Sinusitis and Nasal Polyps
A Brief Review
(What’s in your nose?)
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Disclosure
I have no current financial interest or direct affiliation with any commercial organizations or products that may be referenced in this presentation

Objectives
• Review the definitions and diagnostic criteria of sinusitis
• Review current sinusitis treatment options
• Review the history, pathophysiology and prevalence of nasal polyps
• Detail the history and physical findings of individuals with polyps
• Review nasal polyp therapies

Pre-test
1. Which of the following statements is false regarding sinus development and disease?
   a. ethmoid disease is the most common in children
   b. ethmoid cells are present at birth
   c. frontal and sphenoid sinus disease are more likely to be associated with complicated sinus disease
   d. sphenoid sinuses drain into the superior meatus

2. Fifty to sixty percent of URIs are associated with CT sinus changes
   a. True
   b. False

3. Nasal polyp treatments have included:
   a. sponge and string removal
   b. use of harpsichord wire
   c. topical steroids
   d. surgical excision
   e. all of the above

4. Nasal polyps are usually associated with atopy.
   a. True
   b. False

5. The predominant cells found in most nasal polyps are:
   a. neutrophils
   b. basophils
   c. mast cells
   d. eosinophils

6. Polyps are pre-malignant
   a. True
   b. False
Sinusitis - Definition

• Sinuses are sterile air filled spaces in the skull that are lined with mucous membranes
• Sinusitis is inflammation of one or more of the paranasal sinuses.
• Better termed rhinosinusitis
  – Rhinitis usually precedes sinusitis
  – Coexist
  – Nasal sx of obstruction and drainage are prominent in both

Definitions

• Arbitrary classifications
  – Acute: sx < 4 weeks
  – Subacute: 4-8 weeks
  – Chronic: greater than 8 weeks
  – Recurrent: 3 or more acute infections per yr
  – ??? Chronic recurrent: acute flares upon persistent sx

Definitions

• Chronic
  – Infectious: viral, bacterial, fungal
  – Non-infectious: chronic hyperplastic eosinophilic rhinosinusitis

Anatomy

Anatomy

Sinus development
**Predisposition to Sinus disease**

- Allergic and nonallergic rhinitis
- Anatomic abnormality of the ostiomeatal complex
- Nasal anatomic variants:
  - Septal deviation
  - Concha bullosa
  - Paradoxical curvature of the middle turbinate
  - Haller cells
  - Cystic fibrosis
  - Common variable immunoglobulin deficiency

  — Adapted from Kaliner MA. Medical management of sinusitis. Am J Med Sci

- Specific antibody deficiency
- IgG subclass deficiency
- IgA deficiency
- Ciliary dyskinesia, Kartagener syndrome, Young syndrome
- Aspirin sensitivity
- Acquired immunodeficiency syndrome
- Churg Strauss syndrome
- Rhinitis medicamentosa
- Cocaine abuse

**Predisposition to Sinus disease**

- Up to 90% of URIs are a/w sinus changes by CT
- Hence acute viral sinusitis is common
- Acute bacterial sinusitis follows a URI in 0.5 to 13% of the time
- PCR analysis of 20 pts to OR for chronic sinusitis: 20% RSV
- Bx of sinus mucosa in pts with acute sinusitis: 50% RNA rhinovirus

**Predisposition to Sinus disease**

- Allergic rhinitis is common in sinus pts
  - In children with chronic sinusitis, AR is found in 36-60%
  - Twice as many pts with AR have abnormal CT scans
  - Instilled allergen into nose can induce sinus mucosal changes
  - Radio labeled pollen does not enter sinus*
  - Sinus fluid contains histamine, leukotrienes, eos, cytokines


- 26% of chronic sinusitis pts have NAR
- GERD a/w chronic sinusitis
  - 30 children with chronic sinusitis underwent dual probe pH study
  - 63% refluxed compared to general population of 5%
  - 32% had NP reflux
  - 79% improved with GERD tx


**Diagnosis - History**

- Diagnosis by history and physical exam is frequently enough for acute sinusitis
- Acute sinusitis:
  - 10-14 days of symptoms
  - Adult sx: purulent rhinorrhea, facial/dental pain, nasal congestion, post nasal drip, cough and/or HA
  - Peds sx: add fever, nausea, malaise, fatigue, halitosis, sore throat
  - Double sickening: relapse of cold sx

