospective study looking at the use of corticosteroids for orbital cellulitis with subperiosteal abscess in addition to the usual treatments.
- No significant difference was identified between two small groups (n = 23) and no adverse outcomes were reported with the use of adjuvant interavenous corticosteroids.

TREATMENT OF PRESEPTAL & ORBITAL CELLULITIS

Ophthalmologist evaluation:

- Indicated immediately for all patients with post-septal involvement for:
  - Daily assessments of:
    - Visual acuity
    - Color vision
    - Pupillary reaction
    - Extraocular motility.
  - Surgical planning if needed.
TREATMENT OF PRESEPTAL & ORBITAL CELLULITIS

- **Follow up:**
  - Daily reassessment of orbital signs and symptoms to ensure the clinical improvement on medical management and rule out further progression.
Surgical management:

- Pre-septal cellulitis usually doesn’t require any surgical intervention.

**Indications of surgical drainage in orbital cellulitis:**

- Progression of symptoms despite medical therapy.
- Lack of improvement within 48 hours despite medical therapy.
- Visual acuity of 20/60 or worse on initial evaluation.
- Severe orbital complications (Blindness or an afferent pupillary defect) on initial evaluation.
Surgical management include:

- Adequate endoscopic drainage of infected sinuses.
- Incision and drainage of eyelid abscess if present.
SUB-PERIOSTEAL ABSCESS

- Abscess collection between periorbita and lamina papyracea.
- Second most common orbital complication of rhinosinusitis.
- Most commonly located at:
  - Medial wall of the orbit with superomedial or inferomedial extensions from ethmoid sinusitis.
  - Inferior wall of the orbit from maxillary sinusitis.
  - Superior wall of the orbit from frontal sinusitis.
Sub-periosteal abscess develops when infection breaks through the lamina papyracea or travels through the anterior or posterior ethmoidal foramina.

It can expand rapidly leading to blindness by compromising optic nerve function by:

- Direct optic nerve compression
- Elevation of intra-orbital pressure
- Proptosis causing a stretch optic neuropathy
15-30% patients with sub-periosteal abscess will develop various visual sequelae even with aggressive medical and surgical intervention.

Sub-periosteal abscess can be suspected when a patient who has orbital cellulitis develops:
- Worsening proptosis.
- Gaze restriction.
- Loss of red/green perception due to increasing intraorbital pressure.
- Deterioration of visual acuity.
Clinical Presentation:
- Unilateral eyelid edema, erythema and tenderness.
- Fever.
- Abscess may rupture through septum and present in eyelids.

Signs of involvement of post-septal structures:
- Chemosis
- Proptosis
- Pain
- Ophthalmoplegia due to impaired extraocular muscle movement.
- Displacement of the orbit downward and laterally.
- Impairment of visual acuity.
**SUB-PERIOSTEAL ABSCESS**

- **Diagnosis:**
  - **CT scan with contrast:**
    - Indicated in all patients with post-septal infection.
  - **Findings:**
    - Rim-enhancing hypodensity in extraconal space adjacent to lamina papyracea with mass-effect and lateral displacement and enlargement of medial rectus muscle.
SUB-PERIOSTEAL ABSCESS
TREATMENT OF SUB-PERIOSTEAL ABSCESS

- **Medical management:**
  - Medical management only with close ophthalmologic and otolaryngologic assessment can adequately treat sub-periosteal in 50-60% of patients.
  - Oxford and McClay proposed the following criteria to consider medical management only:
    - Medial Sub-periosteal abscess.
    - Abscess width ≤ 4mm.
    - Normal visual acuity, pupil, and retina.
    - No ophthalmoplegia.
    - Intraocular pressure < 20mm Hg.
    - Proptosis ≤ 5mm.

