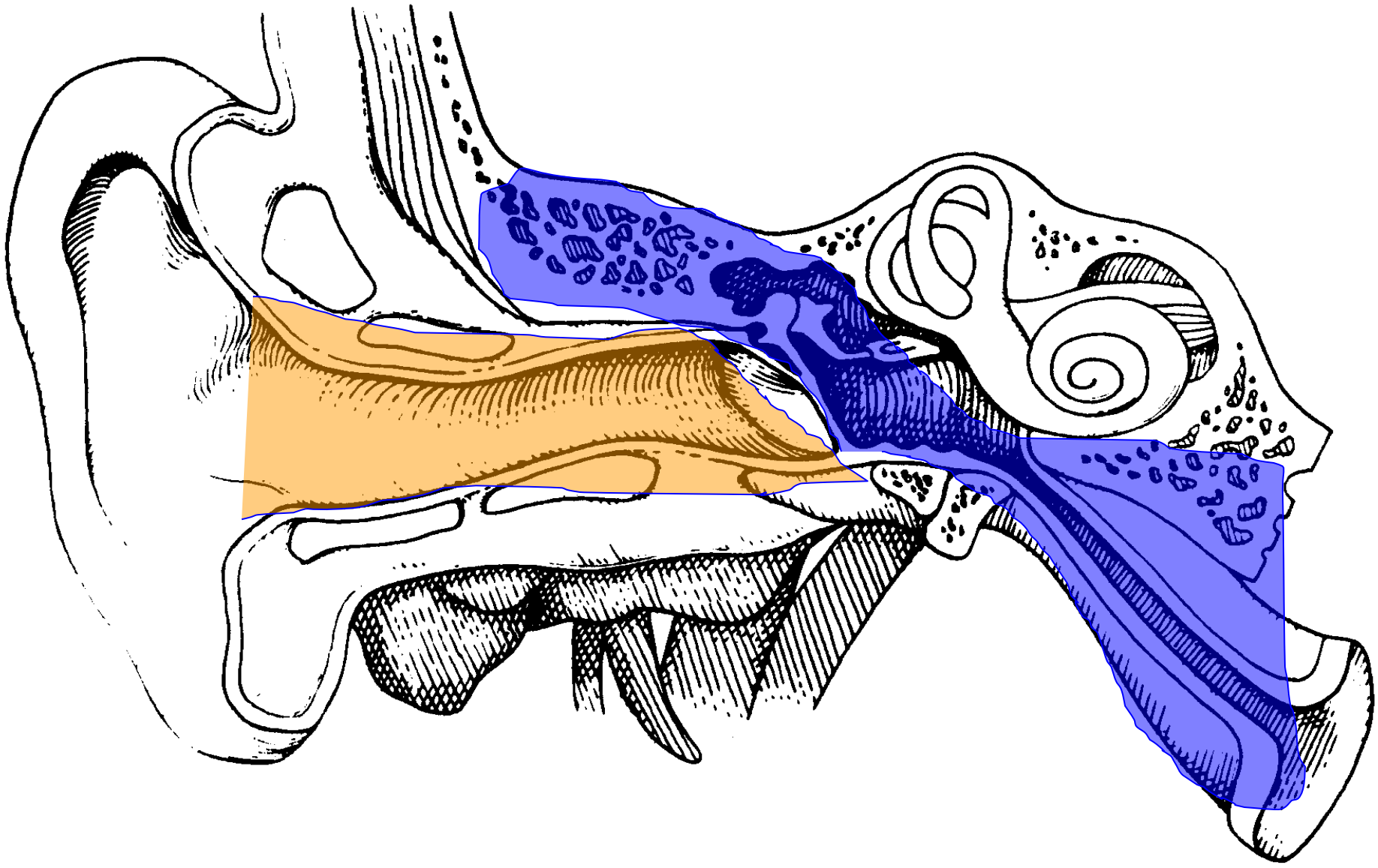
Otitis

Patrick J. Antonelli, M.D.
Department of Otolaryngology
University of Florida

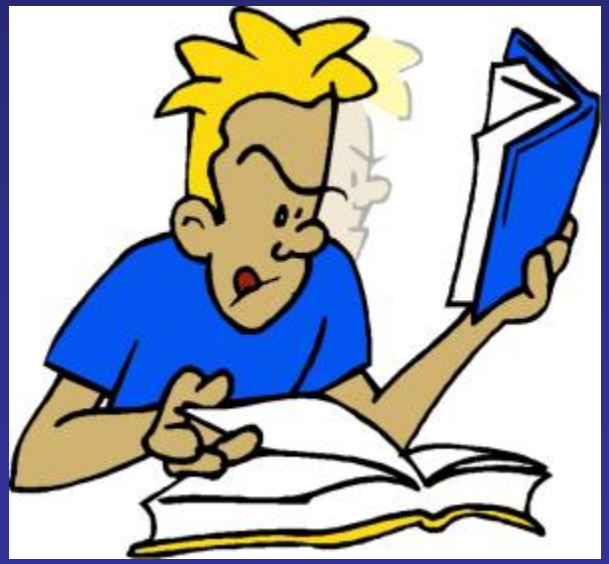


Significance

- Affects nearly everyone at some point in life
- Hurts like hell
- Can be fatal
- Treatable
- Treatment is constantly evolving

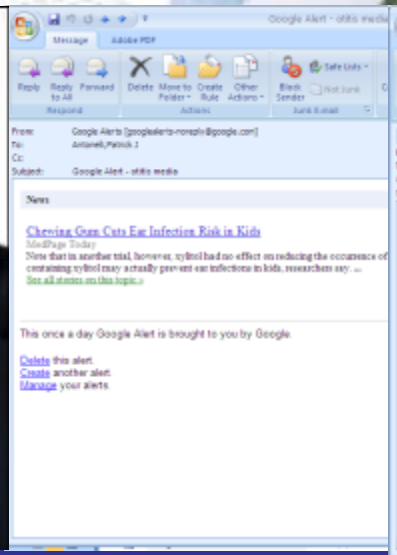
Caveats

- Half of the information in this lecture is wrong
- Nobody can tell you which half is wrong



PubMed

National Library of Medicine NLM

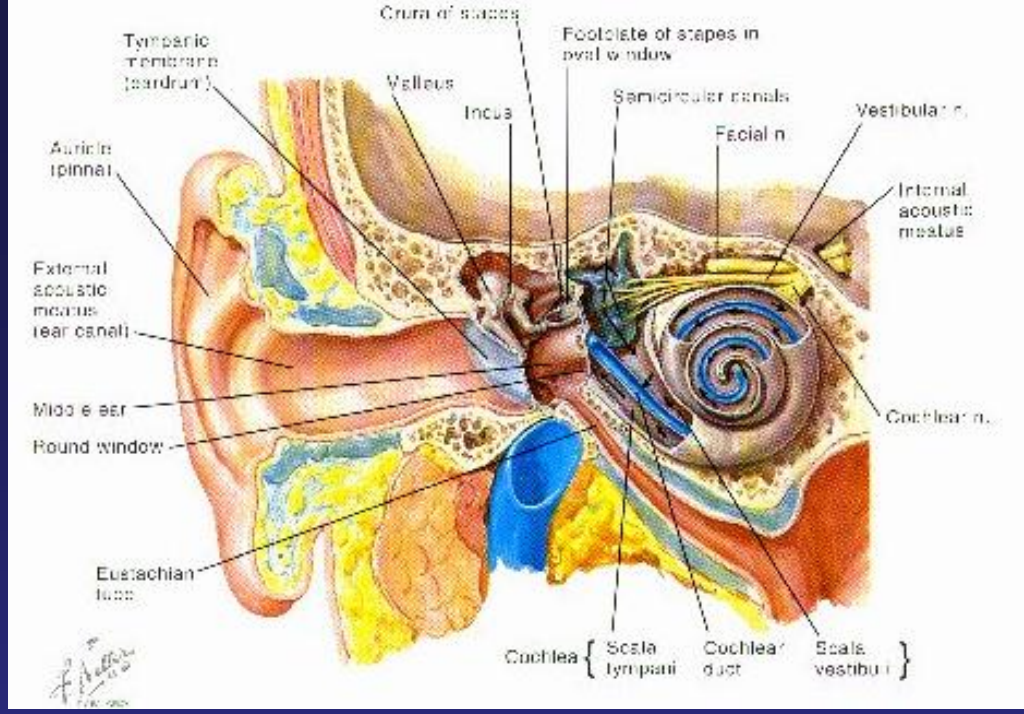


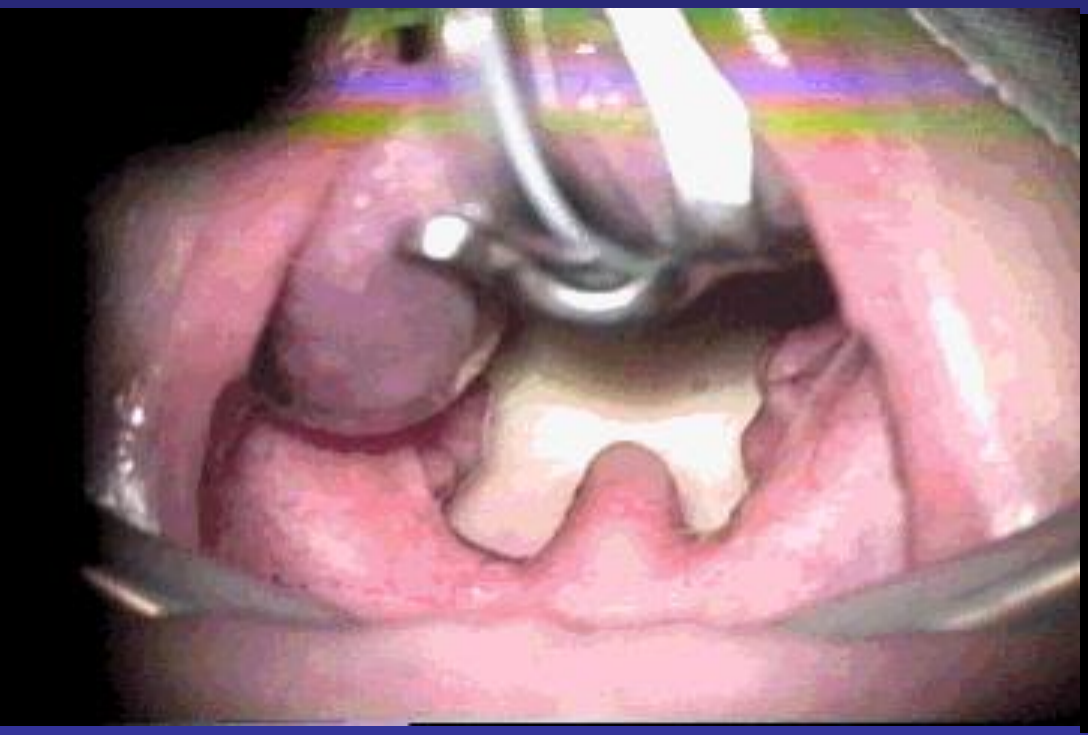
Pathogenesis of Otitis Media

- Eustachian tube dysfunction
  - Developmental
  - Cleft palate
  - Infectious
  - Environmental
    - Allergies
    - Smoke
- Immunologic compromise
  - Developmental
  - Immunodeficiency
  - Infectious
- Microbial challenge
  - Viral
  - Bacterial
  - Daycare!