**Diagnosis - criteria**

- Three diagnostic guidelines for acute sinusitis
  - CDC: three findings:
    - Rhinosinusitis sx lasting for at least 7 days
    - Purulent nasal discharge
    - Maxillary tooth or facial pain or tenderness (especially when unilateral)
### Diagnosis - criteria

- **American Academy of Otolaryngology**
  - Duration <4 wks of purulent nasal drainage plus either or both of nasal obstruction and/or facial pain-pressure-fullness
  - Viral rhinosinusitis if less that 10 days and not worsening. Acute bacterial sinusitis sxs > 10 days or worsening within 10 days after initial improvement

- **Canadian Sinusitis Symposium**
  - 3 sxs and 2 signs as clinical predictors
    - Maxillary toothache
    - Poor response to decongestants
    - History of colored nasal discharge
    - Purulent nasal secretion on exam
    - Abnormal transillumination on exam
  - Presence of only 0 or 1 criteria can rule out acute sinusitis
  - 4 or 5 criteria associated with very high likelihood of sinus disease.
  - 2 or 3 diagnosis unclear, consider sinus films

### Diagnosis - History

- **Chronic sinusitis**
  - Sxs more subtle, may described as worsening rhinitis
  - May benefit from additional studies to differentiate

### Diagnosis - PE

- Swelling and tenderness overlying sinus
- Erythematous, edematous nasal mucosa
- Purulent nasal secretions: middle meatus is highly predictive
- Post nasal drainage
- Dental pain
- Orbital involvement: diplopia or proptosis
- Associated otitis media
- Associated wheezing
- Polyps
- Transillumination: poor sensitivity and specificity

### Diagnosis - Imaging

- Consider imaging for
  - Vague sxs
  - Equivocal PE findings
  - Persistent sxs despite adequate tx
  - Assess for complicating factors: tumor, foreign body, septal deviation

- Radiographs
  - Caldwell (AP), Waters (occipitomental) to assess frontal and maxillary
  - Lateral views to assess sphenoids (and adenoids)
  - Correlations between radiographs and CT are poor
Diagnosis - Imaging

- **CT**
  - Imaging of choice, particularly if considering surgery
  - CT without contrast: coronal, fast, inexpensive, usually no sedation required, assess bone details, air fluid levels, ostiomeatal complex, consider HRCT if FESS
  - CT with contrast: coronal and axial, improves soft tissue evaluation, needed if suspected complicated sinusitis
  - 30-40% of patients with positive CT have no sx

- **Sinus CT of fungal sinusitis**
  - Multiple unilateral lesions
  - Nodular mucoperiosteal thickening
  - Bone destruction
  - Dense concretions

Diagnosis - Lab

- Gold standard of diagnosis is sinus puncture and culture
- Nasal/sinus bx to assess for:
  - Tumor
  - Ciliary disease
  - Granuloma
  - Fungal disease

- NP cx not likely helpful, organism of NP is not consistent with organism in sinus
- ESR, CRP and CBC not sensitive or specific
- CRP > 40 is a/w strep pyogenes or strep pneumo
- ANCA, Wegener's
- Elevated ACE or soluble IL2, Sarcoid
- Immunodeficiency evaluation
- Sweat chloride

Treatment - antibiotics

- Antibiotic treatment is controversial for acute bacterial sinusitis
  - Abxs better than placebo but many (2 out of 3) spontaneously resolve
  - Studies are inconsistent
  - Not able to identify who may benefit
  - No antibiotic appears to be superior
  - Antibiotic complications

- **Antibiotics for acute maxillary sinusitis**
  - Antibiotics provide a minor improvement in simple (uncomplicated) sinus infections. However, 8 out of 10 patients improve without antibiotics within two weeks. The small benefit gained may be overridden by the negative effects of antibiotics, both on the patient and on the population in general.

