Pediatric Ear Infections

3rd SCOEASTA Scientific Conference
Friday, October 20th, 2023

Bryce Noblitt, MD - ENT Consultant - AIC-Kijabe Hospital

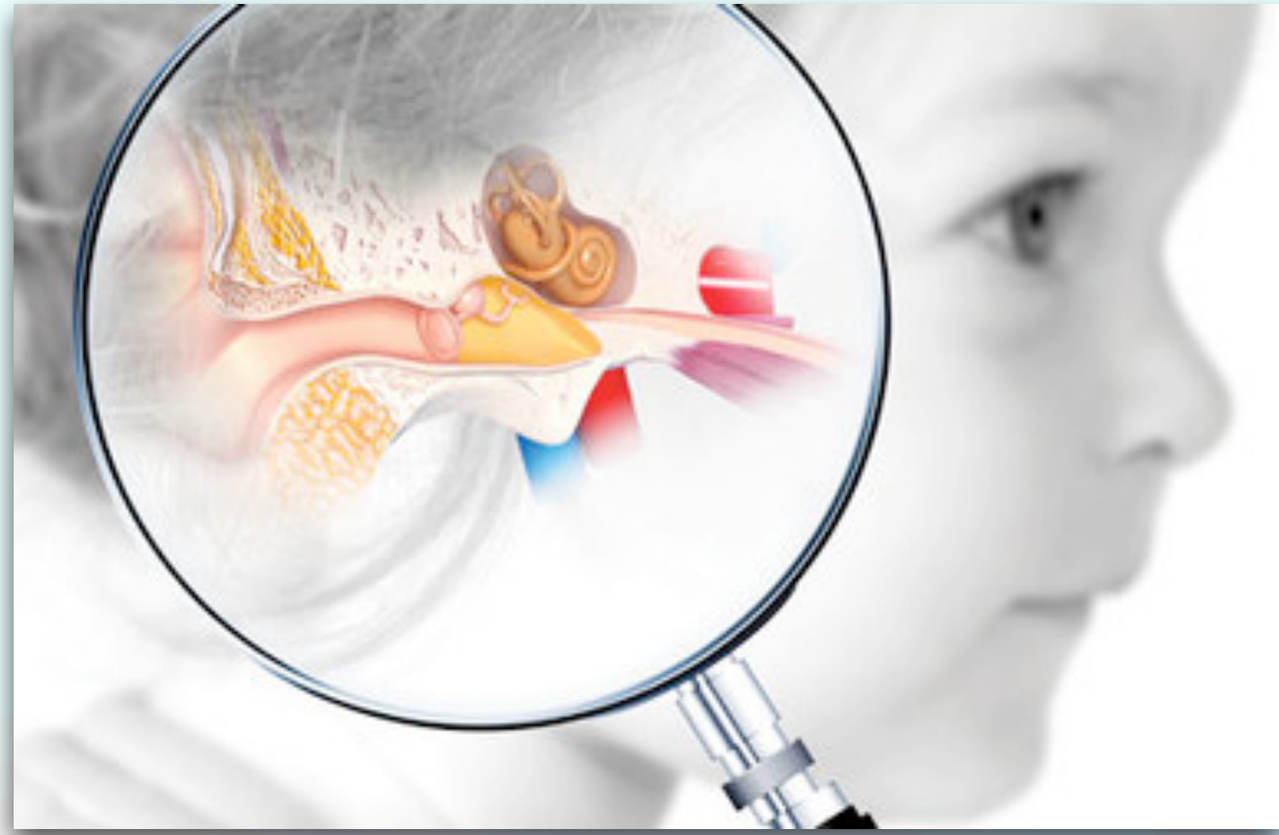
AIC Kijabe Hospital
Health Care to God's Glory

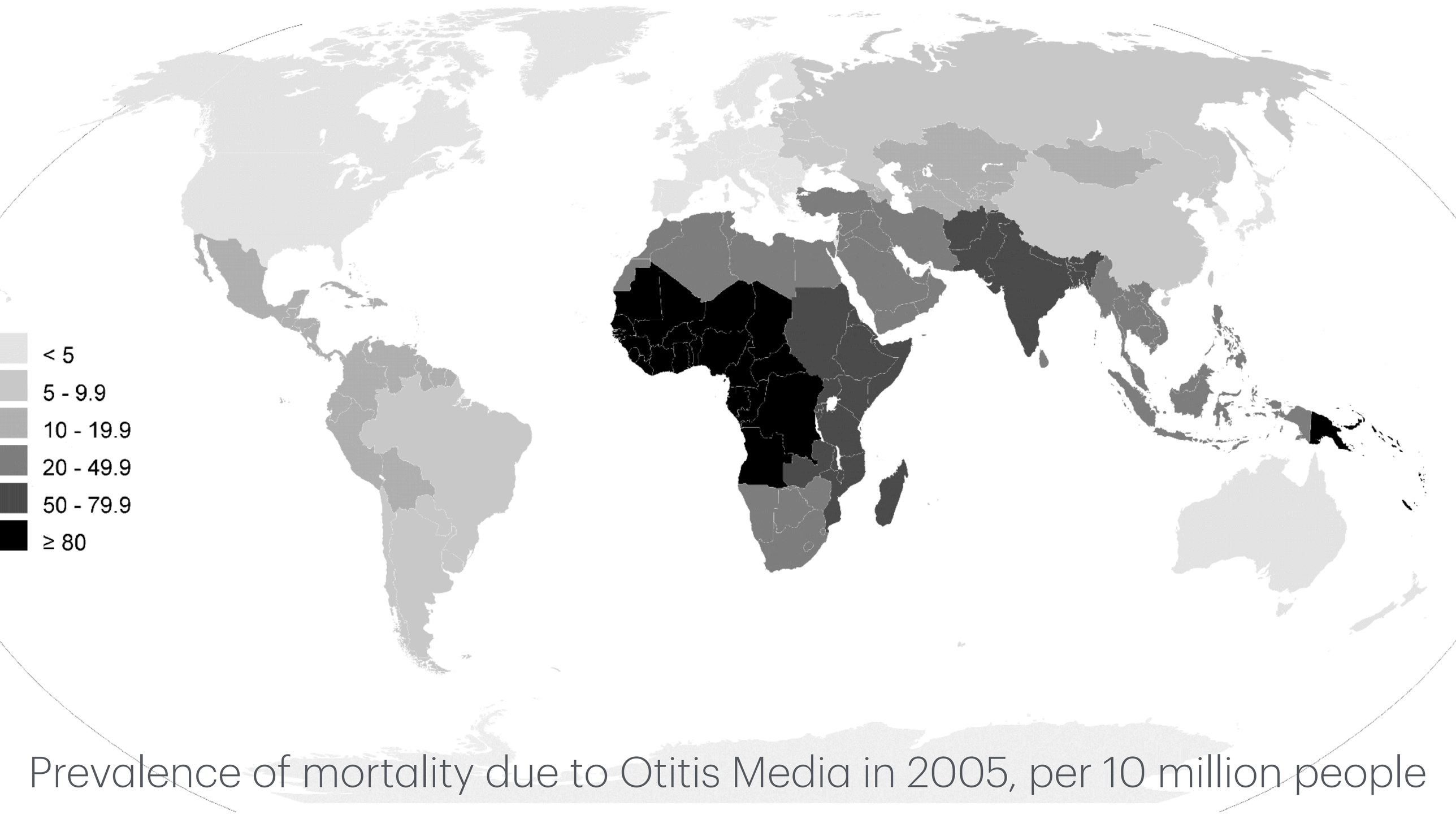
Introduction

Impact of Otitis media

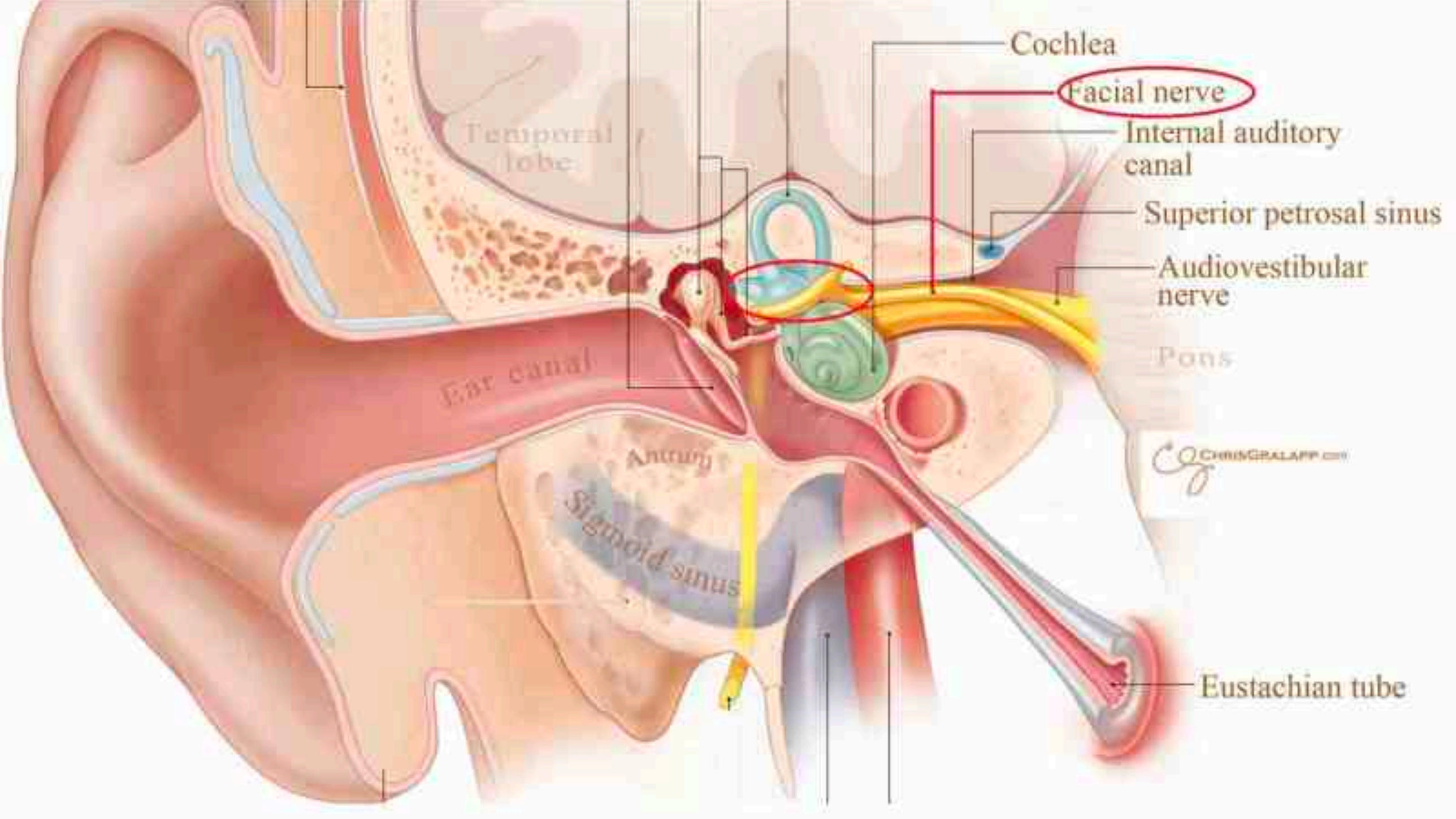
More than just an ear infection

- Most common reason for pediatric visit worldwide
- Most common reason for antibiotic use in children
- Speech and language development
- Missed school days, work days





Prevalence of mortality due to Otitis Media in 2005, per 10 million people


Cochlea
Facial nerve
Internal auditory canal
Superior petrosal sinus
Audiovestibular nerve
Temporal lobe
Pons
Ear canal
Antrum
Sigmoid sinus
Eustachian tube

Acute Otitis Media

AOM

- Rapid onset of signs and symptoms of inflammation in the middle ear ***WITH*** middle ear effusion.
- Signs of inflammation
  - bulging or fullness of the TM
  - erythema of the TM
  - acute perforation of the TM with otorrhea.
  - Symptoms include
    - otalgia, irritability, and fever.

Otitis Media with Effusion

OME

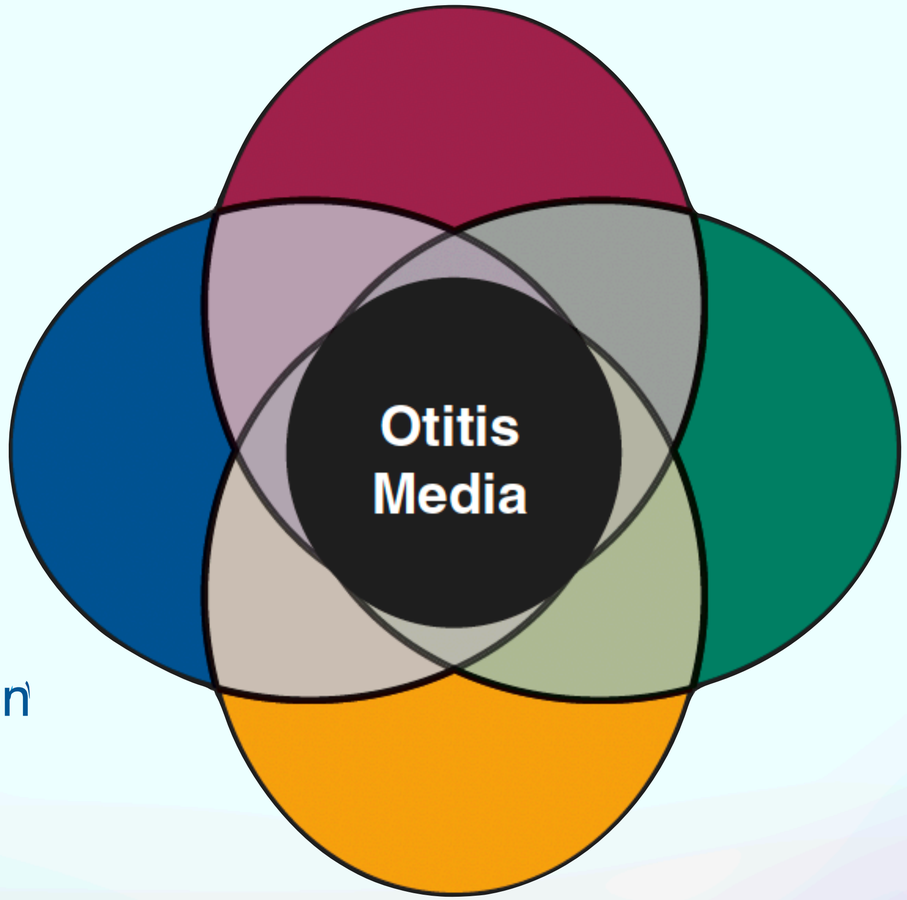
- Middle ear effusion without signs or symptoms of AOM
- Chronic OME (COME)
  - OME that lasts for 3 months

Infections

Viruses, Bacteria

Host Factors

Allergy
Immunology
Gender
Race
Age
Genetic Predisposition

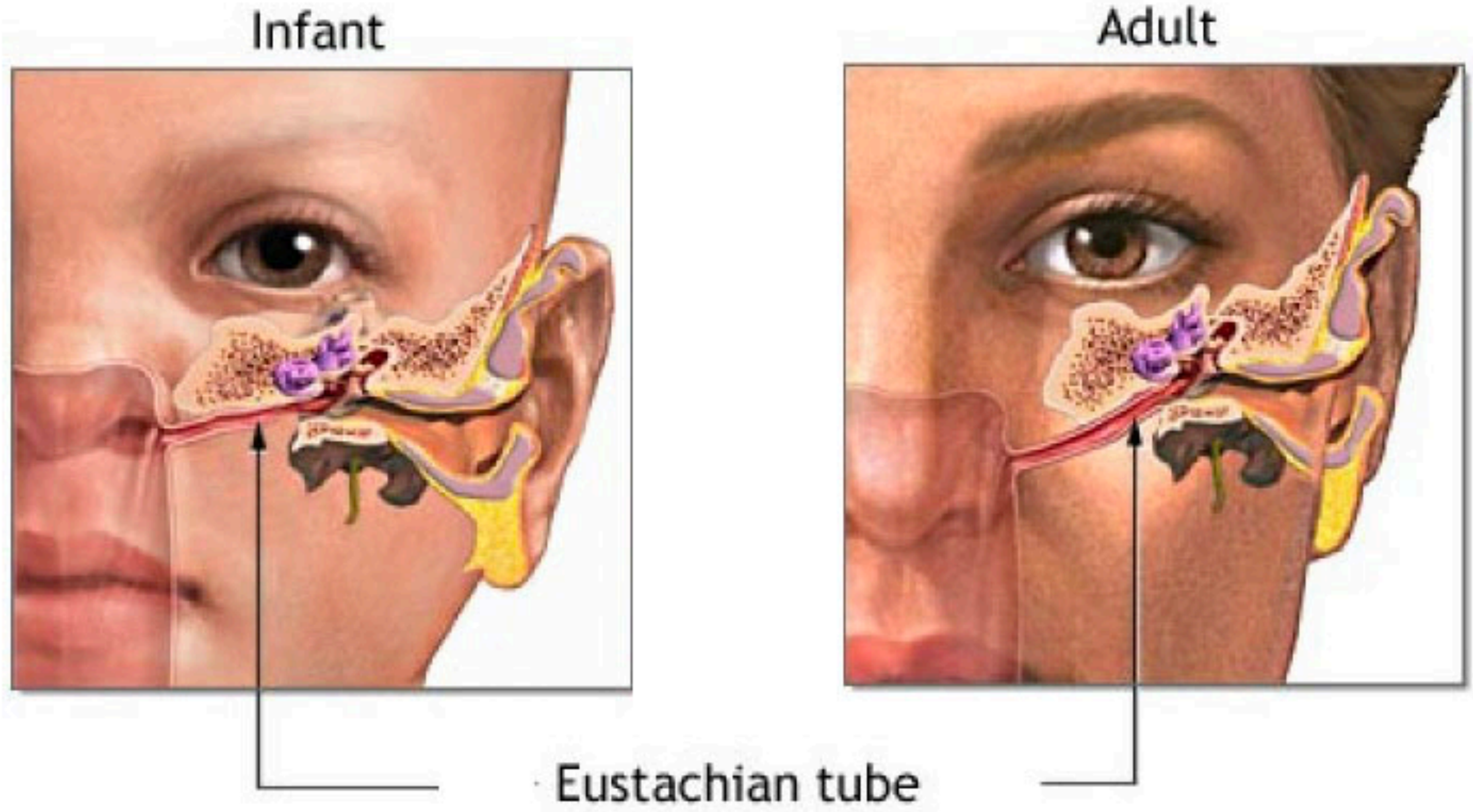


Anatomic/Physiologic Factors

Eustachian Tube
Cleft Palate
Gastroesophageal Reflux

Environmental Factors

Day care
Tobacco smoke exposure
Breast/bottle feeding
Pacifier
Obesity


Infant
Adult
Eustachian tube

Risk Factors for Ear Disease

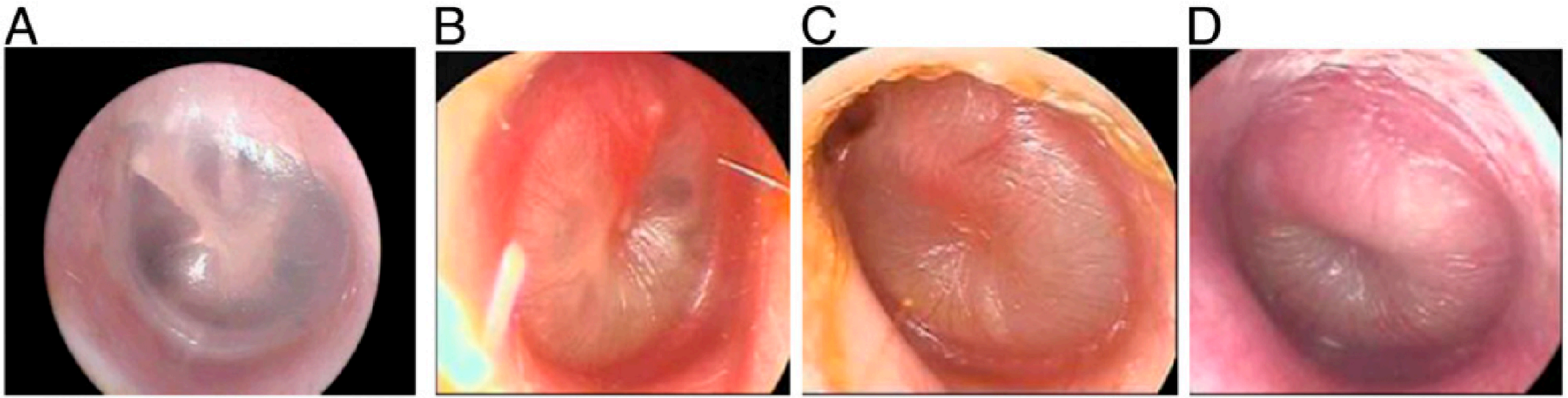
Craniofacial Anomalies

- Down syndrome
- Treacher Collins
- Cleft palate
  - Bifid uvula

Diagnosing AOM on Physical Exam

- Bulging of the TM is the most specific finding for AOM
- Erythema alone, without bulging, without impaired mobility is not sufficient to diagnose AOM

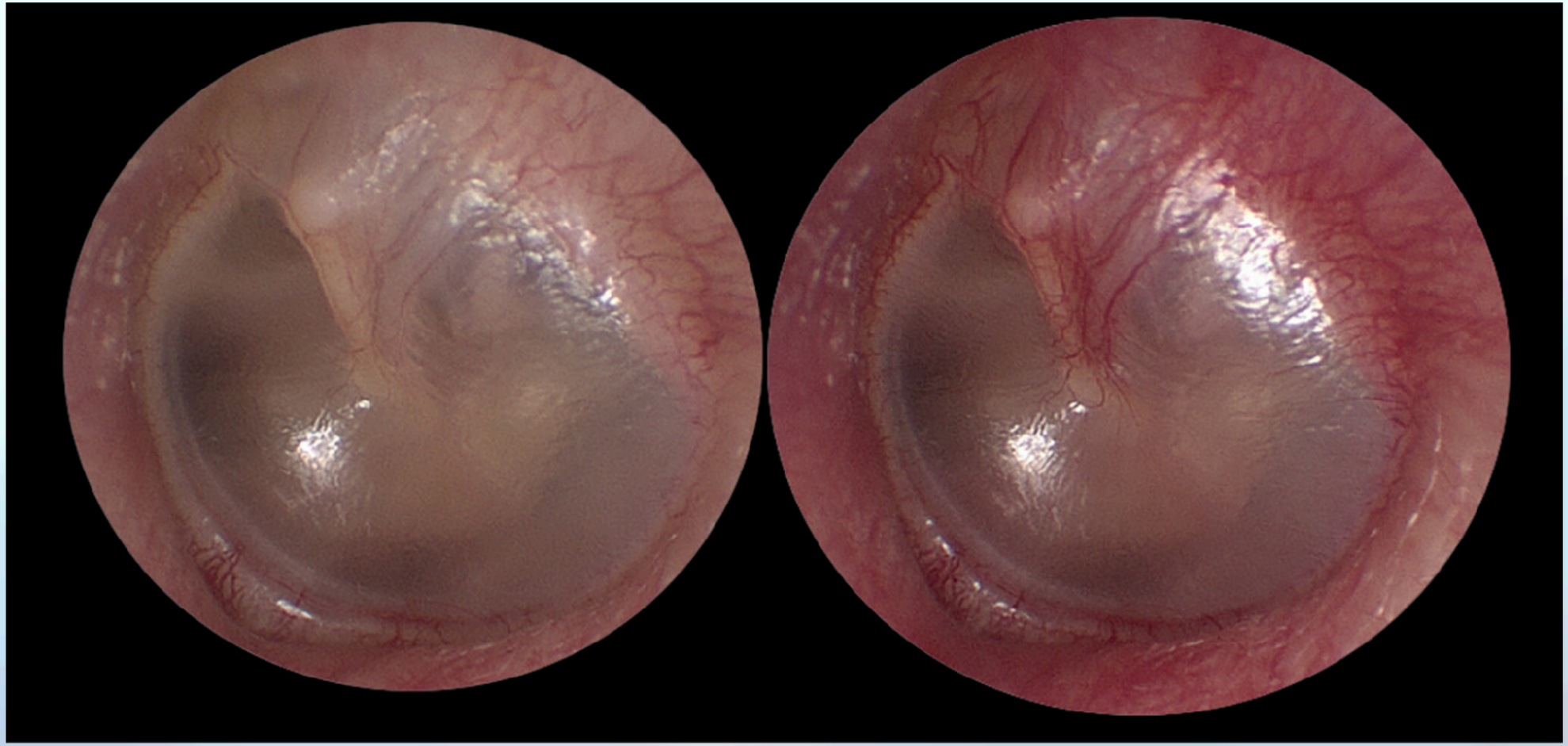
A. Normal TM. B, Mild bulging. C. Moderate bulging. D. Severe bulging.



