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Acute Sinusitis
Diagnosis, Management, and Complications

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Acute Sinusitis
Lecture Outline

• Classification
• Etiology
• Presentation
• Diagnostic tests
• Treatment
• Follow-up
• Complications
Sinusitis Classification

• Definitions
  • Acute
    • Sx & signs of infectious process < 3 weeks duration
  • Subacute
    • Sx & signs 21 to 60 days
  • Chronic
    • > 60 days of sx & signs
    • Or, 4 episodes of acute sinusitis each > 10 days in a single year
General Contributors to Chronic Sinusitis

- Resistant infectious organisms
- Underlying systemic illness (esp. diabetes)
- Immunodeficiency
- Irreversible mucosal changes
- Anatomic abnormality
Sinusitis Incidence

- Reportedly > 31 million cases in U.S.
- ? most common chronic illness
- Is in 17 % of patients > age 65
- May occur in 0.5 to 1.0 % of all URI's
Sinusitis
Pathogenesis

• Basic cause is osteomeatal complex (the middle meatal region & the frontal, ethmoid, & maxillary sinus ostia there) inflammation & infection
  • Sinus ostia occluded
  • Colonizing bacteria replicate
  • Ciliary dysfunction
  • Mucosal edema
  • Lowered PO2 & pH
Development of the maxillary sinus (numbers are age in years)
Paranasal Sinuses: Anterior View

Frontal sinus

Ethmoidal air cells

Maxillary sinus
Location of Sinuses

1. Frontal Sinuses
2. Ethmoid Sinuses (Ethmoidal Air Cells)
3. Sphenoid Sinuses
4. Maxillary Sinuses
A. Technique: index finger rests on tip of nose for examination of left side, on cheek for right side.

- Middle turbinate
- Middle meatus
- Septum
- Inferior turbinate

Nasal airway (clear area to see nasopharynx)
Frontal sinus

Anterior ethmoid air cells

Middle Meatus

Maxillary sinus

Inferior meatus

Frontal sinus

Posterior ethmoid air cells

Superior turbinate

Sphenoid sinus

Middle turbinate

Inferior turbinate

Maxillary sinus
Sinusitis

Etiologic Organisms (& % incidence)

- Aerobic bacteria
  - Strep. pneumoniae (30)
  - Alpha & beta hemolytic Strep (5)
  - Staph. aureus (5)
  - Branhamella catarrhalis (15 to 20)
  - Hemophilus influenzae (25 to 30)
  - Escherichia coli (5)
- Anaerobes (10 % acute, 66 % chronic)
  - Peptostreptococcus, Propionobacterium, Bacteroides, Fusobacterium
- Fungi (2 to 5)
- Viruses (5 to 10)
Acute Sinusitis
Predisposing Conditions

- Local
  - URI
  - Allergic rhinitis
  - Nasal septal defects
  - Barotrauma (diving)
  - Nasal foreign bodies
  - Nasal tubes
  - Dental infections
  - Overuse of topical decongestants
  - Nasal polyps or tumors
  - Aspiration of infected water
  - Smoking
Acute Sinusitis
Predisposing Conditions (cont.)

• Systemic
  • Diabetes
  • Immunocompromise (AIDS)
  • Malnutrition
  • Blood dyscrasias
  • Cystic fibrosis
  • Chemotherapy
  • Long term steroid Rx
Normal Functions of the Components of the Sinuses

- **Ostia**
  - Drain secretions from sinuses
  - Allow pressure equalization
  - Diameter 2 to 5 mm (maxillary), 1 mm (ethmoid)

- **Cilia**
  - Beat at frequency 1000 strokes/min. toward ostia
  - Push secretions out of sinus

- **Sinus secretions**
  - 2 layered mucus
  - Contain IgA & IgG

- Patency of ostiomeatal complex required for sinusitis resolution
Acute Sinusitis
Usual Clinical Presentation