Adenoid Reservoir

mucopus aspirated from nasopharynx





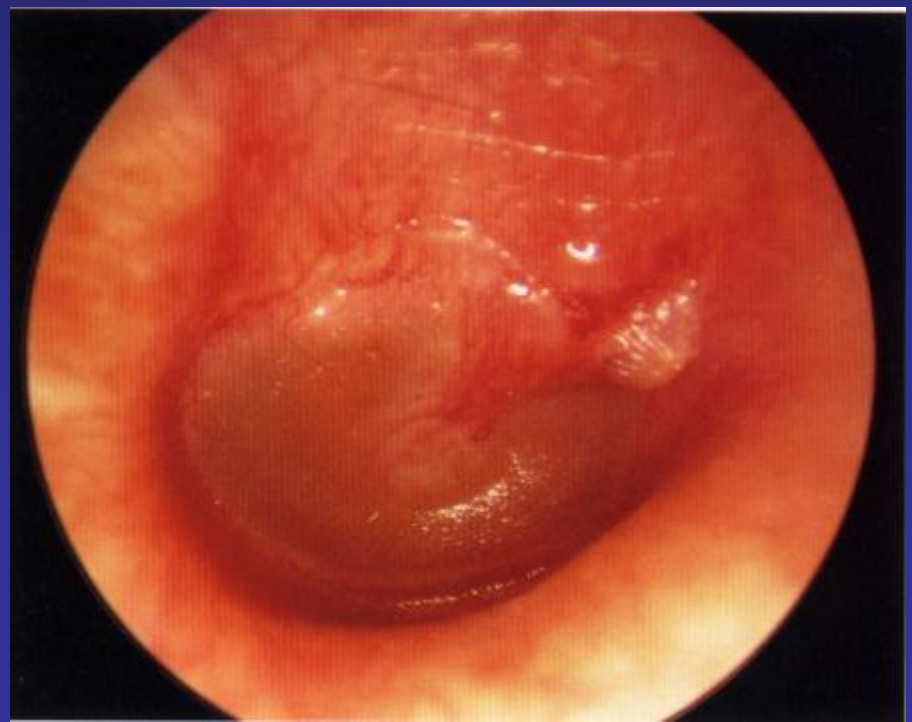
Emerging Concepts OM Pathogenesis

- Colonization
  - Manifest by low grade inflammation
  - Polyclonal, biofilm, distributed genome
- Innate immunity vulnerable to modulation
  - By commensal bacteria (eg, H flu promotes clearance of S pneumo)
  - By viral infection (eg, suppresses macrophage development, promotes colonization
- Density of colonization critical to development of disease

Acute Otitis Media (AOM)

- Acute, symptomatic middle ear infection
  - Abrupt onset of ear symptoms
    - Otalgia
    - Marked erythema, diffuse
    - Distinct TM fullness or bulging
    - Otorrhea (perforation or tube)
  - Presence of middle ear effusion
    - Stiff to insufflation
    - Type B tympanogram
    - Meniscus
  - Nonspecific not inclusive
    - fever
    - irritability

- Clinical course
  - Usually self-limited
  - Serious complications possible



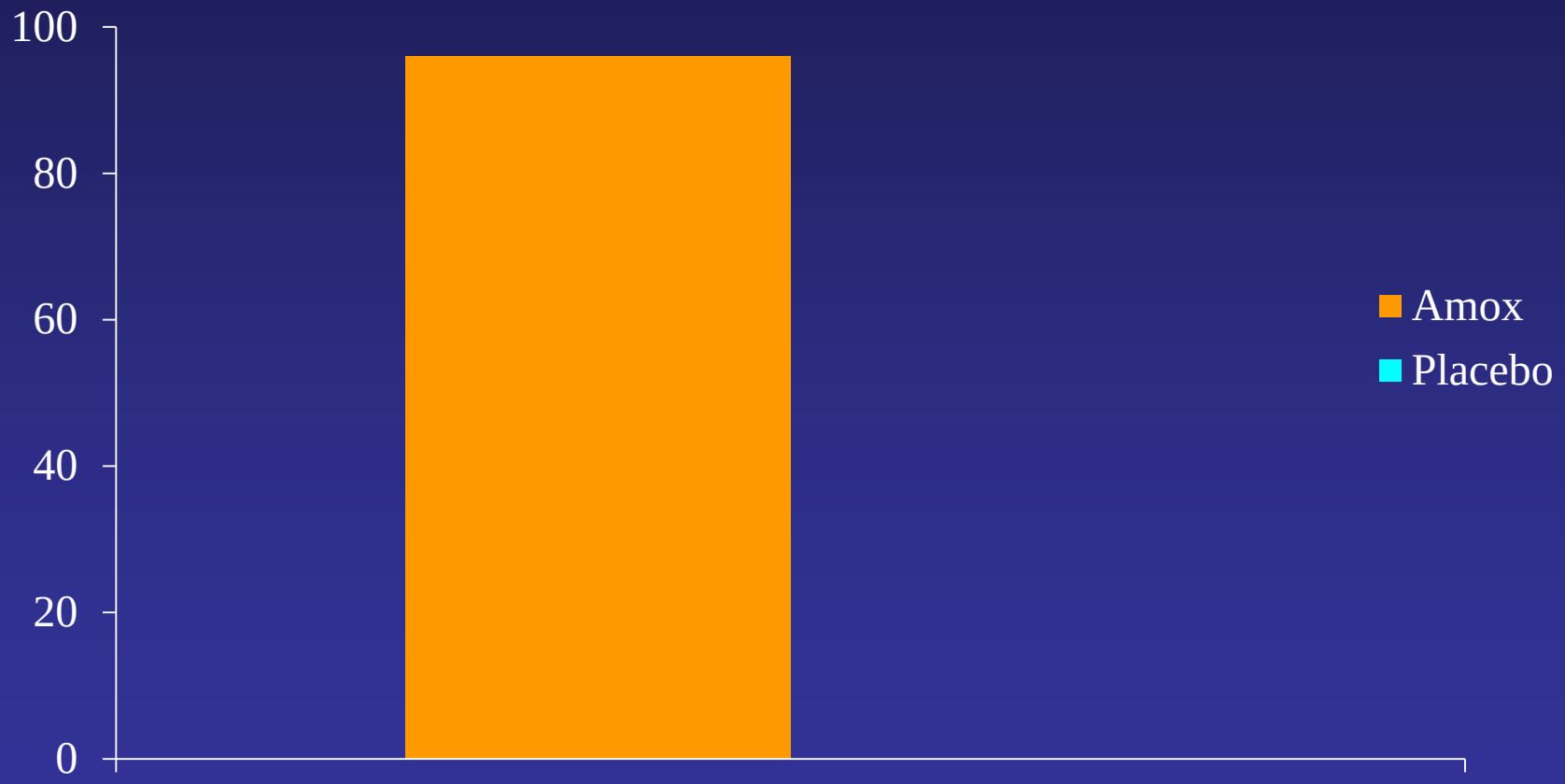
AOM Pathogens

	Symptoms	Persistence	Complications
S. pneumo	++++	++++	++++
H. flu - nontypable	++	+++	++
M. cat	+	+	+

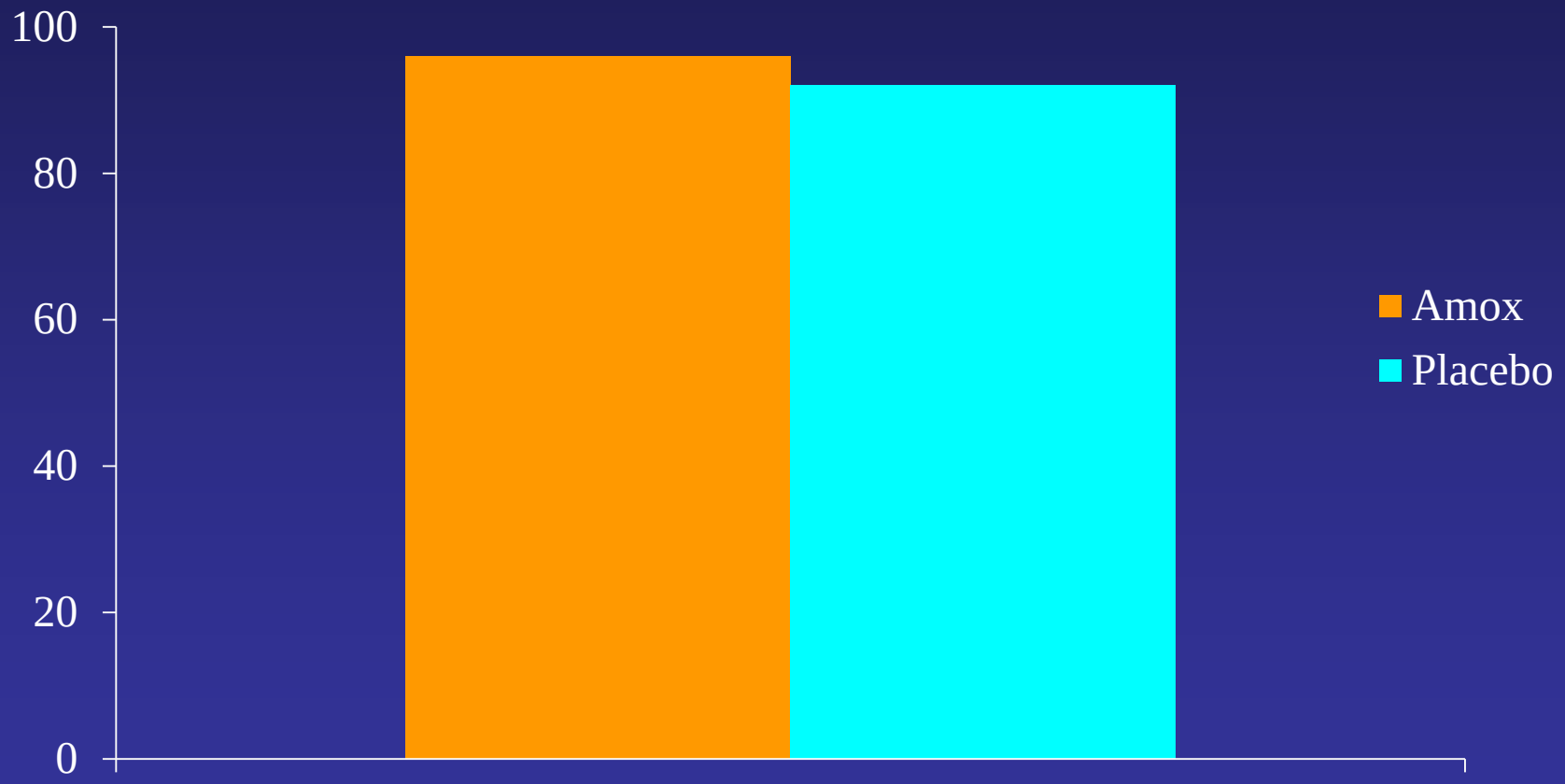
AOM Treatment

- Observation
- Symptomatic treatment
- Systemic antibiotics
  - Standard of care
  - Effect 14% over control
  - Modest improvement in symptom control
  - Empiric
    - First line
      - Amoxicillin (high dose)
      - TMP/SMX
      - AmoxHD-clavulanate
    - Second line
      - AmoxHD-clavulanate
      - Ceftriaxone
  - Culture-directed
    - Tympanocentesis
    - Otorrhea