Photos Courtesy of Alejandro Hoberman, MD.

Beware the crying child

Vascular engorgement occurs during crying, but spares the TM



Pneumatic Otoscopy

Physical Exam

- Impaired mobility seen on pneumatic otoscopy has the highest sensitivity and specificity for diagnosing effusion
- Tips
  - Use the largest speculum that fits
  - Airtight seal must be obtained

Otoscopy Findings

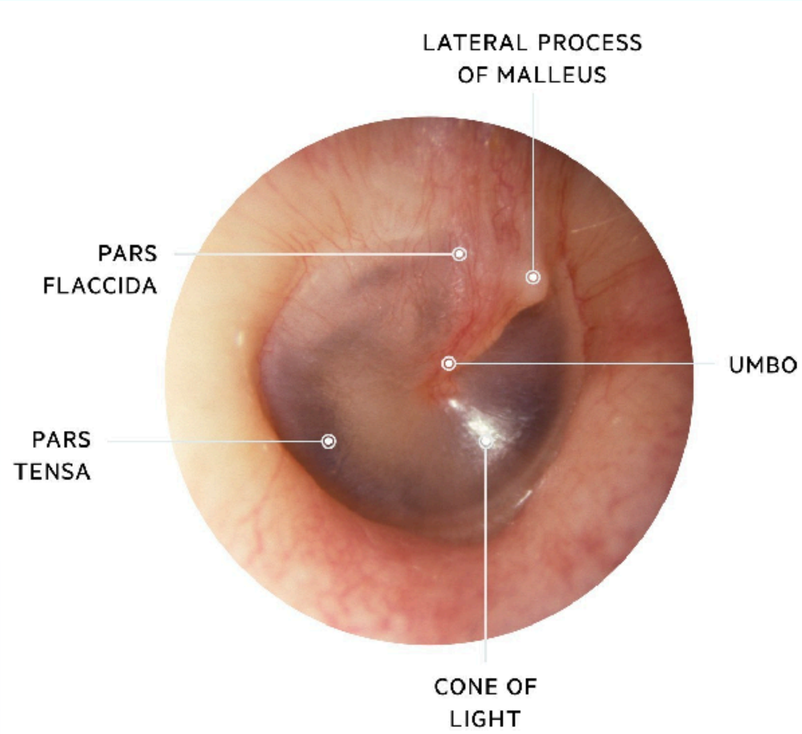
Physical Exam

Condition	Position	Color	Translucency	Mobility
Normal	normal	Pearly grey	clear	Mobile
AOM	Bulging	Red	Opaque	Immoblie
OME	Retracted	Pink, grey, yellow, blue	dull	Reduced
Perforation	Normal/retracted	Grey	clear	Immobile
Tympanosclerosis	Normal	white	opaque	Reduced
Myringitis	Normal/Bulging	red	Opaque, thick	Immobile

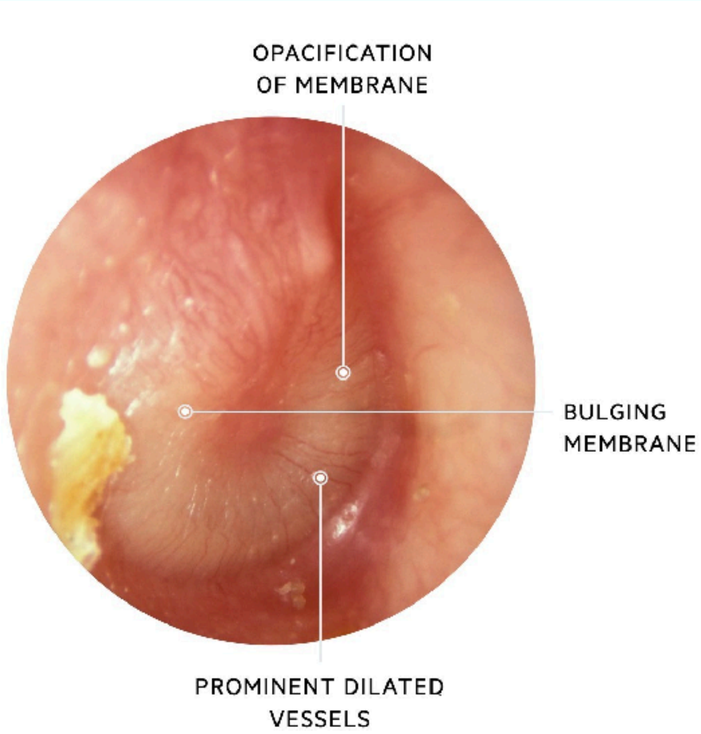
OME versus AOM on Otoscopy

Physical Exam

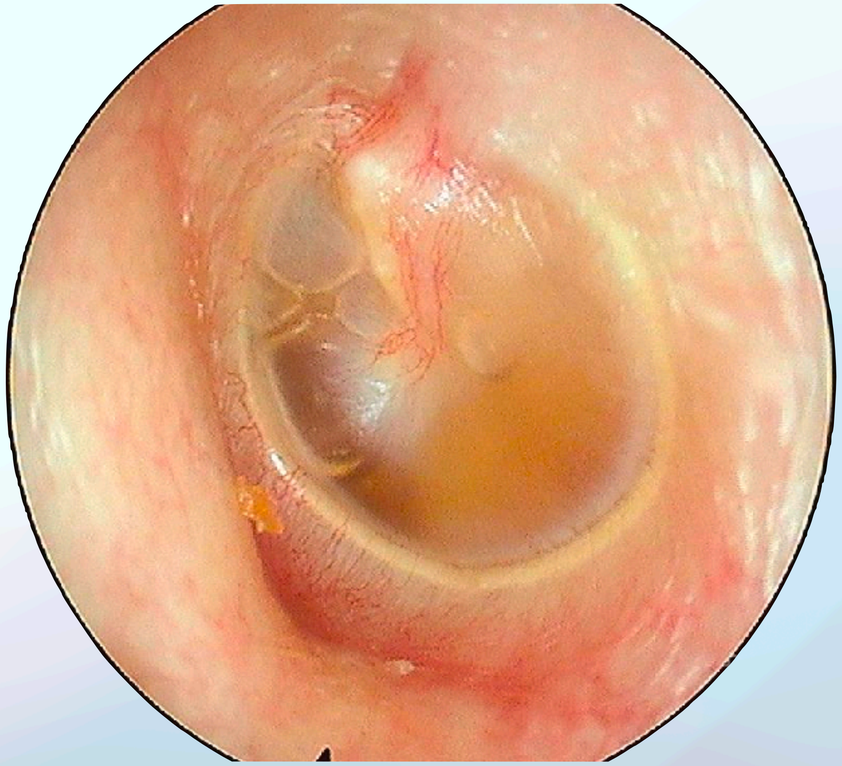
Normal



AOM



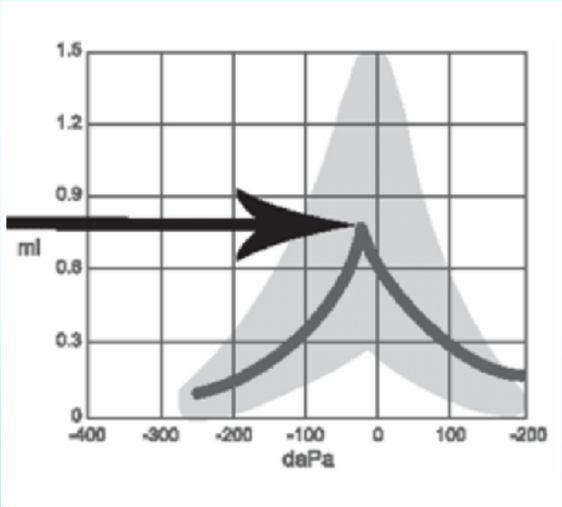
OME



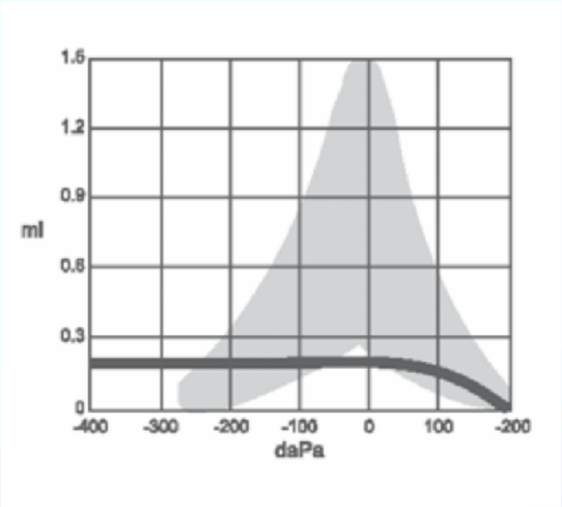
Tympanometry

Most accurate way to diagnose MEE

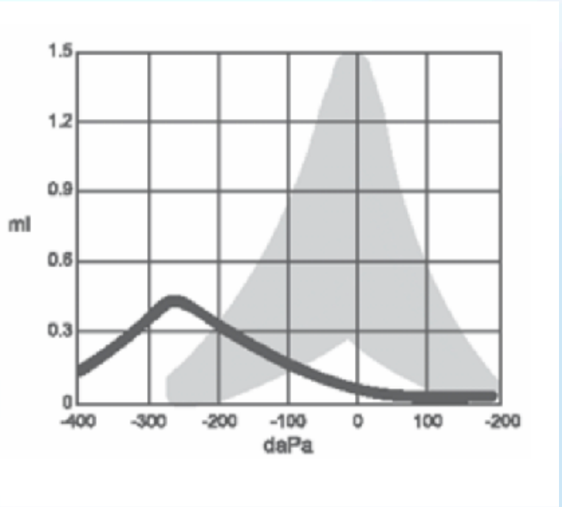
- Measures tympanic membrane compliance, middle ear pressure, and ear canal volume



A: normal TM compliance



B: no TM movement



C: Negative middle ear pressure

Treatment for AOM

Observation appropriate in select cases

- Observation is appropriate for:
  - Children age 6mo-23m with unilateral, *non-severe AOM
  - Children age >24mo Unilateral or bilateral *non-severe AOM
    - *mild otalgia for less than 48 hours, temperature less than 39°C (102.2°F),” and follow-up in case the child worsens or fails to improve within 48 to 72 hours
- 5-7 day course of oral antibiotics is sufficient
  - First line: Amoxicillin 45 mg/kg twice daily
  - Second Line: Amoxil/Clavulonate
  - Penicillin allergy: Cephalosporins such as cefdinir, cefuroxime, cefpodoxime
  - Third Line: Intramuscular Ceftriaxone 50mg

TABLE 5 Recommended Antibiotics for (Initial or Delayed) Treatment and for Patients Who Have Failed Initial Antibiotic Treatment

Initial Immediate or Delayed Antibiotic Treatment		Antibiotic Treatment After 48–72 h of Failure of Initial Antibiotic Treatment	
Recommended First-line Treatment	Alternative Treatment (if Penicillin Allergy)	Recommended First-line Treatment	Alternative Treatment
Amoxicillin (80–90 mg/ kg per day in 2 divided doses)	Cefdinir (14 mg/kg per day in 1 or 2 doses)	Amoxicillin-clavulanate[a] (90 mg/kg per day of amoxicillin, with 6.4 mg/kg per day of clavulanate in 2 divided doses)	Ceftriaxone, 3 d Clindamycin (30–40 mg/kg per day in 3 divided doses), with or without third-generation cephalosporin
or	Cefuroxime (30 mg/kg per day in 2 divided doses)	or	Failure of second antibiotic
Amoxicillin-clavulanate[a] (90 mg/kg per day of amoxicillin, with 6.4 mg/kg per day of clavulanate [amoxicillin to clavulanate ratio, 14:1] in 2 divided doses)	Cefpodoxime (10 mg/kg per day in 2 divided doses)	Ceftriaxone (50 mg IM or IV for 3 d)	Clindamycin (30–40 mg/kg per day in 3 divided doses) plus third-generation cephalosporin
	Ceftriaxone (50 mg IM or IV per day for 1 or 3 d)		Tympanocentesis[b]
			Consult specialist[b]

IM, intramuscular; IV, intravenous.

[a] May be considered in patients who have received amoxicillin in the previous 30 d or who have the otitis-conjunctivitis syndrome.

[b] Perform tympanocentesis/drainage if skilled in the procedure, or seek a consultation from an otolaryngologist for tympanocentesis/drainage. If the tympanocentesis reveals multidrug-resistant bacteria, seek an infectious disease specialist consultation.

[c] Cefdinir, cefuroxime, cefpodoxime, and ceftriaxone are highly unlikely to be associated with cross-reactivity with penicillin allergy on the basis of their distinct chemical structures. See text for more information.

Treatment for AOM

Antihistamines, steroids not useful

- Recommended against
  - Antihistamines
  - Steroids
  - Tympanocentesis
  - Prophylactic antibiotics

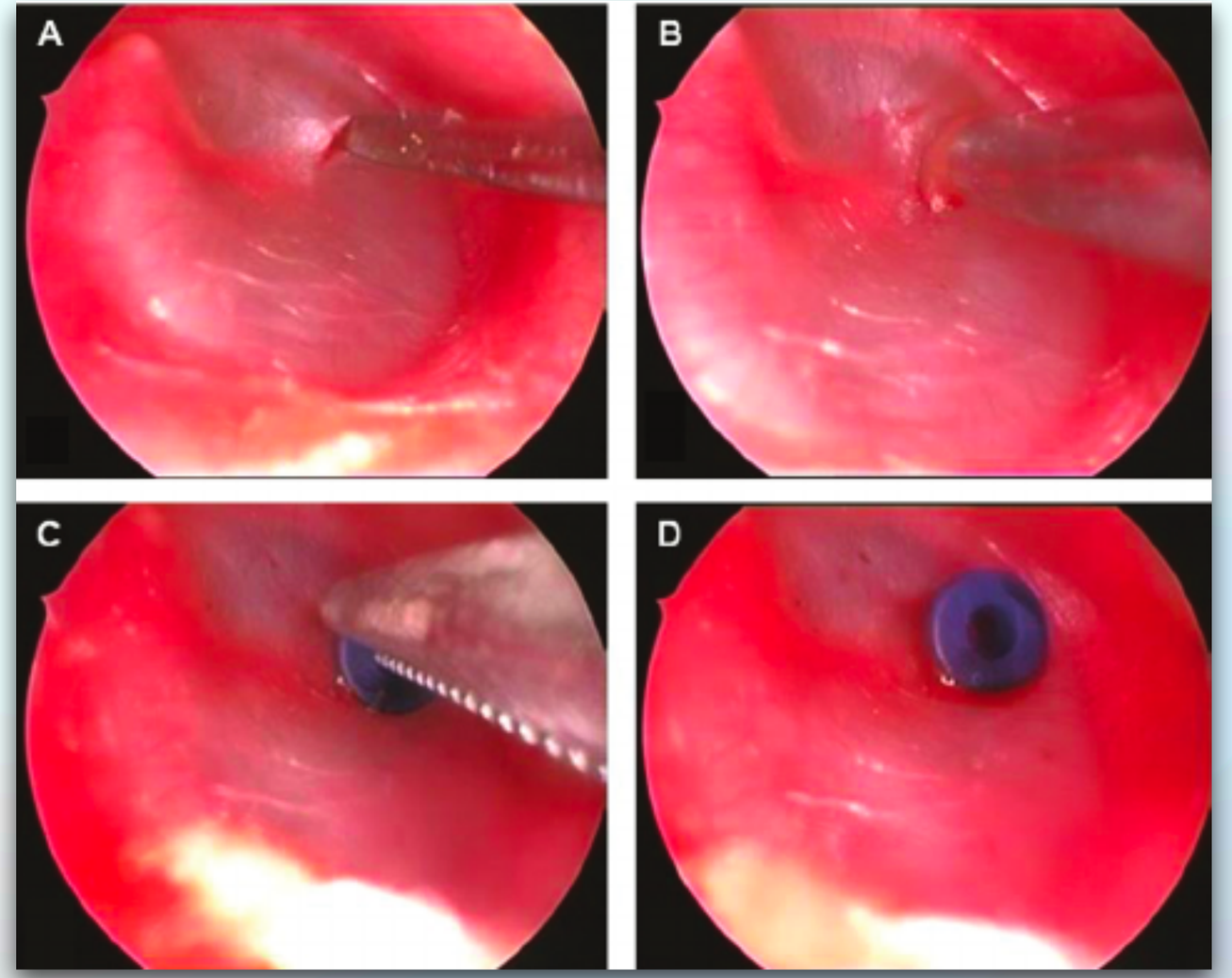
Follow Up after AOM

- 60-70% of children will have Middle Ear Effusion (MEE) after treatment for AOM at 2 weeks
- 40% of children will have Middle Ear Effusion (MEE) after treatment for AOM at 1 month
- Children with developmental delays, speech delays, or known hearing loss should be followed until resolution of MEE
- MEE for >3 months should prompt referral for myringotomy and pressure equalization tube placement

Indications for Myringotomy with Tube Placement

Surgical Treatment for rAOM/COME

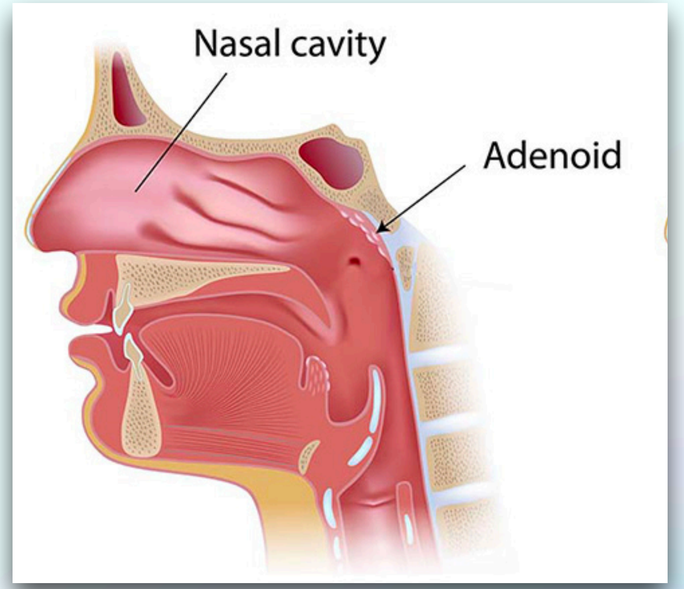
- Three or more episodes of AOM in 6 months or four or more episodes in 12 months
- COME (>3 months)
  - Especially with risk for speech delay
- Complications of AOM
  - Ossicular erosion
  - Coalescent Mastoiditis
- TM retraction, atelectasis

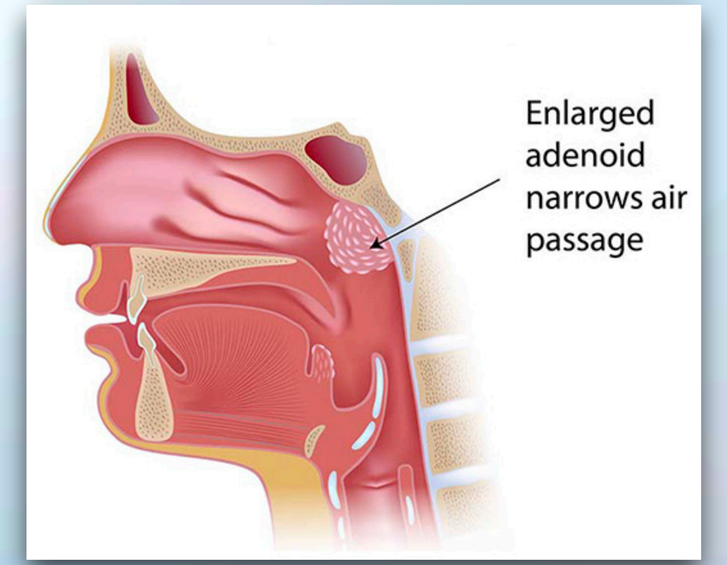


Indications for Adenoidectomy

For treatment of rAOM/COME

- Children over 4 who qualify for myringotomy with tube placement
  - Most children have outgrown recurrent AOM by this age
- Children requiring more than one set of tympanostomy tubes
  - 90% of children only need one set of tubes.
- Concurrent nasal obstruction, chronic adenoiditis





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Tonsillectomy in Children

A Changing Paradigm

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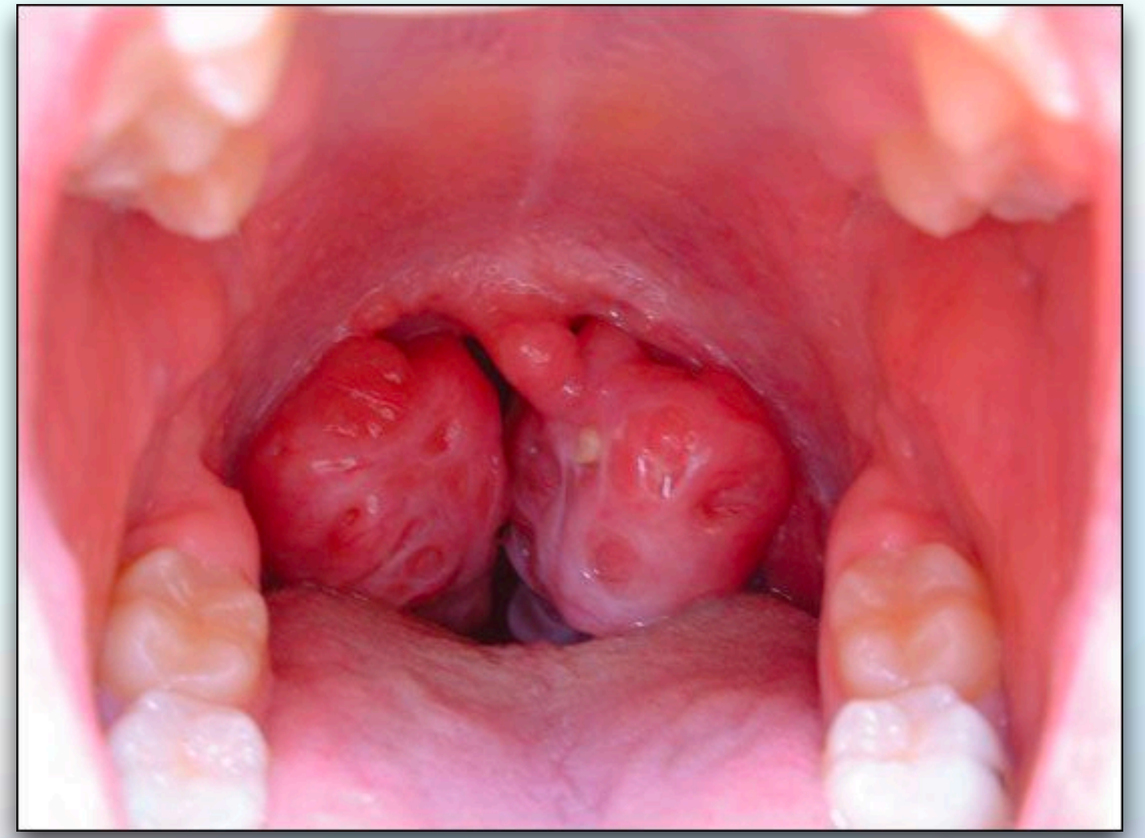
Tonsillectomy in Children

