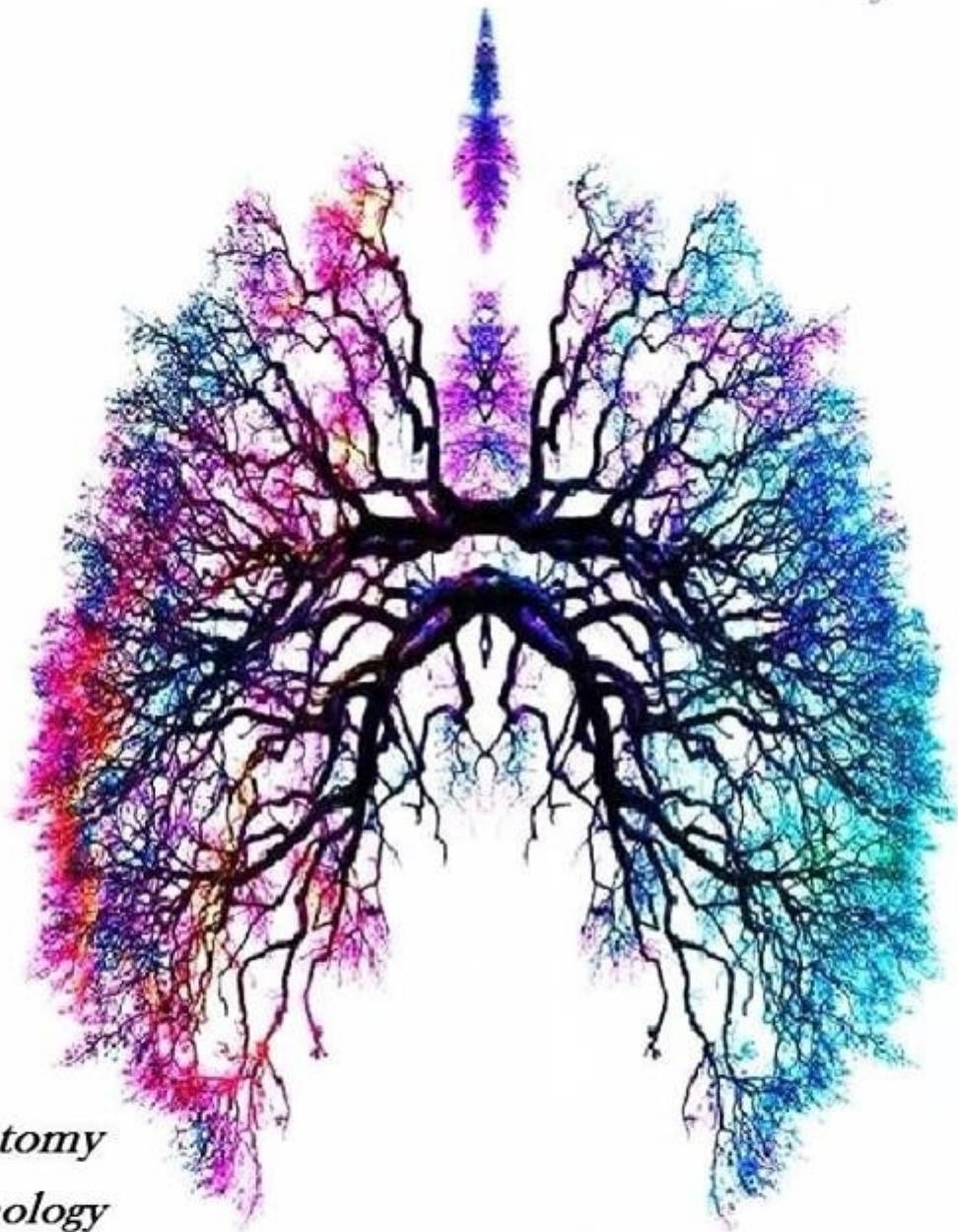


RESPIRATORY SYSTEM

Cover by: *Aseel Khatib*



- Anatomy*
- Pathology*
- Physiology*
- Pharmacology*
- Microbiology*
- PBL*

Dr Name: Dr. Ashraf Khasawneh
Lecture # 1 (VIROLOGY)