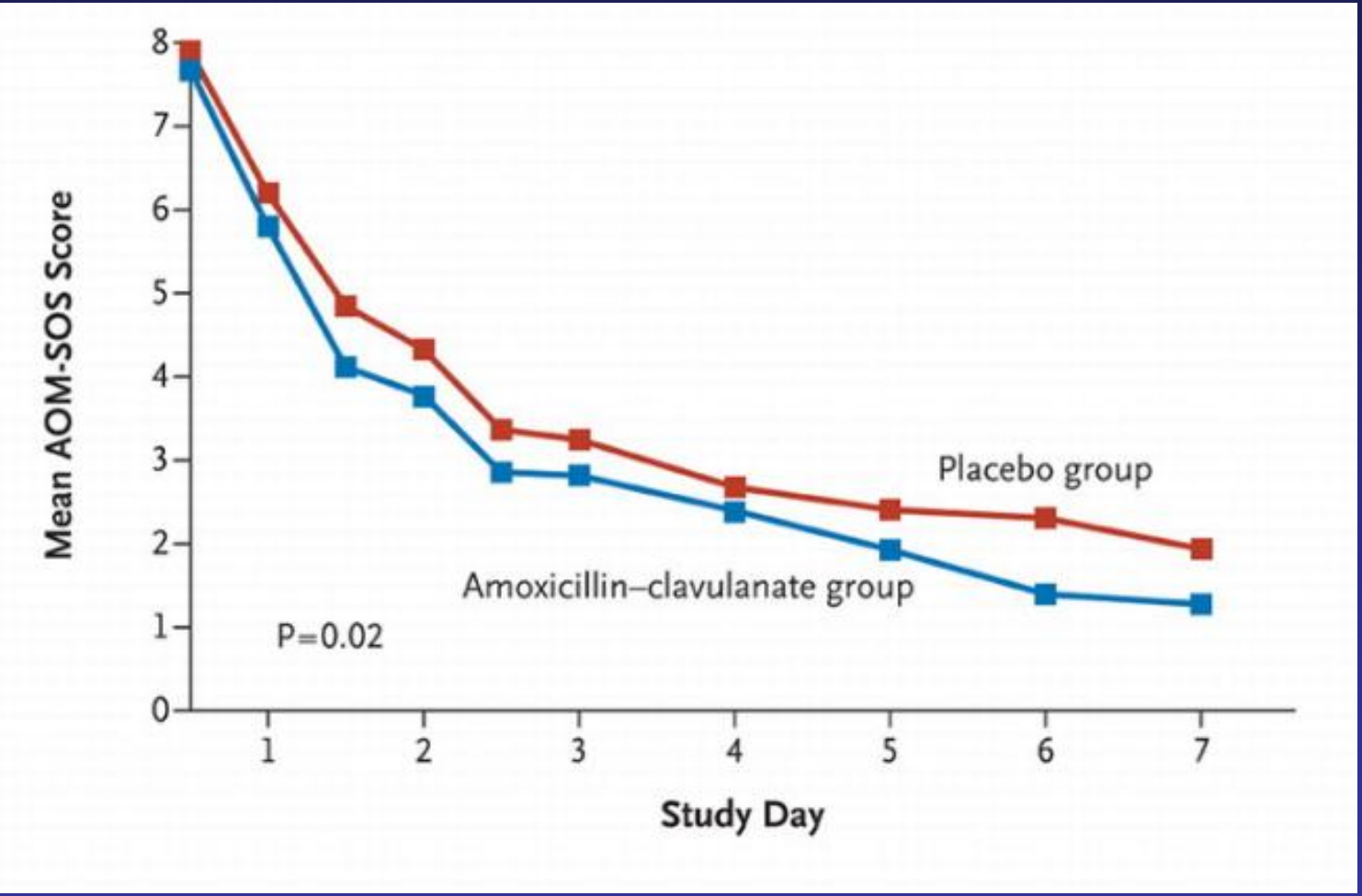
AOM Antibiotic Efficacy



AOM Antibiotic Efficacy



AOM Symptom Resolution



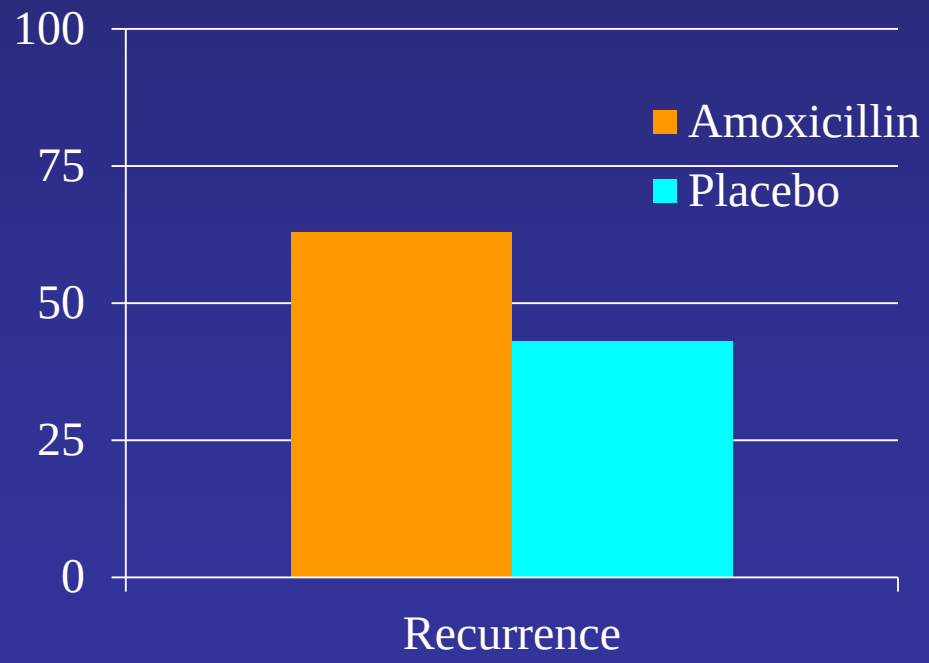
Hoberman NEJM 2011

BMJ

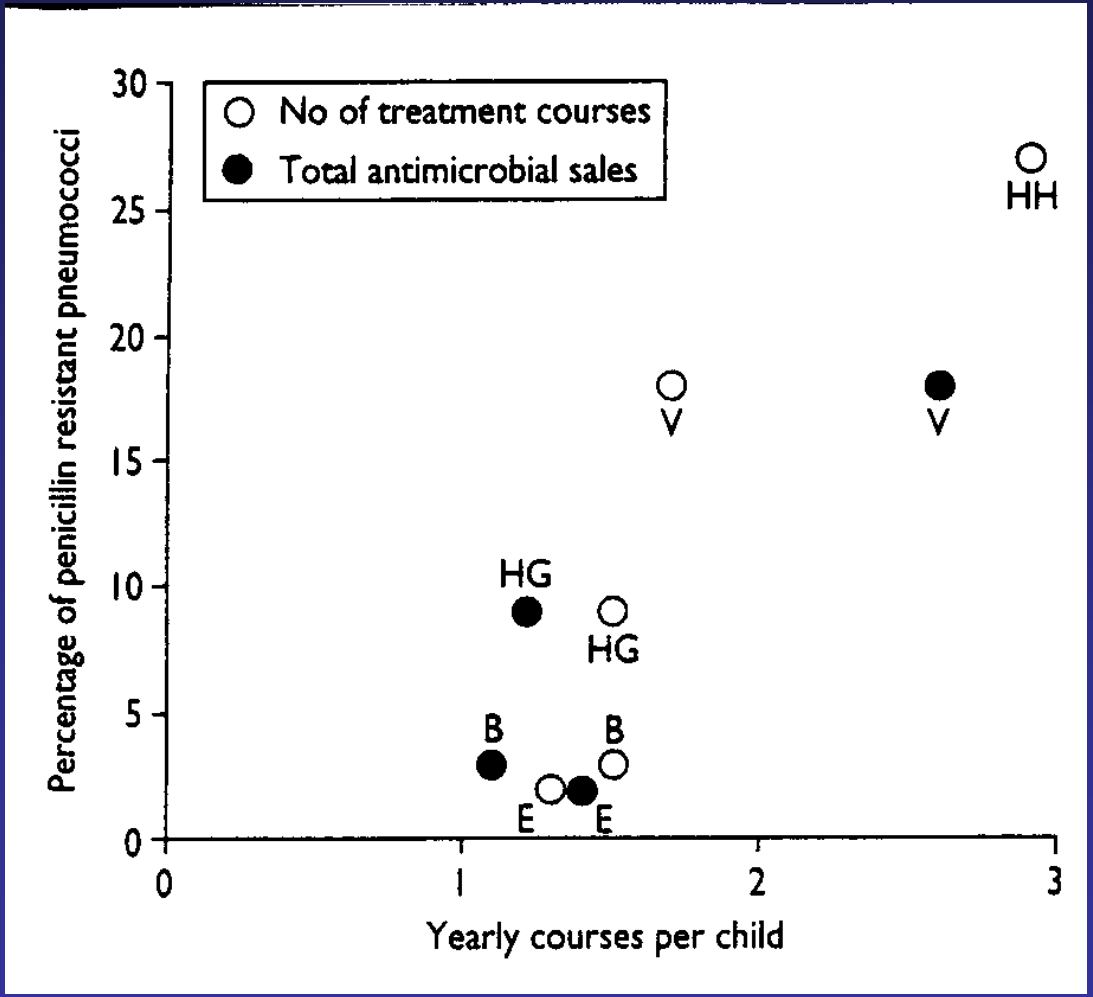
RESEARCH

Recurrence up to 3.5 years after antibiotic treatment of acute otitis media in very young Dutch children: survey of trial participants

Natália Bezáková, medical student,[1] Roger A M J Damoiseaux, general practitioner,[2] Arno W Hoes, professor of clinical epidemiology and general practice,[1] Anne G M Schilder, otorhinolaryngologist and clinical epidemiologist,[3] Maroeska M Rovers, clinical epidemiologist[1]



Antibiotic Prescribing Patterns and Pneumococcal Resistance

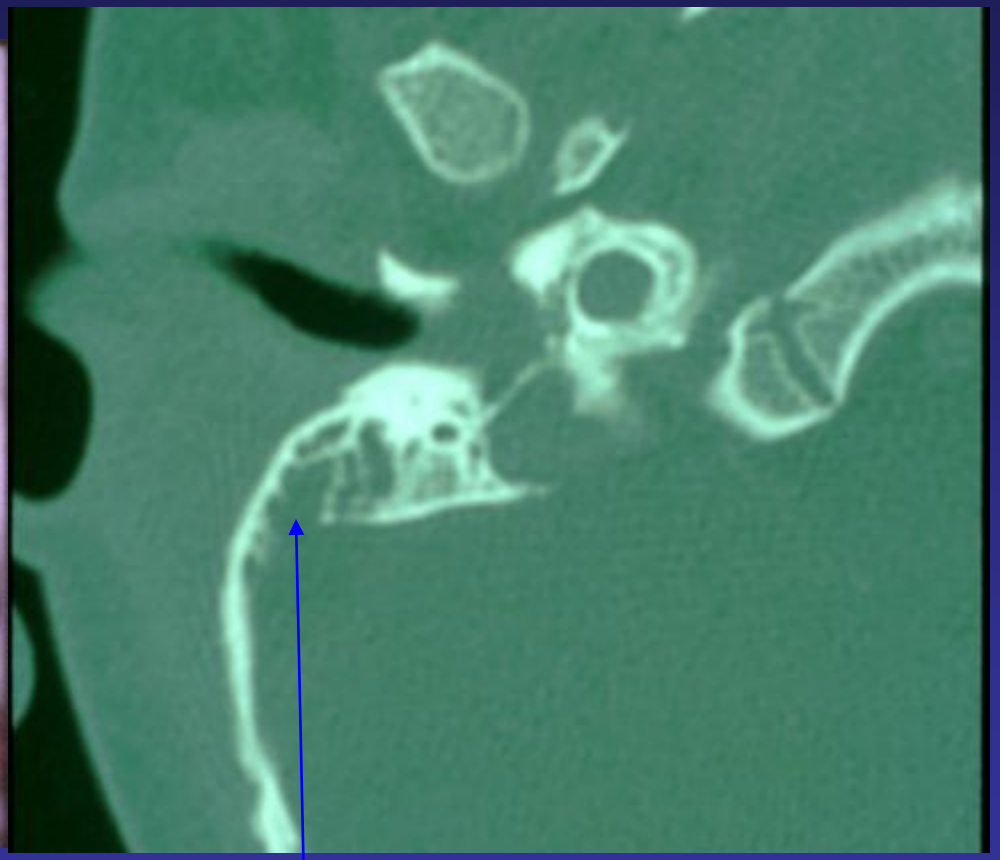


AOM: Observation v. Early Antibiotics

	Age < 6 months	**Age 6 – 24 months**	**Age > 24 months**
Bilateral	Antibiotic	Antibiotic	Antibiotic
Acute perforation	Antibiotic	Antibiotic	Either
Unilateral	Antibiotic	Either	Observe