Presentation Outline

- Indications for Surgery
  - Tonsillitis
  - Obstructive Sleep Disordered Breathing
  - PFAPA (periodic fever, aphthous stomatitis, pharyngitis, and adenitis)
  - Peritonsillar abscess
- Perioperative Work Up
- Surgical Technique
  - Intracapsular versus Extracapsular
- Post-operative Care



Recurrent Streptococcal Tonsillitis

Indications for Surgery

- Viral versus Bacterial Infections: Centor Criteria
  - Score of 3 or higher determines need for antibiotics
- Paradise Criteria
  - 7 infections in 1 year, 5 infections per year for 2 years, 3 infections per year for 3 years

CENTOR SCORE (Modified/McIsaac)

use in age ≥3y, with recent onset (3d) of sore throat

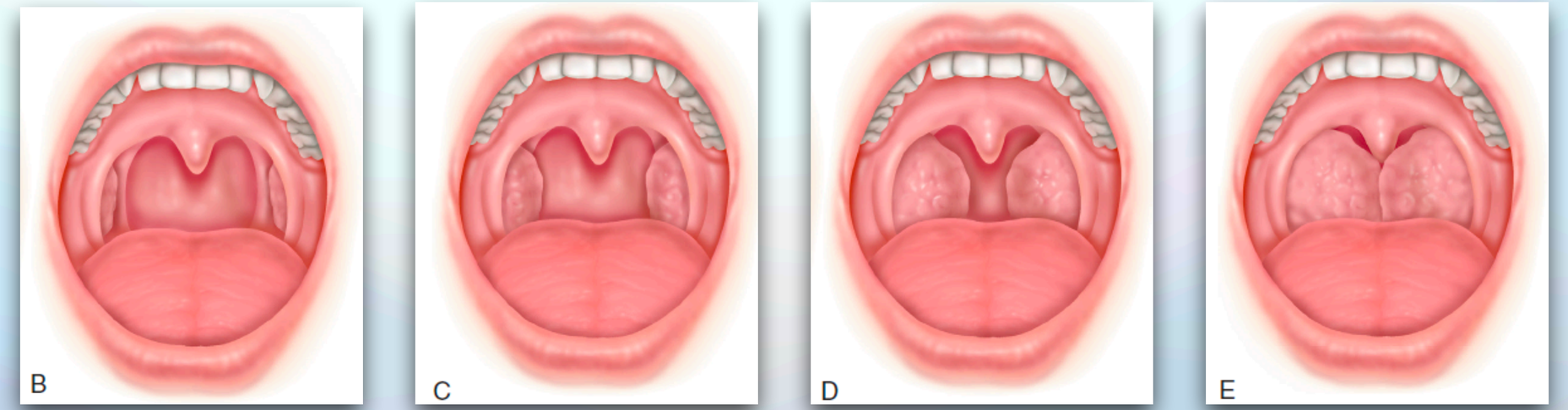
	Score
Fever	1
Tonsillar swelling or exudate	1
Absent cough	1
Tender/swollen anterior cervical lymph nodes	1
Age 3-14 years	1
Age 15-44 years	0
Age ≥45 years	-1

Total score	Risk of Strep Infection	Need for antibiotics? (see page 2 for treatment details)
0	1-2.5%	No antibiotics
1	5-10%	
2	11-17%	
3	28-35%	Immediate antibiotics if severe symptoms or, if less severe, consider a delayed prescription or arrange review in 48h
≥4	51-53%	

Adenotonsillar Hypertrophy

Indications for Adenotonsillectomy

- Brodsky Tonsil Grading Scale
- Subjective grading correlates well with actual volume
- Children with recurrent tonsillitis or oSDB have significantly larger tonsils



Obstructive Sleep Disordered Breathing

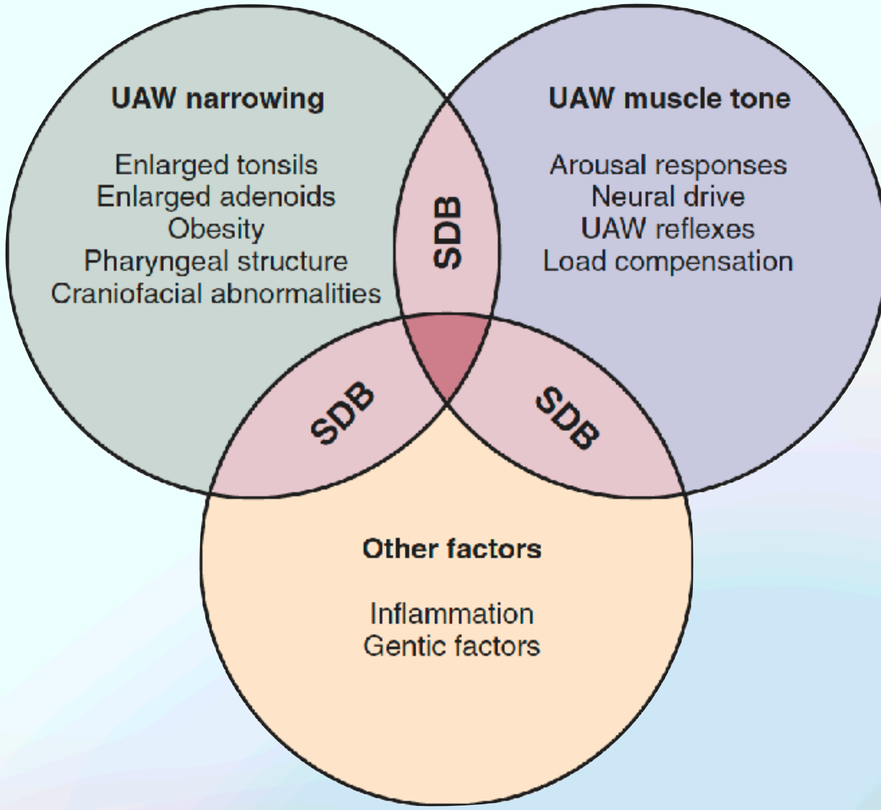
oSDB incidence, risk factors

- Affects approximately 2-4% of the children
  - 10% of children have primary snoring
- Incidence peaks between 2-6 years of age
- Risk Factors
  - Male
  - Obesity
  - Prematurity
  - Asthma
  - Craniofacial Syndromes
- Nocturnal Sleep Study is gold standard, although less than 10% of American children undergo testing
- Spectrum of upper airway resistance

Box 5-2. PREDISPOSING CONDITIONS FOR SLEEP-DISORDERED BREATHING

Obesity
Down syndrome
Craniofacial syndromes
- Craniosynostoses (Apert, Crouzon, Pfeiffer, and Saethre-Chotzen syndromes)
- Pierre Robin sequence
- Stickler syndrome
- CHARGE syndrome
- Mandibulofacial dysostosis (Treacher Collins syndrome)
- Craniofacial microsomia (hemifacial microsomia, Goldenhar syndrome, first and and second branchial arch syndrome)
- Hallerman-Streiff syndrome

Mucopolysaccaridoses
Achondroplasia
Neuromuscular disease
Cerebral palsy
Beckwith-Weideman syndrome
Klippel-Feil syndrome
Prader-Willi syndrome
Arnold-Chiari malformation
Sickle cell disease
Post pharyngoplasty patients



Symptoms of Obstructive Sleep Apnea

- Mouth breathing
- Hyponasality
- Nasal obstruction
- Chronic rhinorrhea
- Dysphagia
- Behaviour difficulties
- Anxiety, depression
- Poor school performance
- Daytime tiredness

- Poor growth or failure to thrive
- Pulmonary hypertension/cor pulmonale/ ventricular dysfunction
- Systemic hypertension

- Apneic pauses
- Snorting
- Gasping
- Restless sleep
- Frequent arousals
- Hyperextended neck
- Unusual sleeping positions (sitting, fetal position)
- Diaphoresis
- Enuresis
- Other parasomnias

PFAPA

Periodic fever, Aphthous stomatitis, Pharyngitis, and Adenitis

- Auto-inflammatory disease of cytokine dysfunction
- Fevers last from 3-7 days
- Symptoms recur every 3-8 weeks
- Steroids effectively treat symptoms
- Tonsillectomy eliminates condition in 80% of patients

Peritonsillar Abscess

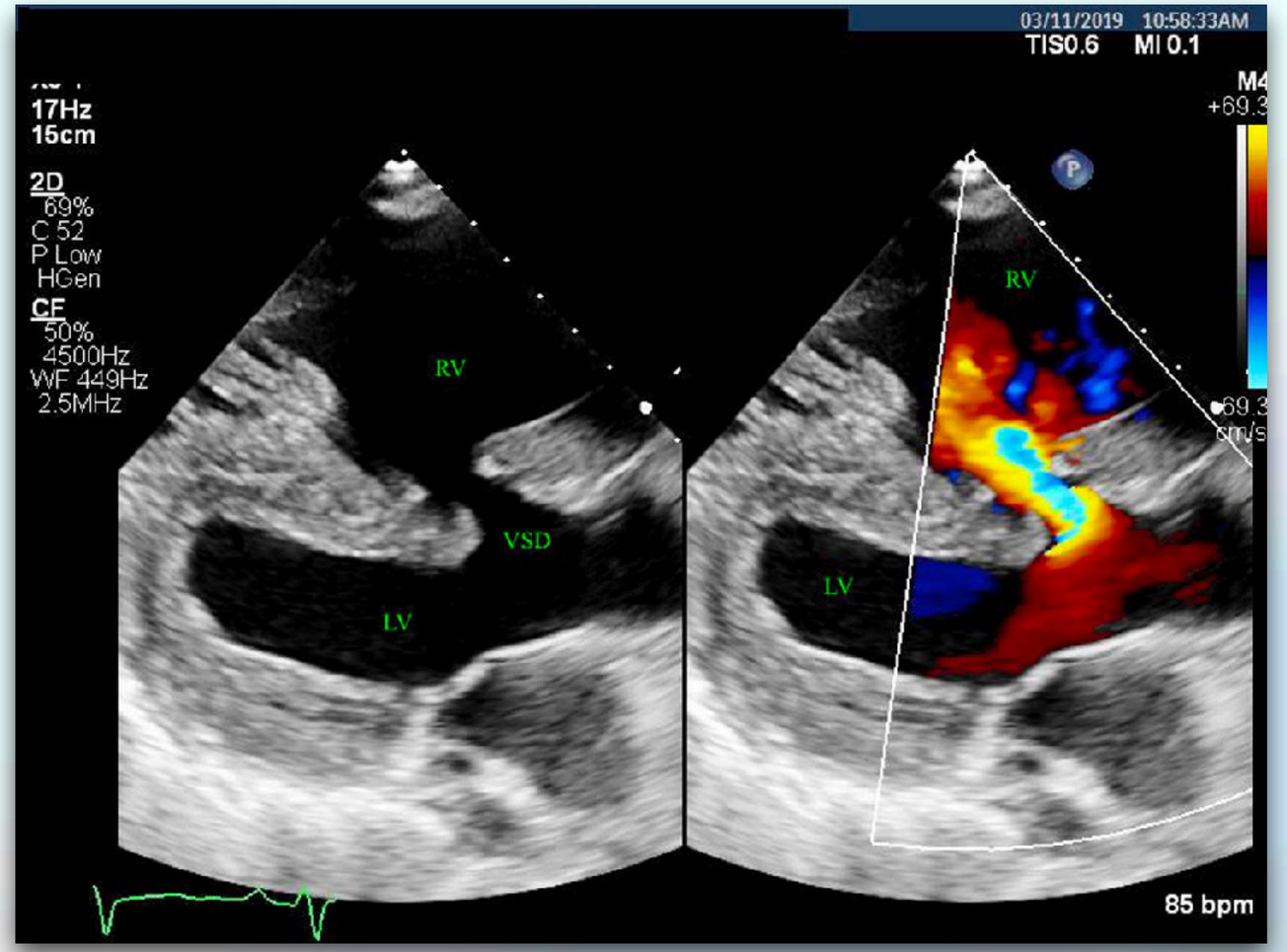
Indications for tonsillectomy

- Intratonsillar bacterial infection migrates to the peritonsillar space
- Requires incision and drainage
  - Can be performed at bedside
- Two or more occurrences is indication for tonsillectomy

Perioperative Evaluation

For Adenotonsillectomy

- History of bleeding disorders
- No routine lab work indicated
- Syndromic children need cardiac evaluation
- Severe sleep apnea
- Nutritional counseling



Post-Operative Management

After Adenotonsillectomy

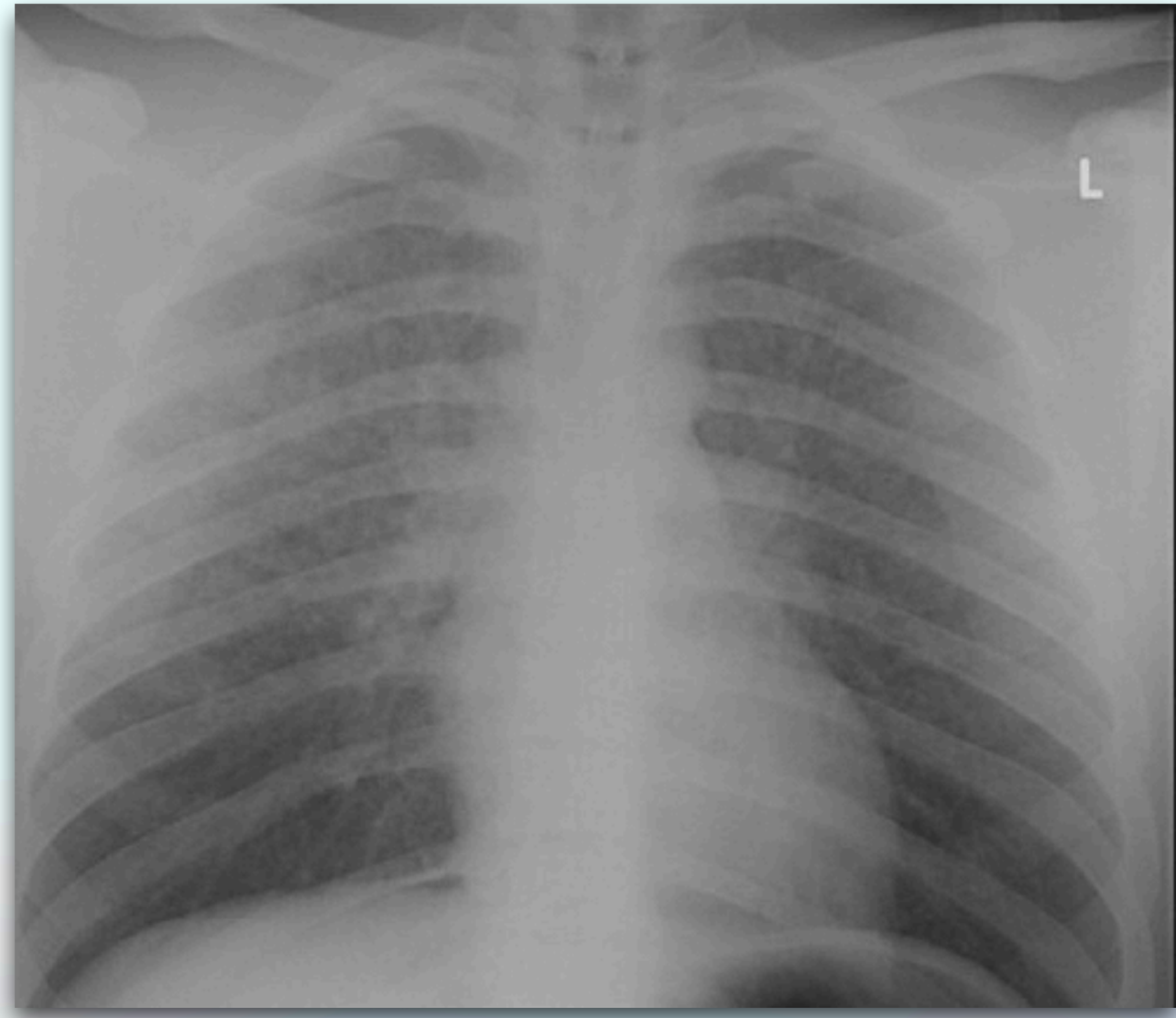
- Admission criteria
  - Age less than 3
  - Severe OSA (AHI>10)
  - Morbid Obesity
  - Pulmonary Hypertension
  - Cardiac abnormalities
  - Craniofacial Syndromes

- Pain management
  - Paracetamol 15mg/kg QID
  - Ibuprofen 10mg/kg QID
  - Avoid narcotics, codeine

Postoperative Pulmonary Edema

Complications of tonsillectomy

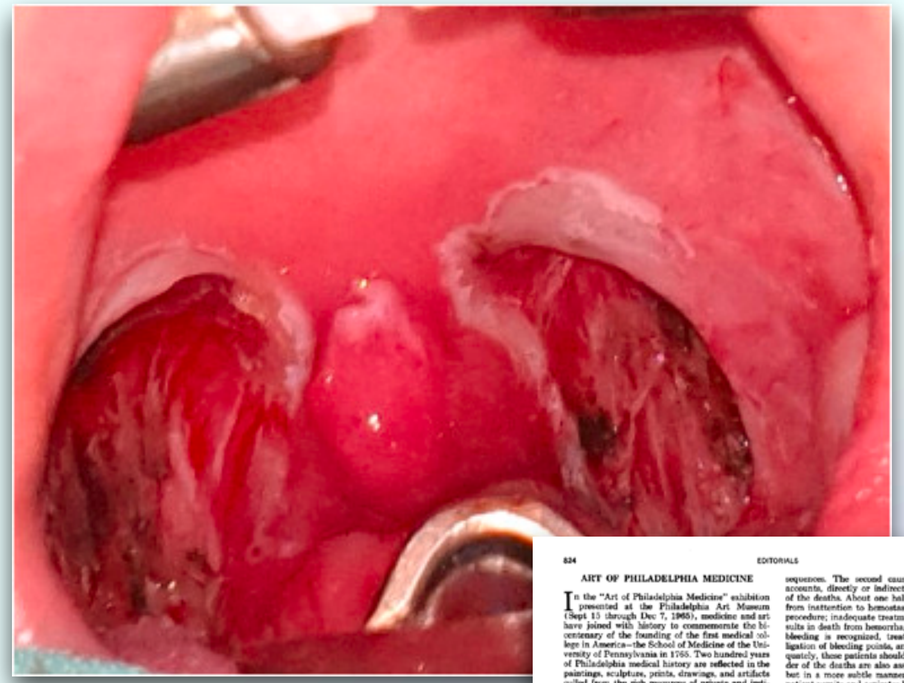
- Relief of chronic obstruction leads to pulmonary fluid shifts
- Pink frothy secretions fill the trachea 1-6 hours after surgery
- Treatment:
  - oxygen therapy
  - possible mechanical respiratory support with positive end-expiratory pressure
  - restriction of intravenous fluids
  - diuretics
  - possibly steroids.
- Risk factors
  - Severe sleep apnea



Postoperative Hemorrhage

Complications of tonsillectomy

- Primary versus secondary hemorrhage
- Hemorrhage rate of 2-5% in literature
- Hemorrhage rate increases for recurrent tonsillitis, and with age
- Mortality rate rate was 1:2,000 in the 1940s, decreased to 1:10,00 by 1965, and today in the US is 1:14,000
- 44% of deaths from tonsillectomy are in medically complex children
  - 2.8% of surgeries are for medically complex children



824 EDITORIALS

ART OF PHILADELPHIA MEDICINE

In the "Art of Philadelphia Medicine" exhibition presented at the Philadelphia Art Museum (Sept 15 through Dec 7, 1965), medicine and art have joined with history to commemorate the bicentenary of the founding of the first medical college in America—the School of Medicine of the University of Pennsylvania in 1765. Two hundred years of Philadelphia medical history are reflected in the paintings, sculpture, prints, drawings, and artifacts culled from the rich resources of private and institutional collections locally and abroad. Great medical names and institutions of Philadelphia are brought to life in vivid depiction by noted artists of their time, such as Gilbert Stuart, Charles Wilson Peale, Thomas Eakens, and the first prominent sculptor in America, William Rush. Early medical instruments, apothecary jars, and anatomical drawings and models—reminders of humble beginnings—add a homey touch and enhance the sense of history.

No stranger to art nor to history, as its weekly "cover story" bears colorful testimony, THE JOURNAL is pleased with the esthetic approach to historic commemoration chosen by the Philadelphia Museum of Art. In congratulating the latter, THE JOURNAL wishes to make mention of Dr. Whitfield J. Bell who initially suggested the idea for the exhibition, of six pharmaceutical firms which contributed toward its realization—McNeil Laboratories, Inc.; Merck, Sharp & Dohme, the National Drug Company; William H. Rorer, Inc.; Smith, Kline & French Laboratories; and Wyeth Laboratories—and of the many others in the fields of art, administration, and medicine who rendered valuable assistance. Their worthwhile efforts bode well for the continuing rapport between medicine and the visual arts in the tradition of Leonardo and the great painters of centuries to follow.

TONSILLECTOMY MORTALITY

Deaths secondary to tonsillectomies are of prime concern to physicians because this procedure is performed frequently. Each year approximately 10 million operating-room procedures are performed in the United States, of which 16% are tonsillectomies. Recent figures indicate that tonsillectomy mortality is about 1:10,000 in urban centers and is probably greater if the entire country is considered.[1] Approximately 100 persons, most of them young adults or children, die each year from the procedure, generally at elective surgery.

Virtually all deaths from tonsillectomies result from two preventable causes. The first, inadequate oxygenation during the surgical procedure, results in cardiac arrest; about one third of the deaths occur in this manner. An adequate airway is essential for proper oxygenation. This can be maintained with or without an endotracheal tube but cannot be compromised at any time without serious consequences. The second cause is bleeding which accounts, directly or indirectly, for the remainder of the deaths. About one half of the deaths result from inattention to hemostasis during the surgical procedure; inadequate treatment of hemorrhage results in death from hemorrhagic shock. If excessive bleeding is recognized, treated aggressively with ligation of bleeding points, and blood replaced adequately, those patients should survive. The remainder of the deaths are also associated with bleeding but in a more subtle manner, occurring when the patient vomits and aspirates blood with subsequent airway obstruction and inadequate ventilation. The tonsillectomy patient is unique in that he has not only had a general anesthetic but also has a greater tendency to vomit and aspirate than the routine surgical patient.

Previous reports[2] indicate that prior to World War II the mortality for tonsillectomies was about 1:2000; the subsequent improvement is encouraging. Better anesthetic techniques and familiarity with closed-chest resuscitation has saved many lives. Newer anesthetic agents such as halothane allow rapid recovery from the anesthesia and cause less postoperative nausea and vomiting. Blood banks are available in most areas and "walking blood banks" are available virtually everywhere. Recovery rooms which were rare ten years ago are more prevalent. These measures have markedly lessened operative mortality and provide tools which, if enthusiastically used, may nearly eradicate the possibility of death from tonsillectomy.