- Symptoms progress over 2 to 3 days
- Nasal congestion & discharge (usually thick & colored, not clear)
- Localized pain +/- referred pain
- Tenderness or pressure sensation over sinuses
- Headache
- Cough due to postnasal drip
- Halitosis
- Malaise
Usual Physical Findings With Acute Sinusitis

- Erythematous edematous nasal mucosa
- Purulent secretions in middle meatal area
  - May be absent if ostia completely blocked
- Percussion tenderness
  - Over the involved sinuses
  - Over the maxillary molar +/- premolar teeth
- Halitosis
- +/- fever
Pain Patterns with Acute Sinusitis

- Maxillary sinusitis
  - Unilateral pain over cheekbone
  - Maxillary toothache
  - Periorbital pain
  - Temporal headache
  - Pain worse if head upright
  - Pain better if head supine
Pain Patterns with Acute Sinusitis (cont.)

- Ethmoid sinusitis
  - Medial canthal pain
  - Medial periorbital or temporal headache
  - Pain worsened by Valsalva or if supine
- Sphenoiditis
  - Retroorbital, temporal, or vertical headache
  - Often deep seated headache with multiple foci
  - Pain worse supine or bending forward
- Frontal
  - Frontal headache
  - Pain worse supine
Paranasal sinuses and locations of referred pain (shaded orange)
Signs of Potentially Dangerous Complications of Acute Sinusitis

- Periorbital, frontal, or cheek edema
- Proptosis
- Ophthalmoplegia
- Ptosis
- Diplopia
- Meningeal signs
- Neuro deficits of cranial nerves II to VI
Acute Sinusitis
Use of Cultures

• Routine culture of nasal secretions not useful
• Poor correlation between non-directed nasal or nasopharyngeal culture isolates & sinus aspirate cultures
• Sinus aspirate cultures useful only for protracted or nonresponsive sinusitis
  • Require endoscopy or needle puncture of sinus
Use of Paranasal Sinus Transillumination to Diagnose Sinusitis

- First remove patient's dentures
- Use darkened room
- Shield light source from observer's eyes
- Use Welch Allyn transilluminator or Mini-Mag Lite
- Shine light over max. sinus & observe light transmission thru hard palate
- Report results as opaque, dull, or normal for either side
- Not useful for frontal sinuses since they often have developed asymmetrically
In order to transilluminate the maxillary sinus, shine a light at the midpoint of the infraorbital ridge. Locate the transmitted light through the hard palate.
Sensitivity of Transillumination to Diagnose Sinusitis

- Different studies have reached opposite conclusions on its usefulness ("Highly predictive" versus "criminal negligence")
- Some studies have indicated it is useful if sinus is completely opaque (c/w Dx of sinusitis) or is completely normal (c/w absence of sinusitis), but has poor predictive value & correlation if transmission is "dull"
- Can't be done in about 25% of children due to poor cooperation
Acute Sinusitis
Radiography

- Plain films not as sensitive as CT
- Radiographic signs of sinus pathology:
  - Air fluid levels
  - Partial or complete opacification
  - Bony wall displacement
  - 4 mm or more of mucosal wall thickening
- Single Water's view has high concordance with 4 view sinus series (Caldwell, Water's, lateral, & submentum vertex views)
Water’s view with air-fluid level in left maxillary sinus
Water’s view showing air-fluid level in right maxillary sinus and mucosal thickening in left maxillary sinus.
Lateral view of normal frontal and sphenoid sinuses
Which sinus has an air-fluid level?
Opacification of the frontal sinuses
Which sinus has an air-fluid level?
Hypoplastic left frontal sinus and nosocomial right maxillary sinusitis
Limitations of Plain Film Radiography for Sinusitis

- Poor visualization of ethmoid air cells
- Difficulty distinguishing between infection, tumor, or polyp if sinus is completely opacified
Use of Ultrasound for Diagnosis of Sinusitis