Acute Mastoiditis

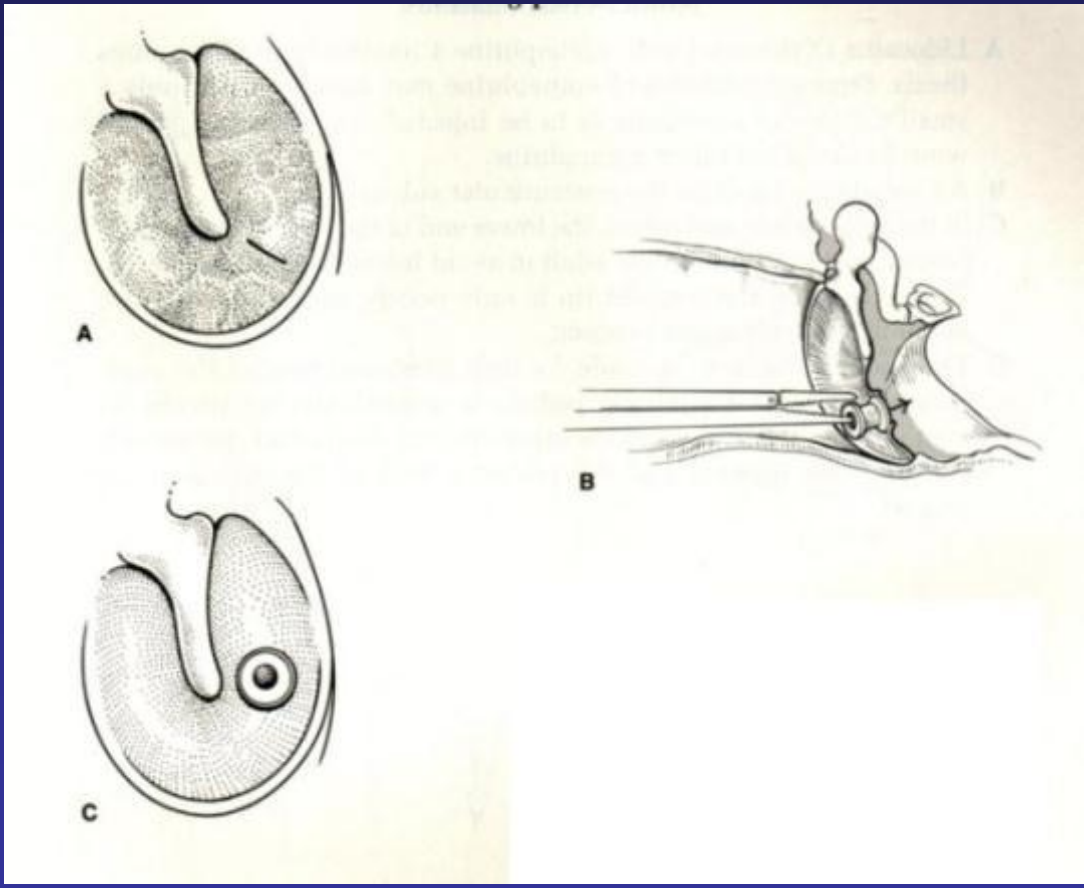
Pinna protruding



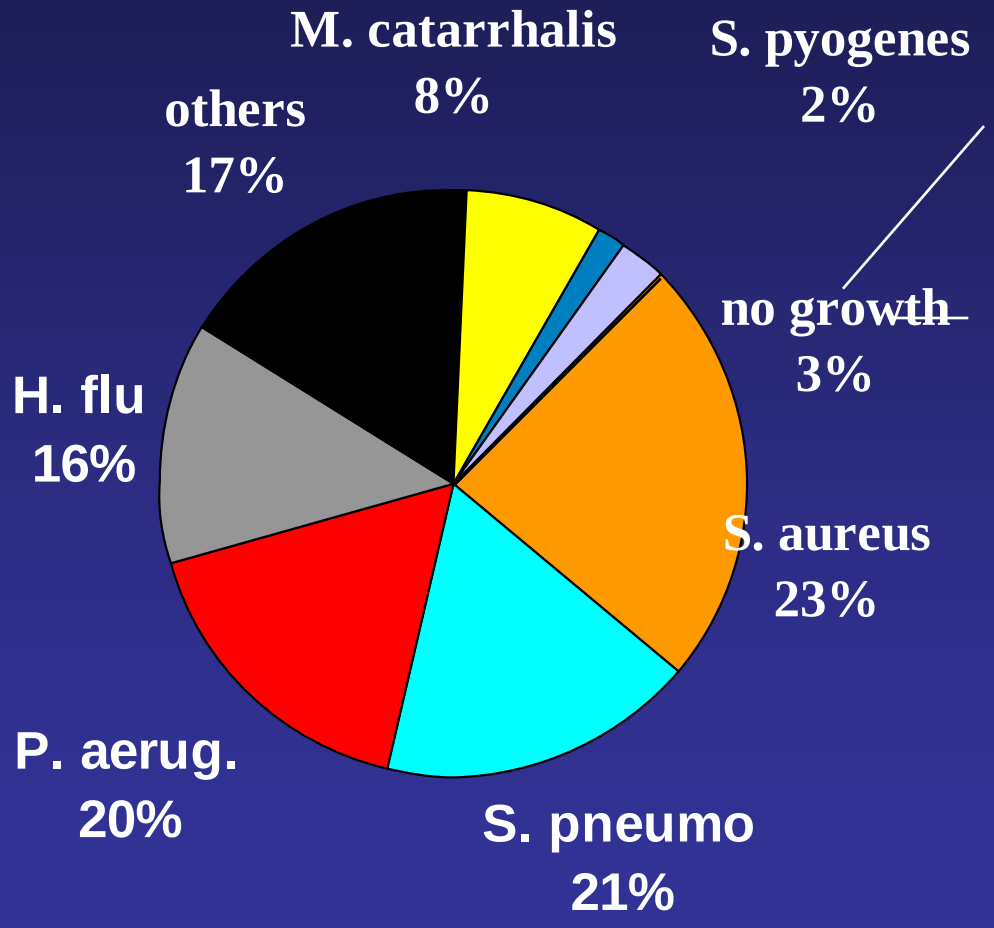
Demineralization of the sigmoid plate

AOM Surgical Treatment

- Myringotomy
- Tympanostomy tube
- Adenoidectomy
- Mastoidectomy



Post-Tympanostomy Otorrhea



- Very common
- Painless

Mandel EM, et al, Ann Otol, 1994

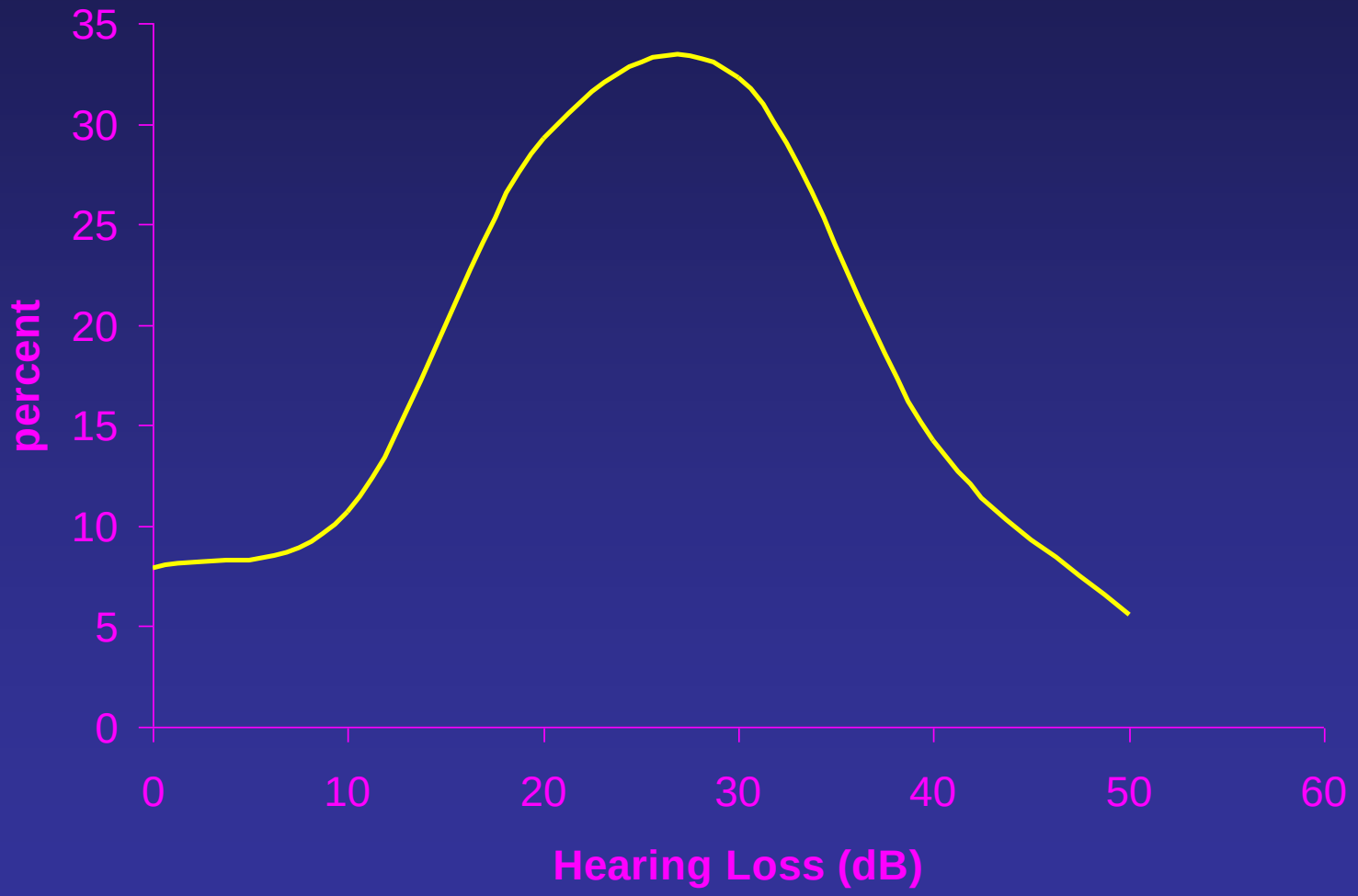
Post-Tympanostomy Otorrhea Treatment

- Systemic antibiotics
  - Ineffective for some pathogens
- Ototopical agents
  - Preferred
  - Concentrations far exceed MICs
- Tragal pump
- Wick?

Otitis Media with Effusion (OME)

- Non-acute middle ear inflammation
- Commonly follows AOM
- Self-limited
- Insidious symptoms & signs
  - Hearing loss primary concern

OME Hearing Loss



OME Pathogens

- Often “sterile” (ie, culture negative)
- Same differential as AOM
  - *Streptococcus pneumoniae*
  - *Haemophilus influenzae (nontypable)*
  - *Moraxella catarrhalis*

Role of Bacteria in OME

- Antibiotic effect 14 - 20%
- Bacterial culture (+) 30%
- Bacterial PCR (+) 80%
  - *Streptococcus pneumoniae*, 30%
  - *Hemophilus influenzae*, 55%
  - *Moraxella catarrhalis*, 47%
  - Numerous “atypical” organisms of uncertain significance
- PCR (+) not associated with killed bacteria
- Biofilm disease?

OME Treatment

- Medical
  - Observation
  - Antibiotics modest benefit
  - Steroids & nonsteroidals controversial
- Surgical
  - Only if persists > 3 months
  - Myringotomy
  - Tympanostomy tube
  - Adenoidectomy

Chronic Suppurative Otitis Media (CSOM)

- Persistent middle ear infection
  - duration > 3 months
  - failure of medical management
- Tympanic membrane defect
  - perforation
  - tympanostomy tube

- Relatively asymptomatic
- May have serious complications

CSOM Pathogens

- *Pseudomonas aeruginosa*
- *Staphylococcus*
  - *aureus*
  - *epidermidus & saprophyticus*
- Enterobacteriaciae
- Diphtheroids
- Streptococci, α - hemolytic
- Anaerobes
- Biofilm

CSOM Management

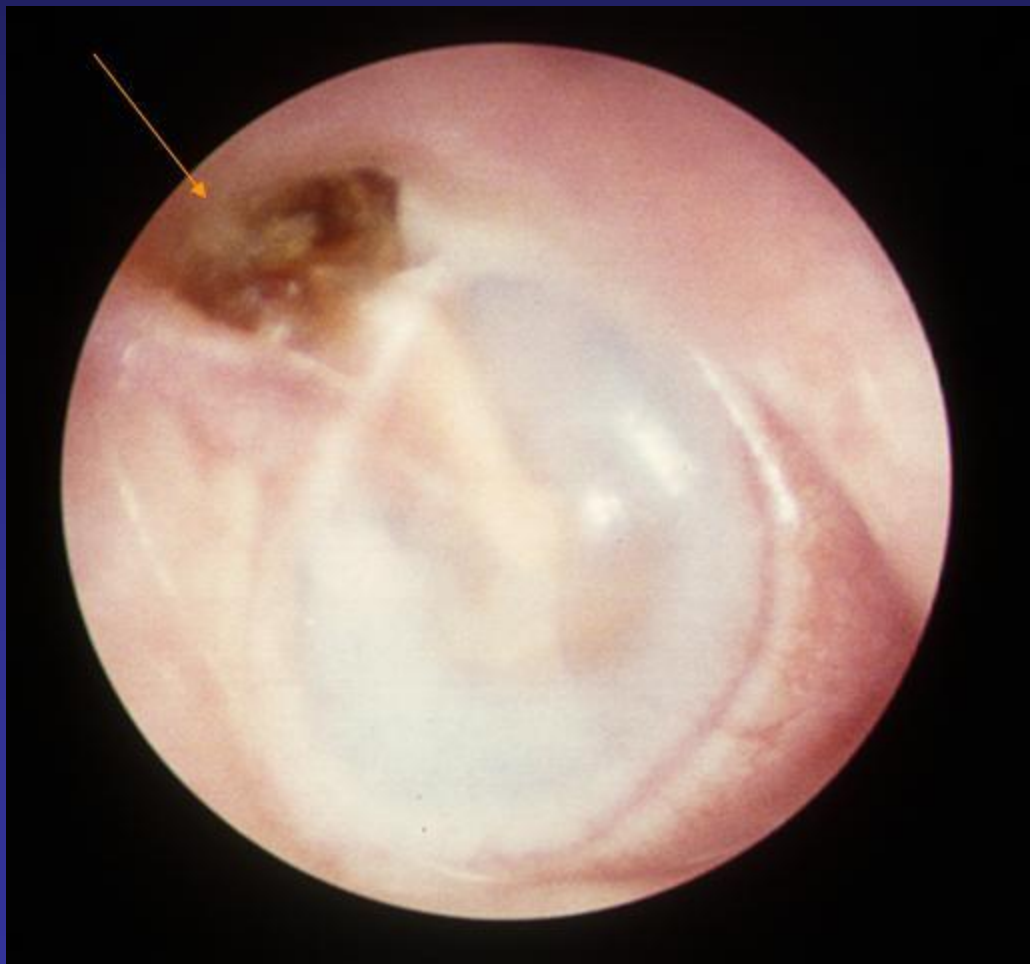
Medical

- Parenteral antibiotics
  - ceftazidime
  - semisynthetic penicillin + aminoglycoside
  - treatment 14-21 days or 3 days after dry
- Aural toilet
  - topical antibacterial agents
  - frequent suctioning
- Dry ears 75 - 90%