1. Alexander, D.W., et al: Factors in Tonsillectomy Mortality, Arch Surg 82:403-412, Mar 1961.
2. Cavanaugh, G.O.: Hemorrhage and Medication Following 20,000 Tonsil and Adenoidectomies, Laryngoscope 66:647-656 (May) 1956.

WILLING ONE'S BODY

There is an increasing demand for human bodies, to be dissected by medical students learning anatomy. New medical schools are created, old ones increase the size of classes, and all schools try to reduce the ratio of students per cadaver. Also, the paramedical professions, such as nursing, physiotherapy, and occupational therapy, are using more and more bodies for dissection. And the supply diminishes.

During the 19th century, many states passed anatomy laws providing that unclaimed bodies should go to medical schools. However, these laws no longer supply a satisfactory number of cadavers for dissection, simply because there are fewer unclaimed bodies.

Nothing can replace the human body in the teaching of anatomy. And no discipline is more fundamental to the education of a physician. What, then, can be done to ensure an adequate supply of subjects for dissection? Voluntary donation is a potential solution. There are legal complications which have not yet been completely resolved, problems related to the fact that the common law does not recognize a dead body as property which can

Surgical Technique

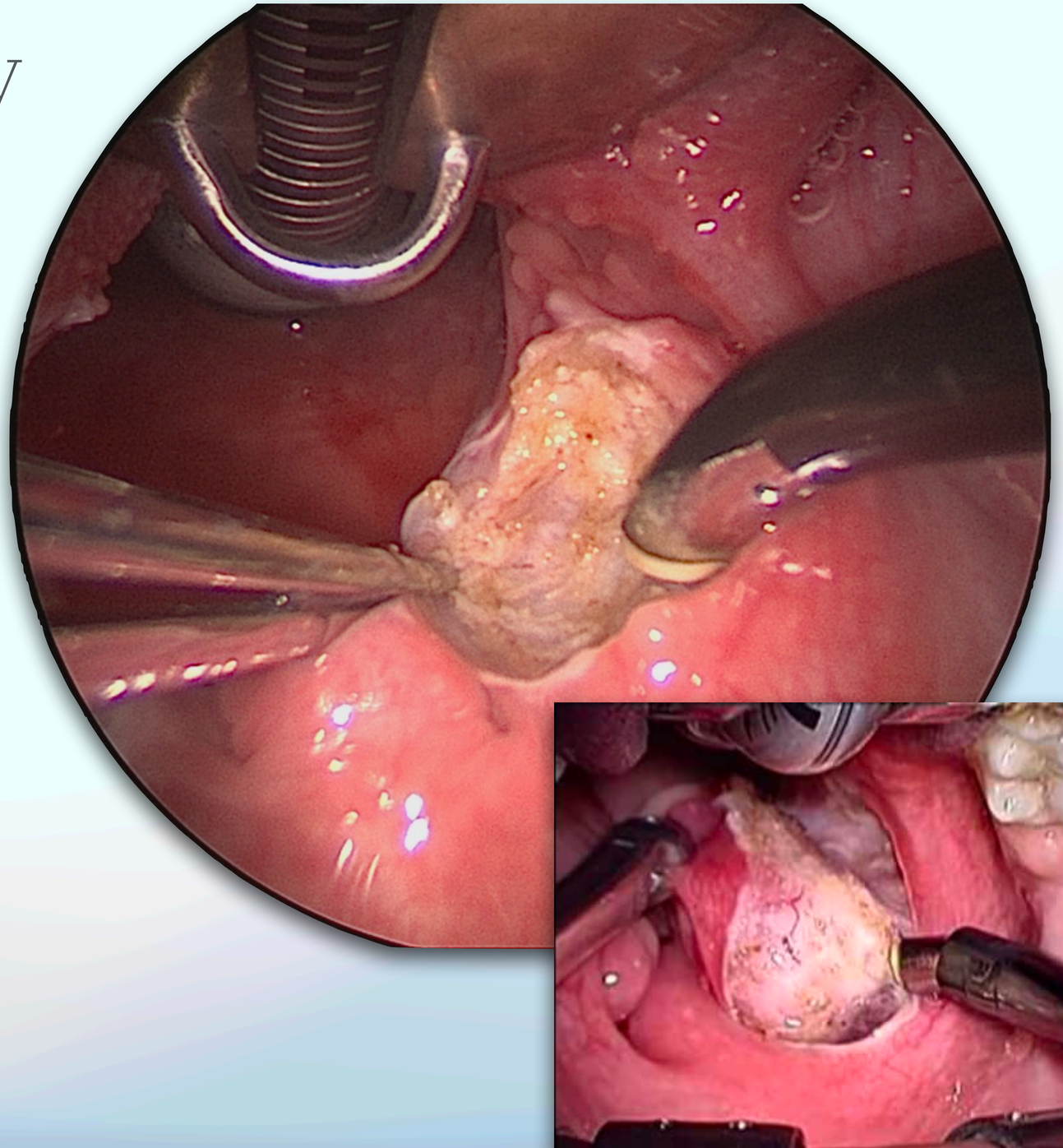
Intracapsular versus Extracapsular

- Traditional tonsillectomy is extracapsular
- Benefits of intracapsular technique
  - Less pain
  - Decreased postoperative bleeding risk
- Drawbacks
  - Increased chance of tonsil regrowth requiring repeat surgery

Intracapsular Tonsillectomy

Surgical Technique

- Pharyngeal constrictor muscles have:
  - More pain nerve fibers
  - Larger diameter blood vessels
- Small amount of tonsil tissue remains over the pharyngeal constrictor muscles
- Rate of tonsil regrowth around 2.5% with IT compared to 0% with ET

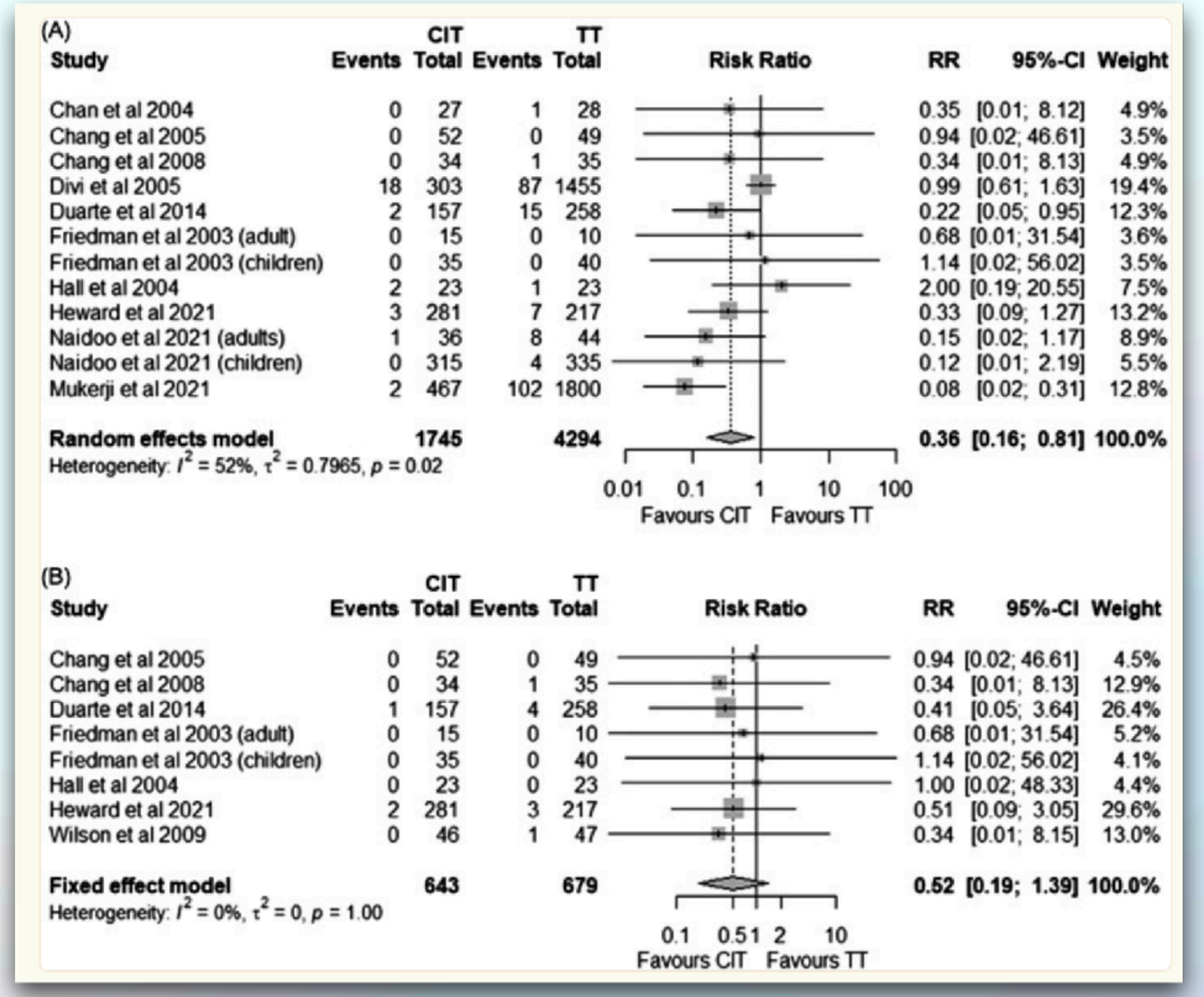


Intracapsular Tonsillectomy

Safer, effective, and quicker recovery

- Removal of 90+% of tonsil, without exposure of the pharyngeal constrictor muscles
  - Time to pain free shorter by 4.2 days (95% confidence interval [CI] 1.5-5.9; p < .0001),
  - Time on analgesia shorter by 4.1 days (95% CI 2.7-5.4; p < .0001)
  - Time to normal diet shorter by 3.5 days (95% CI 1.7-5.4; p = .0002)
  - Time to normal activity shorter by 2.8 days (95% CI 1.6-4; p < .0001) days
- Approximately a 2% revision rate for tonsil regrowth

Bleeding events with Intracapsular and Total Tonsillectomy



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The Chronic Ear

A neglected tropical disease worth our consideration

3rd SCOEASTA Scientific Conference
Friday, October 20th, 2023

Bryce Noblitt, MD - ENT Consultant - AIC-Kijabe Hospital

AIC Kijabe Hospital
Health Care to God's Glory

The Chronic Ear

Presentation Outline

Incidence

Normal Ear Physiology

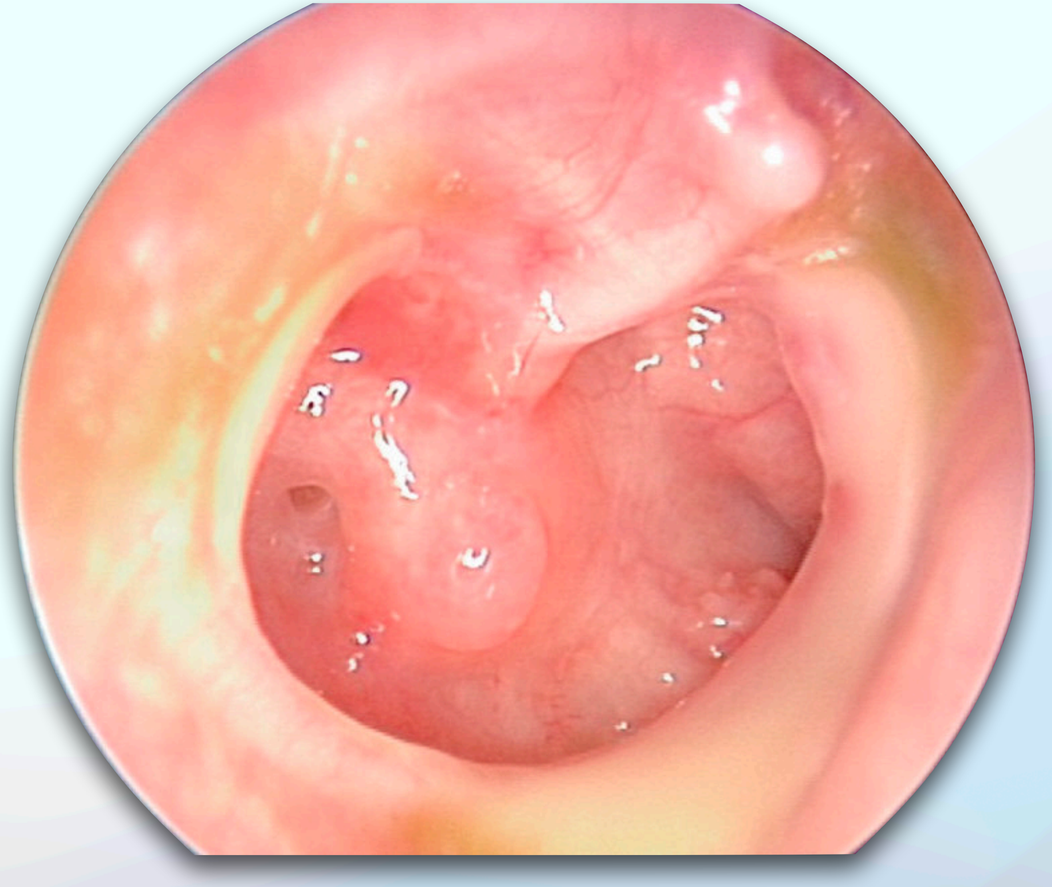
Eustachian Tube Dysfunction

Chronic Otitis Media with Effusion

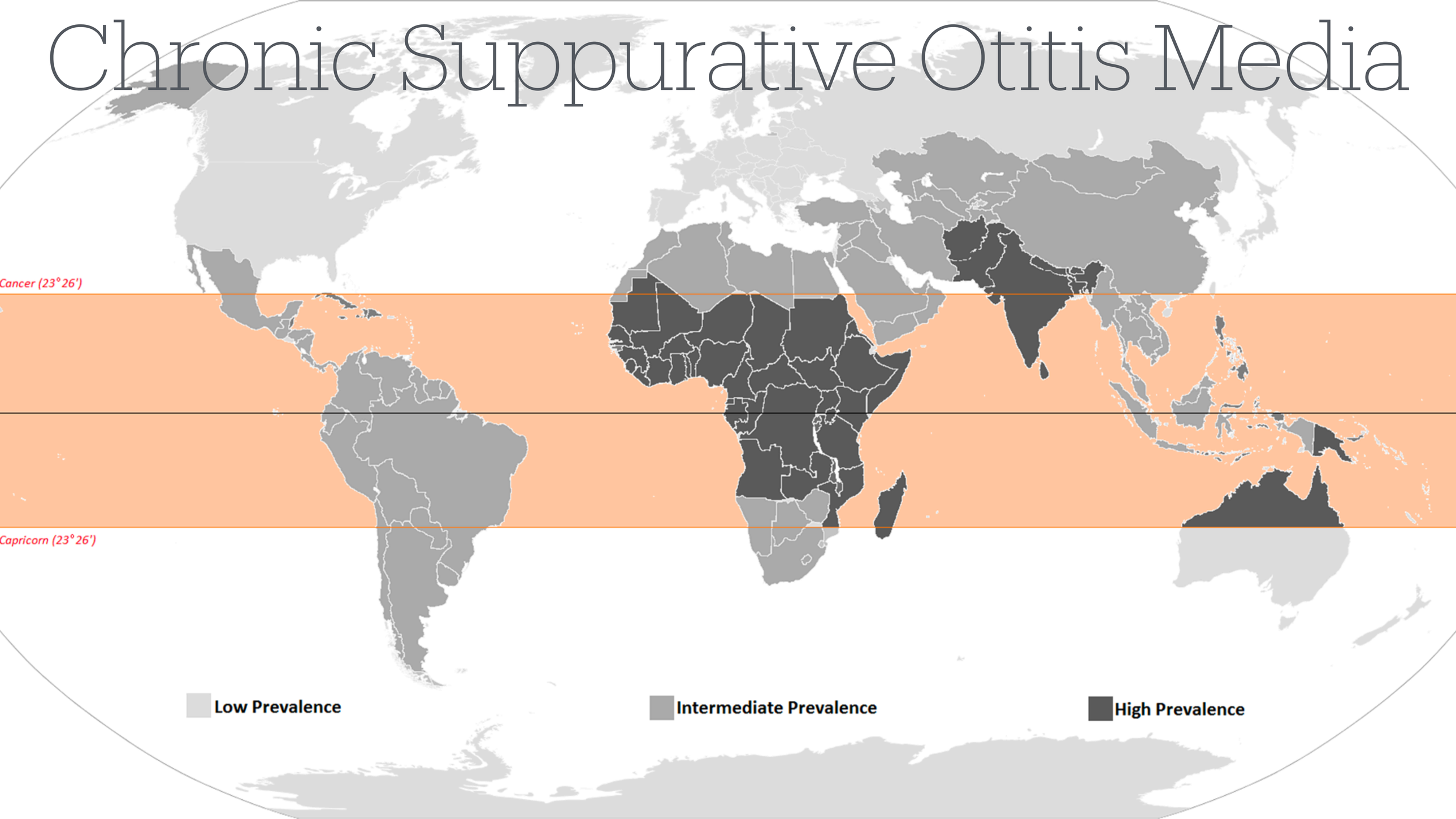
Chronic Suppurative Otitis Media

Cholesteatoma

Medical Treatment



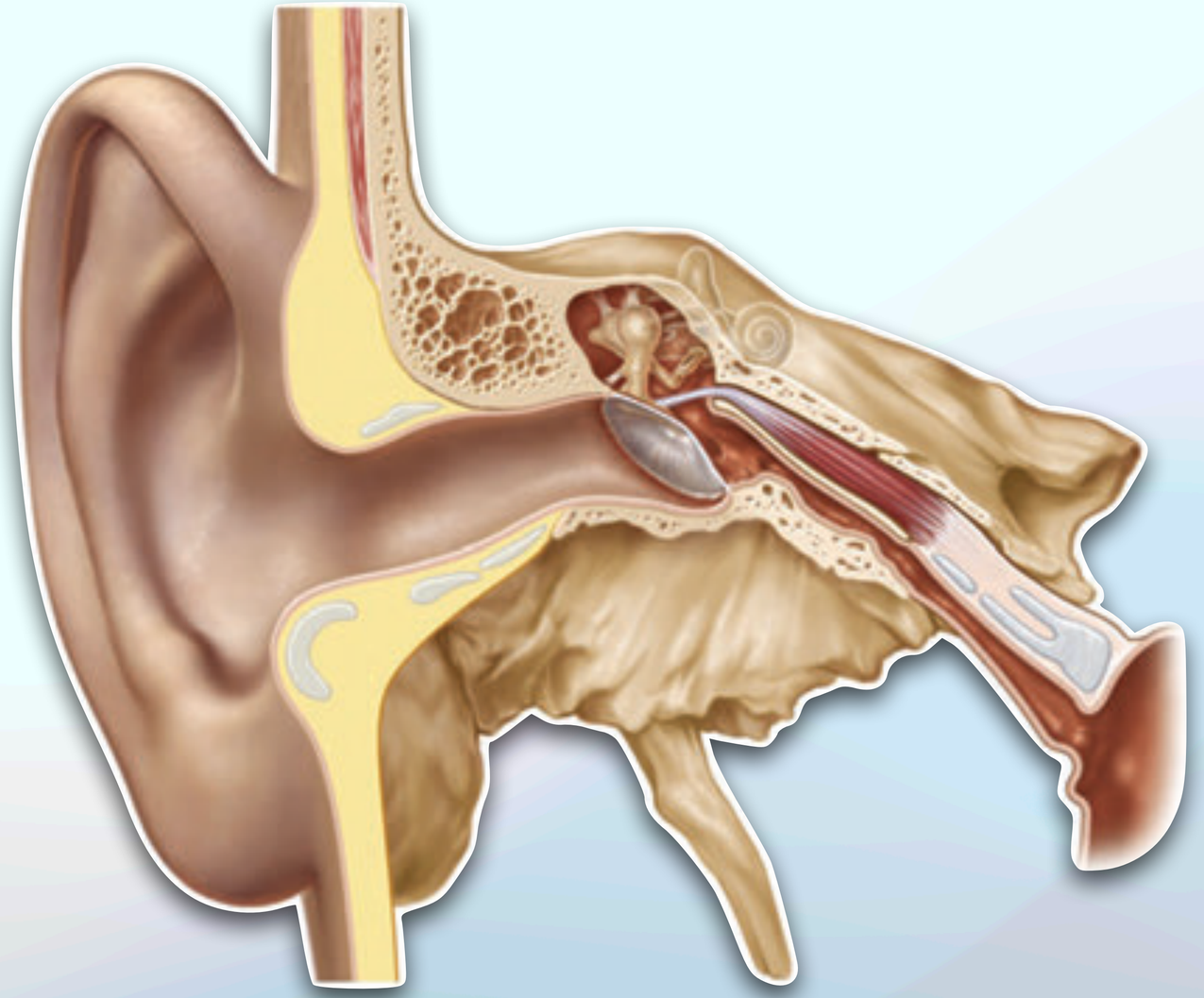
Chronic Suppurative Otitis Media



Normal Middle Ear Physiology

Ventilation is the key

- Gas diffusion through middle ear mucosa and blood vessels
- Eustachian tube ventilation
- Mucosal folds create ventilation pathways through the middle ear and mastoid
- Regulation of middle ear pressure relative to atmospheric pressure



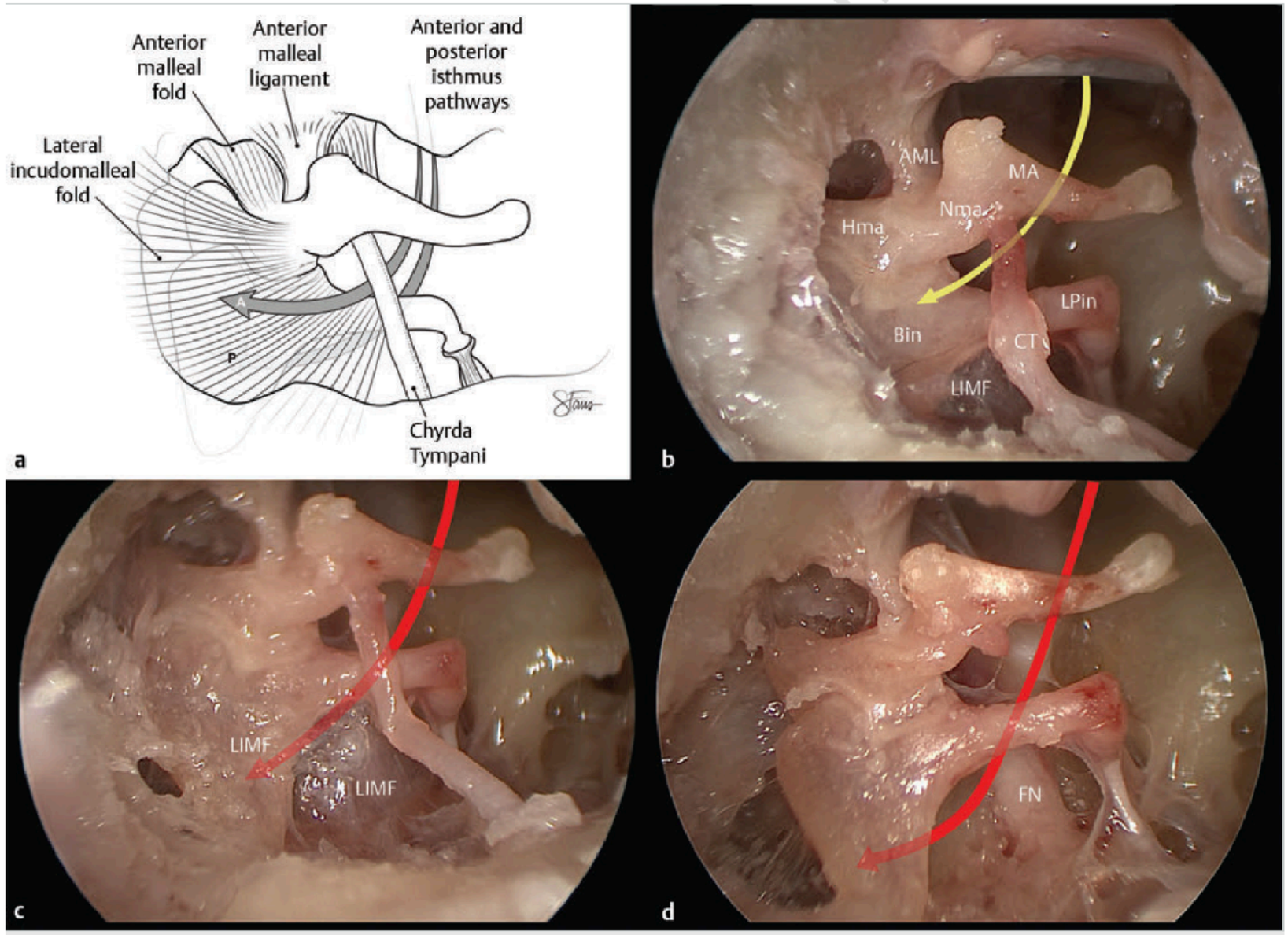


Fig. 7.7 Ventilation pathways. (a) Schematic view of the anterior (arrow A) and posterior (arrow P) isthmuses. (b) The anterior isthmus (yellow arrow), moves air from the Eustachian tube, under the malleus (MA), over the incus and lateral incudomalleal fold (LIMF) to ventilate the lateral posterior epitympanum. (c) The posterior isthmus (red arrow) moves air from the Eustachian tube, medial to the malleus, the LIMF and the incus to ventilate the mastoid, the posterior and anterior epitympanum. (d) Endoscopic photograph of the posterior isthmus after the LIMF has been resected. AML, anterior malleolal ligament; Nma, neck of the malleus; Hma, head of the malleus; Bin, body of the incus; CT, chorda tympani; LPin, lateral process of the incus; FN, facial nerve.

