The Nose and Sinuses

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FIG. 1-10. Bony and cartilaginous anatomy of the external nose.
FIG. 1-11. A: Lateral nasal wall. Key: 1, frontal sinus; 2, middle nasal concha; 3, middle nasal meatus; 4, agger nasi; 5, atrium of middle nasal concha; 6, maxilla; 7, vestibule; 8, inferior nasal meatus; 9, incisive canal; 10, palatine process of maxilla; 11, soft palate; 12, pharyngeal recess; 13, eustachian tubal orifice; 14, torus tubarius; 15, adenoid; 16, sphenoid sinus opening; 17, sphenoid sinus opening; 18, sphenethmoidal recess; 19, inferior nasal concha; 20, superior nasal meatus; 21, superior nasal concha; 22, palatine bone. B: Nasal septum. Key: 1, perpendicular plate; 2,cribriform plate; 3, crista galli; 4, frontal bone; 5, nasal bone; 6, septal cartilage; 7, medial crus; 8, anterior nasal spine; 9, incisive canal; 10, palatine process; 11, perpendicular plate; 12, postnasal spine; 13, horizontal plate; 14, lateral pterygoid plate; 15, medial pterygoid plate; 16, sphenoid sinus; 17, crest; 18, body.
FIG. 26-2. The nasal mucociliary system. The cilia beat in the serous fluid layer, while the tips of the cilia engage the mucous layer during the propulsion phase of their stroke.
Function of the Nasal Mucosa

- warming and humidifying the inspired air
- alter the nasal airway resistance by congestion and decongestion of the nasal mucosa blood vessels
- clean and filter inspired air by impaction on the moist mucus-coated surface
- sense the environment with specialized (olfactory) and general (trigeminal) sensory nerves
Pathologies of The Nose
Trauma

- Nasal bleeding (epistaxis)
- Septal hematoma
- Nasal bone and cartilage fracture
Blood Supply

- Kiesselbach's plexus
- Ant. ethmoid
- Post. ethmoid
- Sphenopalatine
- Greater palatine
- Sub. labial a.
Epistaxis

Bleeding Point On Nasal Septum
Septal Hematoma
Septal Hematoma
Nasal Fractures

A

Normal

Frontal plane 1

Frontal plane 2

Frontal plane 3

B

Normal

Lateral plane 1

Lateral plane 2

Lateral plane 3
Nasal Airway Obstruction

- Conchal hypertrophy
- Septal deviation
Partial/total Turbinectomy
Sub Mucosal Resection (SMR)
Sub Mucosal Resection (SMR)
Sub Mucosal Resection (SMR)
Sinuses
FIG. 1-12. Paranasal sinuses. Key: 1, nasal septum; 2, frontal sinus; 3, nasal cavities; 4, ethmoidal cells; 5, middle nasal concha; 6, middle nasal meatus; 7, maxillary sinus; 8, inferior nasal concha; 9, hard palate.
There are four paired paranasal sinuses, the maxillary, ethmoid, frontal and sphenoid sinuses

“Anterior” and “posterior” sinuses

Lining of the sinuses is pseudostratified, columnar epithelium (respiratory epithelium) which is continuous with the nasal epithelium
FIG. 33-3. This drawing demonstrates the close relationship of the sinuses to the eye. 1, maxillary sinus; 2, ethmoid cells; 3, frontal sinus; 4, sphenoid sinus. (From Mayo Foundation, with permission.)
The Maxillary Sinuses

- The largest sinus, present at birth, reach adult size at age 9yr.
- Floor over maxillary dentition, often thin and dehiscent over tooth roots.
The Ethmoid Sinus

- Present at birth, adult size by age 12
- Separated by the ground (basal) lamella into anterior and posterior ethmoids. Drains into middle and superior meatuses respectively
- Lateral border = lamina papyracea
- Ethmoiditis - child sinusitis
Frontal Sinus

- Rarely present at birth; usually not visible until age 2
- Great variability in size
- Congenitally absent in 3-5%
- Adult size - 20yr
- Drains into frontal recess in middle meatus
- Circular mucociliary clearance
Rarely present at birth; usually seen around age 8. Congenital absent in 3-5%. Drains into superior meatus in sphenoethmoidal recess. Optic nerve lies superiorly. Cavernous sinus is lateral, along with CN-III, IV and VI and carotid artery. Carotid artery is dehiscent in 50% of specimens.
Function of the sinuses

- Humidification, filtering, and temperature regulation are important functions of the nose and paranasal sinuses.

- The nose and paranasal sinuses are connected through the various sinus ostia and are lined with ciliated stratified columnar epithelium, containing goblet cells.
FIG. 26-2. The nasal mucociliary system. The cilia beat in the serous fluid layer, while the tips of the cilia engage the mucous layer during the propulsion phase of their stroke.
The mucus secretes a mucous which traps bacteria

The mucous is naturally extruded through sinus ostia to be expectorated or swallowed

The drainage of the maxillary and frontal sinuses follows a circular pattern through the natural ostia
Mucociliary clearance patterns in the maxillary and frontal sinuses

FIG. 31-5. Schematic depicting mucociliary transport routes in the maxillary and frontal sinuses. In the maxillary sinus, the transport leads from the floor of the sinus toward the ostium, and in the frontal sinus, the pathway leads up the medial wall to the roof, then laterally and finally back across the floor to the ostium medially.
Maxillary Sinuses

- Sinus ostia located anteriorly in middle meatus
- Circular mucociliary clearance
Rhinosinusitis
Sinusitis

- Rhinitis
- Sinusitis
- Rhinosinusitis

- Allergic
- Infection:
  1. Viral
  2. Bacterial
  3. Fungal
Pathophysiology of Sinusitis