Sheet

Slide

Other

Upper Respiratory Tract Infections

Viral etiology

OBJECTIVES

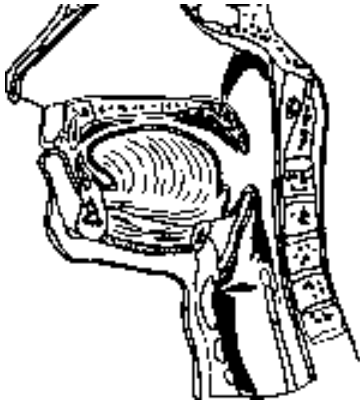
- **Understanding of**
- Presentation of Upper Respiratory Infections
- Causative organisms
- Pathogenesis
- Diagnosis(clinical, laboratory, other)
- Clinical Management(treatment, preventative measures)

Infection Syndromes

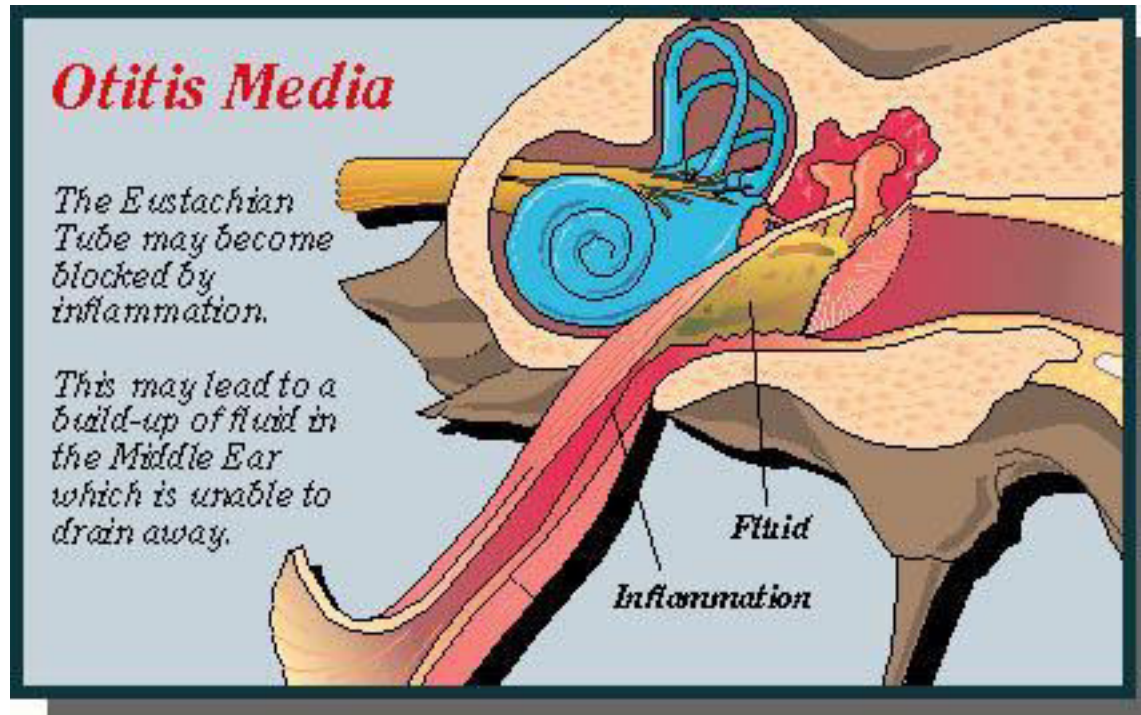
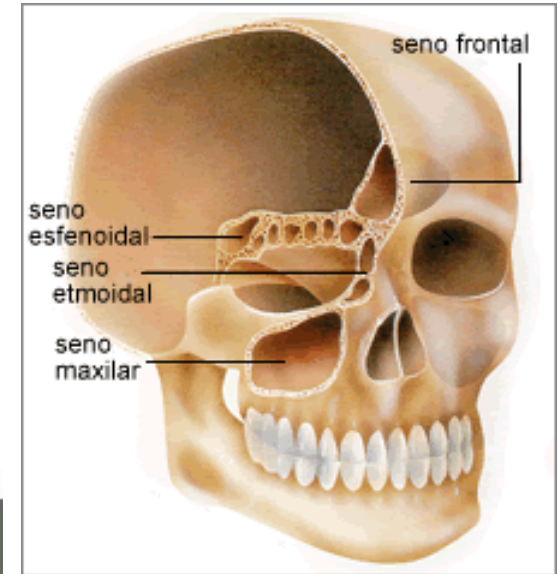
- Common Cold
- Pharyngitis/Tonsillitis
- Quinsy
- Epiglottitis
- Otitis Media
- Sinusitis