Surgical

- Standard of care
- Tympanoplasty +/- mastoidectomy
- Dry ears 90%

CSOM with Cholesteatoma



Acute OE

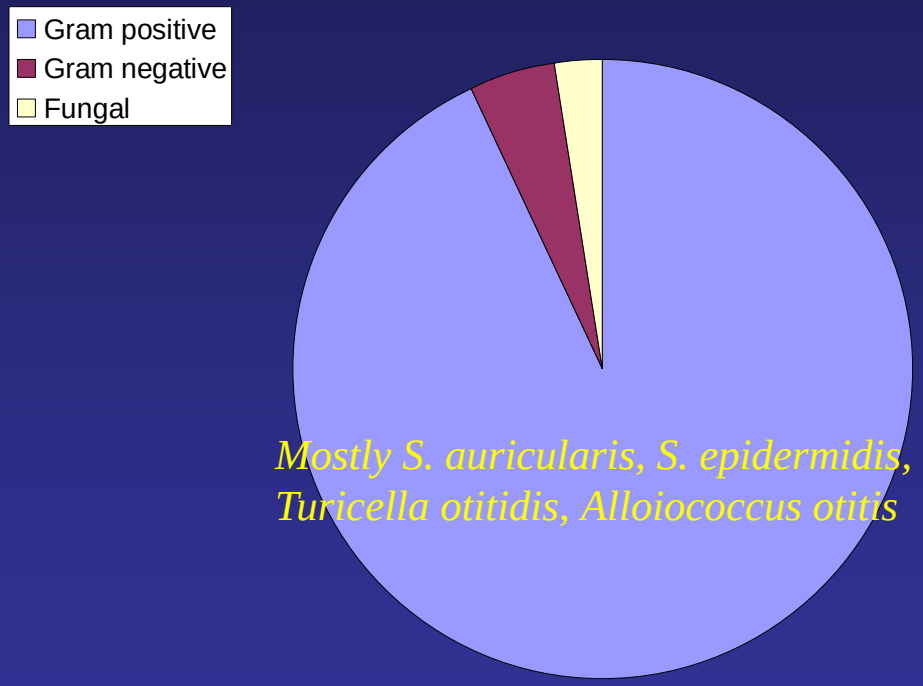
- “Swimmer’s ear”
- Usually self-limited
- Symptoms
  - Otalgia
  - Otorrhea
- Findings
  - Ear canal edema
  - Otorrhea
  - Tender to pinna traction

Acute Otitis Externa

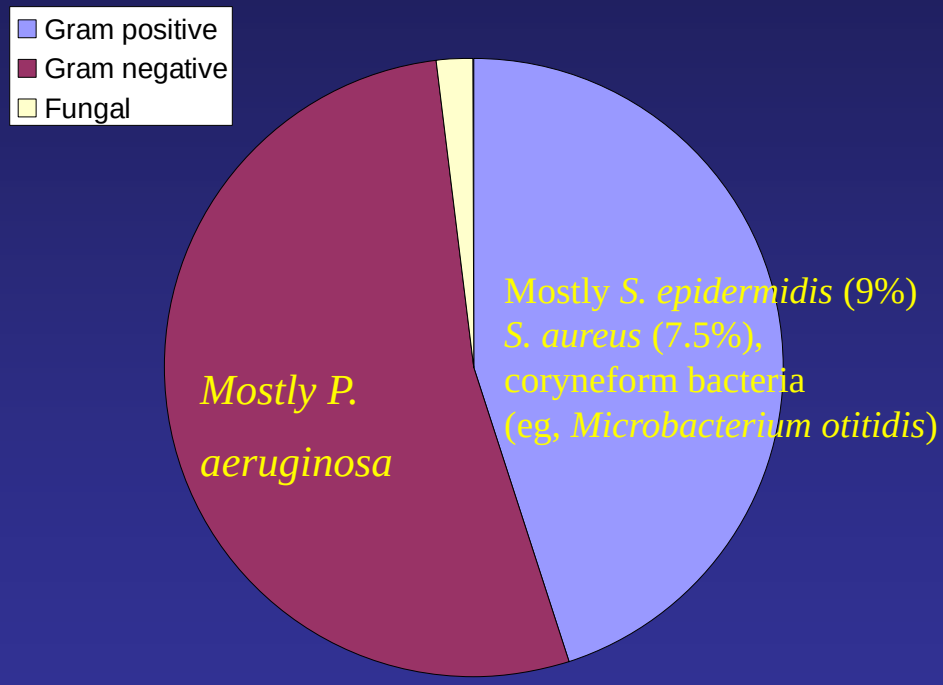
debris and swelling of ear canal, very tender!

May require wick

Microbiology of the Ear Canal
Normal v. Acute Otitis Externa



Stroman, Roland, Dohar, & Burt *Laryngoscope* 2001



Roland & Stroman. *Laryngoscope* 2002

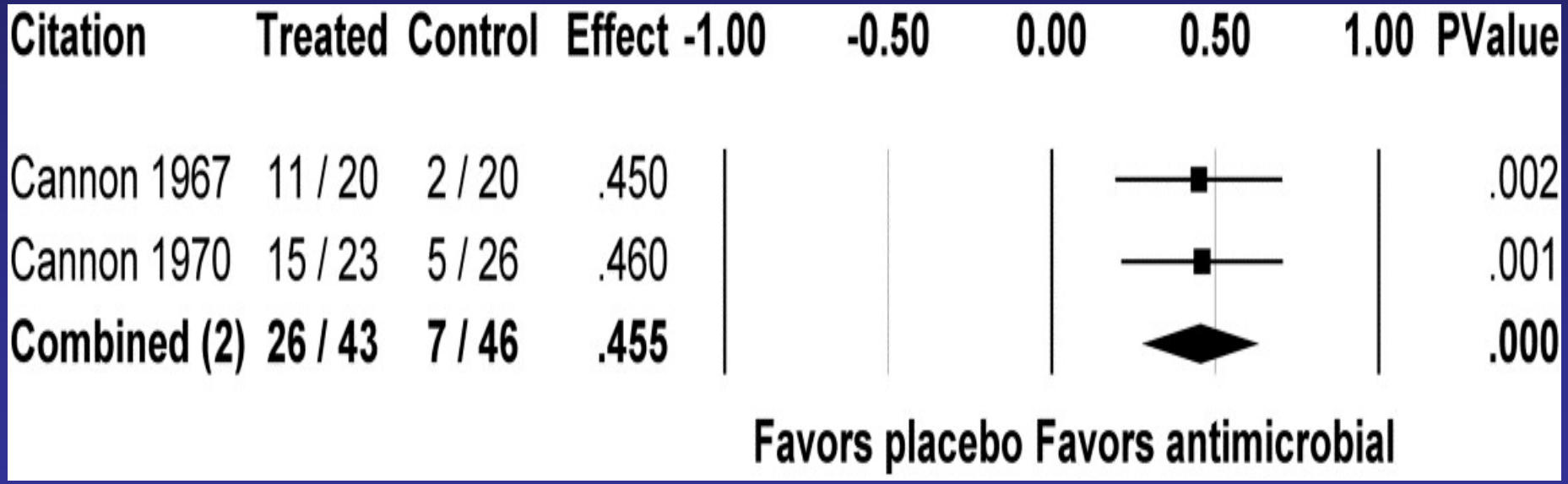
AOE: more P. aerug, S. aureus,
& microbacterium sp.

Pathogenesis of AOE

- Water exposure
- Loss of protective barriers
  - Removal of wax
  - Irritation of EAC skin
- Accumulation of exfoliated skin debris
- Obstruction

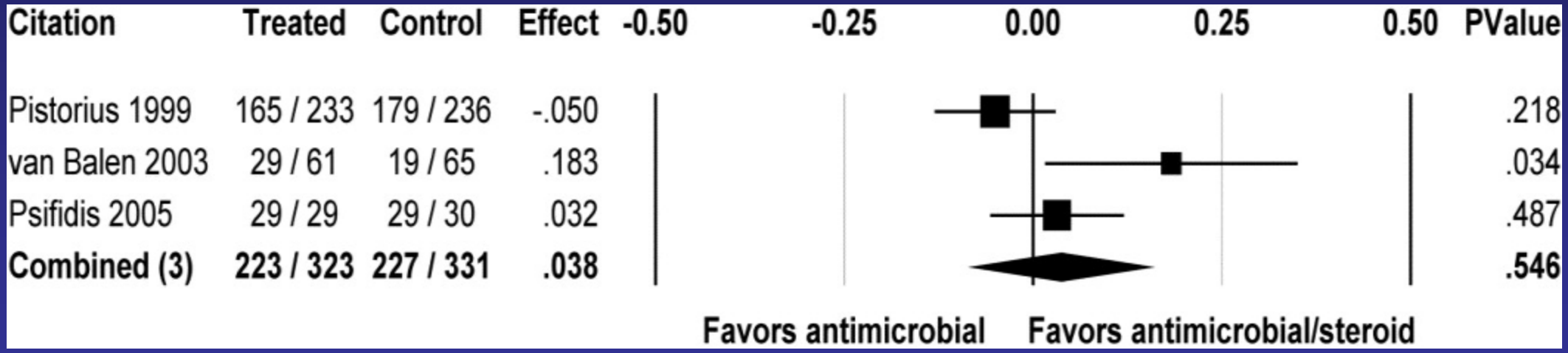
Antibiotic v. Placebo in AOE

- NNT = 2



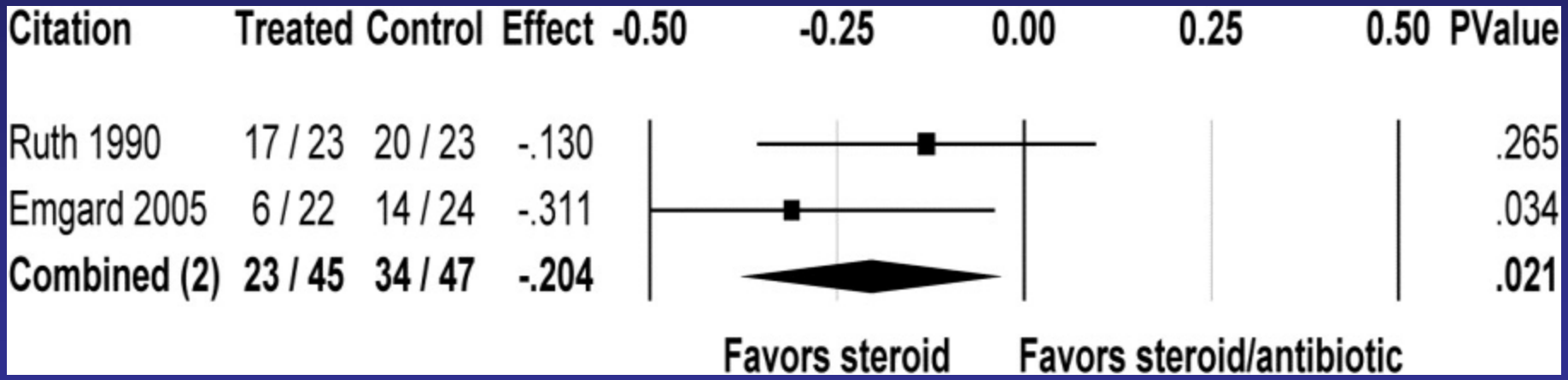
Rosenfeld et al. Otolaryngol Head Neck Surg. 2006

Antibiotic v. Antibiotic-Steroid in AOE



Rosenfeld et al. Otolaryngol Head Neck Surg. 2006

Steroid v. Antibiotic in AOE



Rosenfeld et al. Otolaryngol Head Neck Surg. 2006

Necrotizing OE

- Osteomyelitis of the skull base
- High morbidity & mortality
- Risk factors
  - Diabetic
  - Immunocompromised
- Pathogens
  - *Pseudomonas aeruginosa (most)*
  - *Staphylococcus aureus*
  - *Aspergillus sp. (rarely)*
- Parenteral antibiotics critical
  - Quinolones
  - 3rd generation cephalosporin
  - Aminoglycoside + SS-PCN
  - Extended duration
    - Minimum 6 weeks
    - Normal gallium scan
- Regular cleaning
- Diabetes control
- Watch renal function*