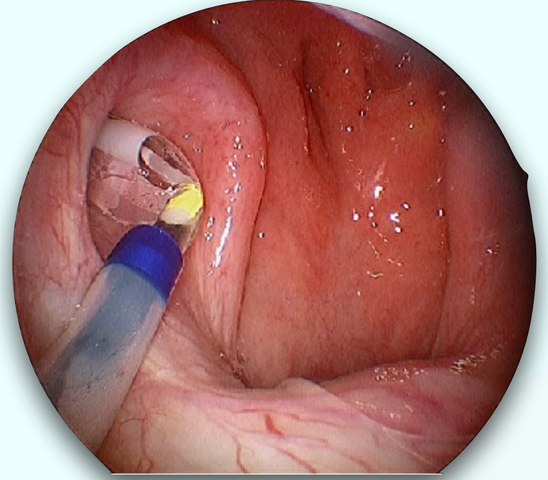
Classification of Chronic Ear Disease

Timing, Tympanic Membrane Status, Hearing Status

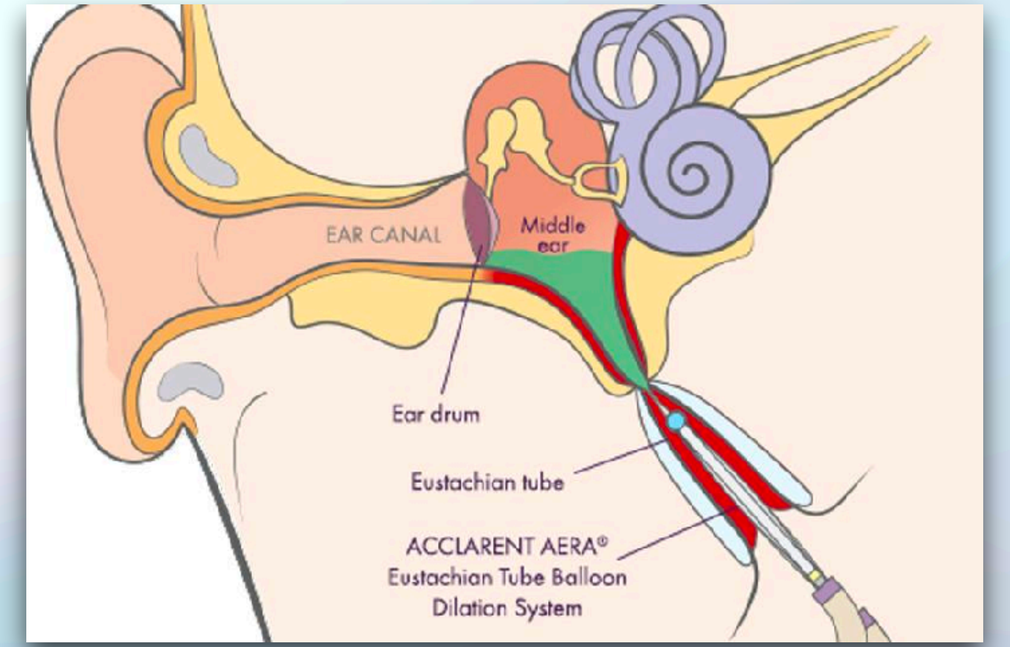
- Intact Tympanic Membrane
  - Eustachian Tube Dysfunction (ETD)
  - Chronic Otitis media with Effusion (COME)
- Abnormal Tympanic Membrane
  - Retraction pockets
  - Atelectasis
- Tympanic Membrane Perforation
  - Chronic (Suppurative) Otitis Media (CSOM)
  - Cholesteatoma
    - Congenital
    - Acquired

Eustachian Tube Dysfunction

Obstructive, Patulous, and Mixed



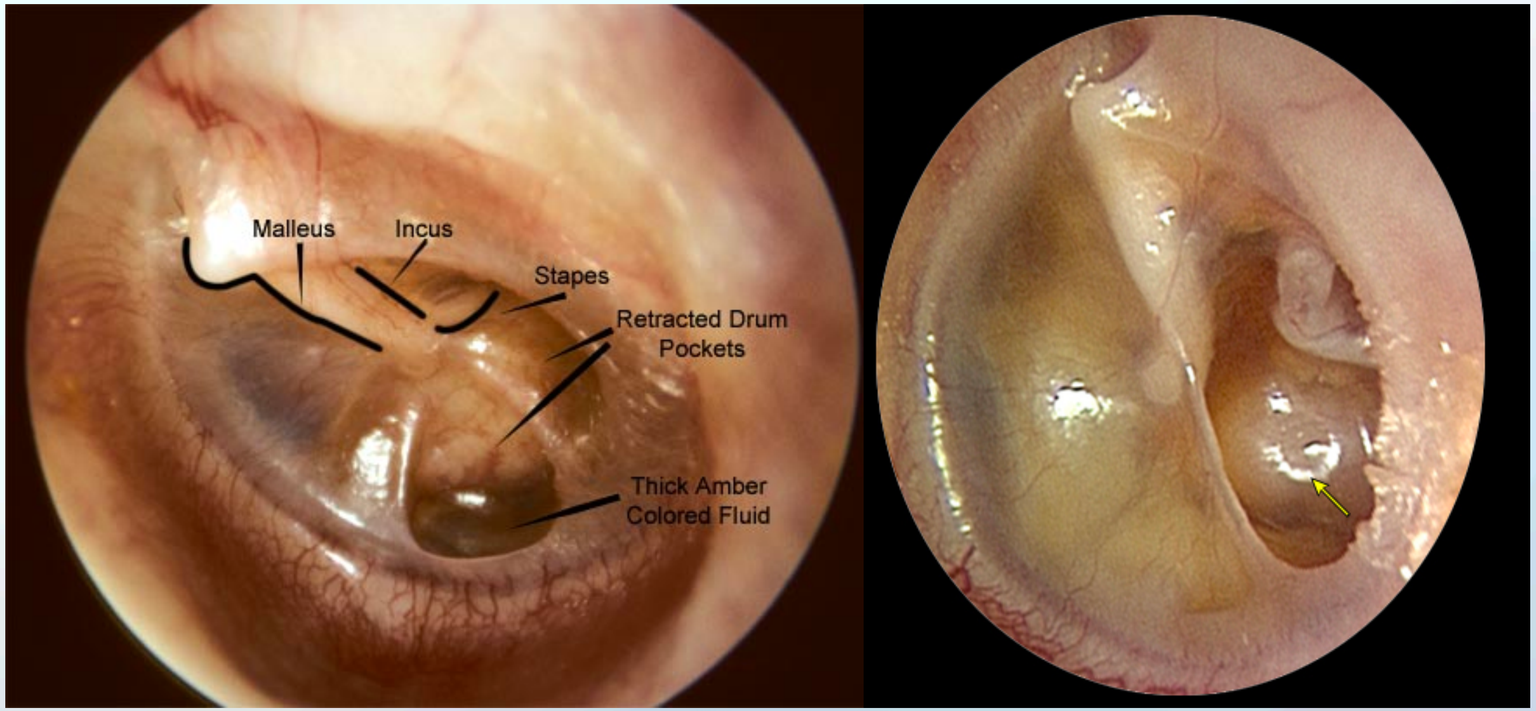
- Obstructive Eustachian Tube Dysfunction
  - Causes: mucosal inflammation within the cartilaginous Eustachian tube,
  - Risk factors: allergic rhinitis, chronic rhinosinusitis, laryngopharyngeal reflux (LPR), and smoke exposure.
  - Symptoms: Aural fullness, impaired pressure equalization
  - Treatment: nasal steroids, balloon dilation, PET
- Patulous Eustachian Tube Dysfunction
  - Symptoms: Autophony, aural fullness
  - Risk factors: weight loss, medications, Multiple sclerosis
  - Treatment: Estrogen drops, pillar injections, fat grafting



Chronic Otitis Media with Effusion

Chronic Ear Disease

- Presents with hearing loss, aural fullness
- Serous versus mucoid fluid
- Treatment
  - Observation
  - Myringotomy with tube placement
  - ET balloon dilation



Retraction Pockets and Atelectasis

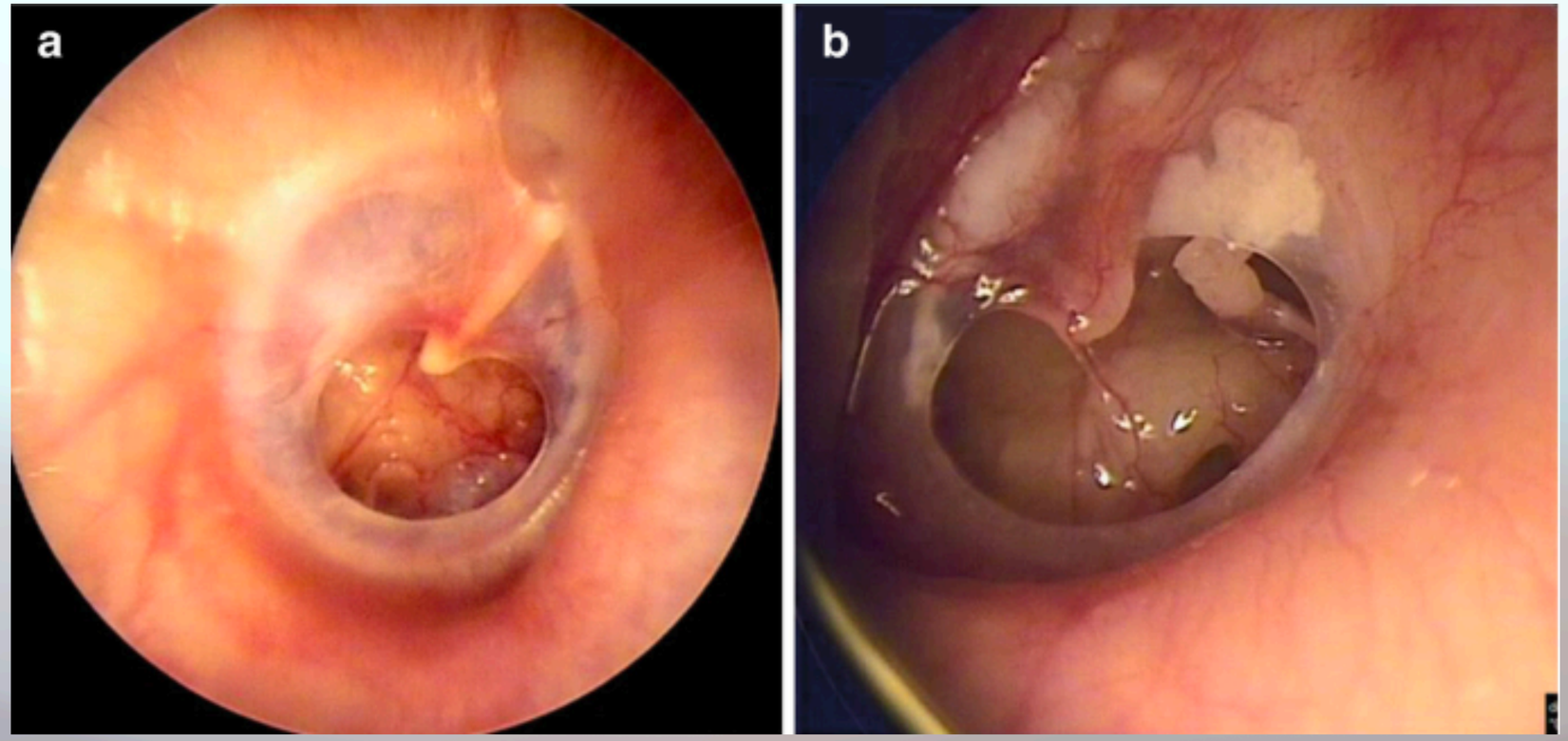
Chronic Ear Disease

- Chronic negative middle ear pressure pulls the TM medially
- Pars flaccid lacks fibrous layer, more susceptible to retraction
- Atelectasis
    - End stage retraction, where the TM is draped over the middle ear structures

Stage	Description
1	Tympanic membrane atrophic but not adherent to middle ear structures
2	Tympanic membrane adherent to the promontory only
3	Tympanic membrane adherent to incus and/or stapes
4	Tympanic membrane adherent to ossicles, with deep retraction pocket but without cholesteatoma
5	Retraction pocket with cholesteatoma and/or breakthrough

Used with permission from Borgstein J, Gerritsma TV, Wieringa MH, Bruce IA. The Erasmus atelectasis classification: proposal of a new classification for atelectasis of the middle ear in children. Laryngoscope. 2007; 117(7):12551259

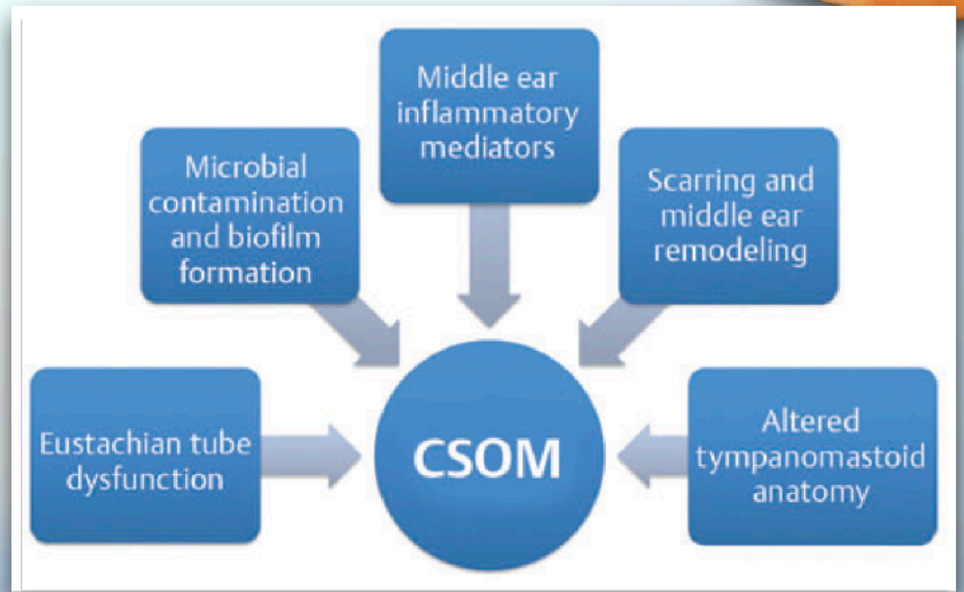
Tympanic Membrane Perforation



Chronic Suppurative Otitis Media

The result of untreated OME/ETD

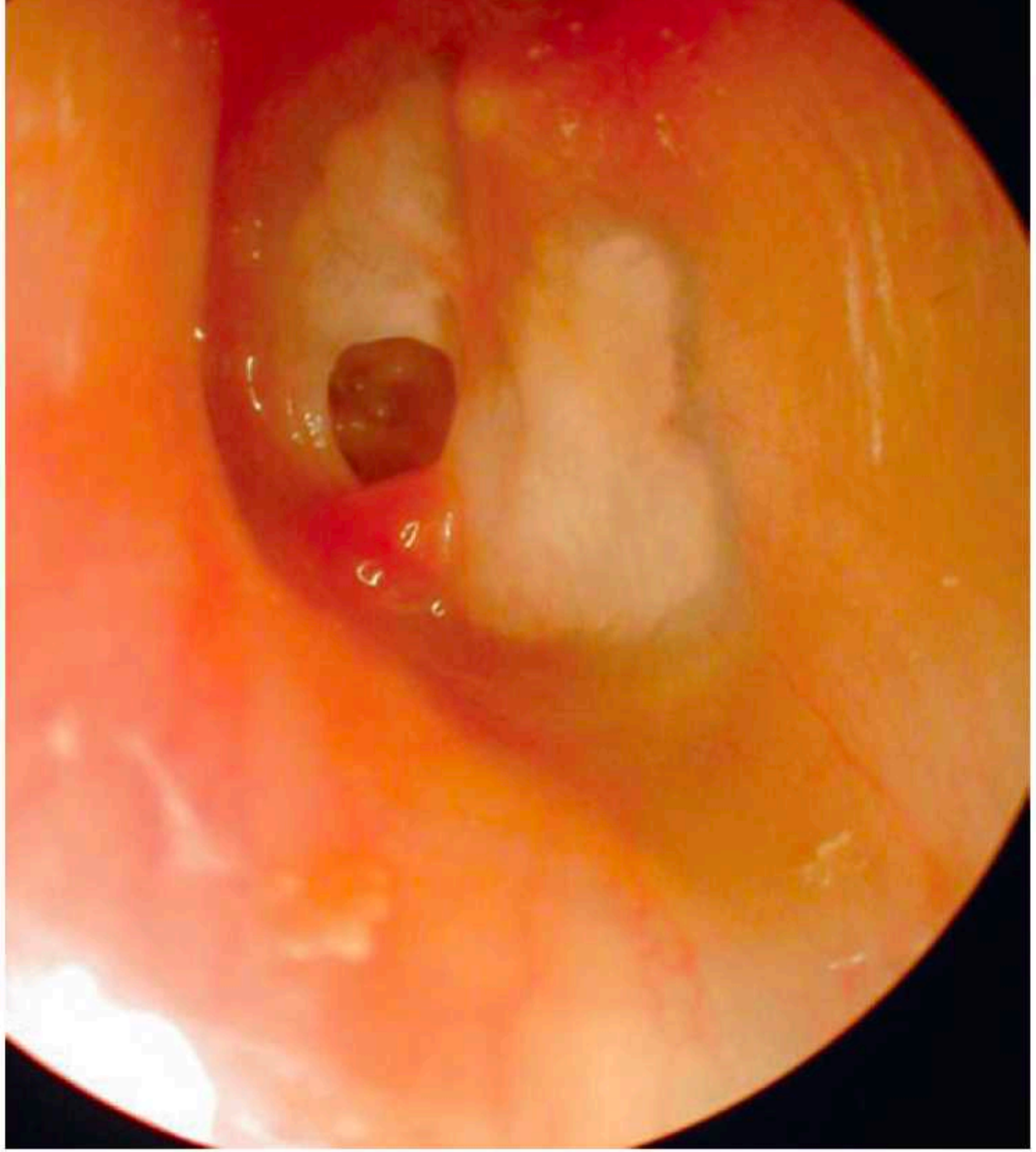
- Middle ear fluid leads to mucosal changes that increase the fluid viscosity
- Goblet cell proliferation leads to secretory middle ear mucosa
- Chronic viscous middle ear fluid causes inflammation of the middle ear, biofilm formation, and adhesion formation



Granulation Tissue

In CSOM

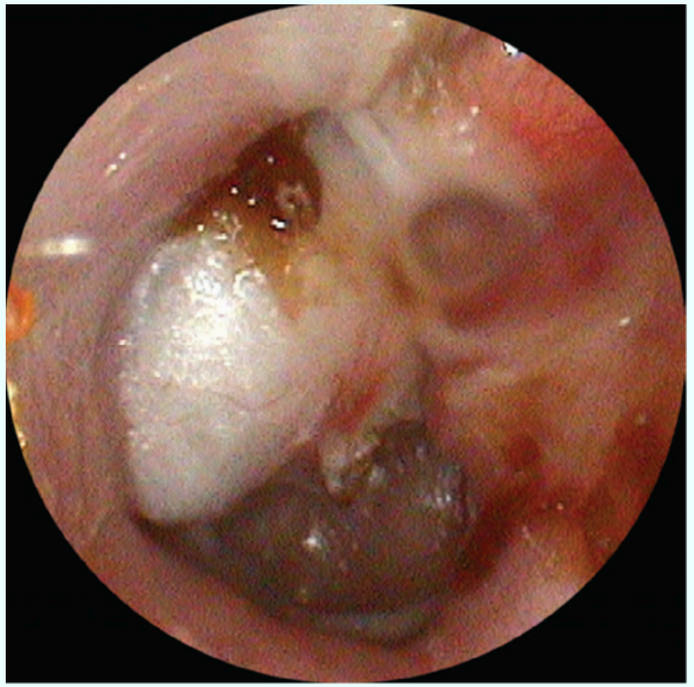
- Granulation tissue is secretory
- Promotes biofilm formation
- Treatment
  - Antibiotic/Steroid Combination ear drop
  - Aural toilet

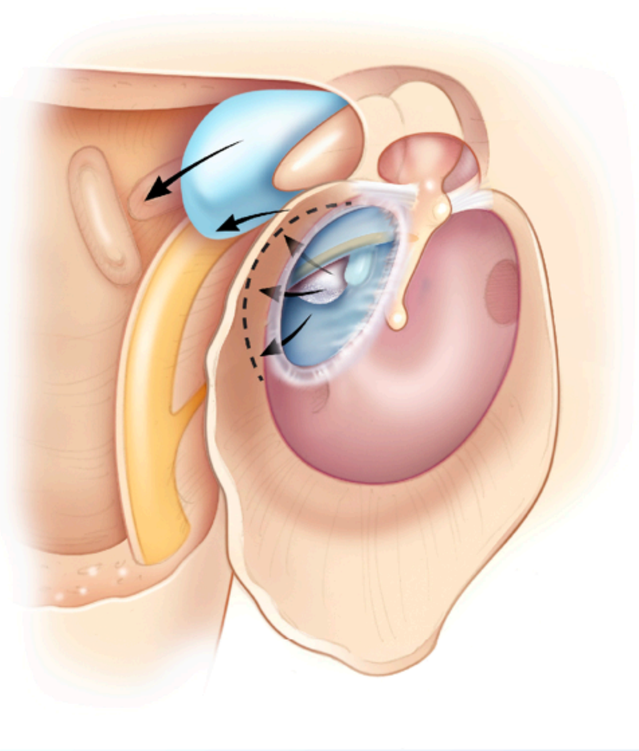


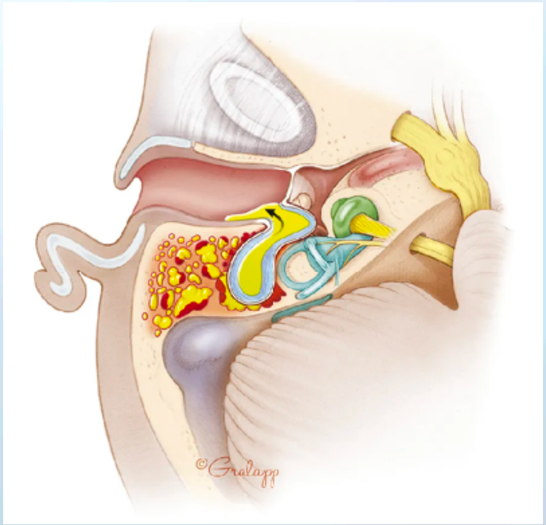
Cholesteatoma

Acquired

- Definition
  - Keratinized squamous epithelium in the middle ear
  - Retraction pocket too deep to see the bottom
- Pressure and enzymatic activity lead to bony erosion
- CT Temporal Bone
- Surgical removal via tympanomastoidectomy is required