Pharyngitis, Epiglottitis

Anatomy



Sinusitis



Otitis Media

Common Cold

- Causative agents: Coronaviruses etc
- Epidemiology: usually common in the winter months
- Presentation: rhinitis, headache, conjunctival suffusion
- Management: **Antimicrobial agents not to be given.** Symptomatic relief may be accompanied by mucopurulent rhinitis(thick,opaque or discolored nasal discharge), this is not an indication for antimicrobial treatment unless it persists without signs of improvement 10-14 days suggesting possible sinusitis.

Common Cold Viruses

- Common colds account for one-third to one-half of all acute respiratory infections in humans.
- Rhinoviruses are responsible for 30-50% of common colds, coronaviruses 10-30%.
- The rest are due to adenoviruses, enteroviruses, RSV, influenza, and parainfluenza viruses, which may cause symptoms indistinguishable to those of rhinoviruses and coronaviruses.

RHINOVIRUSES

- Common cold accounts for 1/3 to 1/2 of all acute respiratory infections in humans.
- Rhinoviruses are responsible for 50% of common colds, coronaviruses for 10%, adenoviruses, enteroviruses, RSV, influenza, parainfluenza can also cause common cold symptoms indistinguishable from those caused by rhinoviruses and coronaviruses.
- *Common cold is a self-limited illness.*
- More than 100 serologic types of rhinoviruses (No vaccine)
- Receptor: Intracellular adhesion molecule I (ICAM-1)
- Most viral replication occurs in the nose, and the **severity** of symptoms correlates with the **quantity (titer) of virus in nasal secretions.**

TRANSMISSION

- Directly from person to person via respiratory droplets
- Indirectly in which droplets are deposited on the hands or on a surface such as table and then transported by fingers to the nose or eyes.
- An individual may suffer 2 to 5 episodes of colds per year. The primary site of rhinovirus infection is in the nasal epithelium. Rhinoviruses rarely cause lower respiratory infection.

Clinical presentation

- IP: 2-3 days
- URIs caused by rhinoviruses usually begin with sneezing, followed soon by rhinorrhea.
- The rhinorrhea increases and is then accompanied by symptoms of nasal obstruction.
- Increased levels of bradykinin: increased secretions, vasodilation, cough and sore throat.
- headache, malaise and the “chills” (rigors).
- The illness peaks in three to four days and last up to 7 days.

COMPLICATIONS

- ***Acute bacterial sinusitis***
 - The major causes are Pneumococcus, *Hemophilus influenza*, *Moraxella*, and *Staphylococci*.
- ***Acute bacterial otitis media***
 - mainly a problem in children
- ***Asthma attacks in children***
- ***Exacerbation of chronic bronchitis***

LABORATORY DIAGNOSIS

- Usually, common cold does not require laboratory investigation
- Cell culture isolation from nasal secretion

Prevention and Treatment

- **No antiviral drug** has been proved useful.
- Cold treatment recommended include the following:
 - Antihistamines
 - Nonsteroidal antiinflammatory drugs
 - Decongestants (vasoconstrictors)
 - Cough suppressants (narcotics)
- **No vaccine.** The multiplicity of serotypes and the fleeting immunity pose major problems for the development of vaccines.
- Ab directed at the virus receptor or a recombinant soluble receptor ICAM-1 might block attachment of rhinovirus.
- **Hand Hygiene** is the most potent method of prevention and control

CORONAVIRUSES

CORONAVIRUSES

- The group was so named because of the ***crow-like projections on its surface.***
- At present, at least 10 species are recognized, of which human coronavirus is one. The other viruses are found in animals.