- Less sensitive than 4 view X-ray
- Shown to not correlate well with sinus cultures
- Accuracy is operator dependent
- CT preferred for evaluation of complications
Another diagnostic modality for sinusitis is nasal endoscopy.
Nasal endoscopic view showing uncinate process (U) displaced against middle turbinate (T) & closed off opening to frontal recess (arrow) from acute sinusitis
Nasal endoscopic view showing Aspergillus fungal mass arising from the sphenoid sinus
Use of Computed Tomography (CT) for Diagnosis of Sinusitis

- Advantages of CT:
  - Visualizes ethmoid air cells
  - Evaluates cause of opacified sinus
  - Differentiates bony changes of chronic inflammation from osteomyelitis

- Indicated only if complications suspected or if diagnosis uncertain (not needed initially for most cases)
CT scan showing fluid with pockets of air in frontal air cells from frontal sinusitis in a six year old male.
Coronal CT scan showing left sphenoid sinusitis
CT scan showing right maxillary sinusitis
Coronal MRI scan showing maxillary sinusitis
Infectious and Granulomatous Diagnoses to Consider in the Differential Diagnosis of Sinusitis

- Nasopharyngitis / adenoiditis
- Dental abscess
- Vestibulitis / furunculosis
- Sarcoidosis
- Tuberculosis
- Rhinosporidiosis
- Syphilis
- Leprosy
- Wegener's Granulomatosis
- Midline (lethal) granuloma
- Nasopharyngeal cancer
Lab Work for Diagnosis of Acute Sinusitis

- Not helpful!
Goals of Medical Therapy for Acute Sinusitis

- Control Infection
- Facilitate sinus ostial patency and drainage
- Provide relief of symptoms
- Evaluate and treat any predisposing conditions to prevent recurrences
General Treatment for Acute Sinusitis

- Oral antibiotic
- Topical and systemic decongestants
- Pain medications
- Optional or secondary medications:
  - Guaifenesin (1200 mg po q 12h)
  - warm nasal saline irrigations qid
  - Antihistamine orally: only in the small % of patients with true allergic component
First - Line Antibiotic Therapy for Acute Sinusitis

- Treatment duration should be 10 to 14 days (one recent study indicated 3 days may be OK)
- Amoxicillin 500 mg po q 8 h
- Augmentin 500 mg po q 8 h
- Trimethoprim / Sulfamethoxazole DS one po bid
- Azithromycin 500 mg po then 250 mg po q d x4
- Pediazole (Erythromycin - sulfisoxazole) QID may be best choice in kids
Antibiotic Therapy in Acute Sinusitis if Staph. aureus is suspected

- Also useful if patient fails Rx with antibiotics on previous slide
  - Cefuroxime axetil 500 mg po q 12h
  - Cefprozil 500 mg po q 12h
  - Cefpodoxime 200 mg po 12h
  - Loracarbef 400 mg po q 12h
Precautions Regarding Medication Interactions in Rx of Acute Sinusitis

- Remember that ciprofloxacin and clarithromycin are contraindicated if any of the nonsedating antihistamines (terfenadine, astemizole, and loratidine) are used as they cause prolonged QT syndrome and ventricular arrhythmias.
- Also oral decongestants may cause problems in patients on TCA's, MAO inhibitors, and alpha blockers.
Use of Topical Decongestants for Rx of Acute Sinusitus

- Ephedrine sulfate 1 % 2 sprays each nostril q 4h
- Phenylephrine HCl 0.25 to 0.5 % 2 sprays q 4h
- Oxymetazoline HCl 0.05 % 2 sprays q 12h

Limit use to 3 to 5 days to avoid rebound vasodilatation and "rhinitis medicamentosa"
Use of Oral Decongestants for Rx of Acute Sinusitis

- Phenylpropanolamine HCl 12.5 mg po q 4h or 75 mg q 12h (now not available in U.S.A.)
- Pseudoephedrine HCl 60 mg po q 6h or 120 mg q 12h