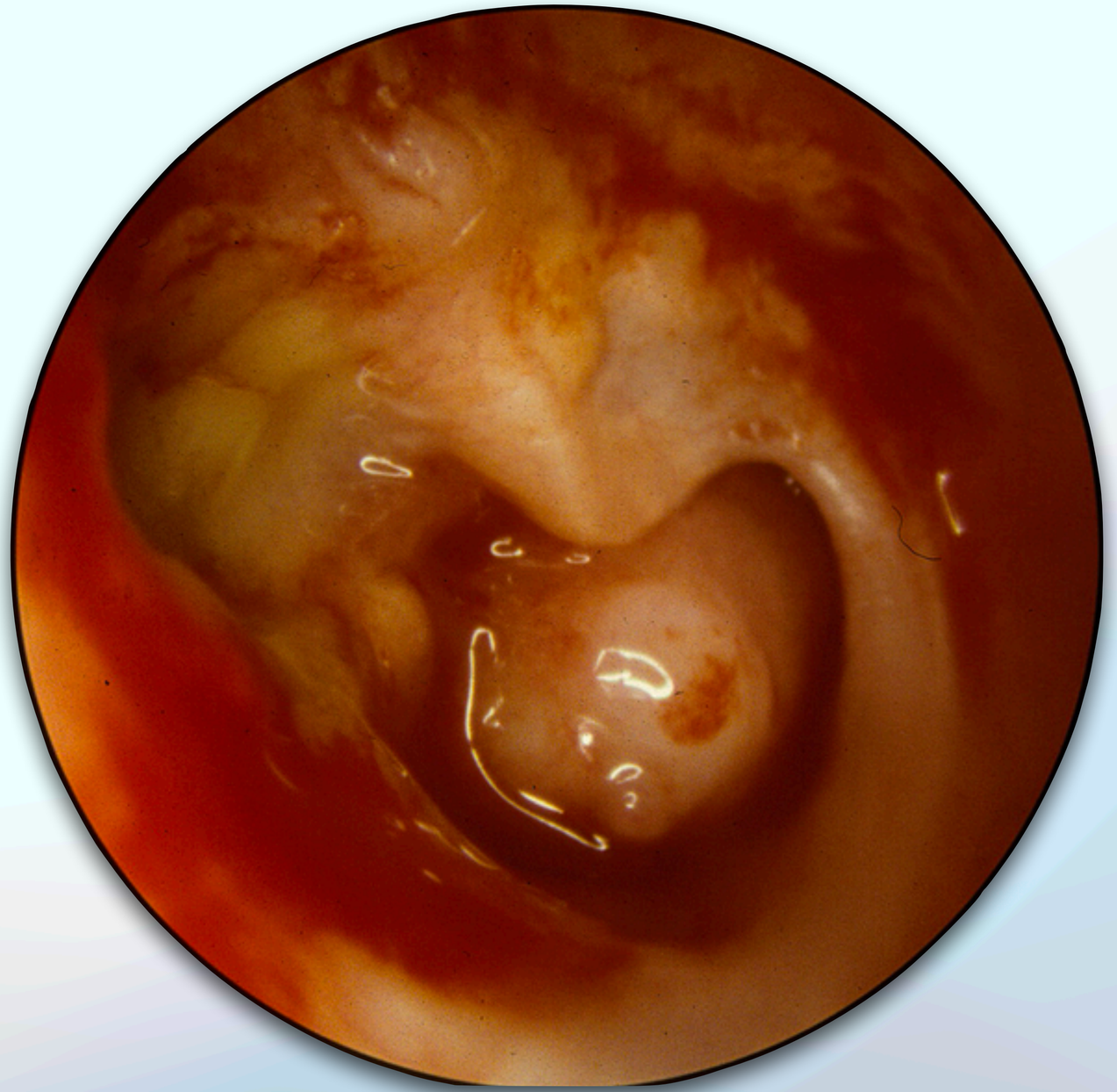
The goal of treatment is a safe, dry ear-

Which may be achievable without surgery

Medical Management

Of Chronic Otitis Media

- Thorough ear cleaning in clinic with suction
- Ototopical antibiotic drops are effective
- CSF powder also effective, contains
  - ciprofloxacin
  - clotrimazole
  - dexamethasone
  - boric acid
- Acetic Acid/Rubbing Alcohol lavage



Deciding between Medical and Surgical Management

For CSOM

Table 15.5 Criteria to consider when deciding for or against surgical treatment

Watchful waiting	Surgical treatment
Entire retraction pocket can be visualized completely by microscopic examination	Entire retraction pocket cannot be visualized completely by microscopic examination
Conductive hearing loss < 20 dB SPL	Conductive hearing loss > 20 dB SPL
No otorrhea	Recurrent otorrhea
Good pneumatization	Poor pneumatization
Normal Eustachian tube function	Disturbed Eustachian tube function
Adult patient	Pediatric patient
Pars flaccida	Pars tensa
No progression	Progression
Poor medical conditions	Social criteria

SPL, sound pressure level

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The Chronic Ear

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Deep Neck Space Infections

Clinical presentation and Management

3rd SCOEASTA Scientific Conference
Friday, October 20th, 2023

Bryce Noblitt, MD - ENT Consultant - AIC-Kijabe Hospital

AIC Kijabe Hospital
Health Care to God's Glory

Deep Neck Space Infections

General Considerations

- 16% of DNSI occur in patients with diabetes
- 40% occur in patients who smoke

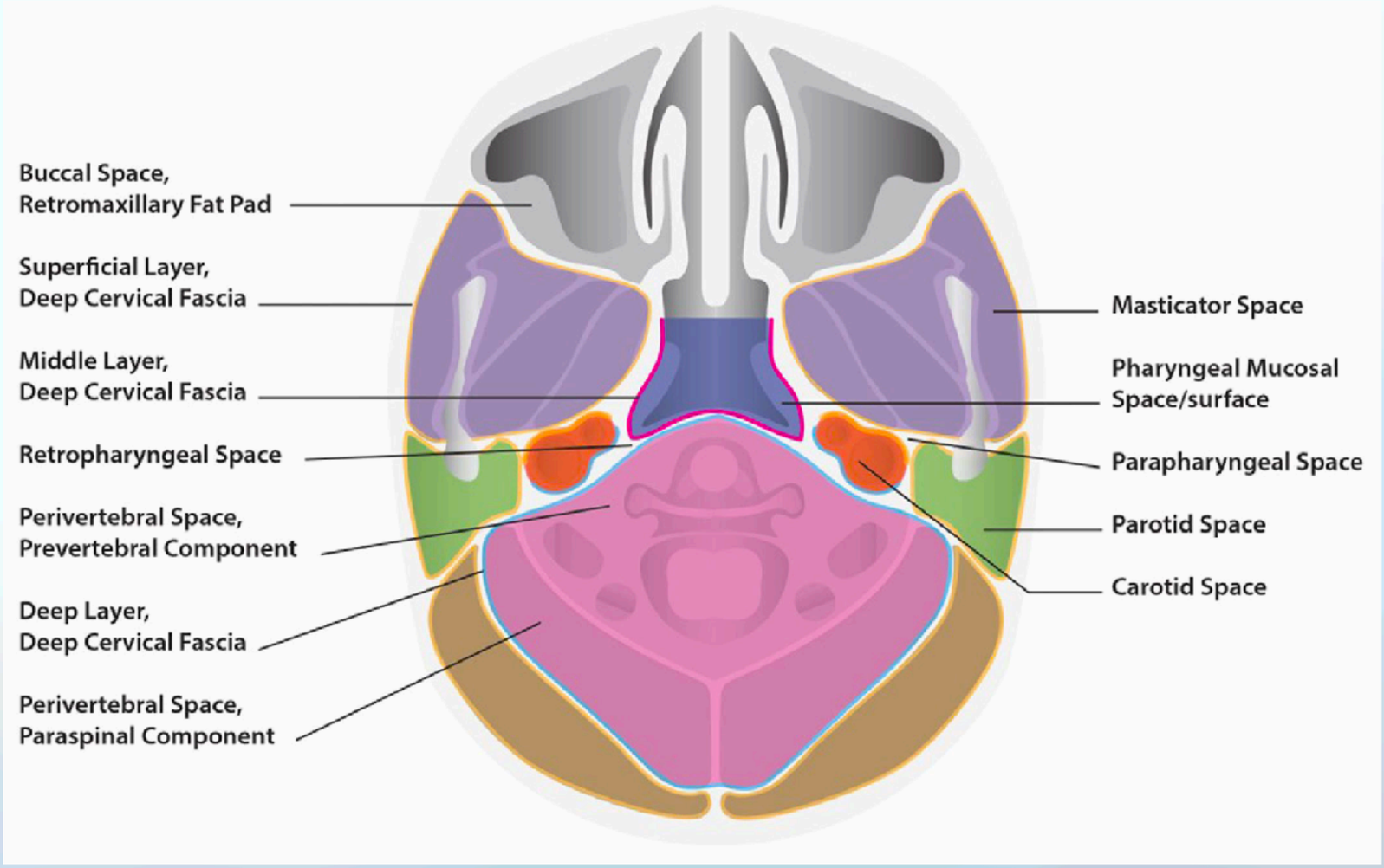
- The most common organisms:
  - Staphylococcus aureus
  - S. viridans
  - Peptostreptococcus
  - Anaerobes

- Risk Factors:
  - poor oral hygiene, lack of nutrition, smoking and chewing of beetle nut and tobacco

Deep Neck Space Infections

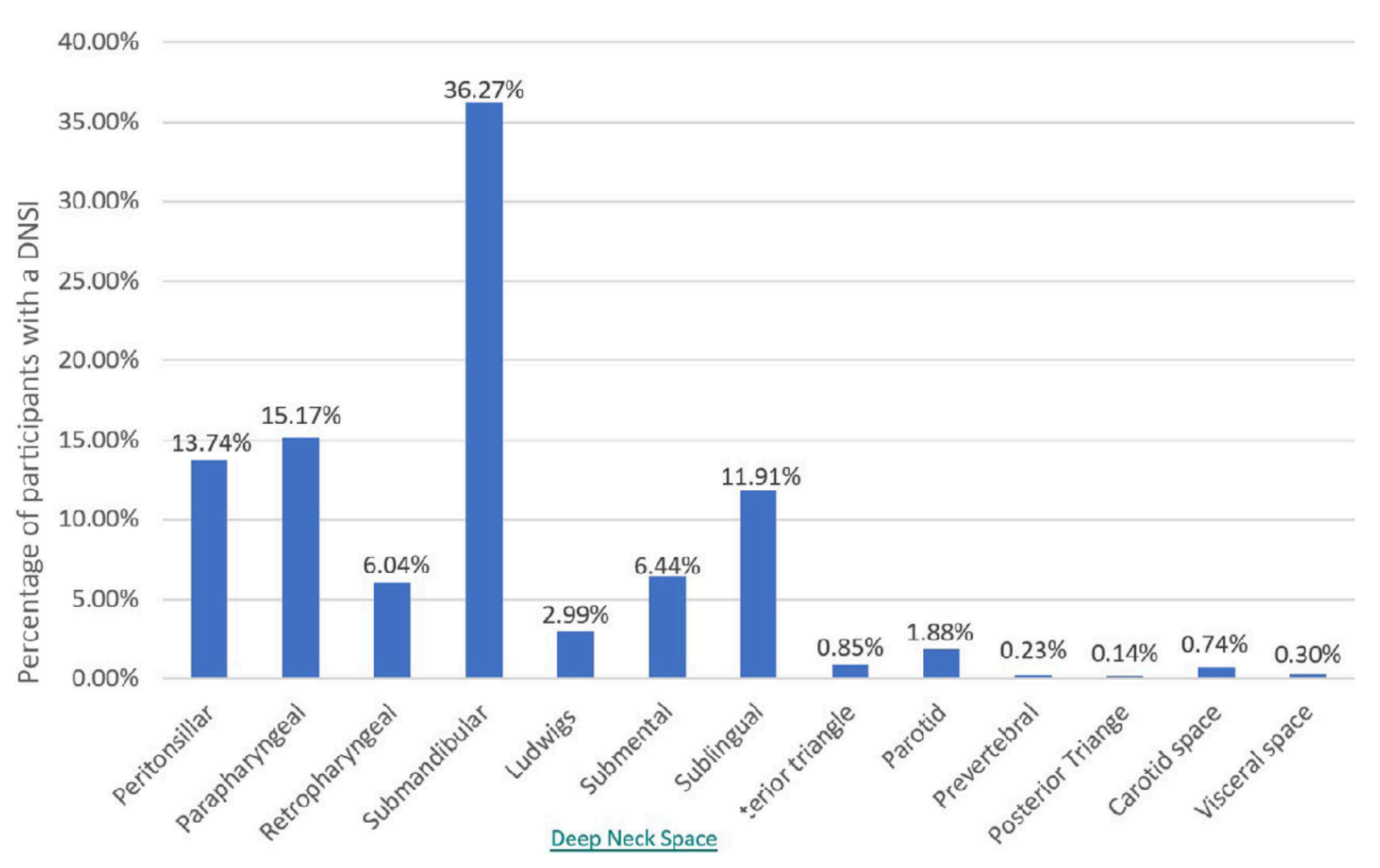
Presentation Outline

- Anatomy of fascial planes of the neck
- Imaging Considerations
- Deep Neck Spaces
  - Submandibular
  - Massticator
  - Parotid
  - Prestyloid Parapharyngeal
  - Poststyloid Parapharyngeal
  - Retropharyngeal
  - Danger
  - Prevertebral
  - Anterior Visceral
- Differential Diagnosis
- Medical Treatment
- Surgical Treatment



Rates of Infection by Location

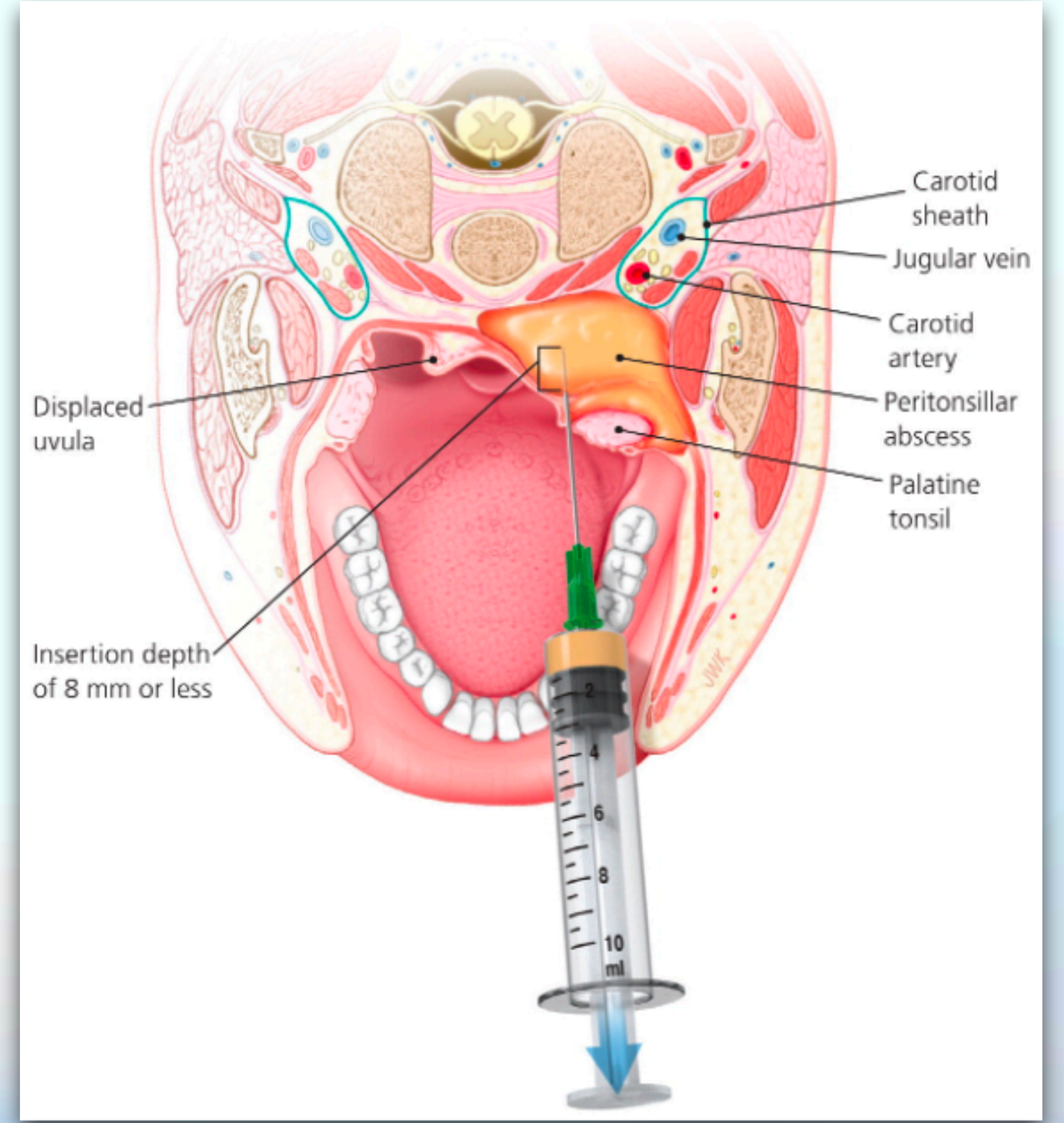
Deep Neck Space Infections



Etiology of Infection

Deep Neck Space Abscesses

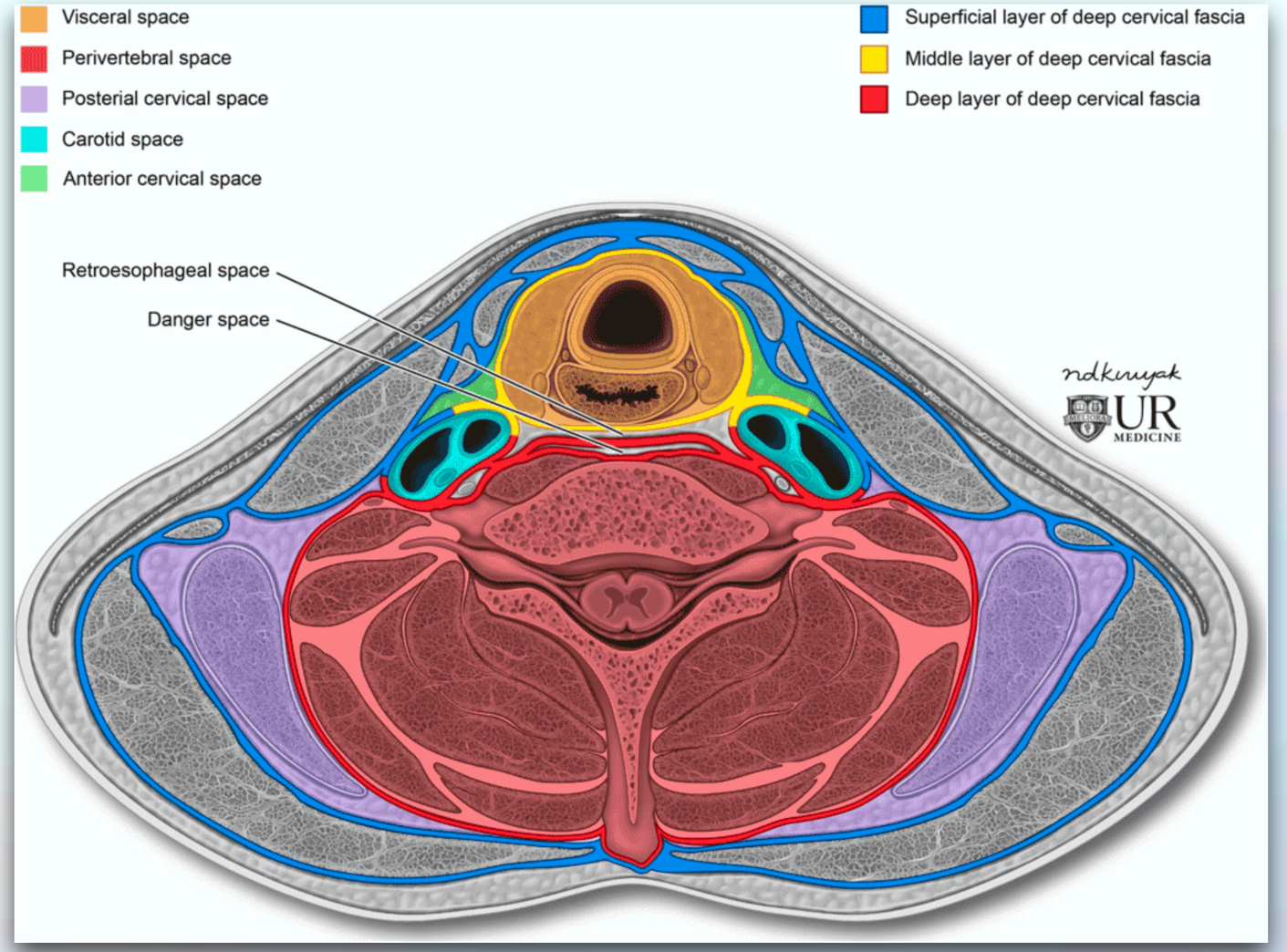
- Source control is important
- Investigate inciting event
- Common causes
  - Odontogenic
  - URTI
  - Trauma, foreign body
  - Sialoadenitis



