Complications of Acute Rhinosinusitis

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My Background

- East Catholic High School, Manchester, CT 1985
- University of Vermont, B.A. 1989
- University of Connecticut School of Medicine, M.D. 1995
- University of Connecticut Residency Training in ENT 2001
- Ear, Nose and Throat Associates of Southeastern Connecticut
Objectives:

- Define acute rhinosinusitis
- Describe the three main types complications of acute rhinosinusitis
- Define risk factors, anatomical routes of extension and typical findings in patients suspected of complicated rhinosinusitis
- Review the medical/surgical management of the complications of acute rhinosinusitis
So what is Rhinosinusitis?

- Inflammation of the nasal mucosa and lining of the paranasal sinuses
  - Obstruction of the sinus ostia
  - Impaired ciliary transport
- Acute (up to 4 weeks)
- Chronic (greater than 12 weeks)
- Recurrent Acute (up to 4 episodes/year)

- Effects 1 in 8 adults in the U.S.
- 30 million annual diagnoses
- Direct costs exceed $11 Billion
  - Lost work
  - Reduced job performance
  - Loss of QOL
- 5th most common diagnosis requiring antibiotic therapy
Acute Rhinosinusitis

- Up to 4 weeks of *purulent nasal discharge*
  - Cloudy or colored
  - Noted by patient or found on exam
  
  Accompanied by:

  - **Nasal obstruction**
    - Obstruction, congestion, blockage, stuffiness
    
    And/or

  - **Facial pain/pressure/fullness**
    - Anterior face or periorbital region or
    - Headache that is localized or diffuse
Paranasal sinuses: all about the OMC

The **ostiomeatal complex** is a common channel that links the frontal sinus, anterior and middle ethmoid sinuses and the maxillary sinus to the middle meatus that allows air flow and mucociliary drainage.
Sinus pathophysiology in a nutshell:

- **Ostium is Closed**
  - Mucosal congestion (often due to viral rhinitis) or anatomic obstruction blocks airflow and drainage
  - Secretions stagnate
  - Mucosal thickening creates further blockage
  - Retained secretions cause tissue inflammation

- **Secretions thicken, pH changes**
  - Frontal sinuses
  - Ethmoid sinuses
  - Mucosal gas metabolism changes
  - Cilia and epithelium are damaged

- **Bacterial infection develops in the sinus cavity**
  - Change in host milieu creates culture medium for bacterial growth in closed cavity
Complications of Acute Rhinosinusitis

- Complications range from relatively benign to potentially fatal
- Fortunately incidence has decreased as a result of appropriate antibiotic use
- Three main categories
  - Orbital (60-75%)
  - Intracranial (15-20%)
  - Bony (5-10%)
Imaging: CT vs MRI

CT Scan
- The established technique for patients with sinusitis
- Excellent anatomic resolution of bony details
- Best for the evaluation of orbital and bony complications

MRI
- Superior delineation of soft tissues
- Demonstrates infections without bone artifacts and brain pathology
- Best for evaluation of intracranial complications
Orbital Complications

- Most commonly involved site
  - Close proximity to ethmoid sinuses
  - Only soft tissue barrier is the periorbital/septum
  - Valveless superior and inferior ophthalmic vein

- Continuum of inflammatory/infectious changes
  - Lamina papyracea
  - Impaired venous drainage from thrombophlebitis
  - Rapid progression

- Children more susceptible
  - Higher incidence of URI’s and sinusitis
Chandler’s Classification for Orbital Complications

- Five classifications, can occur concurrently

I. **Preseptal cellulitis**
   - lid edema, no limitation in ocular motion
   - or visual changes

II. **Orbital cellulitis**
    - diffuse orbital infection and inflammation without abscess formation

III. **Subperiosteal abscess**
    - collection of pus between medial periosteum and lamina papyracea,
    - impaired ocular motion

IV. **Orbital abscess**
    - discrete pus collection in orbital tissues,
    - proptosis and chemosis with decreased vision

V. **Cavernous sinus thrombosis**
    - bilateral eye findings and worsening of all previously
I. Preseptal Cellulitis

- 70% of all sinus complications
- Limited to the skin subcutaneous tissues of the eyelid, anterior to the orbital septum (normal EOM, visual acuity)
- Least severe, most frequent
- CT reveals diffuse thickening of the lid and conjunctiva

Medical therapy usually sufficient
- IV antibiotics
- Warm compresses
- HOB elevation
- Sinus drainage
II. Orbital Cellulitis

- Post septal infection
- Eyelid edema/erythema
- Proptosis and chemosis
- Impaired EOM
- No discrete abscess
- Visual acuity intact
- CT shows low attenuation adjacent to lamina papyracea
- Same therapy as preseptal cellulitis EXCEPT may need surgical therapy in no improvement in 48 hours

** All surgical treatment needs to include adequate drainage of the infected sinuses**
III. Subperiosteal Abscess

- Pus formation between periorbital and lamina papyracea
- Displacement of orbital contents
- Similar presentation to orbital cellulitis but worsening proptosis and gaze restriction
- Ophthalmologic evaluation is essential
- CT shows rim-enhancing density with mass effect
III. Subperiosteal Abscess (cont..)