PROPERTIES

- *ssRNA* enveloped viruses of **pleomorphic** morphology
- **60 to 220nm** in diameter.
- Positive stranded RNA; helical symmetry
- Three antigenic molecules are found in the virions i.e. nucleocapsid, surface projection and transmembrane proteins. The main antigenic determinants reside on the *surface projections*.
- Human coronavirus strains fall into serological groups, which are named **OC43**, and **229E**.

EPIDEMIOLOGY

- Human coronavirus infections occur during the *winter and early spring*.
- High infection rates during the year are caused by *either 229E or OC43* group viruses. This pattern is observed throughout the world.
- Human coronaviruses are responsible for **10 - 30%** of all *common colds*.

Genetic variation & evolution of new strains

A high frequency of:

- deletion mutations
- high frequency of recombination during replication which is unusual for an RNA virus with unsegmented genome

Clinical picture & epidemiology

- Upper respiratory infections, similar to “colds” caused by rhinoviruses, but with a longer incubation period (average three days).
 - 15-30% of respiratory illness in adults during winter months but lower respiratory infections were rare.
 - Antibodies appear early in childhood and are found in 90% in adults
 - CORONAVIRUSES may be associated with gastroenteritis which occurs year-round.

DIAGNOSIS AND TREATMENT

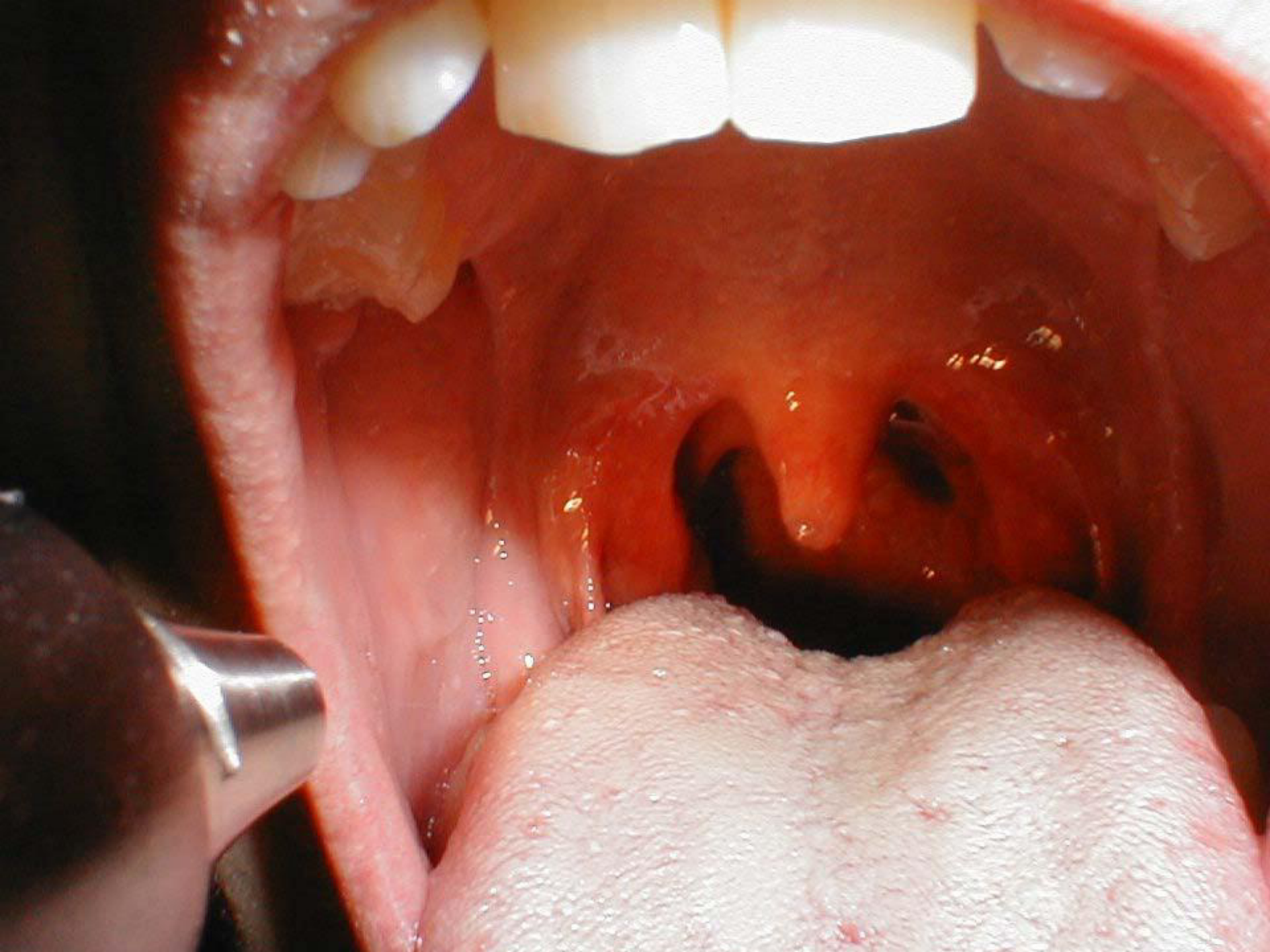
- Laboratory diagnosis is not attempted.
- Coronaviruses have fastidious growth requirement in cell culture.
- No antiviral drugs against coronaviruses are available.

