Sinogenic intracranial complications

Paweł Burduk
Sinogenic intracranial complications

- complications from acute rhinosinusitis commonly involve intracranial structures
- this kind of complications are life-threatening
- management requires a multidisciplinary approach: ophthalmologist, neurosurgeon
- treatment involves the use of intravenous antibiotics and appropriate drainage of the inflammatory region
Sinogenic intracranial complications

- osteomyelitis
- meningitis
- epidural abscess
- subdural abscess
- brain abscess
- cavernous sinus thrombosis

Cranial & Intracranial complications of sinusitis

A. Osteomyelitis
B. Pericranial or Periorbital Abscess
C. Epidural Abscess
D. Subdural Empyema
E. Brain Abscess
F. Meningitis
G. Superior Sagittal Sinus Thrombosis

- 3.7% of patients admitted with sinusitis
- More common in adolescent boys due to a peak in the vascularity of the diploic venous system of this age group
Sinogenic intracranial complications

**Epidemiology**

- Intracranial complications are second to orbital in frequency
- The incidence is about 1 to 10%
- The most common source is the frontal sinus
Sinogenic intracranial complications

**Epidemiology**

- complications occur most frequently in adolescent, via the diploic venous system
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Epidemiology

- the frontal is the most common sinus involved with osteomyelitis
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**Epidemiology**

- meningitis is among the most common intracranial complications of sinusitis in adults and children - from ethmoid or sphenoid sinusitis
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Epidemiology

- epidural and subdural abscess - from frontal sinus
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Pathophysiology

- **Mechanisms**
  - direct extension
  - retrograde thrombophlebitis via the valveless diploic veins

**Bacteriology:**

*S. aureus, Streptococcus, H. influenzae, Bacterioides,*
Sinogenic intracranial complications

Clinical presentation

- patients with frontal sinusitis demonstrating persistent fever, forehead swelling

presentation could be acute or fulminant with bacterial meningitis

rupture of the brain abscess into the ventricular system

acute neurological deterioration
Sinogenic intracranial complications

Clinical presentation

- Osteomyelitis
- Headache
- Well circumscribed swelling of the forehead
- Collection of pus under the periosteum (Pott’s puffy tumor)

CT bony destruction
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Clinical presentation

- Meningitis
- Headache
- Fever
- Seizure and irritability - somnolence, delirium and coma

Lumbar puncture:
- Pleocytosis, elevated protein, low glucose, infectin organisms
Sinogenic intracranial complications

Clinical presentation

- Epidural abscess
  - Symptoms are mild and neurologic deficits are absent (**unrecognized !!!**)
  - Orbital inflammation is common
  - Forehead swelling and tenderness
  - Headache and low fever
  - May rupture to subdural space or extend to intracranial structures (via venous network)
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Clinical presentation

- Subdural abscess (empyema)
- Increased intracranial pressure
- Meningeal irritation and cerebritis
- Increased headache, fever
- Neck stiffness
- Localized meningeal inflammation
Sinogenic intracranial complications

**Clinical presentation**

- subdural empyema - frontal lobe
- changes in personality
- mood and focal neurologic symptoms
- patients is febrile, demonstrating meningismus and systemic signs of infection

rapid progression

- depressed level of consciousness, focal neurologic deficits, cranial nerve palsy, papilledema, nausea, vomiting and septic shock
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Clinical presentation

- Brain abscess
- Lack of neurologic signs
- Mental dullness
- Lethargy and headache

Rupture into the ventricular system - 19%

Death
Sinogenic intracranial complications

Clinical presentation

- Cavernous sinus thrombosis
- proptosis, chemosis
- reduced or absent extraocular motion
- reduced vision

fever, headache, photophobia, diplopia, periorbital
Sinogenic intracranial complications

Diagnostic

- CT (visualizing paranasal sinuses)
- MRI (meningitis, epidural, subdural and brain abscess, caverous sinus thrombosis)
Sinogenic intracranial complications

Diagnostic

- Lumbar puncture

### Table 4. Normal CSF characteristics and main pathological alterations

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Normal</th>
<th>Acute bacterial</th>
<th>Viral</th>
<th>Chronic</th>
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<tr>
<td>Pressure (mm/H₂O)</td>
<td>100-200</td>
<td>N or ↑</td>
<td>N or ↑</td>
<td>N or ↑</td>
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<tr>
<td>Aspect</td>
<td>Clear</td>
<td>Turbid/purulent</td>
<td>clear/cloudy</td>
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<td>Cytology (mm³)</td>
<td>Until 4</td>
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<td>500-1,000</td>
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<td>Lymphocytes</td>
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<tr>
<td>Protein (mg/dL)</td>
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<td>Normal or ↑</td>
<td>Normal or ↑</td>
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<td></td>
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<tr>
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<td>L 15-45</td>
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<tr>
<td>Glucose (mg/dL)</td>
<td>2/3 from serum</td>
<td>↓</td>
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<td>Normal or ↓</td>
</tr>
<tr>
<td>Lactic acid (mmol/L)</td>
<td>&lt; 3.5</td>
<td>&gt; 3.5</td>
<td>&lt; 3.5</td>
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</tr>
</tbody>
</table>

Lumbar puncture for CSF Examination
Sinogenic intracranial complications

Treatment

- high dose intravenous antibiotics crossing the blood-brain barrier

- third generation cephalosporin plus metronidazole
- Vancomycin

- steroids ?? when brain edema can inhibit capsule formation around abscess

surgical approach: endoscopic or external (frontal sinus, ethmoidectomy, sphenoidotomy, antrostomy)

- neurosurgery - abscess surgery (craniotomy or transfrontal approach)
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Outcomes

Mortality

Abscess
dropped from 66% to 2 - 7%

Mortality - meningitis 45%

Mortality - cavernous sinus thrombosis 40%

Antibiotics, CT, MRI

Aggressive neurosurgical and otorhinolaryngologic drainage