



Pharynx 1 & 2

Objective:

➤ NOT given.

[Color index: **Important** | **Notes** | Extra | **433 Box**]

Done By : Khalid Alnaeem.

Edited By: Saleh Al-sahwi.

Revised By: Adel Al Shihri.

Resources: Slides+433team+Notes+Lecture notes of ENT.

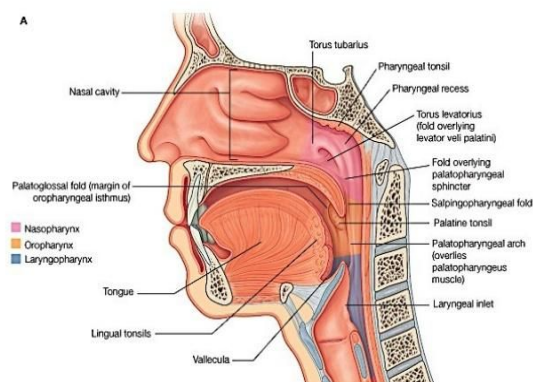
Anatomy of the pharynx:

- It extends from the base of the skull to the level 6 cervical vertebra at the lower border of cricoid cartilage.
- Funnel shaped, 10 cm length.
- **Widest portion (5cm) at hyoid.**
- **Narrowest portion(1.5cm) at caudal end.**

◆ Parts of the pharynx:

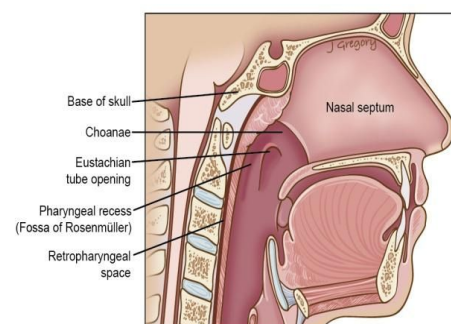
1- Nasopharynx

- Opens **anteriorly** to the nose,
- **Above:** the base of skull
- **Below:** soft palate
- **Laterally:**
 - Opening of the Eustachian tube
 - Torus tubarius (the elevated edge of the Eustachian tube opening).
 - Pharyngeal recess (fossa of rosenmuller) (Is a depression in the pharyngeal wall behind the torus tubarius) (very important to examine nasopharynx in smoker adult complaining of nasal obstruction because nasopharyngeal cancer commonly occurs in this fossa).
 - Adenoid
 - Nasopharyngeal isthmus (opening in the floor between the soft palate and the posterior pharyngeal wall).



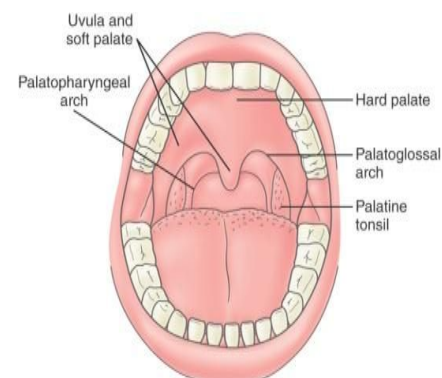
2. Oropharynx

- Opens **anteriorly** to the mouth and **divided from the oral cavity by Tonsillar pillar.**
- **Above:** soft palate.
- **Below:** the upper border of epiglottis.
- **Palatine tonsils:** between the anterior and posterior pillars



3. Laryngopharynx (Hypopharynx)

- Opens **anteriorly** to the larynx
- **Above:** the upper border of the epiglottis
- **Below:** lower border of cricoid
- **Pyramidal fossa:** (Is a depression in the mucous membrane on each side of the laryngeal inlet).
- **Valleculae:** Is a depression on each side of the median glossoepiglottic. It is the area between the epiglottis and base of the tongue. Important landmark for intubation and traps saliva to prevent the initiation of the swallowing reflex



❖ Structures of pharynx:

Fibromuscular tube

Four layers:

1-mucous membrane:

- Nasopharynx – Ciliated columnar epithelium
- Oro and hypopharynx –Stratified squamous epithelium
- Subepithelial lymphoid tissue of the pharynx(waldeyer's ring)

2-Submucosa

- Nerves, blood vessels,and lymphatics.
- Mucous and salivary glands .
- Subepithelial lymphoid tissue (Waldeyer's Ring). Characteristics of Waldeyer's Ring:
 - No afferents
 - Efferent to deep cervical nodes
 - No capsule except the palatine tonsils
- structures of Waldeyer's Ring:
 - Adenoid (No capsule.)
 - Lingual tonsils.
 - Tubal tonsils.
 - Lateral pharyngeal bands.
 - discrete nodules.