OTHER CAUSES OF COMMON COLD SYNDROME

- **Coxsackievirus**
 - Herpangina (severe sore throat with vesiculoulcerative lesions)
 - Pleurisy
 - common cold syndrome
- **Adenovirus**
 - Pharyngitis
 - common cold syndrome
 - Bronchitis
 - pneumonia (types 3, 4, 7 and 21)
- **Influenza C**

Pharyngitis

- Definition: Inflammation Syndrome of the pharynx caused by several microorganisms
- Causes: most viral but may also occur as part of common cold or influenza syndrome
- The most bacterial cause is Group A Streptococcus (*Streptococcus pyogenes*)-5-20%



ETIOLOGY

Microbial Causes of Acute Pharyngitis		
Pathogen	Syndrome/Disease	Estimated Importance
Viral		
Rhinovirus (100 types and 1 subtype)	Common cold	20
Coronavirus (3 or more types)	Common cold	≥5
Adenovirus (types 3, 4, 7, 14, 21)	Pharyngoconjunctival fever, ARD	5
Herpes simplex virus (types 1 and 2)	Gingivitis, stomatitis, Pharyngitis	4
Parainfluenza virus (types 1-4)	Common cold, croup	2
Influenza virus (types A and B)	Influenza	2
Cocksackievirus A (types 2, 4-6, 8, 10)	Herpangina	<1
Epstein-Barr virus	Infectious mononucleosis	<1
Cytomegalovirus	Infectious mononucleosis	<1
HIV-1	Primary HIV infection	<1
Bacterial		
Streptococcus pyogenes (group A β-hemolytic streptococci)	Pharyngitis/tonsillitis, scarlet fever	15-30
Group C β-hemolytic streptococci	Gingivitis, Pharyngitis (Vincent's angina)	5-10
	Peritonsillitis/peritonsillar abscess (quinsy)	<1
		<1
		<1
		≥1
Mixed anaerobic infection		
<i>Neisseria gonorrhoeae</i>	Pharyngitis	<1
<i>Corynebacterium diphtheriae</i>	Diphtheria	<1
<i>Corynebacterium ulcerans</i>	Pharyngitis, diphtheria	<1
<i>Arcanobacterium haemolyticum</i> (<i>Corynebacterium haemolyticum</i>)	Pharyngitis, scarlatiniform rash	<1
<i>Yersinia enterocolitica</i>	Pharyngitis, enterocolitis	Unknown
<i>Treponema pallidum</i>	Secondary syphilis	<1
		Unknown
Chlamydial		
<i>Chlamydia pneumoniae</i>	Pneumonia/bronchitis/Pharyngitis	
Mycoplasmal		
<i>Mycoplasma pneumoniae</i>	Pneumonia/bronchitis/Pharyngitis	
<i>Mycoplasma hominis</i> (type 1)	Pharyngitis in volunteers	
Unknown		