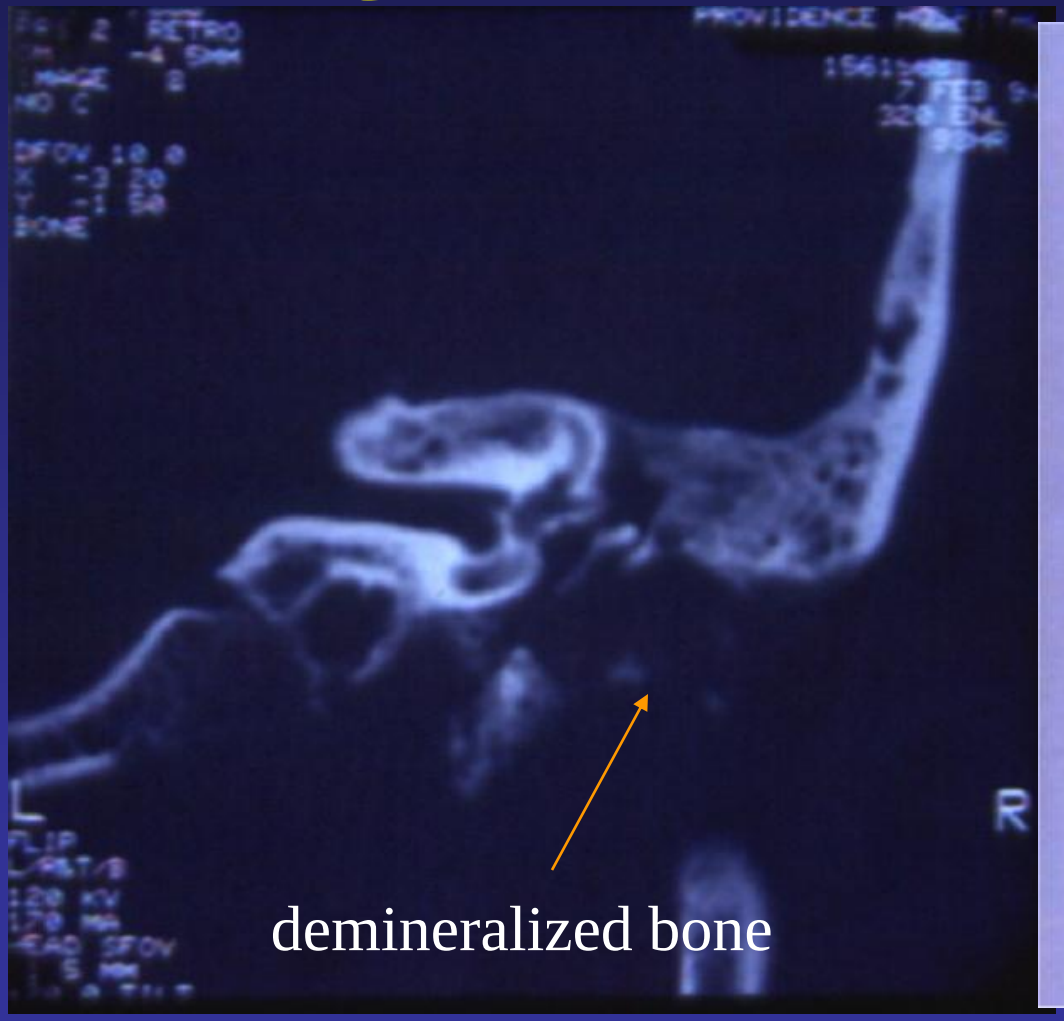
Necrotizing OE

- Symptoms
  - Otalgia
  - Otorrhea
  - Hearing loss
  - Fever
  - Hoarseness
  - Aspiration
  - Dysphagia
  - Facial palsy
- Signs
  - Granulation tissue*
  - Otorrhea
  - Canal edema
  - Cranial neuropathies

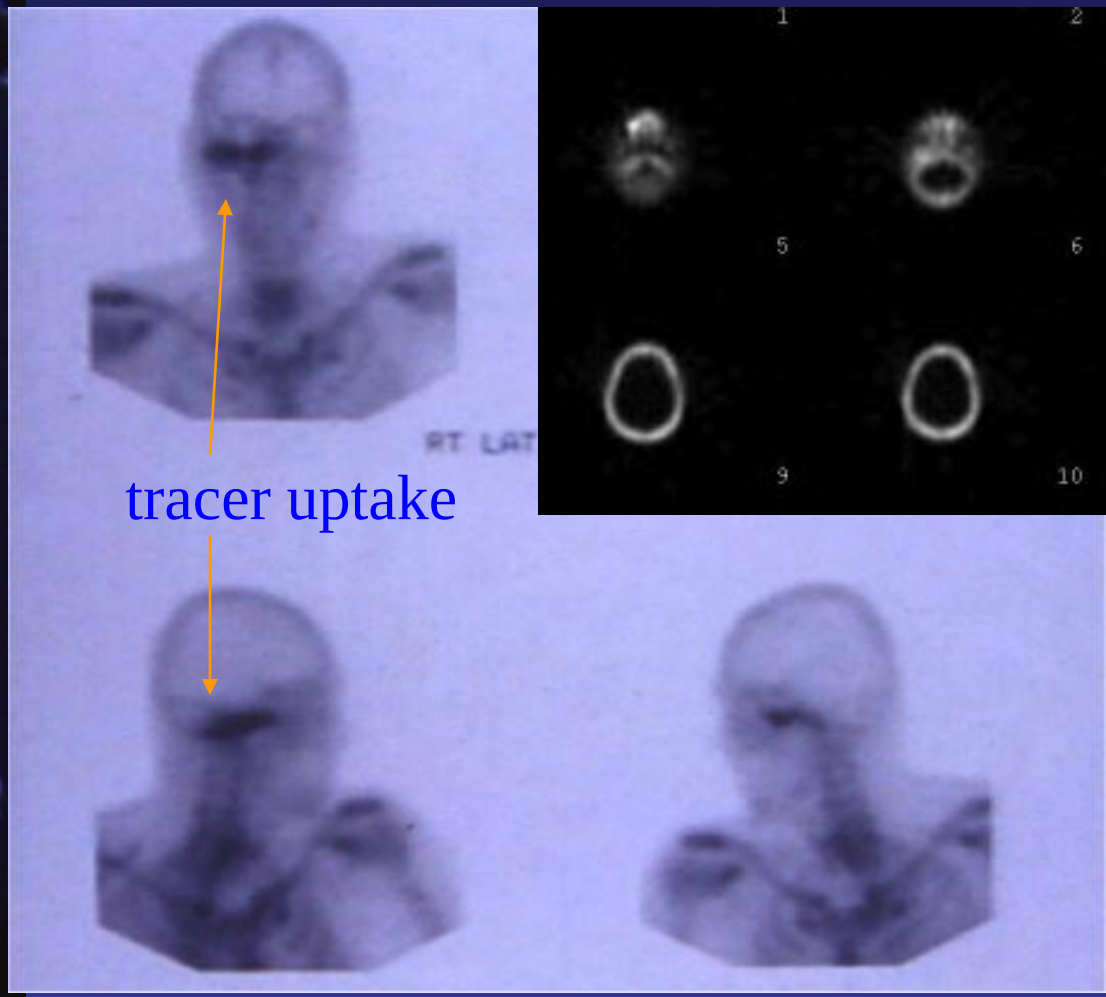
Distinguishes from routine Acute OE

Necrotizing OE

CT



Bone Scan



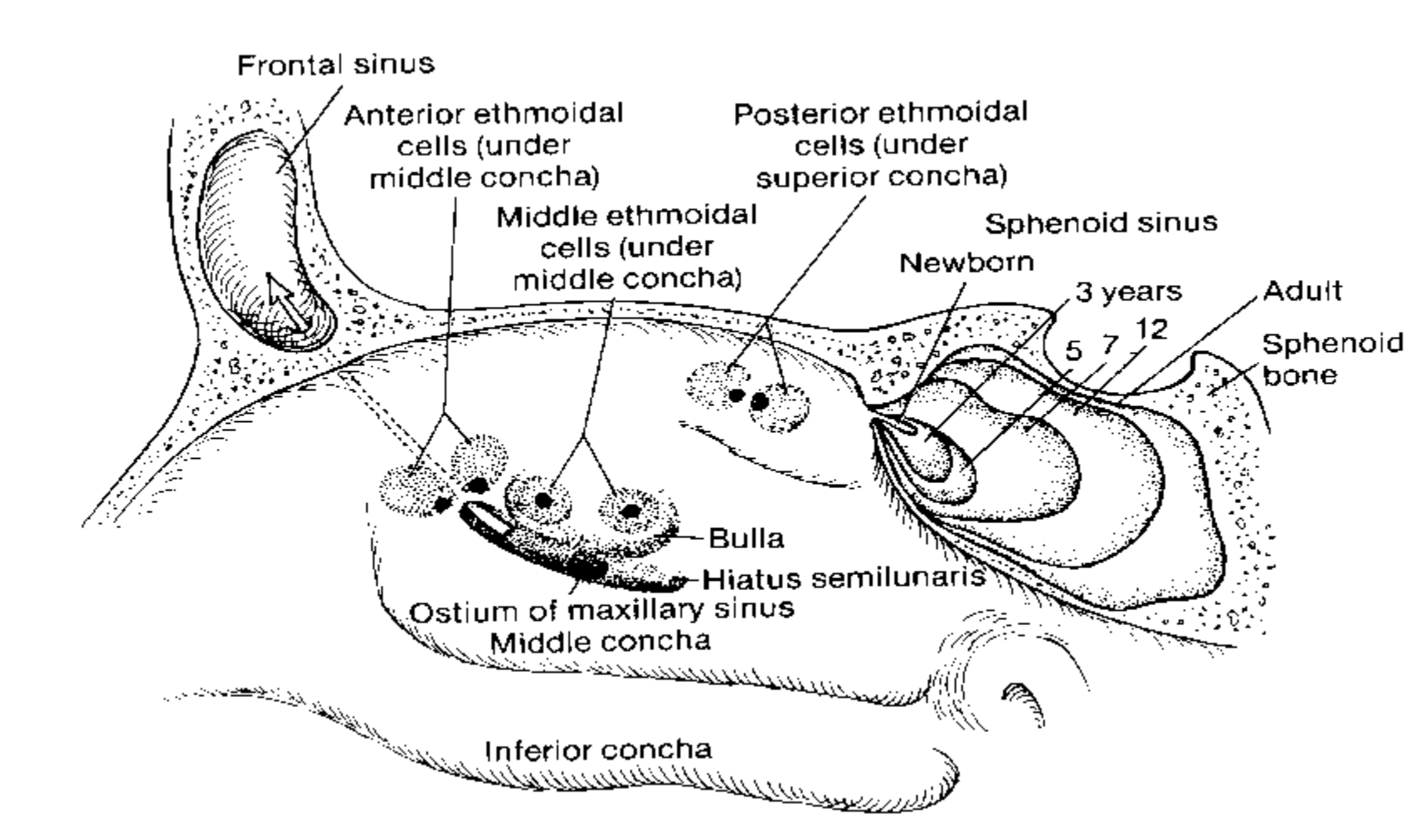
Chronic Otitis Externa

- External canal inflammation
- Symptoms: primarily pruritus
- Aggravating factors
  - Cleaning ears
  - Contamination
- Treatment: topical steroids
- Commonly leads to acute OE flares

debris and swelling, nontender

Sinusitis
(aka, Rhinosinusitis)

Anatomy of the Sinuses

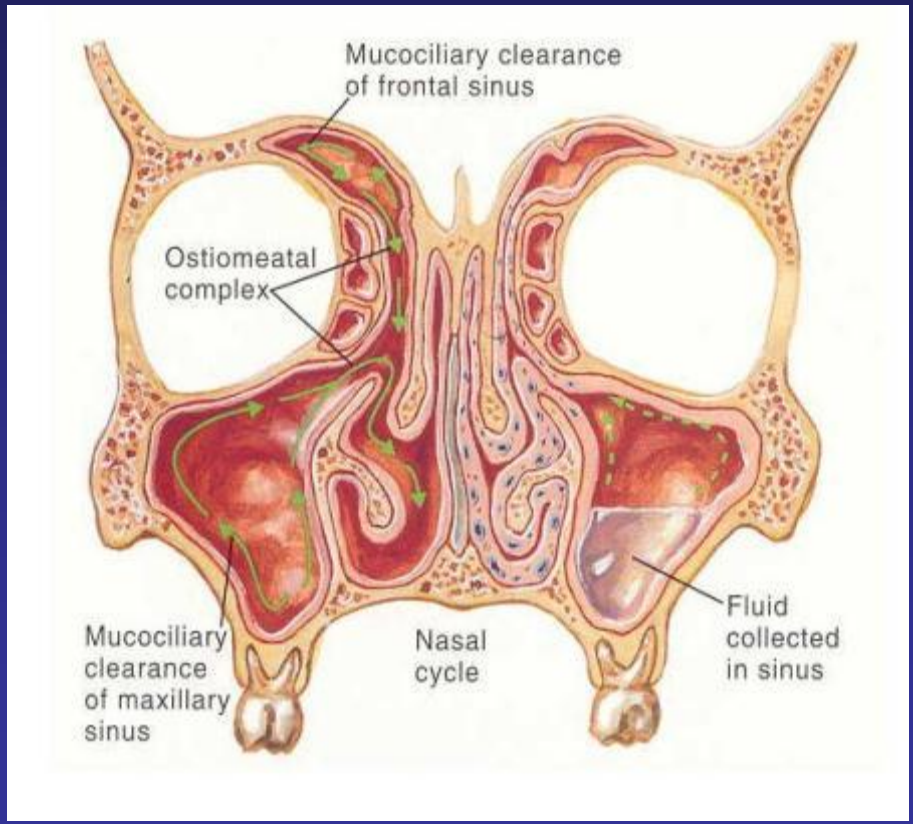


Pathogenesis of Sinusitis

- Obstruction of sinus ostia
  - Viral
  - Atopic
  - Developmental
  - Traumatic
  - Toxic (e.g., smoke)
- Overgrowth of microbes
  - Pathogens
  - Endogenous flora
  - Biofilms