3-Muscle layer

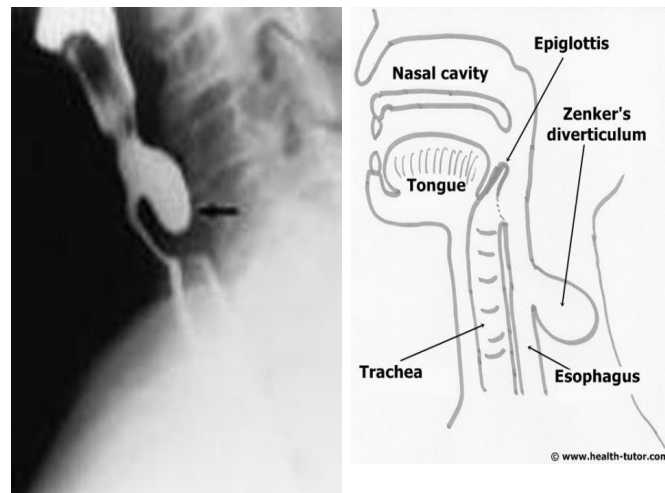
- **External:** Three constrictor muscles:
 1. **Superior constrictor:** Arises from pterygoid, pterygomandibular ligament post end of mylohyoid fibers
 2. **Middle constrictor:** Arises from the hyoid bone and stylohyoid ligament.
 3. **Inferior constrictor:** Thyropharyngeus, Cricopharyngeus.

Killian's dehiscence:

Potential gap between the thyropharyngeus and cricopharyngeus (Zenker's diverticulum occurs in this weak area and diagnosed by barium swallow).

Superior constrictors 4 parts :

- pterygopharyngeal : from pterygoid
- buccopharyngeal: from ptergomandibular ligament
- Mylopharyngeal: mylohyoid
- Glossopharyngeal: from tongue



- **internal:** Three muscles:

1. Stylopharyngus
2. Salpingopharyngus
3. palatopharyngus

Pharyngeal aponeurosis:

- Incomplete connective tissue coat in the lateral and posterior walls of the pharynx between the muscular layers.

Buccopharyngeal fascia

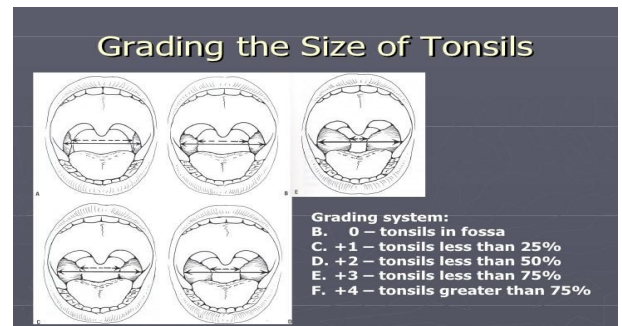
- Thin layer covers the muscular layer of pharyngeal wall.

Relations of pharynx:

- **Posteriorly:** prevertebral fascia
- **Anteriorly:** Parapharyngeal space

◆ Palatine tonsils:

- 12--15 crypts.
- The deep surface is separated from the constrictor muscles of the pharynx by connective tissue (capsule).
- When tonsillectomy is performed you have to make the incision in the connective tissue, if the surgeon goes more medially he will enter the tonsils, if more lateral he will enter the muscles
- **Food may be trapped in the crypts ⇒ Halitosis**



◆ Parapharyngeal Space:

Potential space lies outside the pharynx. Triangular in cross section, it extends from the base of the skull above to the sup mediastinum and apex of hyoid bone.