# TREATMENT OF SUB-PERIOSTEAL ABSCESS

Table 2. Medical management of subperiosteal abscess of the orbit

<table>
<thead>
<tr>
<th>Name</th>
<th>Number post-septal</th>
<th>Conversion to surgery</th>
<th>Indications</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botting et al.²⁸</td>
<td>35</td>
<td>8/35</td>
<td>Visual disturbance/not responding</td>
<td>Nil at 3/12</td>
</tr>
<tr>
<td>Cannon et al.¹⁷</td>
<td>36</td>
<td>14/36</td>
<td>Visual disturbance/not responding</td>
<td>Nil</td>
</tr>
<tr>
<td>Garcia and Harris²⁶</td>
<td>40</td>
<td>13/40</td>
<td>Visual disturbance/not responding, &lt;9 years</td>
<td>Nil</td>
</tr>
<tr>
<td>Greenberg and Pollard²⁹</td>
<td>25</td>
<td>12/25</td>
<td>Visual disturbance/not responding</td>
<td>1 repeat drainage 1/12</td>
</tr>
<tr>
<td>Nargeswaran et al.¹⁸</td>
<td>41</td>
<td>29/41</td>
<td>Visual disturbance/not responding</td>
<td>Nil</td>
</tr>
<tr>
<td>Noel et al.³⁰</td>
<td>23</td>
<td>3/23</td>
<td>Visual disturbance/not responding</td>
<td>NA</td>
</tr>
<tr>
<td>Oxford and McClay¹²</td>
<td>44</td>
<td>24/44</td>
<td>Visual disturbance/not responding</td>
<td>1 ptosis post drainage</td>
</tr>
<tr>
<td>Rahbar et al.³¹</td>
<td>14</td>
<td>9/14</td>
<td>Visual disturbance/not responding</td>
<td>2 required repeat surgery for residual abscess</td>
</tr>
<tr>
<td>Ryan et al.³²</td>
<td>70</td>
<td>23/70</td>
<td>Visual disturbance/not responding</td>
<td>NA</td>
</tr>
<tr>
<td>Sobol et al.⁷</td>
<td>12</td>
<td>8/12</td>
<td>Visual disturbance/not responding</td>
<td>Nil</td>
</tr>
<tr>
<td>Soulriere et al.²⁴</td>
<td>10</td>
<td>5/10</td>
<td>Visual disturbance/not responding</td>
<td>Nil</td>
</tr>
<tr>
<td>Yang et al.³³</td>
<td>20</td>
<td>13/20</td>
<td>Visual disturbance/not responding</td>
<td>Nil</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>370</strong></td>
<td><strong>161/370 (43%)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TREATMENT OF SUB-PERIOSTEAL ABSCESS

- Todman et al. show that volume of SPA seemed to be the most important criterion in determining medical versus surgical management.

- Volumes of <1,250 mm³ did not require surgical management.
Surgical management:

Combined surgical and medical treatment achieve complete resolution in 95-100% of cases.

Indications of immediate surgical intervention for patients started on medical therapy:
- Progression of symptoms despite medical therapy.
- Lack of improvement within 48 hours despite medical therapy.

Goals of surgical management:
- Removing lamina papyracea to drain the abscess.
- Opening ethmoid cells to facilitate sinus drainage.
TREATMENT OF SUB-PERIOSTEAL ABSCESS

- **Endoscopic Trans-Nasal Approach:**
  - Gold standard approach for medial sub-periosteal abscess.
  - Intra-operative measurement of orbital pressures is extremely helpful and dictates the extent of orbital decompression.

- **Advantages:**
  - Avoiding facial scar
  - Removal of polypoidal tissue, polyps, and necrosed debris.

- **Disadvantages:**
  - Increase risk of bleeding from the acutely inflamed mucosa.
TREATMENT OF SUB-PERIOSTEAL ABSCESS

- **External Frontoethmoidal Orbitotomy/Lynch:**

  Indicated for superior-medial or superior supra-periosteal abscess if endoscopic approach is not feasible.

- **Advantages:**
  - Ensure adequate drainage of the abscess.

- **Disadvantages:**
  - facial scar
**Figure 41.3** Dry skull to show the regions approached through a Lynch incision. The lateral wall of the frontal recess is exposed and the frontal sinus can be accessed (circle). External ethmoidectomy is performed after a wide exposure of the medial orbital wall and the ethmoid is entered through the lamina papyracea. The level of the skull base is defined by the frontoethmoidal suture line and bone is removed inferior to this line (rectangle).
TREATMENT OF SUB-PERIOSTEAL ABSCESS

- **Transcaruncular Medial Orbitotomy:**
  - Indicated for medial sup-periosteal abscess if endoscopic approach is not feasible.

- **Advantages:**
  - No cutaneous scar.
  - Allows confirmation of complete drainage from nasal and orbital sides when used in conjunction with ESS.
TREATMENT OF SUB-PERIOSTEAL ABSCESS
TREATMENT OF SUB-PERIOSTEAL ABSCESS

- **Lateral Eyebrow Orbitotomy:**
- Indicated for sup-periosteal with substantial superior and lateral extension.
ORBITAL ABSCESS