Mucociliary Clearance

- Cilia of respiratory epithelium beat towards natural sinus ostia
  - Mucous cleared out ostium, into nasal cavity, posteriorly down pharynx
- Ciliary function affected by congenital disorders, smoking, dehydration, hypoxia, chronic infection



From Josephson, 1994

Acute Sinusitis

- Diagnosis dependent upon
  - Clinical data
    - Fever
    - Facial pain & inflammation
    - Pus draining from sinus ostium
    - Tooth tenderness
  - Presence of sinus effusion
- Usually self-limited
- Affects both kids and adults
- Complications rare, more in young kids

Microbiology of Acute Sinusitis

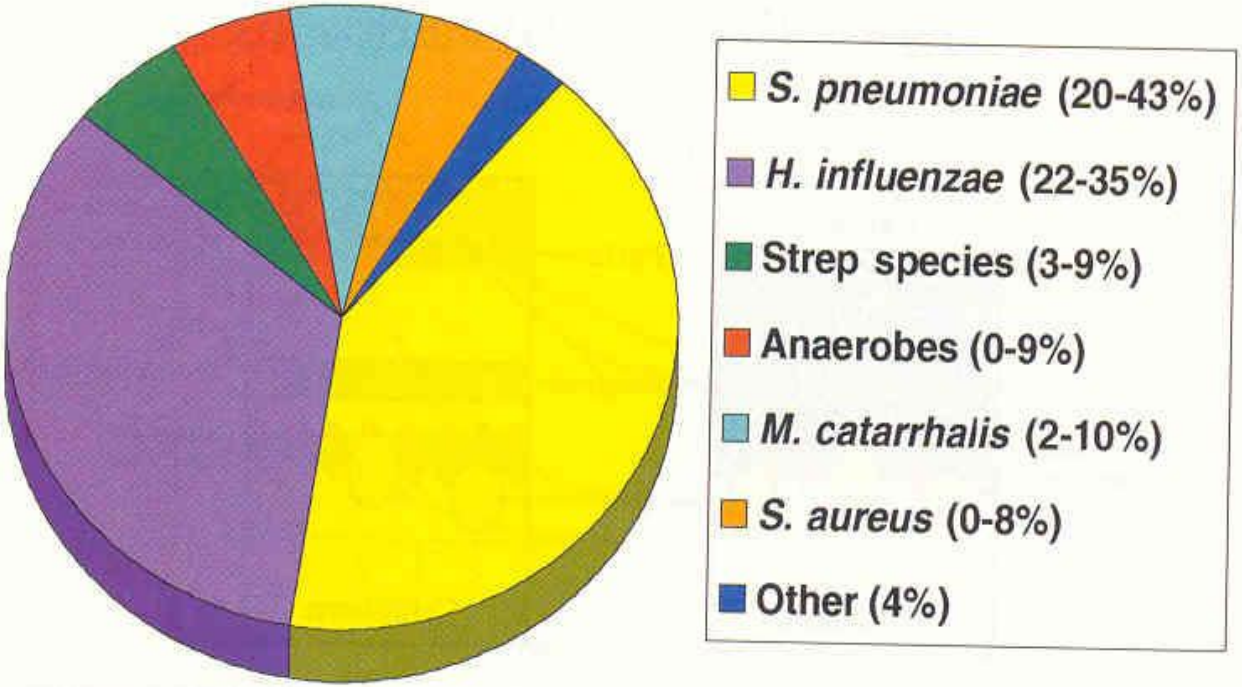
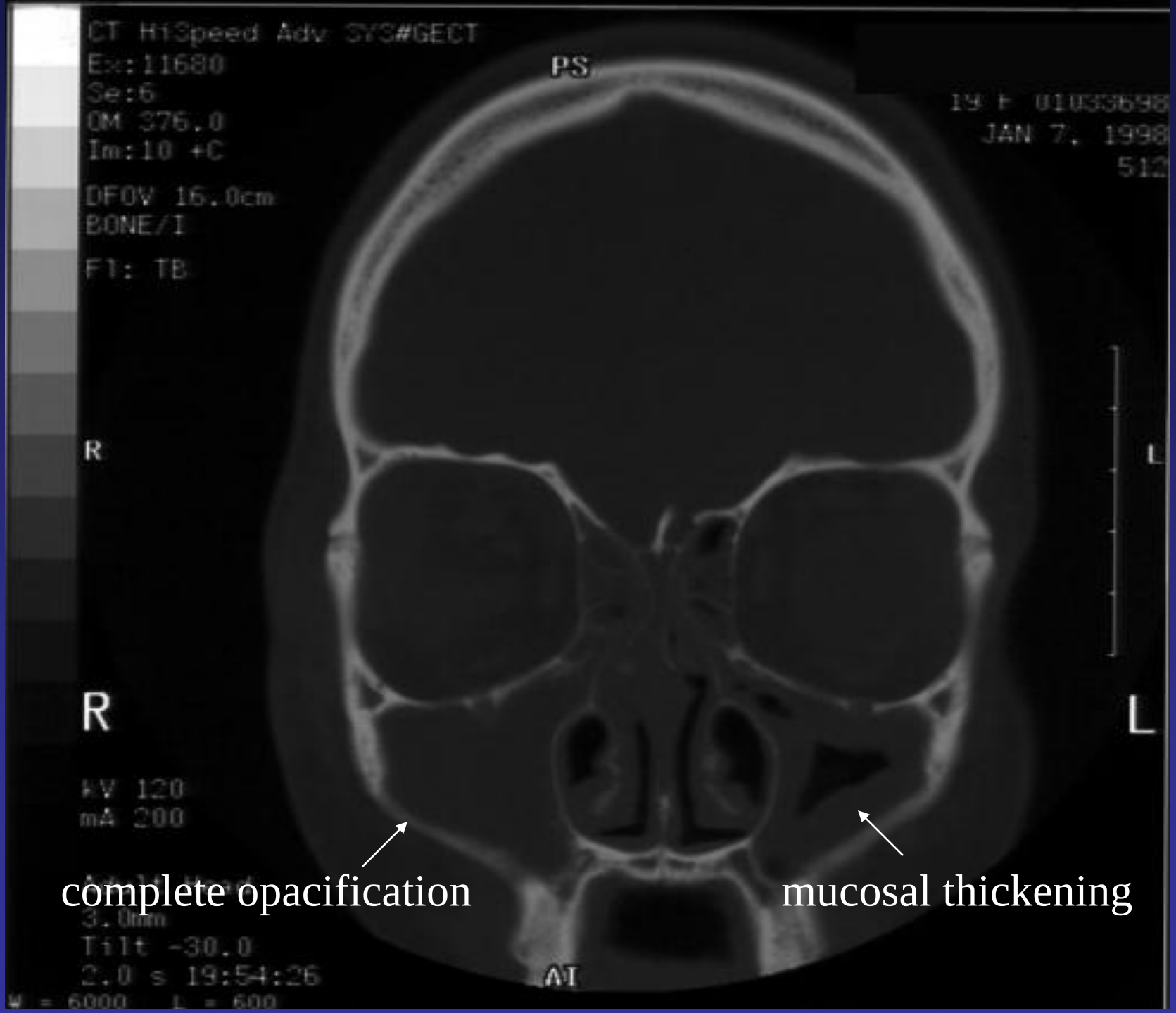


Fig 3. Ranges of prevalence of the major pathogens associated with ABRS in adults.

From Antimicrobial Treatment Guidelines, 2000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Ex:11680
Se:6
OM 376.0
Im:10 +C
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3.0mm
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2.0 s 19:54:26
AI
W = 6000 L = 600
complete opacification
mucosal thickening

Acute Sinusitis Treatment

- Medical treatment
  - Observation
  - Symptomatic treatment
  - Nasal decongestants
  - Systemic antibiotics

- Surgical treatment
  - Rarely needed
    - Mainly for complications of acute sinusitis
  - Trephination vs. Sinus tap & lavage
  - Endoscopic sinusotomy
  - Sinusectomy (eg, ethmoidectomy)

Purulent Rhinorrhea

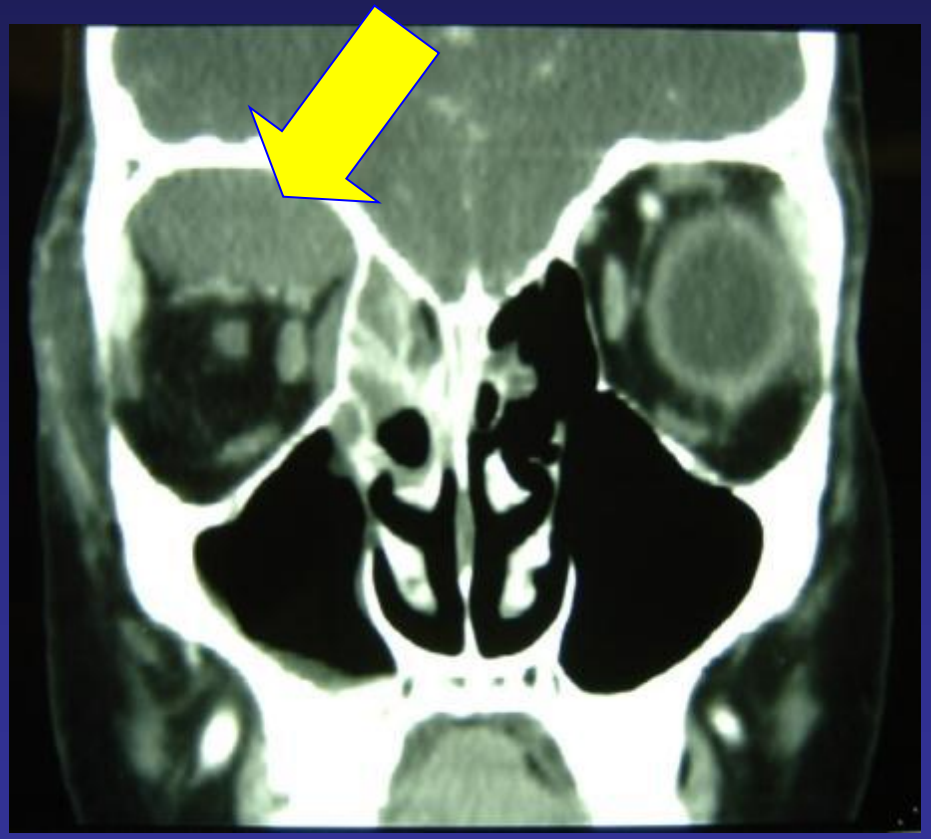
- All pus in the nose is not sinusitis
  - Stasis (eg, foreign body)
- Viral looks like bacterial (kids 10 / year)
- Poor correlation between rhinorrhea and sinus aspirates
- Nasopharyngeal swab of little value
- Endoscopic culture of sinus ostium much more accurate

Nasal Foreign Body Cause of Rhinorrhea

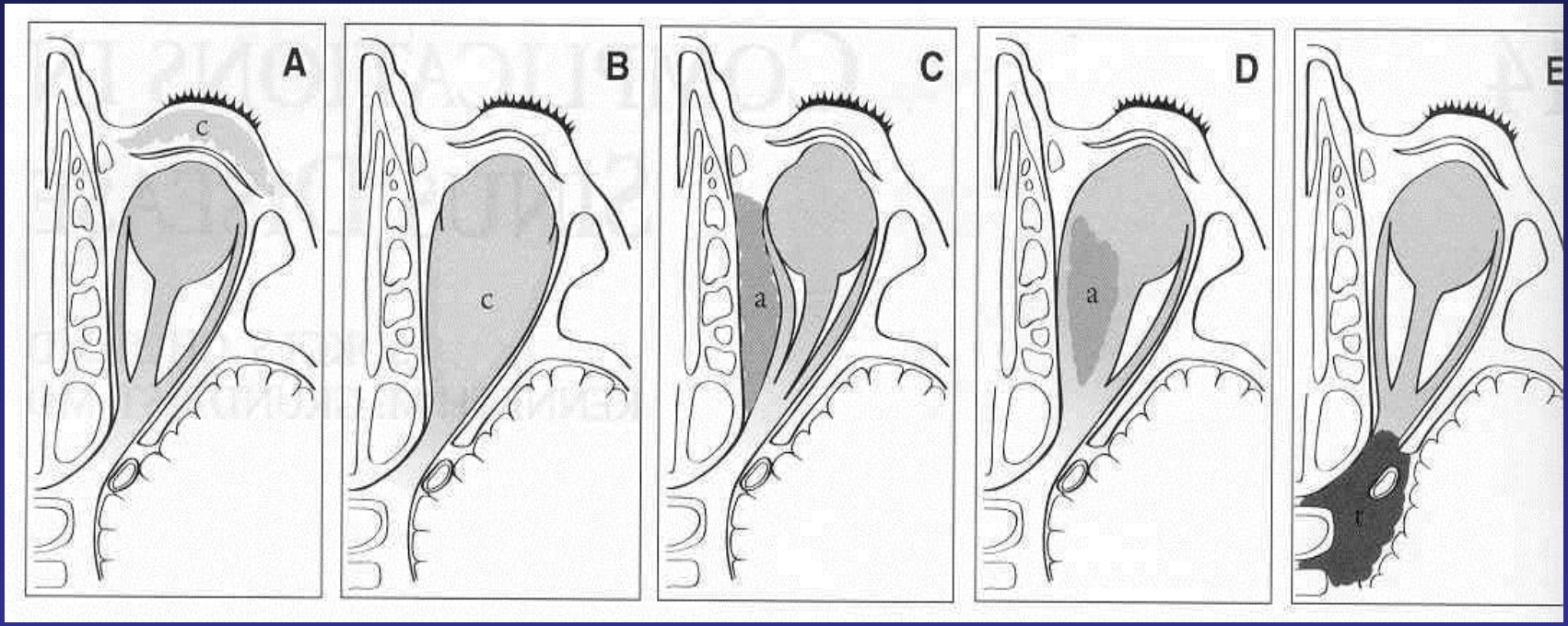
Complications of Sinusitis

- 2 broad categories:
  - Orbital
  - Intracranial
- Presentation depends on age
  - Children more likely to get complications from acute
  - Adults more likely from chronic