- **Anteromedial wall:** Buccopharyngeal fascia
- **Posteromedial wall:** Cervical vertebrae, prevertebral muscle and fascia
- **Lateral wall:**
 - **(Up)** the mandible, pterygoid muscle, parotid gland
 - **(Lower)** Sternomastoid muscle

→ Compartment:

Prestyloid	internal maxillary artery, fat, inferior alveolar, lingual, and auriculotemporal nerves.
Poststyloid	neurovascular bundle (carotid artery,, internal jugular vein, sympathetic chain ,CN IX,X and,XI).

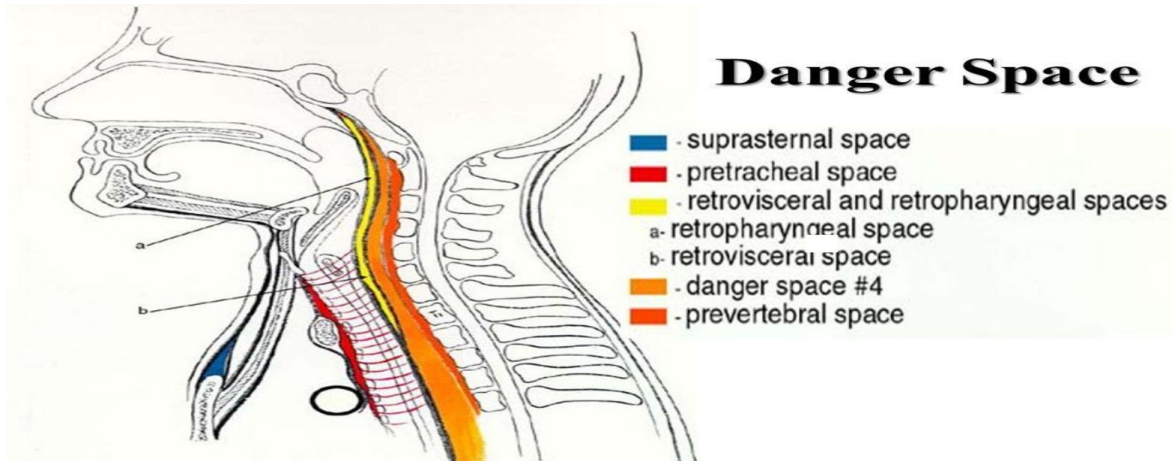
◆ Retropharyngeal Space:

It extends from the base of skull to superior mediastinum. Lies behind the pharynx

- **Anterior:** posterior pharyngeal wall and its covering buccopharyngeal fascia.
- **Posterior:** cervical vertebrae and muscles and fascia
- **Contents:** Retropharyngeal lymph nodes

(If a child has tonsillitis and on examination you found a bulge in the posterior wall (in front of you) you do a CT scan. It might be an abscess. An adult with a posterior bulge without acute infection, think of TB).

- Posterior to the retropharyngeal space, there is a Danger Area, any infection in this area will lead to mediastinitis.
- Also there is the Prevertebral Space. any infection in this space will be transmitted all the way down to the coccyx.



TEAM 433

Nerve Supply

Sensory: Each of the three sections of the pharynx have a different innervation:

- The **nasopharynx** is innervated by the maxillary branch of the trigeminal nerve (CN V).
- The **oropharynx** by the glossopharyngeal nerve (CN IX).
- The **laryngopharynx** by the vagus nerve (CN X).

Motor: All the muscles of the pharynx are innervated by the vagus nerve (CN X), except for the stylopharyngeus, which is innervated by the glossopharyngeal nerve (CN IX).

Also the Sympathetic fibers of the superior cervical ganglia play a role in the innervation.

Blood supply

Arterial from the external carotid

artery:

- Ascending pharyngeal
- The lingual artery
- The facial artery
- The maxillary artery

Venous drainage to the internal jugular

Lymphatics

- Retropharyngeal nodes.
- Deep cervical (jugular) nodes.

Physiology of the pharynx:

◆ Functions of the pharynx:

- Respiration
- Speech
- Resonating cavity
- Articulation
- Taste: taste buds

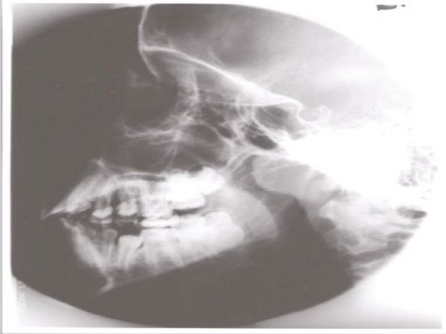

◆ Functions of the sub epithelial lymphoid tissue:

- Protective functions :
 - Formation of lymphocytes
 - Formation of antibodies
 - Acquisition of immunity
 - Localization of infection
 - Salivation.