- Abscess collection within the orbital soft tissue.
- Occurs when orbital cellulitis coalesces into a discrete collection of pus within the orbital tissues.
- Progression to this stage is linked to either:
  - Delay in diagnosis and therapy.
  - Immunocompromised state.
- Presents similar to sub-periosteal abscess but with more severe manifestations.
Clinical Presentation:
- Unilateral eyelid edema, erythema and tenderness.
- Fever.
- Abscess may rupture through septum and present in eyelids.
- Signs of involvement of post-septal structures:
  - Severe chemosis
  - Severe proptosis
  - Severe pain
  - Complete ophthalmoplegia due to impaired extraocular muscle movement.
  - Impairment of visual acuity.
  - Risk of irreversible blindness.
ORBITAL ABSCESS

- **Diagnosis:**
  - **CT scan with contrast:**
    - Indicated in all patients with post-septal infection.
  - **Findings:**
    - Diffuse infiltration of the intraconal and extraconal orbit fat with areas of cavitations.
    - Massive proptosis, extraocular enlargement and gas formation.
  - **MRI with Gad:**
    - True necrotic abscess appears as HYPOintensity on T1 and HYPERintensity on T2.
TREATMENT OF ORBITAL ABSCESS

- Combined Medical and Surgical management:
  - **Endoscopic Trans-Nasal Approach:**
    - Preferred alone for drainage of medial extra-conal orbital abscess (Periorbita).
    - Should be combined with external approach if intra-conal abscess is present with the assistance of ophthalmologist to avoid the significant risk of irreversible blindness.
CAVERNOUS SINUS THROMBOSIS

- Serious orbital and intracranial complication of rhinosinusitis.
- Results from retrograde spread of infection from orbit and sinonasal cavities (Sphenoid > Ethmoid > Frontal) through the valveless superior and inferior ophthalmic veins connecting the cavernous sinus.
Extension of phlebitis posteriorly into the ipsilateral cavernous sinus and through intercavernous sinuses to the contralateral cavernous sinus occurs within 24-48 hours of the initial presentation and results in a progression of symptoms in the opposite eye, which is the hallmark feature of cavernous sinus thrombosis.
Carotid thrombosis may follow cavernous sinus thrombosis with concomitant strokes, subdural empyema, brain abscess or meningitis.

Staph. aureus is the most common pathogen.

High mortality rate reaching up to 30% even with rapid recognition and treatment.
**CAVERNOUS SINUS THROMBOSIS**

- **Clinical Presentation:**
  - Picket fence spiking fevers.
  - Toxemia.
  - **Severe bilateral orbital involvement:**
    - Severe chemosis
    - Severe proptosis
    - Severe pain
    - Complete ophthalmoplegia and paralysis of extraocular muscles due to involvement of CN-III, IV,VI.
    - Papilledema due to obstruction of venous drainage from the retina.
    - Fixed dilated pupils.
    - Impairment of visual acuity with irreversible blindness.
CAVERNOUS SINUS THROMBOSIS

- **Diagnosis:**
  - **CT scan with contrast:**
    - **Findings:**
      - Identify source of infection
      - thickening of superior ophthalmic vein
      - Irregular filling defects in the cavernous sinus.
      - Aneurysm of the internal carotid artery as a complication of cavernous sinus thrombosis.

Fig. 6. Coronal CT sinuses with contrast demonstrating left sphenoid sinusitis (S) with bone erosion (black arrow). Note the filling defect and expansion of the left cavernous sinus consistent with CST (asterisk), and an abscess formed around the supraclinoid internal carotid artery (arrowhead). (Courtesy of Ilana Seligman, MD, Chicago, IL.)
CAVERNOUS SINUS THROMBOSIS

- MRI with Gad/MRV:
  - More sensitive method for diagnosing cavernous sinus thrombosis.
  - Findings:
    - Engorgement of the cavernous sinus, ophthalmic veins, and extraocular muscles.
    - Heterogeneous intensity in the abnormal cavernous sinus with HYPER-intense signal of thrombosed vascular sinuses on all sequences.
    - Cavernous portion of the internal carotid artery is usually deformed.
    - Aneurysm of the internal carotid artery as a complication of cavernous sinus thrombosis.
TREATMENT OF CST

- IV antibiotics are recommended for a minimum of 3-4 weeks.
- **Anti-coagulants ???**
  - Bhatia suggested that maintaining a INR between 2-3 for three months would provide therapeutic alleviation.
  - Risk of fatal hemorrhagic cerebral infarction and a subarachnoid hemorrhage.
  - Endoscopic drainage of the affected sinuses is advisable in most circumstances once the patient is stable.

Orbital complications are the most common rhinosinusitis-related complications.

Rare but results in devastating consequences if they are not promptly recognized and treated.

Concurrent medical and surgical intervention (in some cases) is the best way to achieve resolution, necessitating the close cooperation of other specialties.
REFERENCES

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