Approximately 15% of all cases of Pharyngitis are due to *S. pyogenes*. Strep. of Group C and B have also been implicated in some cases.

Pharyngitis Clinical Presentation



- Clinical presentation with soreness of the throat, may be dysphagia and pain on swallowing, fever and additional upper respiratory symptoms may also be present, Tender cervical lymphadenopathy

Pharyngitis-Clinical Presentation

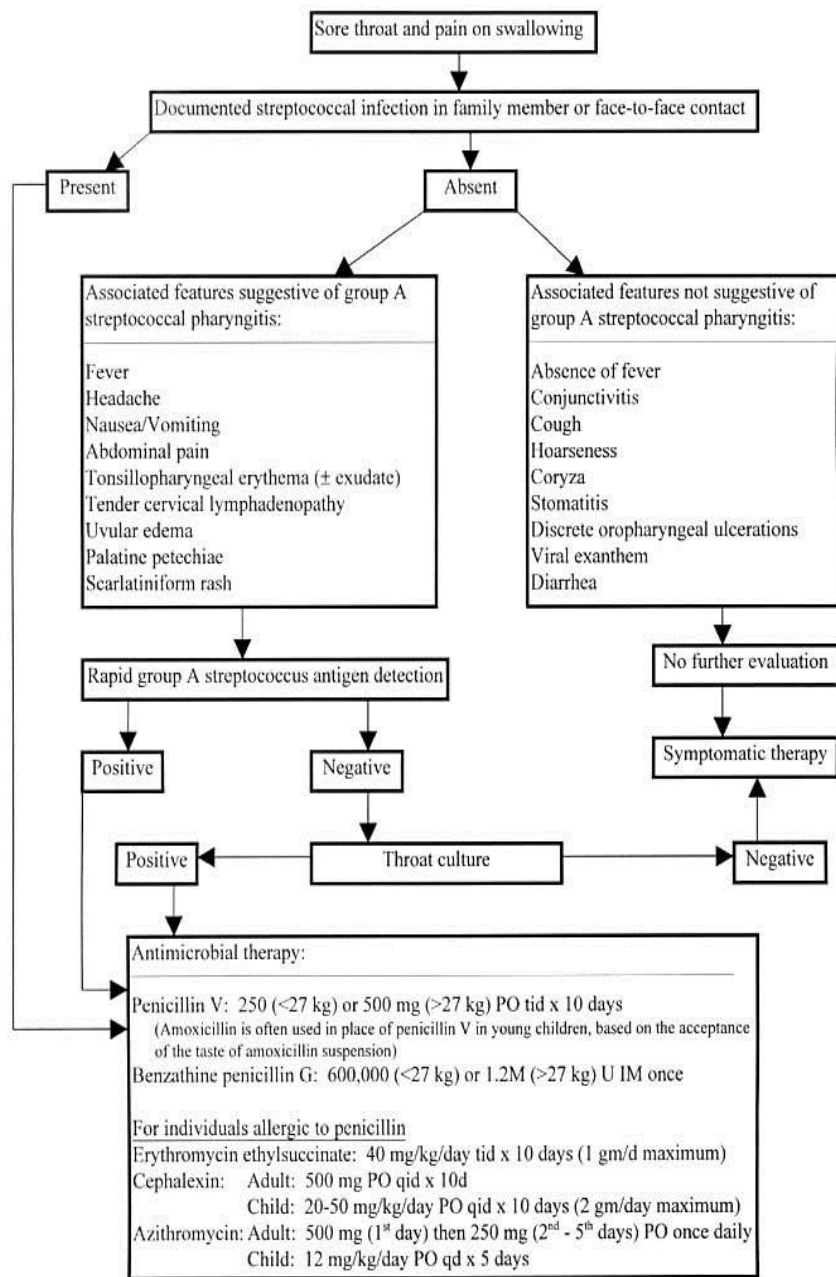
- Exudative or Diffuse erythema- *Group A , C, G Streptococcus , EBV, Neisseriae gonococcus C.diphtheriae, A.haemolyticum, Mycoplasma pneumoniae*
- Vesicular, ulcerative- *Coxsackie A9, B 1-5, ,ECHO, Enterovirus 71, Herpes simplex 1 and 2*
- Membranous- *Corynebacterium diphtheriae or Vincent Angina (anaerobes/spirochetes)*