Complications of Acute Sinusitis



Intraorbital Complications



A) Preseptal cellulitis

B) Orbital cellulitis

C) Subperiosteal abscess

D) Orbital abscess

E) Cavernous sinus thrombosis

From Kennedy, 2001

Intracranial Complications

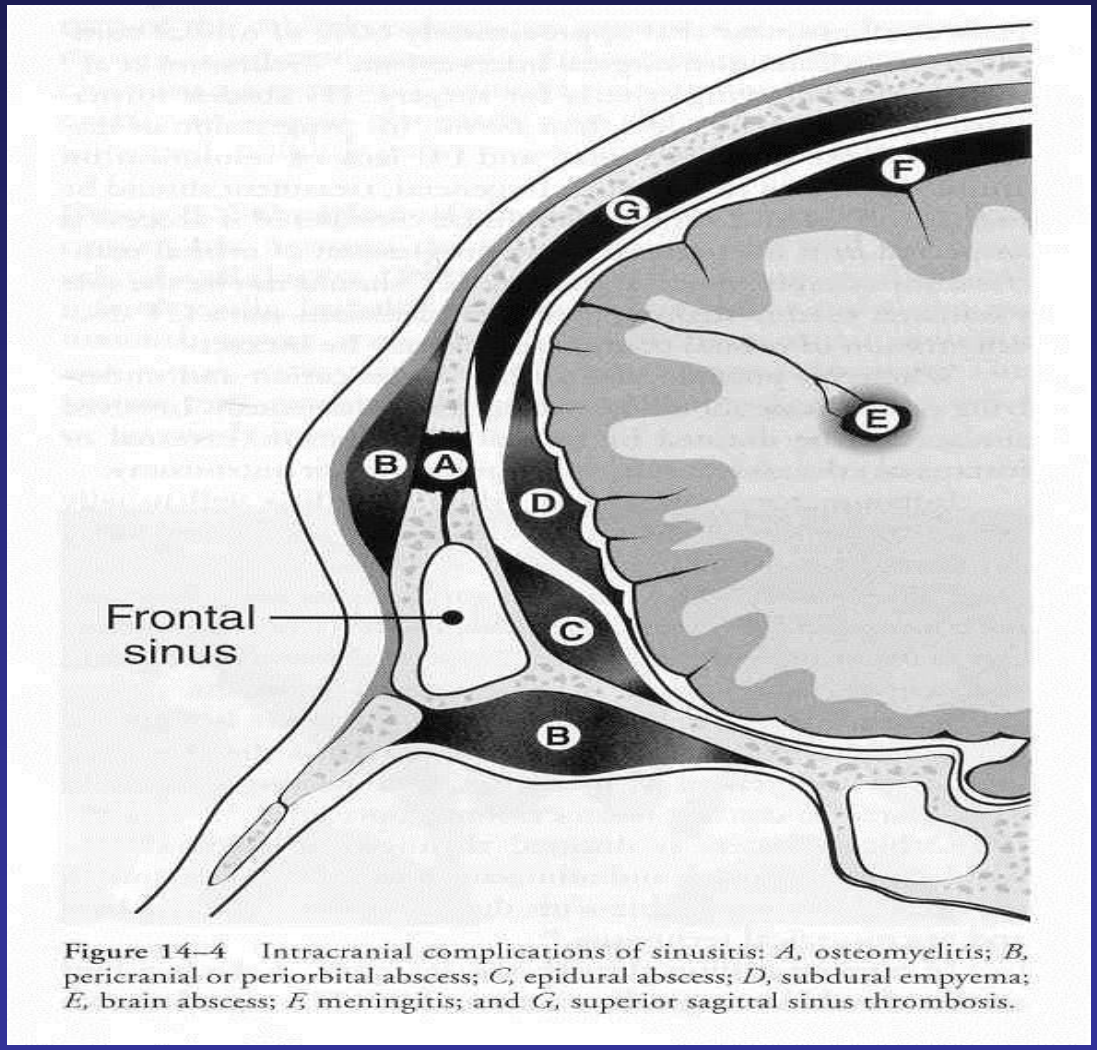


Figure 14–4 Intracranial complications of sinusitis: *A*, osteomyelitis; *B*, pericranial or periorbital abscess; *C*, epidural abscess; *D*, subdural empyema; *E*, brain abscess; *F*, meningitis; and *G*, superior sagittal sinus thrombosis.

A) Osteomyelitis

B) Pericranial abscess

C) Epidural abscess

D) Subdural empyema

E) Brain abscess

F) Meningitis

G) Sagittal sinus thrombosis

From Kennedy, 2001

Chronic Sinusitis

- More indolent course
- May have acute flares
- Risk factors
  - Allergies
  - Tobacco smoke
- CT imaging

- Treatment
  - Nasal steroids
  - Systemic antibiotics
    - Broad spectrum
    - prolonged
  - Surgery
    - More commonly needed
    - Endoscopic sinusotomy
    - Sinusectomy
    - Obliteration

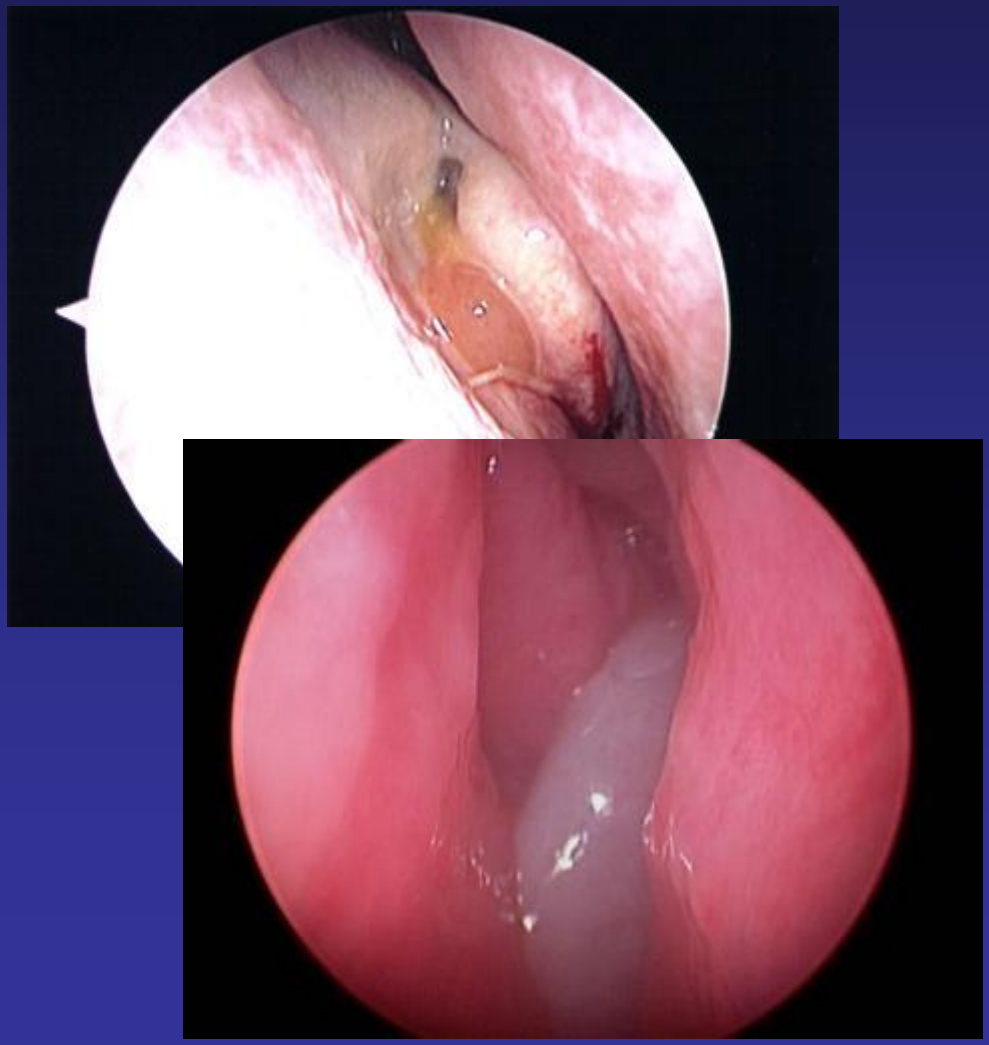

obstruction of sinus ostia
mucosal thickening
R
L

Chronic Sinusitis: Pathogens

- Gram negative bacilli
- Staphylococci
- Anaerobes
- Viridans streptococci
- Fungi

Allergic Fungal Sinusitis

- **Subset of chronic sinusitis**
- **Not immunocompromised**
- **Atopic disease**
- **Pathogens: dermatophytes**
- **Treatment**
  - **Surgical drainage**
  - **Steroids**

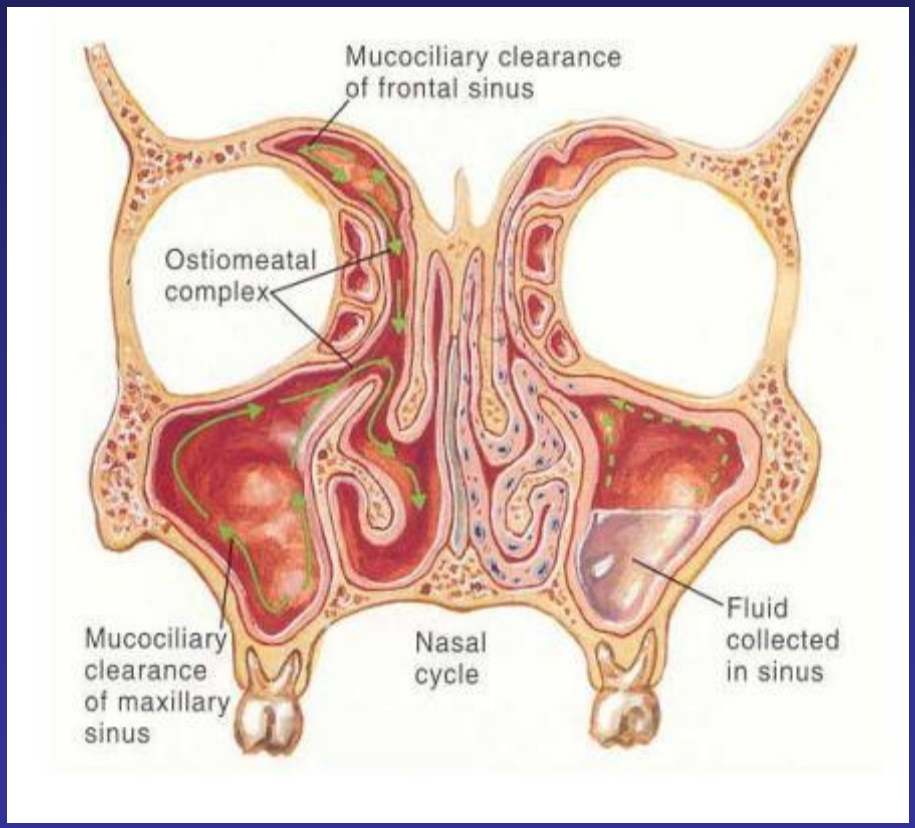


Invasive Fungal Sinusitis

- Immunocompromised patients (DKA & neutropenic)
- High mortality due to vascular invasion
- Pathogens:
  - Rhizopus
  - Aspergillus
- Treatment
  - Surgical debridement (often radical) back to normal tissue
  - Systemic antifungal agents

Functional Endoscopic Sinus Surgery (FESS)

- Based on principles of mucosal preservation
  - Increasing size of natural ostium
  - Helps preserve/improve sinus *function*
- Extent of surgical dissection varies by patient disease
- Chronic, low-grade osteomyelitis may exist
  - Necessitates removal of infected bone



From Josephson, 1994

Questions?