- Treatment is slightly controversial
  - Medical treatment alone may be effective
  - Age <9 respond better to medical rx alone
- Reserve surgical rx for medical failures
- Open (Lynch) vs. endoscopic surgical approaches
- Primary goal of surgical treatment is to open the ethmoids and remove the lamina papyracea
Endoscopic drainage of orbital abscess
IV. Orbital Abscess

- Pus formation within orbital tissues, inside or outside the muscle cone
  - Progression is result of immunocompromised host or delay in diagnosis
- Severe exophthalmos and chemosis
- Ophthalmoplegia
- Visual impairment
- Risk for irreversible blindness
- Can spontaneously drain through eyelid

Drainage is MANDATORY
V. Cavernous Sinus Thrombosis

- Orbital pain, proptosis and chemosis
- Spread of infection from sinuses or middle third of face
  - Freely anastomosing valveless venous system
- Symptoms in **contralateral** eye
- Associated with sepsis and meningismus
  - High morbidity and mortality (30%)
  - Carotid thrombosis
- Best visualized on MRI
- High dose IV antibiotics that cross B/B barrier
- Anticoagulant use is controversial
IV. Cavernous Sinus Thrombosis
Intracranial Complications

- More common in CRS
- Direct extension
  - Sinus wall erosion
  - Trauma
  - Neurovascular foramina
- Retrograde thrombophlebitis
  - Diploic veins
  - Especially frontals
- Five main types:
  - Meningitis
  - Epidural abscess
  - Subdural abscess
  - Intracerebral abscess
  - Cavernous sinus thrombosis
- Not exclusive!
A. Osteomyelitis
B. Periorbital Abscess
C. Epidural Abscess
D. Subdural Empyema
E. Brain Abscess
F. Meningitis
G. Superior Sagittal Sinus Thrombosis
Intracranial Complications: common signs and symptoms

- Fever (92%)
- Headache (85%)
- Nausea, vomiting (62%)
- Altered consciousness (31%)
- Seizure (31%)
- Hemiparesis (23%)
- Visual disturbance (23%)
- Meningismus (23%)
Meningitis

- Most common intracranial complication
- Sinusitis is the most common cause
  - Sphenoid
  - Ethmoids
- CT is normal, MRI may show dural enhancement
- Usually to medical treatment
  - If not better, sinus surgery may be very helpful
- Hearing loss and seizures can be long term sequela
# Intracranial Abscesses

<table>
<thead>
<tr>
<th>Location</th>
<th>Epidural *</th>
<th>Subdural</th>
<th>Intracranial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between skull and dura</td>
<td>Subdural space no boundaries</td>
<td>Frontal/frontopariental white/gray matter</td>
<td></td>
</tr>
<tr>
<td>Progression</td>
<td>Slow expanding</td>
<td>Spreads diffusely convexities, interhemispheric</td>
<td>Asymptomatic phase while it coalesces</td>
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<tr>
<td>Symptoms</td>
<td>Mild, non-specific for weeks. Increase ICP</td>
<td>Meningismus, rapid progression to coma</td>
<td>Subtle if frontal (mood) H/A, lethargy, seizures, focal deficits</td>
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<tr>
<td>Diagnosis</td>
<td>CT or MRI</td>
<td>CT may show it but MRI is better</td>
<td>MRI (T2) Hypointense with capsule</td>
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<tr>
<td>Treatment</td>
<td>IV Abx. + Surgery (craniotomy / ESS)</td>
<td>IV Abx., craniotomy, ESS, anticonvulsivants, +/- steroids</td>
<td>ESS / Neurosurgery (stereotactic vs. open)</td>
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</tbody>
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Recent OR Photo
Venous Sinus Thrombosis

- Sagittal sinus most common
- Retrograde thrombophlebitis from frontal sinusitis
- Extremely ill
  - Subdural abscess
  - Epidural abscess
  - Intracerebral abscess
- Elevated mortality rate
  - High dose abx
  - Sinus surgery
  - Anticoagulants
  - Burr holes, thrombectomy
Bony Complications (aka Pott’s Puffy Tumor)

- Frontal sinusitis with acute osteomyelitis
- Subperiosteal pus collection leads to “puffy” fluctuance
- Only 20-25 cases reported in the post anti-biotic era
- Multidisciplinary team
  - ENT
  - Neurosurgery
  - Infectious disease
What I Learned:
(i.e. the last slide)

- Acute sinusitis is a leading cause of orbital infection, and may have other life-threatening complications
- Orbital infections may be pre or post-septal
- CT is the initial imaging modality of choice
- MRI is a valuable modality for complex intracranial cases
- Orbital & intracranial sinus complications are due to the close proximity of these structures and the presence of valveless veins.
- Children have a higher incidence of acute sinusitis and more likely to have complications
- Patients with sinusitis and persistent headache, fever, nausea, vomiting, &/or any focal neurologic abnormality should raise concerns about intracranial complications
- A team approach is essential
- Drain abscesses and open involved sinuses