Pharyngitis Diagnosis

- Clinical Presentation
- Determine if Group A Streptococcus is present by throat swab onto blood agar
- Antigen Kit may also be used
- Important to determine if present as treatment reduces risk of acute rheumatic fever and will reduce duration of symptoms

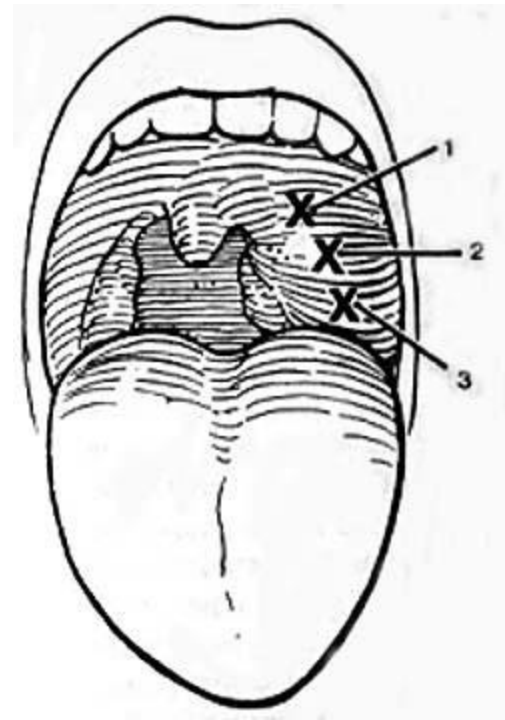


MANAGEMENT OF PHARYNGITIS



Quinsy Clinical Presentation

- Tonsillar Abscess with pain, fever, difficulty swallowing
- Drainage of Abscess and antimicrobial therapy



Epiglottitis

- Definition: Inflammation of the epiglottis due to infection
- Epidemiology: usually occurs in the winter months
- Causative Organisms: *H. Influenzae* (now rare), *S. pyogenes*, *Pneumococcus*, *Staphylococcus aureus*

OTITIS MEDIA

Otitis Media

- Definition: for diagnosis requires 3 things
- Confirmation of acute onset
- Signs of Middle Ear Effusion (Pneumatic otoscopy)-Bulging of TM, Limited mobility, Air-fluid level, otorrhoea
- Evaluation of Signs and Symptoms of Middle Ear Inflammation: Erythema of TM or Distinct otalgia (interferes with sleep)
- Epidemiology : AOM most common cause of antibiotic prescribing in paediatric population, cost \$1.96 billion in U.S, more common in some conditions such as cleft palate, Down's syndrome, genetic influences, occurs in the winter months but may be recurrent

Otitis Media

- Causative Organisms:
- *Streptococcus pneumoniae*-25-50%
- *Haemophilus Influenzae*-15-30%
- *Moraxella catarrhalis*-3-30%
- *Rhinovirus/RSV/Coronaviruses/Adenoviruses/Enteroviruses* –40-75%