Treatment - antibiotics

• Bacterial sinusitis
  – Strep pneumo, M. catarrhalis and H. influenza
  – Penicillin resistance, due to PBP changes, is high, > 50%
  – 50% H. influ and 90% M. cat are beta-lactamase positive
  – Refractory disease may suggest resistance, other organism (staph or anaerobic) or wrong diagnosis

• First line therapy
  – High dose amoxicillin, not effective against beta-lactamase positive organisms

• Second line therapy
  – Augmentin ES, cefuroxime, cefpodoxime, cefprozil, cefdinir, quinolones, macrolides, ketolides

• Bactrim – high resistance with all 3 pathogens
• EES – GI intolerance
• Azithromycin or clarithromycin – relatively weak against pen-resist H. influ and S. pneumo

• Cephalosporins
  – First gen
    • Cephalexin and cefadroxil – poor H. influ coverage
  – Second gen
    • Cefuroxime and cefprozil – increased activity against H. influ and S. pneumo, cefuroxime susp not palatable
  – Third gen
    • Cefdinir and cefpodoxime - adequate

• Quinolones
  – Appropriate for adults, caution in children
• Other
  – Clindamycin and metronidazole – anaerobic coverage

• Length of therapy
  – Not well defined
  – 10-14 days
  – 7 days symptom-free
  – Chronic sinusitis: 4-6 weeks?
  – Recurrent: prophylaxis? Once daily in season
Treatment - antibiotics

- Inhaled or nebulized abxs – little data
- When to initiate oral abxs
  - Uncomplicated course after 7-10 days of sx
  - Early intervention
    - Worsening sx after 3-5 days
    - Temp > 39c
    - Tooth or facial pain
    - Unilateral sinus tenderness
    - Periorbital swelling

Other therapies

- Antihistamines: not recommended
- Decongestants: lack of data
- Steroids: systemic doses may hasten resolution, topical steroids lack consistent data
- Guaifenesin: no trials in sinusitis
- Saline – prevents crusting, improved symptom score
- ASA desensitization: Improves symptoms

Other therapies

- **Steroids for acute sinusitis**
  - Acute sinusitis is a common reason for primary care visits; it is one of the 10 most common diagnoses in ambulatory practice. There have been suggestions, based on studies of allergic rhinitis and chronic sinusitis, that intra-nasal corticosteroids (INCS) may relieve symptoms and hasten recovery in acute sinusitis due to their anti-inflammatory properties. A critical systematic review of the literature found four well-conducted, randomized placebo-controlled intervention studies, involving 1943 participants treated for 15 or 21 days. The results suggest that there may be a modest effect with INCS in the resolution or improvement of symptoms. Only minor adverse events were reported. Given the small number of studies included in this review, it is recommended that further randomized controlled trials be conducted.


Treatment - Surgery

- Directed towards removal of mucosal disease and involved bone within ethmoid sinus and ostia
  - Indicated for:
    - Acute sinusitis with threatening intracranial complications
    - Chronic disease – unclear
    - Fungal sinusitis

Treatment - Surgery

- Surgery will likely reduce frequency of treatment and symptoms. Most will still require ongoing medical management
- FESS – typical, complications <1%
- Open surgery – sometimes with frontal or sphenoid disease

Why treat?

- 75% of orbital cellulitis is associated with sinusitis
- Osteomyelitis
- CNS complications
- Poor asthma control
- Increased OM
Why treat?

Polyp History

- Described in India in 1000BC, curette used to remove polyp
- Hippocrates described polyps in 400BC, sponge and string technique, hot iron for cautery
- Fallopius (Gabriele Fallopio), 1550AD, used a harpsichored wire.

Polyp History

- Initial reports on the link between asthma, aspirin and nasal polyposis were made by Widal in 1922
- Max Samter and Beers, 1968, triad of:
  - Asthma
  - Nasal polyps
  - Aspirin sensitivity

What is a polyp?

- A polyp is an edematous semi-translucent mass in the nasal and paranasal cavities, mostly originating from the mucosal linings of the sinuses and prolapsing into the nasal cavities.

Nasal Polyps

- Most common mass encountered in the nose
- Outgrowth of the nasal/sinus mucosa
- Usually from the ethmoids but can originate from any sinus
- Lateral wall of the nose, in the middle meatus or along the middle and superior turbinates
### Nasal Polyps

#### Pathogenesis
- **Etiology** is unknown (-itis, -oma, -plasia)
- **Hypothesis**: formation of polyps involve rupture of the surface epithelium and prolapse of the lamina propria as a result of tissue pressure from edema.
- Allergic and infectious etiologies are the most frequently discussed.
- Genetics – HLA association not clear.