◆ Deglutition:

A. Oral stage	<ul style="list-style-type: none">➤ voluntary➤ closure of mouth➤ cessation of respiration➤ raising of larynx➤ sudden elevation of the tongue to press against the palate, and pushes it backwards towards the oropharynx
B. Pharyngeal stage	<ul style="list-style-type: none">➤ reflux➤ contraction of nasopharynx sphincter➤ larynx rises more,➤ laryngeal inlet closure➤ epiglottis diverts the food into cricopharyngeal sphincter➤ contraction of constrictor muscles➤ relaxed cricopharyngeal sphincter
C. esophageal stage	

ADENOID (**IMPORTANT**):

<ul style="list-style-type: none"> • Hypertrophy of the nasopharyngeal tonsils due to infections and other causes which can cause symptoms of airway obstruction. • Most commonly between the age of 3-7 years. 	
Pathological types	<ul style="list-style-type: none"> • Inflammatory. • Tuberculosis.
Clinical features:	<ul style="list-style-type: none"> • Mouth breathing and snoring. • Hyponasality (loss of normal resonance). • Adenoid face (long and open-mouthed face of children with adenoid hypertrophy). • Nasal discharge and Eustachian tube obstruction.
Main Adverse effects (433)	<ul style="list-style-type: none"> • Nasal obstruction. • Pharyngitis (due to dry mouth). • Otitis media. • Rhinosinusitis. • Recurrent upper respiratory tract infections. • Obstructive sleep apnea. • Lateral x ray shows enlarged adenoid (IMP) 
Diagnosis	<p>1) X-ray. (should be done with the neck extended in order to fully visualize the adenoid)</p> <p>2) Flexible fiberoptic. (now used instead of x-ray)</p> <p>Using fiberoptic, adenoid hypertrophy is graded based on the degree of obstruction:</p> <ul style="list-style-type: none"> > Grade 1: <25%obstruction > Grade2: 25-50% obstruction > Grade3: 50-75% obstruction > Grade4 : 75-100% (complete obstruction) > fiberoptic inserted through the nose showing grade 3 adenoid 
Treatment	<ul style="list-style-type: none"> → Conservative if small. → Surgical: adenoidectomy. → Indications: recurrent / persistent otitis media, recurrent/chronic sinusitis, and obstructive sleep apnea.

SLEEP APNEA :

- Snoring is a sign of partial obstruction of the upper airway during sleep.
- Snoring is always present during **obstructive** sleep apnea.
- Sleep apnea: Cessation of airflow at the mouth and nostrils lasting 10 seconds for at least 30 apneic episodes.

→ Types:

1. Central sleep apnea: Failure of respiratory drive from the brain.
2. Obstructive sleep apnea (OSA): Due to anatomical narrowing of the upper airway. "For example: deviated nasal septum, large inferior turbinate, polyp, adenoid, large tongue, large tonsils and retrognathia (posterior positioning of the maxilla or mandible)".
3. Mixed.

→ Stages of sleep (skipped by the doctor he said not important):

Slow wave sleep:

- Brain waves are slow in deep restful sleep.
- There's a decrease in vascular tone and respiratory rate and basal metabolic rate.

Rapid eye movement:

- Brain quite active.
- Active dreaming.

→ Pathophysiology of OSA:

- During REM or deep sleep, obstruction occurs resulting in decrease arterial oxygen and increased arterial carbon dioxide pressure.
- Nocturnal desaturation arouses patient and causes increase pulmonary and systemic arterial pressure.
- Leads to hypersomnolence (excessive sleeping or sleepiness).
- Predisposes to hypertension and stroke.

→ Predisposing Factors:

- Obesity, nasal or pharyngeal obstruction by tonsils or adenoids in children, increasing age, alcohol, and smoking.