Fascial Planes of the Neck

Neck Anatomy

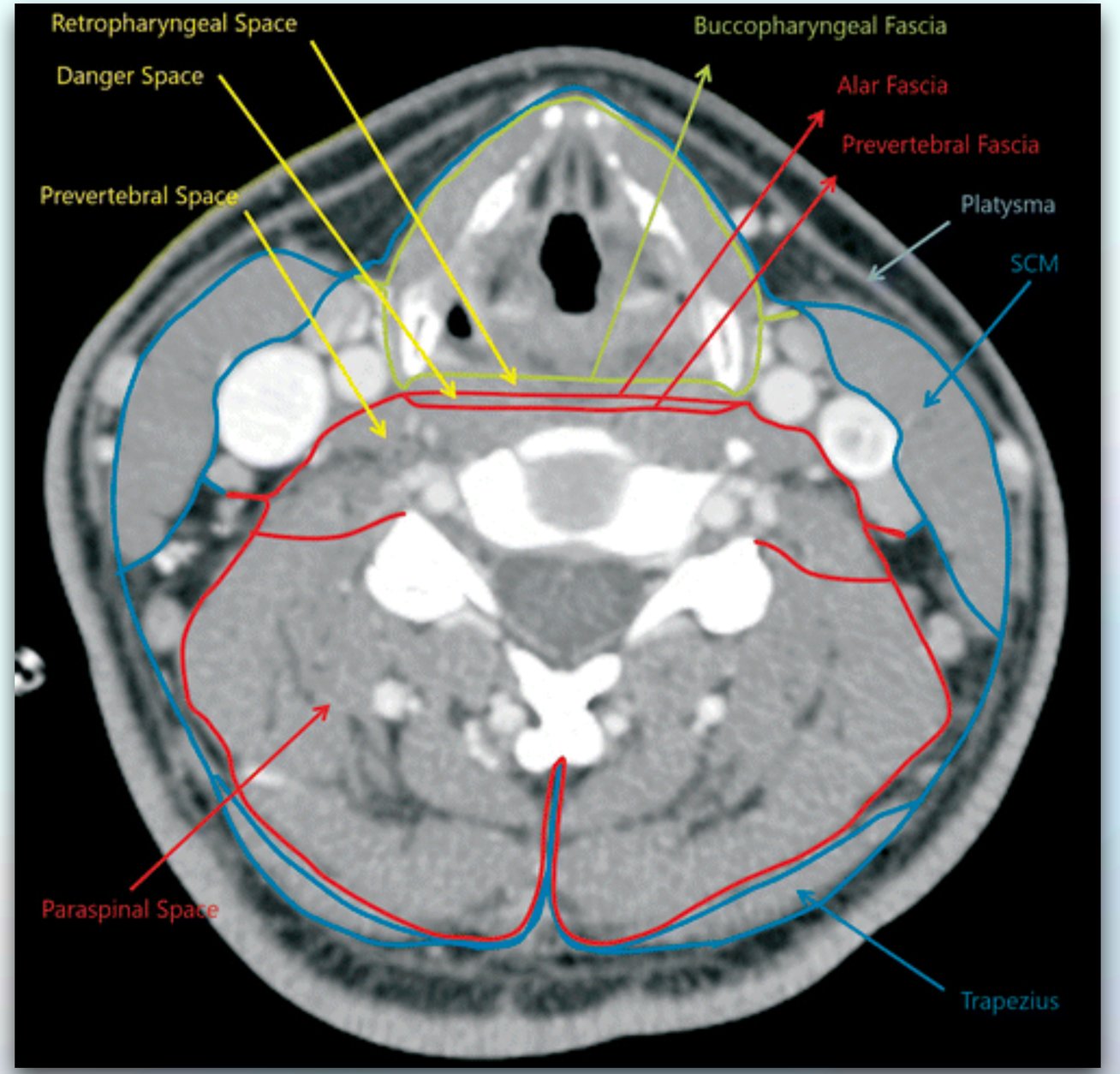
- Potential Spaces definied by fascial planes
- Determine route of spread
- 3 layers of deep cervical fascia
  - Superficial
  - Middle
    - Muscular Division
    - Visceral Division
  - Deep
    - Alar
    - Prevertebral



Imaging Modalities

For Diagnosing Deep Neck Space Infections

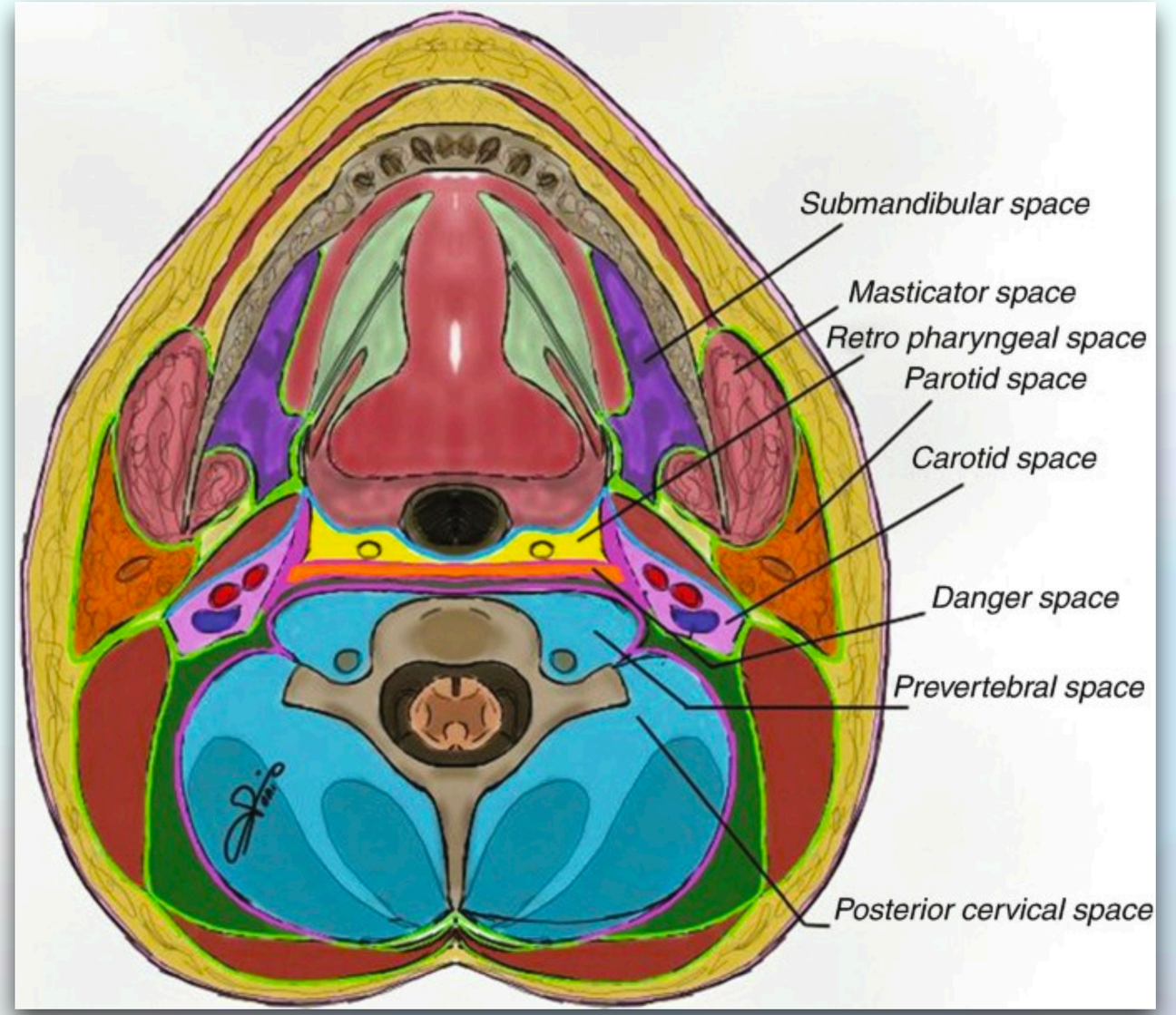
- Plain Film
- OPG
- Ultrasound
- CT neck with contrast
- MRI with contrast



Spaces of the Neck

Neck Anatomy

- Masticator
- Submental
- Submandibular
- Parotid
- Parapharyngeal
- Retropharyngeal
- Anterior visceral
- Danger
- Prevertebral spaces



Massticator Space

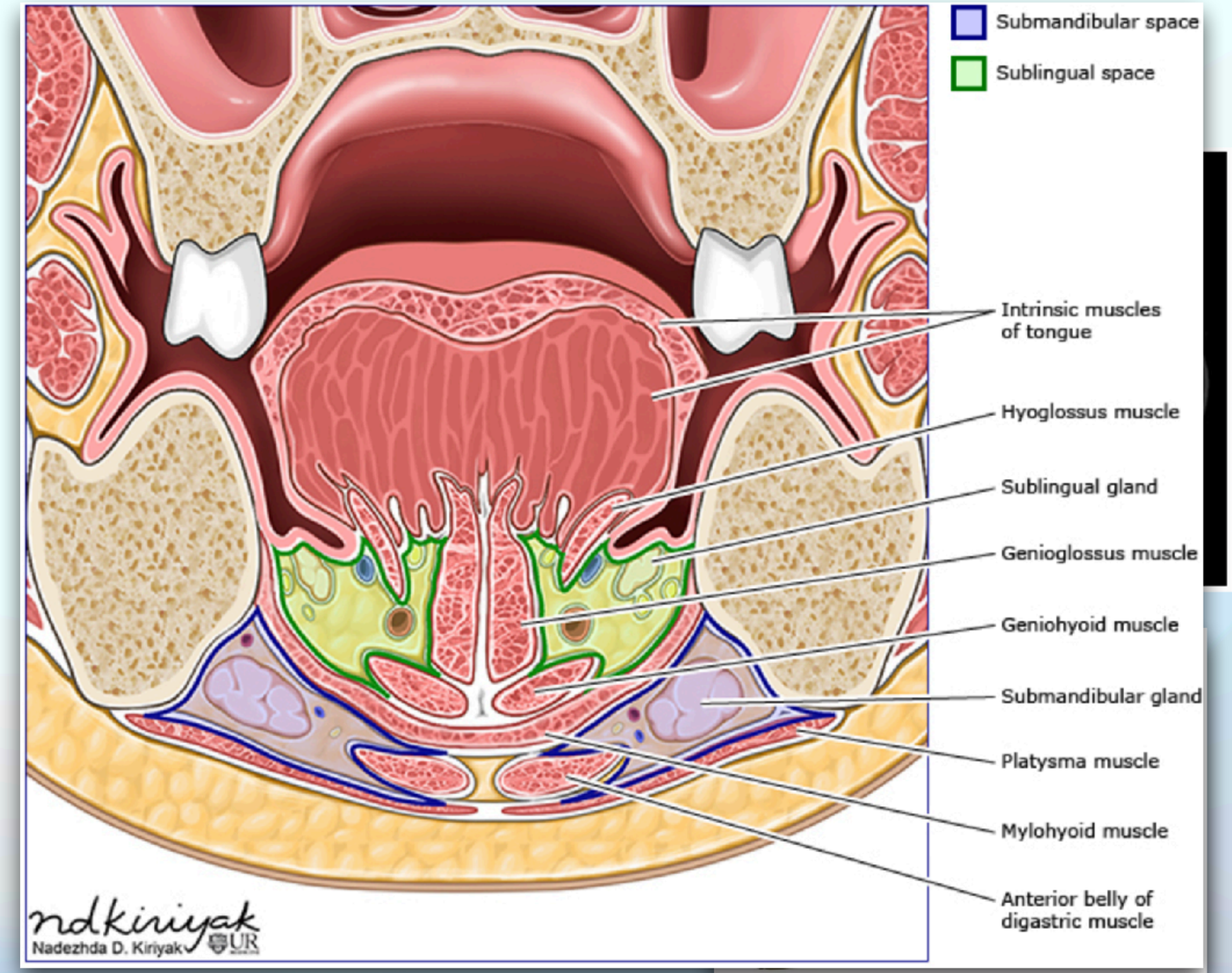
Deep Neck Spaces

- Contents:
  - temporalis muscle
  - Mandibular ramus
  - divisions of the mandibular nerve (V3) and the internal maxillary artery.
- Closely related to the
  - buccal space anteriorly
  - parotid space posteriorly
  - PPS medially
  - submandibular space inferiorly
  - skull base superiorly
- Odontogenic sources are common
- Abscesses medial to the ramus can be drained intraorally

Submental and Submandibular Space

Deep Neck Spaces

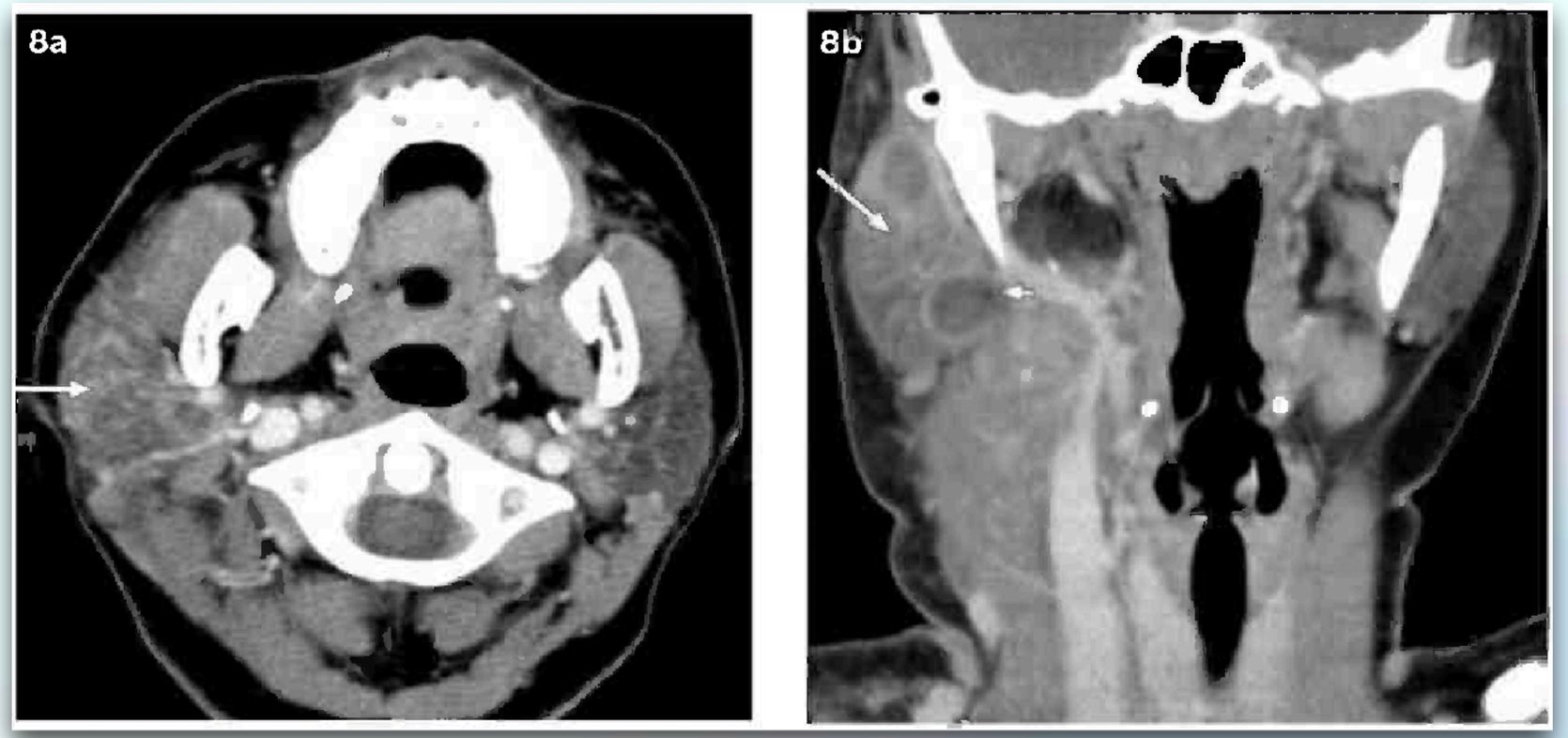
- Divided by the mylohyoid muscle
- Infections originate from
  - odontogenic
  - submandibular siloadenitis
  - lymphadenitis
- Ludwig's Angina
  - Floor of mouth swelling causing glossoptosis and airway compromise
  - Intraoral drainage versus transcervical
- Odontogenic infections require dental extraction



Parotid Space

Deep Neck Spaces

- Contains
  - Facial nerve
  - Intraparotid lymph nodes
  - Auriculotemporal nerve
  - Superficial temporal artery
- Sources of Infection
  - Acute parotitis
  - intraparotid lymphadenitis
- High risk of facial nerve injury with surgical drainage



Prestyloid Parapharyngeal Space

Deep Neck Spaces

- Space extends from skull base to hyoid
- Space contains fat, which quickly liquifies with infection
- Peritonsilar abscess is most common source
- Infections can spread from surrounding areas
- Intraoral drainage is usually sufficient

Post styloid Parapharyngeal Space

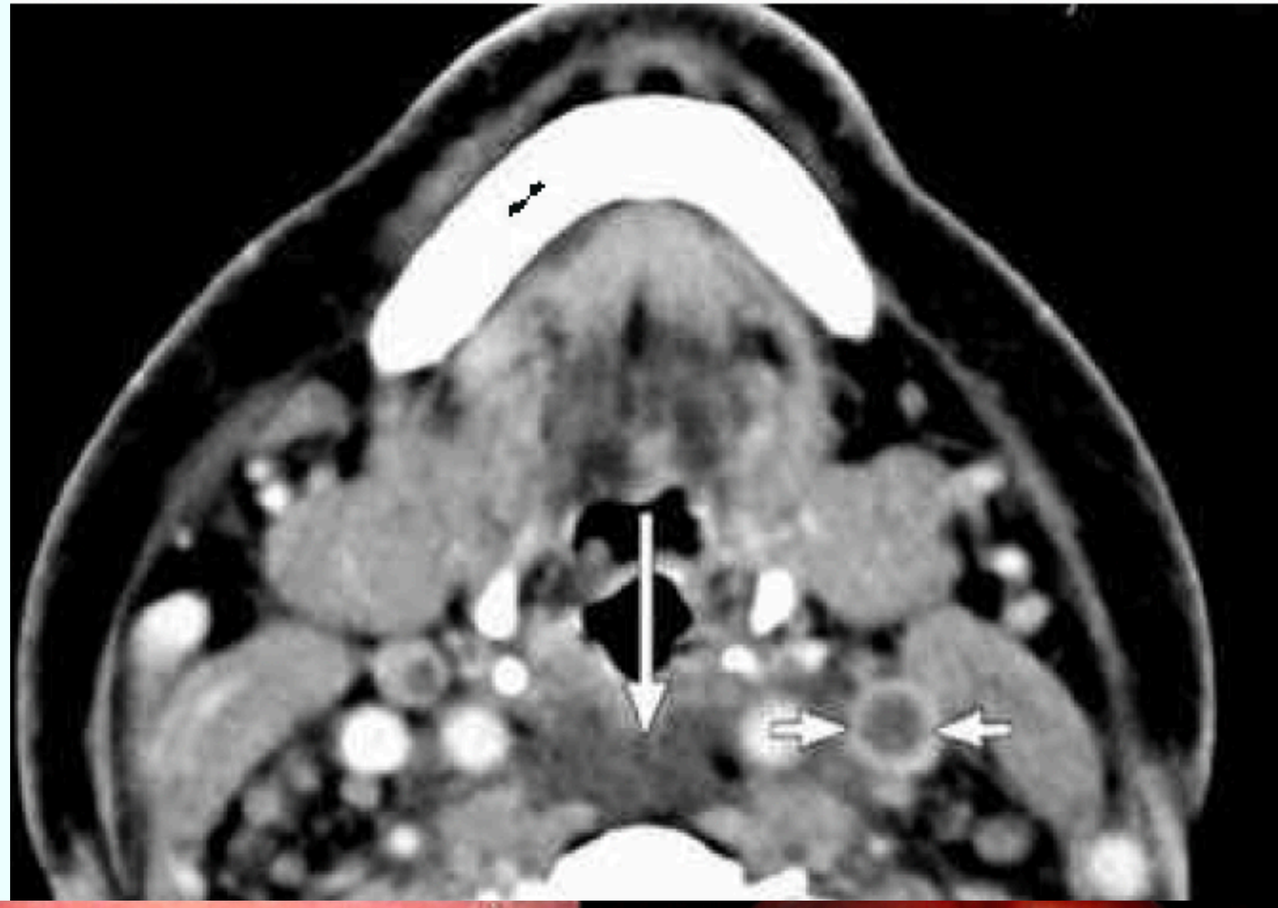
Deep Neck Spaces

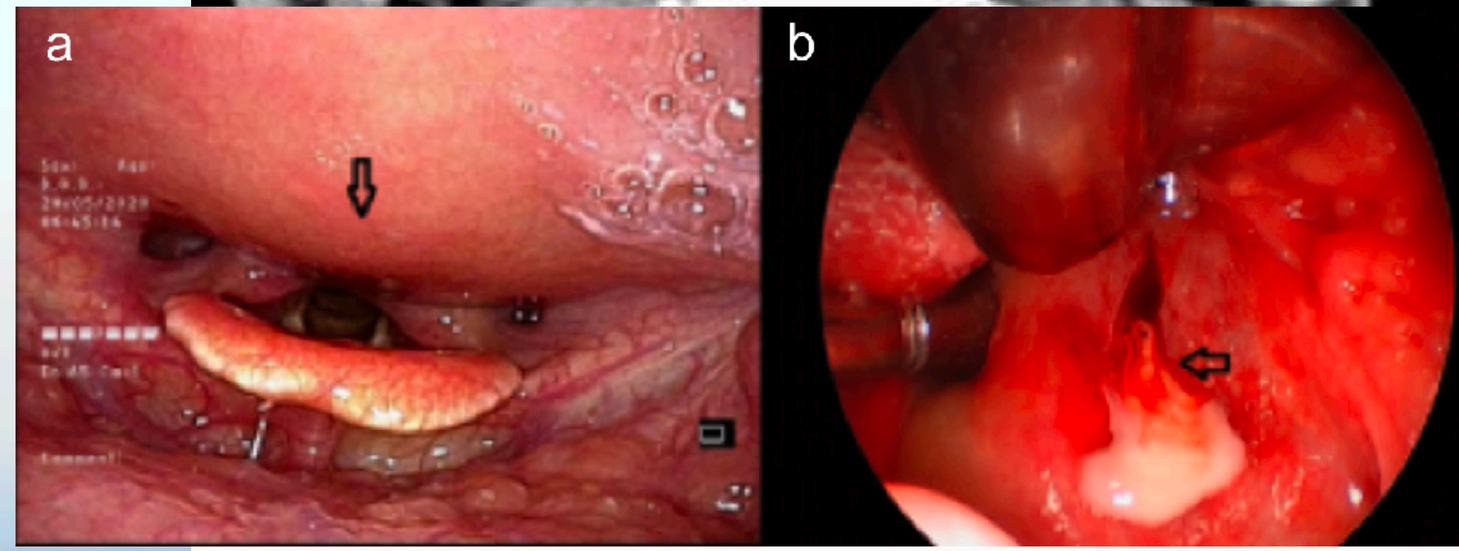
- Carotid Space contains
  - carotid artery
  - internal jugular vein
  - sympathetic trunk
  - cranial nerves IX, X, XI and XII
- Lemierre's syndrome
  - Internal jugular vein infective thrombosis

Retropharyngeal Space

Deep Neck Spaces

- Extends from skull base down to T2 in the mediastinum
- Between the buccopharyngeal fascia and alar fascia
- Young children frequently have suppurative lymphadenitis of this space
  - 50% occur in children <1 year, 96% in children <6 years
- Transoral drainage is effective