Otitis Media Clinical Presentation

- Symptoms: Infant excessive crying, pulling ear
- Toddler: irritability , earache
- Both may have otorrhoea
- Signs: Fever , bulging eardrum, fullness and erythema of tympanic membrane
- May also be additional upper respiratory symptoms



Overview of Acute Otitis Media Treatment Options

Child Age	Certain Diagnosis	Uncertain Diagnosis
Under 6 months	Antibiotics	Antibiotics
6 months to 2 years	Antibiotics	Antibiotics if severe illness Observe* if non-severe illness
2 years or older	Antibiotics if severe illness Observe* if non-severe illness	Observe*

* Observation is appropriate *only* when follow-up can be assured and antibiotics started if symptoms persist or worsen.

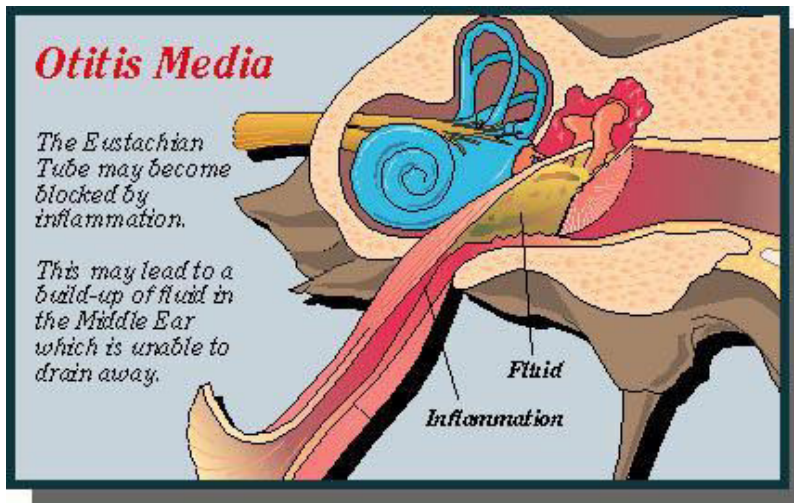
Non-severe illness implies mild otalgia and fever $<39^{\circ}\text{C}$ orally (about 102°F) or 39.5°C rectally in the past 24 hours.

Severe illness is moderate to severe otalgia or higher fever.

Certain diagnosis is a clinical picture suggesting acute otitis media with a high probability of middle-ear effusion.

Uncertain diagnosis is a clinical picture suggesting acute otitis media with anything less than a high probability of middle ear effusion.

Otitis Media Clinical Management



- Analgesia
- Observation if appropriate
- If a decision is made to treat with an antibacterial agent amoxicillin should be prescribed for most children at a dose of 80-90 mg/kg/day.

Recommendation

- If there is no clinical improvement in 48-72 hours
- Reassess and confirm or exclude diagnosis of AOM
- If Observation arm: treat
- If Treatment arm: Change therapy
- Duration of therapy: 10 days if 2 or less or severe 10 days , if > 2 years 5-7 days

Sinusitis

- Definition: Acute Bacterial Sinusitis, subacute Bacterial Sinusitis, Recurrent acute, Chronic sinusitis , Superimposed
- Epidemiology: children has 6-8 viral UTI per year and 5-13% may be complicated by sinusitis

Definitions Sinusitis

- Acute Bacterial : Bacterial Infection of the paranasal sinuses lasting less than 30days in which symptoms resolve completely
- Subacute Bacterial Sinusitis: Lasting between 30 and 90 days in which symptoms resolve completely
- Recurrent acute bacterial sinusitis: Each episode lasting less than 30 days and separated by intervals of at least 10days during which the patient is asymptomatic
- Chronic Sinusitis: Episode lasting longer than 90 days .Patients have persistent residual respiratory symptoms such as cough, rhinorrhoea or nasal obstruction
- Chronic Sinusitis: New symptoms resolve but underlying residue symptoms do not.

Sinusitis

- Pathogens:
- *Streptococcus pneumoniae*-30%
- *Haemophilus Influenzae*-20%
- *Moraxella catarrhalis*-20%