#### Histopathology
- Polyp is made up of edema, fibrous cells, mucous glands
- Thickened basement membrane
- CD8+ suppressor cells > CD4+ helpers
- EG2+ (activated) Eosinophils are the most prominent cells and found in 80% of polyps. Lymphocytes and neutrophils are more common in CF and ciliary dyskinesias
- VCAM on nearby vessels leading to increased eos.
- IL-5, key cytokine, IL-5 antagonist led to upregulation of isoform receptor

### Incidence and Prevalence
- Occurs in 5% of non-allergic and 1.5% of atopic individuals.
- No racial or gender predilection (some resources M:F 2:1)
- Found in 14% of ASA-sensitized individuals and 48%* of CF patients. Also seen in Churg-Strauss and Immotile Cilia Syndrome


### Incidence and Prevalence
- Morbidity is related to the obstruction, leading to chronic sinusitis, facial pain, bony erosion.
- Hyposmia and anosmia.
- Polyps are not pre-malignant, however can be confused with the pre-malignant lesions.
Comorbidities

• 20-70% of patients with polyps have asthma, tend to lead more towards eosinophilic infiltration of lungs and polyps
• 14% of patients with ASA sensitivity have polyps
• 6-48% of patients with CF have polyps
• Atopy is not a risk factor for polyps

Patient Hx and PMHx

• Nasal congestion (100%), hyposmia (75%), rhinorrhea (60%), sneezing (60%), anosmia, changes in taste sensation, post nasal drainage, recurrent sinus infections, obstructive sleep apnea, snoring.
• Asthma – Drake-Lee et al. 200 pts admitted for polypectomy, 30% with asthma. Recurrence rate high, 115/200. Ages 14-81 yo.

Physical Exam

• Mouth breathing, nasal congestion
• Fleshy translucent to slightly yellow, smooth, gelatinous, avascular mobile mass
• Mucopurulent discharge
• Mass is insensitive and does not bleed
• When to refer to ENT – unilateral, friable, firm, spontaneous bleeding or with manipulation

Lab and Radiologic Evaluation

• Allergy testing controversial
• Sweat chloride
• Coronal sinus CT
• Nasal endoscopy
• Biopsy – not required for diagnosis

Endoscopic Evaluation

• Polyp seen in right nares by endoscopy

Endoscopy

Nasal polyp seen with nasal speculum

Widened nasal bridge due to polyp
**Diagnosis**

- History
- Physical findings
- Endoscopy
- CT
- Biopsy

**Differential Diagnosis**

- Squamous cell carcinoma
- Sarcoma
- Angiofibroma
- Encephalocele
- Inverting papilloma
- Hypertrophied or polypoid turbinate

**Treatment**

- No evidence shows that management of allergies reduces or eliminates polyps.
- Oral corticosteroids (medical polypectomy) – may induce apoptosis, 5-60mg po q day, taper over 2-3 weeks
- Intranasal steroids – prevent or reduce growth of polyp, 200-400 micrograms per day.

- Steroids for acute sinusitis
  - For acute sinusitis confirmed by radiology or nasal endoscopy, current evidence is limited, but supports the use of INCS as a monotherapy or as an adjuvant therapy to antibiotics. Clinicians should weigh the modest but clinically important benefits against possible minor adverse events when prescribing therapy.

- Holmberg et al.*: 55 patients, treated over 26 week period with fluticasone (200mcg bid), beclomethasone (200mcg bid) or placebo. Significant improvement:
  - Physician assessment of symptoms
  - Polyp size score
  - Nasal inspiratory flow
  - Faster onset of improvement with fluticasone but equal scores on end of trial with beclomethasone.


**Reference:**

Pre-test

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Post-test

3. Nasal polyp treatments have included:
   a. sponge and string removal
   b. use of harpsichord wire
   c. topical steroids
   d. surgical excision
   e. all of the above

4. Nasal polyps are usually associated with atopy.
   a. True
   b. False

5. The predominant cells found in most nasal polyps are:
   a. neutrophils
   b. basophils
   c. mast cells
   d. eosinophils

6. Polyps are premalignant
   a. True
   b. False

References

• Archer. Nasal Polyps, Non-surgical Treatment. Emedicine.
• Middleton’s Allergy, Principles & Practice