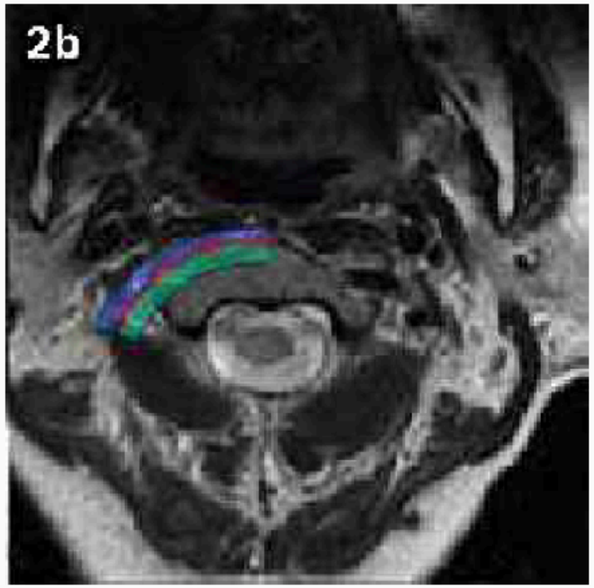
Retropharyngeal Planes

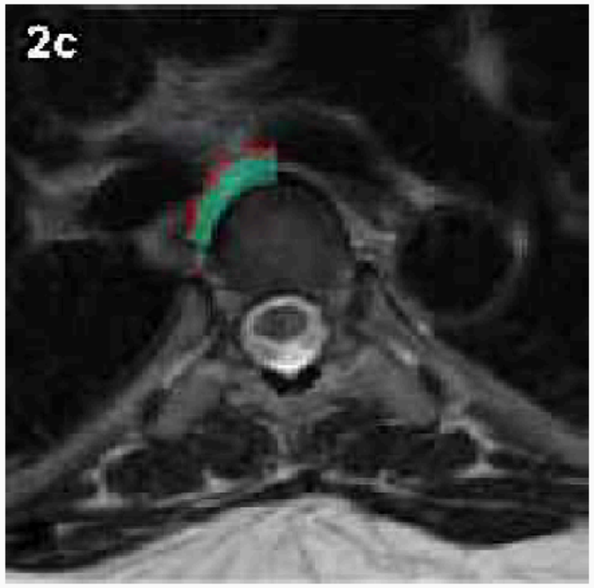
Deep Neck Spaces

Danger space (red)

retropharyngeal space (blue)

and prevertebral space (green)

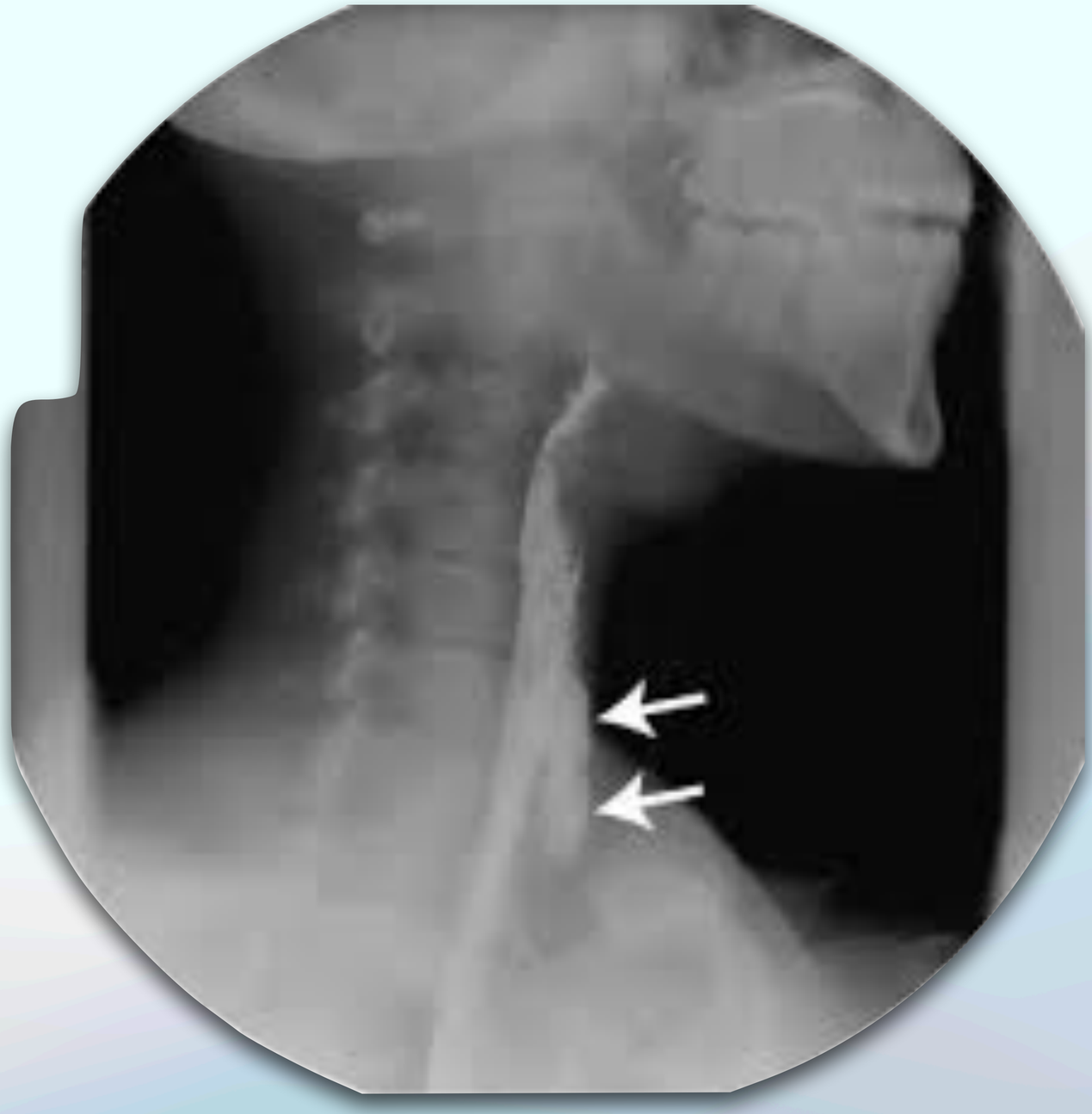




Anterior Visceral Space

Deep Neck Spaces

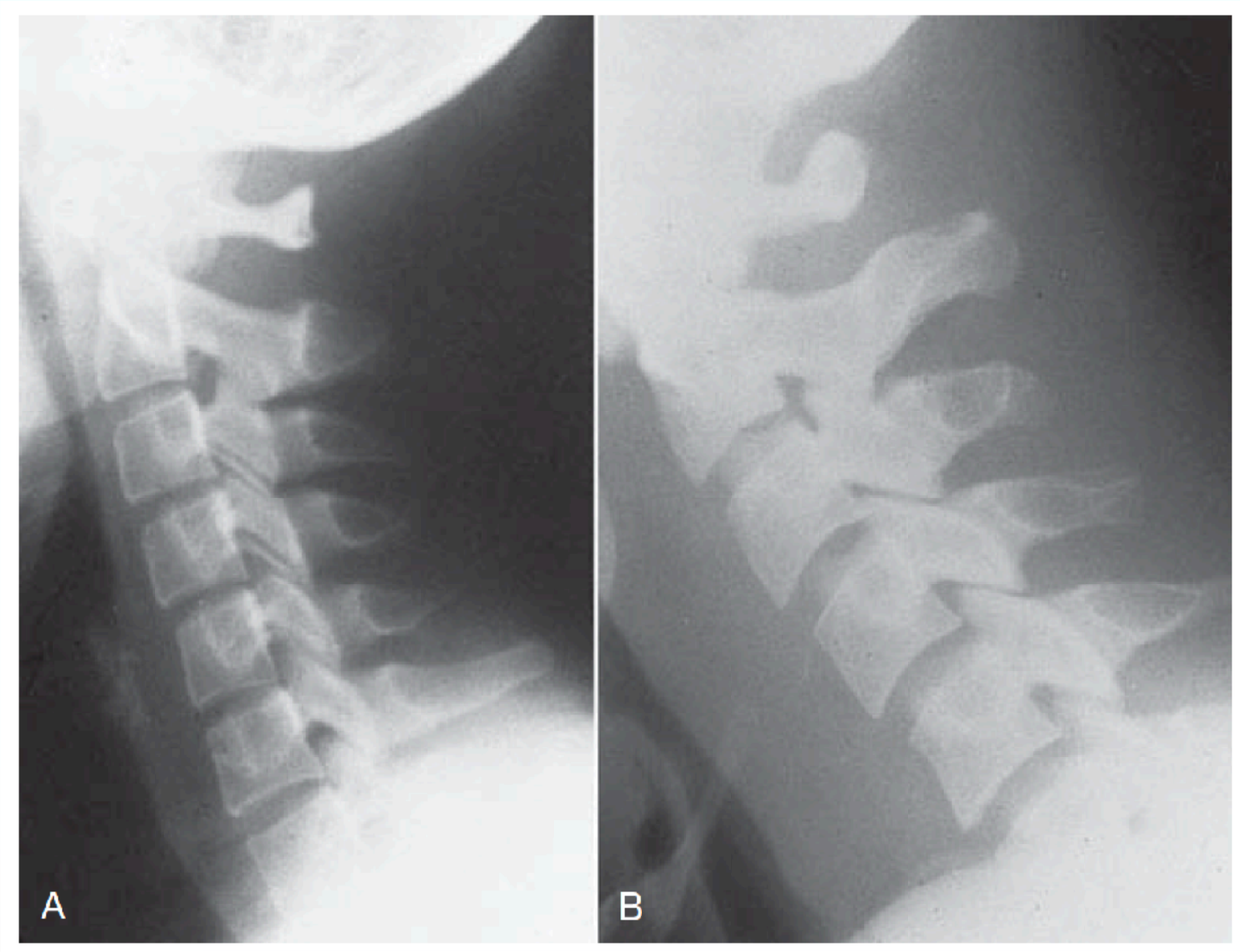
- AKA Pretracheal Space
- Bounded by visceral division of the middle layer of the DCF
- Contains:
  - Thyroid
  - Trachea
  - oesophagus
- Etiology
  - Traumatic esophageal perforation
- Complications
  - Frequently cause airway compromise



Danger Space

Deep Neck Spaces

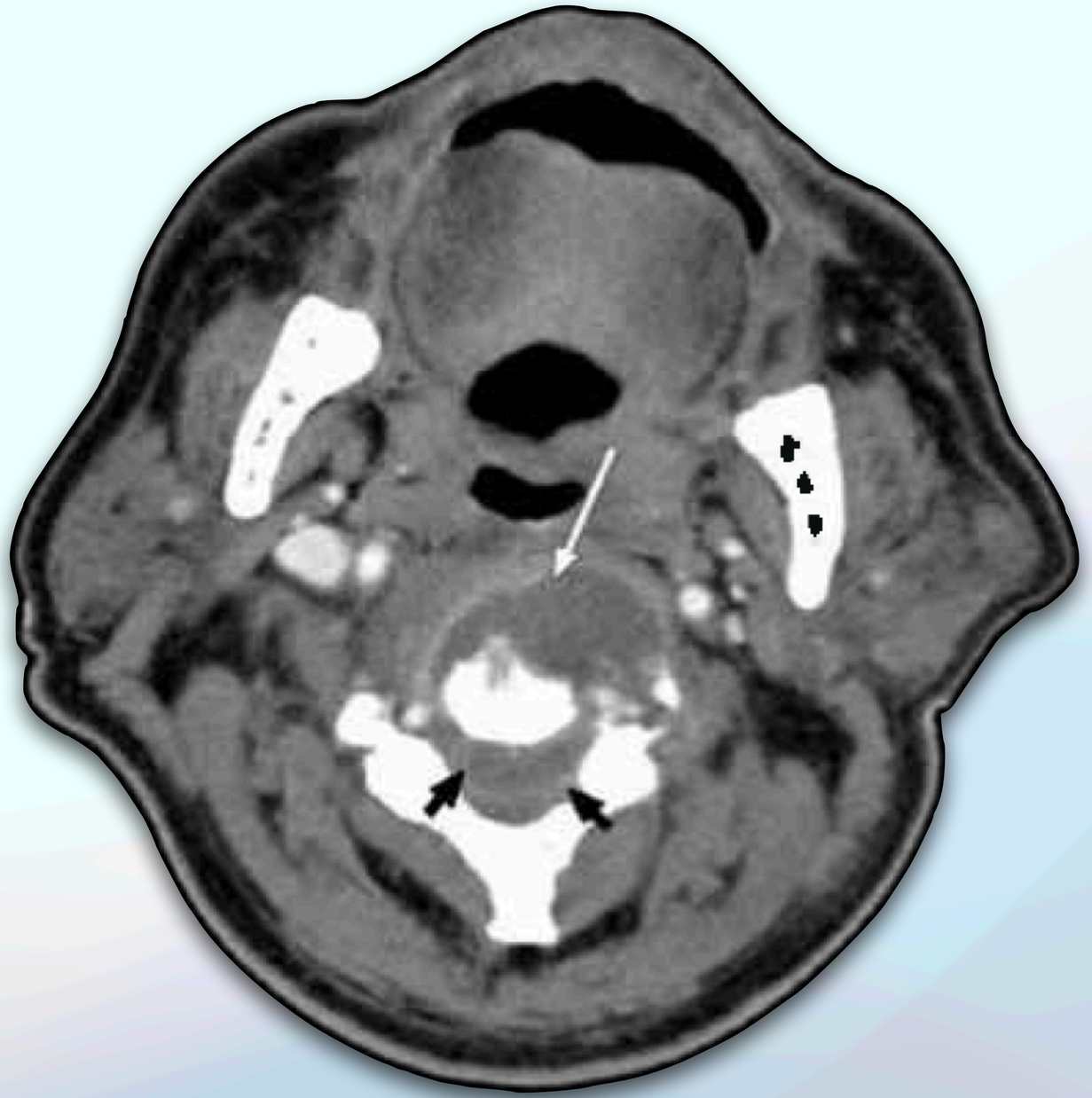
- Extends from the skull base to the diaphragm
- Between alar and prevertebral fascia
- Descending infection causes mediastinitis



Prevertebral Space

Deep Neck Spaces

- Extends from skull base to coccyx
- Causes:
  - infective spondylodiscitis
  - penetrating injuries to the posterior pharyngeal wall.
- Must drain externally to avoid fistula



Differential Diagnosis

Deep Neck Infections

- Children
  - Dermoid Cyst
  - Ranula
  - Thyroglossal duct cyst
  - Thymic cyst
  - Branchial Cleft Cyst/Sinus
  - Lymphangioma/Vascular Malformation
- Adults
  - Cervical Metastasis
  - Sialoadenitis
  - Carotid Body tumor
  - Esophageal Perforation

Medical Therapy

For Deep Neck Space Infections

- Antibiotics should cover beta-lactamase producing organisms, and anaerobes
  - Ampicillin/Sulbactam
  - Vancomycin + Pip/Tazo
  - Vanc + Cefepime + Metronidazole
- Steroids improve airway swelling

PEARLS

- Gram-positive cocci (streptococci and staphylococci) are the most commonly identified organisms in deep neck infection.
- The *retropharyngeal space* extends into the thorax.
- The *prevertebral space* extends to the sacrum.
- Broad-spectrum antimicrobial therapy should be administered until the specific pathogen has been identified.
- Failure to improve with antibiotic therapy is an indication for *incision and drainage* of deep neck infection.

Indications for Drainage

For Deep Neck Space Infections

- Rim enhancing fluid collection
- Airway compromise
- Critical condition
- Septicemia
- Descending infection
- Diabetes mellitus
- Failure to improve after 48 hours of antibiotic therapy

Image-guided Drainage

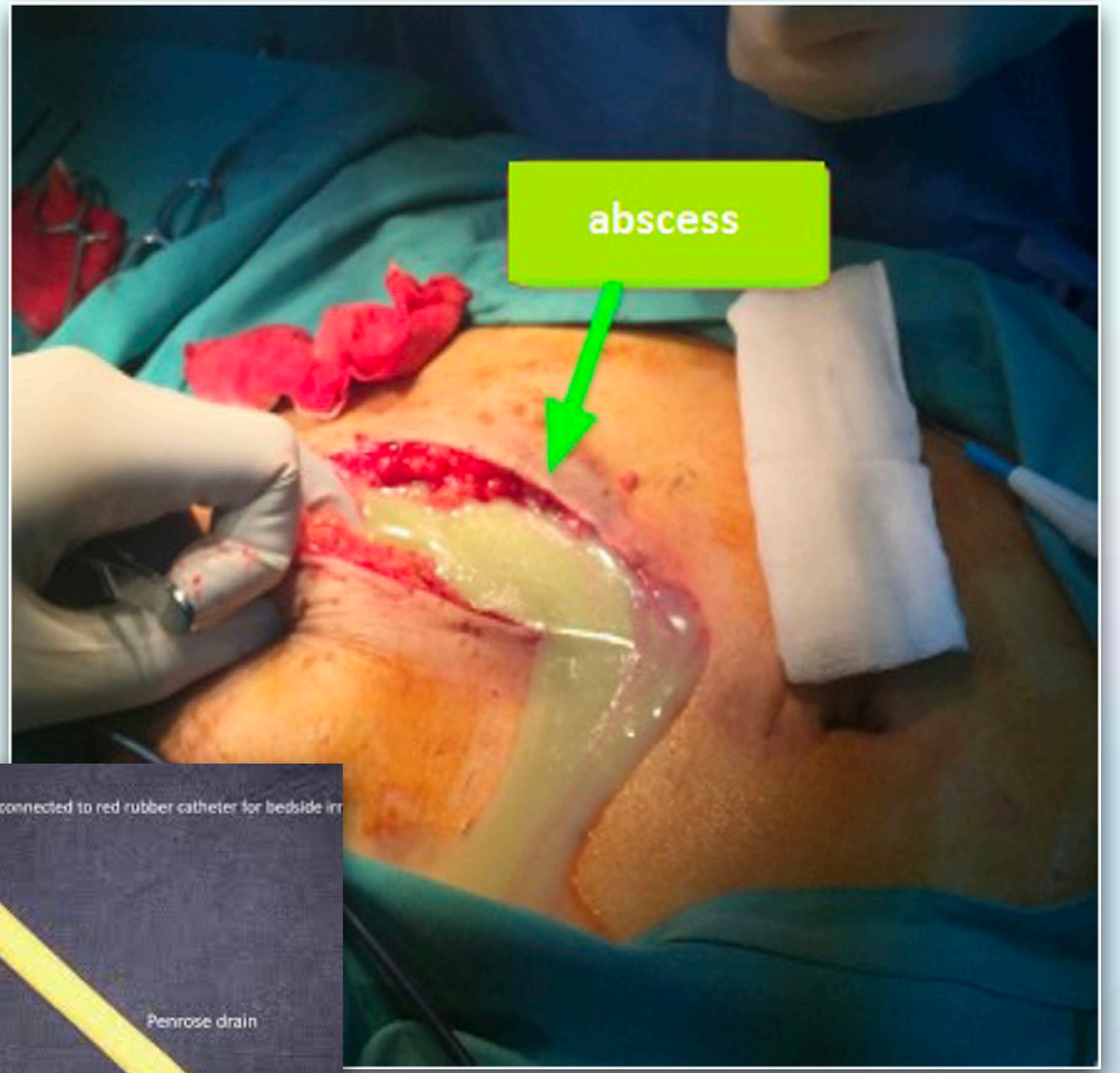
For Deep Neck Space Infections

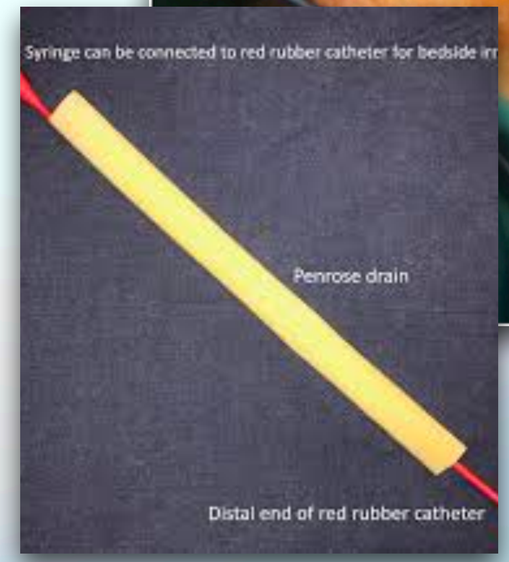
- US or CT-assisted percutaneous drainage
  - Well-defined, uniloculated, single-space abscesses
- Failure rate (requiring open surgical drainage) is close to 25%
- With initial open surgical intervention, 40% required a second intervention.

Incision and Drainage

Deep Neck Space Infections

- Local versus general anesthesia
- Airway management
- Intraoral versus transcervical approach
- Drain placement versus gauze packing

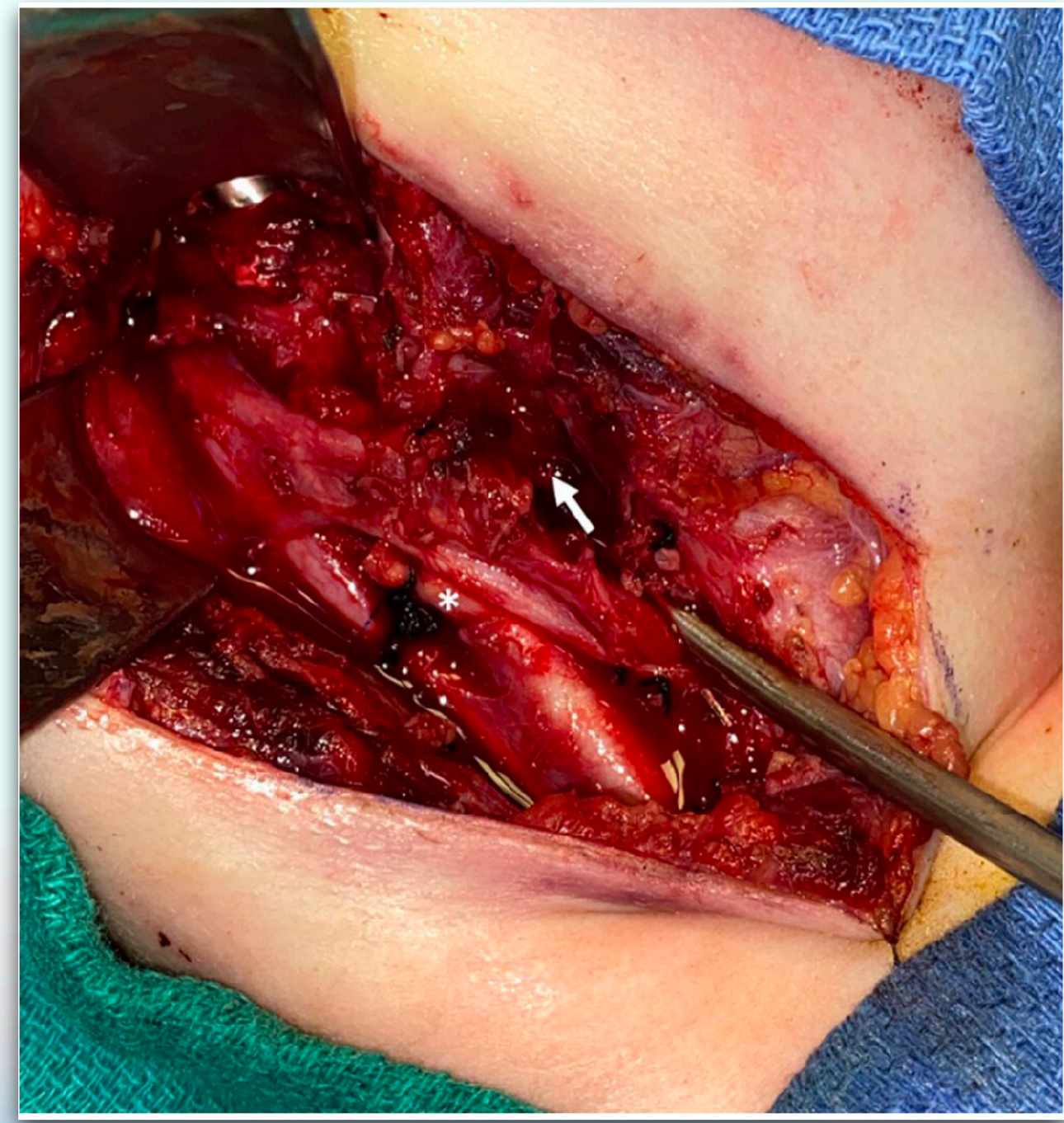




Complications

Of Deep Neck Space Infections

- Carotid pseudoaneurysm
- Jugular vein thrombosis
- Airway compromise
- Mediastinitus
- Pericarditis
- Aspiration pneumonia
- Osteomyelitis
- Meningitis



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