→ Investigations: (doctor didn't skip this part)

Sleep study:

- EEG
- EKG
- EOG
- pulse oximeter
- respiration rate
- nasal and oral air flow

→ Treatment:

- Nonsurgical :behavior modification : reduce weight and coffee intake - reflux management and avoid alcohol at night. Or use positive pressure ventilation
- medical treatment
- CPAP (continuous positive airway pressure).
- Surgical :UPPP (Uvulopalatopharyngoplasty) : a procedure that is done when the soft palate is redundant or if big tonsils or adenoids are present.

ACUTE INFECTIONS OF THE OROPHARYNX:

Acute tonsillitis

CAUSES	<ul style="list-style-type: none">• Viral (most common cause).• Bacterial (group A β-hemolytic streptococcus) moraxella, H. influenza, bacteroides).
Signs and symptoms	<ul style="list-style-type: none">• Fever.• Sore throat.• Pain on swallowing (odynophagia).• Jaw stiffness (trismus).• Halitosis (bad breath).• Phases: erythema, exudative, follicular tonsillitis.
Complications	<ul style="list-style-type: none">• Peritonsillar abscess (Quinsy).• Parapharyngeal or retropharyngeal abscess.• Otitis media.• Rheumatic fever, glomerulonephritis, scarlet fever. associated with group A streptococcus (GAS).
Treatment	<ul style="list-style-type: none">• Oral antibiotics (penicillin), bed rest, hydration, analgesia.• If the symptoms are severe : admit the patient and give IV fluids, IV antibiotics and analgesia.



Membranous Tonsillitis



Follicular Tonsillitis



Catarrhal Tonsillitis




Parenchymatous Tonsillitis

INFECTIOUS MONONUCLEOSIS


Pathogen	<ul style="list-style-type: none">● Epstein barr virus. Adolescents are especially susceptible (kissing disease).
Signs and symptoms	<ul style="list-style-type: none">● Fever.● Lymphadenopathy.● Malaise.● Exudative tonsillitis.● Hepatosplenomegaly.
Diagnosis	<p>→ Monospot test.</p> <p>→ Paul bunnell test (heterophile antibodies in serum) 80% mononuclear and 10% atypical lymphocytes on smear.</p>
Complications	<ul style="list-style-type: none">● Involvement of cranial nerves.● Meningitis.● Autoimmune hemolytic anemia.● Splenic rupture (activity restriction may be necessary to prevent splenic rupture in patients with splenic enlargement).
Treatment	<ul style="list-style-type: none">● Hydration, analgesia and oral hygiene. avoid ampicillin causes maculopapular rash.



Scarlet fever

Cause	<ul style="list-style-type: none"> → Endotoxin produced by type A β-hemolytic streptococcus (wrong). → The rash of scarlet fever is caused by the streptococcal pyrogenic exotoxins (ie, SPE A, B, C, and F). (couldn't find it in lecture notes but the internet +433 say exo)
Signs and symptoms	<ul style="list-style-type: none"> • Red pharynx • Strawberry tongue • Perioral skin erythema and desquamation • Dysphagia • Malaise • Severe cervical lymphadenopathy. 
Diagnosis	→ Dick test a test to determine susceptibility or immunity to scarlet fever by an injection of scarlet fever toxin.
Treatment	• Antibiotic.

Diphtheria

Pathogen	• <i>Corynebacterium diphtheriae</i> . The incidence has fallen markedly because of immunization.
Signs and symptoms	<ul style="list-style-type: none"> • Sore throat. • Fever. • Green plaques friable membrane on uvula and tonsils bleeds with scrapping. • Systemic symptoms due to the exotoxins: Toxemia , Mild fever , Tachycardia and Paralysis. • unilateral mostly.
Diagnosis	→ Culture
Complications	<ul style="list-style-type: none"> • Myocarditis. • Nephritis. • Airway obstruction death. 
Treatment	• Antibiotics (penicillin or erythromycin), antitoxin.

Vincent's angina

Cause	<ul style="list-style-type: none">• Gram negative fusiform bacillus and a spirillum with anaerobic.• Acute ulcerative lesion.
Signs and symptoms	<ul style="list-style-type: none">• Sudden in onset.• Pain.• Fever.• Cervical adenitis.• The base of the deep ulcers bleed when the membranous slough is removed.• The symptoms subside in 4-7 days.
Treatment	<ul style="list-style-type: none">• Metronidazole (flagyl), antiseptic, mouthwash.