Usually should be continued for 4 weeks
Treatment of Frontal Sinusitis

• Usually should be admitted for initial IV antibiotic Rx
• Higher incidence of intracranial complications
• Give IV Cefuroxime 2 gm IV q 8h or Ceftriaxone 2 gm IV q d and decongestants
• If not resolving in 24 to 48 hours of Rx may need surgical intervention (frontal sinus trephination or external sinusectomy)
Fungal Sinusitis

• Increasing incidence in both immunocompetent and immunocompromised patients

• 3 types
  • Fulminant infection with soft tissue invasion
  • Progressive indolent invasive disease
  • Noninvasive localized disease (mycetoma or allergic fungal sinusitis)
Fungal Sinusitis

- Causative fungi:
  - Aspergillus (most common)
  - Rhizopus (mucormycosis)
  - Candida
  - Histoplasma
  - Blastomces
  - Coccidioides
  - Cryptococcus
Fungal Sinusitis

• Major risk factors:
  • Granulocytopenia
  • multiple prolonged courses of antibiotics or steroids
  • DKA
  • AIDS
Presentation of Invasive or Acute Fulminant Fungal Sinusitis

- Facial soft tissue tenderness
- Cloudy rhinorrhea
- Fever
- Gray, friable, anesthetic nasal tissue
- May have necrotic black tissue
- May have bloody rhinorrhea
Mucormycosis involves the sinuses, brain, or lungs as the areas of infection. Internationally, mucormycosis was found in 1% of patients with acute leukemia.

- Adapted from Wikipedia
Treatment of Invasive Fungal Sinusitis

- Always should be admitted
- Correct metabolic abnormalities
- High dose Amphotencin B +/- fluconazole
- Surgical debidement
General Management of Complications of Acute Sinusitis

- Hospitalization
- CT scan of sinuses ( +/- cranial CT)
- IV antibiotics with anaerobic coverage
- ENT consult
List of Complications from Acute Sinusitis

• Mucocele or mucopyocele
• Osteomyelitis
• Facial cellulitis
• Oroantral fistula
• Orbital cellulitis
• Cavernous sinus thrombosis
• Septic thrombophlebitis
• Meningitis
• Epidural, subdural, or intracerebral abscess
Sinusitis Complications: Mucocele

- Most common in frontal sinus
- Expansive mucus accumulation causes progressive pressure necrosis
- Signs:
  - soft tissue mass over sinus
  - proptosis
  - ophthalmoplegia
Coronal CT scan showing left maxillary sinus mucocele
Sinusitis Complications: Signs of Cavernous Sinus Thrombosis

- Abrupt high fever
- Toxicity
- Progressive obtundation
- Cranial nerve palsies (III - VI)
- Trigeminal anesthesia
- Visual loss
Axial CT scan with contrast showing cavernous sinus thrombosis
CT scan showing orbital & brain abscesses from ethmoid sinusitis
CT scan showing epidural abscess from frontal sinusitis (six year old male with headache, emesis, and fever)
Coronal CT scan showing left ethmoid opacification and displacement of globe by intraorbital mass (patient was a 2 year old male presenting with fever, proptosis, and left orbital cellulitis)
Antibiotics to Consider for Rx of Sinusitis Complications

- Ceftriaxone 1 gm IV q 12h
- Cefotaxime 2 gm IV q 4h
- Ceftizoxime 4 gm IV q 8h + metronidazole 30 mg/Kg/d
- Ampicillin / sulbactam 3 gm IV q 6h
- Vancomycin 500 mg q 6h + aztreonam 1 gm q 8h or chloramphenicol (for PCN - allergic patients)
Follow-up for Acute Sinusitis

- If not resolved in 10 days, continue antibiotics for 3 weeks
- If not resolved at 3 weeks consider further workup (CT +/- sinus cultures)
- Secondary antibiotics to consider:
  - Clindamycin, ciproflaxacin, metronidazole
- Consider topical intranasal steroids
Management of Sinusitis

Summary

• Diagnosis by clinical presentation
• Evaluate for complications
• Admit to hospital if complications present
• Treat for 10 to 14 days
• Extend Rx if not resolved in 10 days
• Workup and consult if not resolved in 3 weeks