- The sinuses are lined by respiratory epithelium.
- Mucous blanket is in two layers: a superficial viscous layer and an underlying serous layer.
- Cilia beat in the serous layer, moving the blanket towards the natural ostia.
- Normal function depends on patent ostia, ciliary function and quality of mucous.
Most important pathologic process in disease is obstruction of natural ostia

Obstruction leads to hypooxygenation

Hypooxygenation leads to ciliary dysfunction and poor mucous quality

Ciliary dysfunction leads to retention of secretions
Pathophysiology of Sinusitis

obstruction of ostia
↓
hypooxygenation
↓
ciliary dysfunction / poor mucous quality
↓
retention of secretions / infection
Osteomeatal Complex

FIG. 31-6. Concept of the ostiomeatal unit (shaded).
Predisposing Factors

- Viral upper respiratory tract infection - common
- Allergic rhinitis
- Anatomic obstruction of ostia
- Nasal polyposis
- Smoking / air pollution
- Pregnancy
- Dental infection
- Cystic fibrosis
- Genetic predisposition
- Ciliary dyskinesia
Predisposing Factors

- Foreign body.
- Nasal tube/ nasal zonda.
Major & Minor Factors (2 or 1+2)

**Major factors**
- Nasal obstruction
- Purulent discharge
- Hyposmia/anosmia
- Cough not caused by asthma (children)

**Minor factors**
- Facial pain/headache (increased by positioning)
- Fever (child)
- Halitosis
- Dental pain
- Fatigue
- cough (adults)
# Sinusitis: inflammation of the mucous membranes with associated symptoms

<table>
<thead>
<tr>
<th>Type</th>
<th>Duration Description</th>
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<tbody>
<tr>
<td><strong>Acute</strong></td>
<td>4 weeks or less with complete resolution</td>
</tr>
<tr>
<td><strong>Subacute</strong></td>
<td>4-12 weeks</td>
</tr>
<tr>
<td><strong>Chronic</strong></td>
<td>12 weeks or more</td>
</tr>
<tr>
<td><strong>Recurrent acute</strong></td>
<td>4 or more attacks per year</td>
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Diagnosis

- Primarily clinical
- Tenderness on percussion. PND
- Plain films - low yield (air fluid level)
  Caldwell- ethmoid, frontal(nose-forehead)
  Water’s- maxilla (nose-chin to film).
- CT scan - most accurate
FIG. 33-8. Plain sinus radiograph (Waters’ view, demonstrating left pansinusitis/maxillary ethmoid, and frontal sparing sphenoid).
FIG. 32-10. Polyposis, coronal computed tomography. A: Nasoethmoid polyposis has resulted in unusual lateral expansion of the ethmoidal bulla and lateral nasal walls which now protrude in a diverticular-like fashion into the maxillary antra. On the left, the uncinate plate is wedged between the bulla and the neck of the inferior turbinate (small arrow). There have been prior Caldwell-Luc antrostomies (large arrows) and ethmoidectomies. B: In a different patient, typical peripheral low-density polyps are seen. High-density inspissated secretions are noted to insinuate between the polypoid densities. There have been prior ethmoidectomies, uncinectomies, middle meatal antrostomies, and partial turbinectomies.
Treatment (Acute sinusitis)

- All sinusitis
  - Decongestants
  - Antihistamines
  - Steroids

- Bacterial sinusitis
  - PO ABx
  - IV ABx
Acute sinusitis and subacute sinusitis are treated medically

Chronic sinusitis is considered irreversible by medical therapy alone, and it is currently believed oxygenation of the sinuses through opening of the ostia is the primary treatment
Acute Bacterial Sinusitis

- Acute sinusitis can be thought of as an abscess or empyema
- Cornerstone is drainage and antibiotics
- Drainage is usually medical with topical decongestants and sometimes antihistamines
- In rare cases where medical treatment fails, surgical drainage may be required
Acute Bacterial Sinusitis, continued

- S. pneumo, H. flu and M. carrarhalis
- Amoxicillin is the first line antibiotic. Failure to respond to amoxicillin necessitates broading coverage with clavulonic acid and possible Gram’s stain and culture
- Surgical drainage is required for failures on augmentin and topical decongestants
Acute Fungal Sinusitis

- Uncommon
- Seen usually in immunocompromised
- Aspergillosis, mucormycosis, candidiasis, histoplasmosis and coccidiomycosis seen
- Aspergillosis most common
- Requires high index of suspicion
- Diagnosed by biopsy and culture
Complications: Orbital

- Orbit separated from ethmoids by thin lamina papyracea
- First indication of orbital involvement is inflammatory edema of eyelids
- Inflammatory edema of eyelids progresses to cellulitis, proptosis, chemosis and ophthalmoplegia
Complications: Orbital

- classifications of orbital complications
  1) **Inflammatory edema**: lid edema otherwise normal.
  2) **Orbital cellulitis**: diffuse edema
  3) **Subperiosteal abscess**: usually seen near lamina papyracea
  4) **Orbital abscess**: collection within orbit
  5) **Cavernous sinus thrombosis**: bilateral
Complications: Orbital

- Abscesses are treated with surgical drainage and IV antibiotics.
- Indications for surgical drainage include progressive orbital cellulitis, symptoms which do not resolve, abscess, loss of visual acuity.
Complications: Cavernous Sinus Thrombosis

- High mortality rate
- Usually results from retrograde transmission through valveless veins leading to the cavernous sinus
- Heralded by bilateral orbital involvement, progressive chemosis,
- Treat with drainage, IV antibiotics
- Heparin is controversial
Complications: Intracranial

- Meningitis
- Epidural abscess
- Subdural abscess
- Acute/chronic brain abscess
FESS

Functional Endoscopic Sinus Surgery
Fig. 13
OR situation during intervention under local anesthesia.