Tonsillar hypertrophy grading:

- **Grade 0** : Tonsils are found confined to the space between the anterior and posterior pillars
- **Grade 1** : Tonsils are enlarged and is just seen coming out of the anterior pillar. (cover 25% of the space between the pillars)
- **Grade 2** : The enlarged tonsil reaches to about half the distance of uvula. (cover 50% of the space between the pillars)
- **Grade 3** : The enlarged tonsil comes into contact with the uvula. (cover 75% of the space between the pillars)
- **Grade 4** : The enlargement of tonsil is so much that both tonsils lie virtually in contact with each other i.e. kissing tonsils

Indications of Tonsillectomy:

1. **Recurrent tonsillitis**: 6 attacks or more during 1 year or 4 attacks per year for 2 years, or 3 attacks per year for 3 years.
2. **Hypertrophied tonsils causing airway obstruction.**
3. **Unilateral tonsillar enlargement**: tonsillar enlargement suspicious of malignancy (firm unilateral enlargement in an adult smoker).
4. **Peritonsillar abscess (Quinsy)** -treated by incision and drainage - wait for 6 weeks then book the patient for tonsillectomy.

Tonsillectomy complications:

1. Hemorrhage:

- Primary
- Reactionary
- Secondary

2. Respiratory obstruction. (because of uvular edema, hematoma, aspirated material).

3. Injury to near-by structures.

4. Pulmonary and distant infections.

❖ Primary hemorrhage

- Bleeding occurring during the surgery
- Causes:
 - Bleeding tendency
 - Acute infections
 - Bad technique
- Management:
 - General supportive measures
 - Diathermy, ligature or stitches
 - Packing

❖ Reactionary hemorrhage

- Bleeding occurring within the first 24 hours postoperative period
- Causes:
 - Bleeding tendency
 - Slipped ligature
- Diagnosis:
 - Rising pulse & dropping blood pressure
 - Rattle breathing
 - Blood trickling from the mouth
 - Frequent swallowing
 - Examination
- Treatment:
 - General supportive measures
 - Take patient back to OR
 - Control like reactionary hemorrhage

❖ Secondary hemorrhage

- Occur 5-10 days postoperatively
- Due to infection
- Treated by antibiotics
- May need diathermy or packing

moniliasis:

- White patches caused by candida albicans fungus.
- In bronchial asthma patients (using inhaled steroids) or immunocompromised patients like patients on renal dialysis.
- RX: nystatin.



Parapharyngeal abscess	
Source	➤ Source of the infection: odontogenic ,tonsils, , parotid
Signs and symptoms	<ul style="list-style-type: none"> • trismus • fever • muffled voices • intraoral bulge • Investigations: • Laboratory and bacteriology • CT (best modality) • MRI
Complications	<ul style="list-style-type: none"> ➤ aspiration ➤ cranial nerve palsy ➤ airway compromise ➤ septic thrombophlebitis ➤ carotid blowout ➤ endocarditis
Treatment	<ul style="list-style-type: none"> • external drainage • iv ABX • airway management

Retropharyngeal abscess (more in children) (IMP)

Signs and symptoms	<ul style="list-style-type: none">• odynophagia• hot potato voice• drooling• stiff neck fever• stridor
Complications	<ul style="list-style-type: none">➤ mediastinitis➤ respiratory distress➤ rupture abscess
Treatment	<ul style="list-style-type: none">• drainage• IV ABX• Make sure to secure the airway

Peritonsillar abscess (quinsy)(IMP) : An abscess between the tonsil capsule and the adjacent lateral pharyngeal wall

Signs and symptoms	<ul style="list-style-type: none">• fever• otalgia• odynophagia• uvular deviation• trismus• drooling of saliva• on one side
Complications	<ul style="list-style-type: none">➤ Para and retropharyngeal abscess➤ aspiration pneumonia
Treatment	<ul style="list-style-type: none">• I&D• aspiration• Iv ABX

Ludwig's angina: Bilateral cellulitis of submandibular and sublingual spaces.

occurs in diabetics after dental procedure ⇒ difficulty in breathing

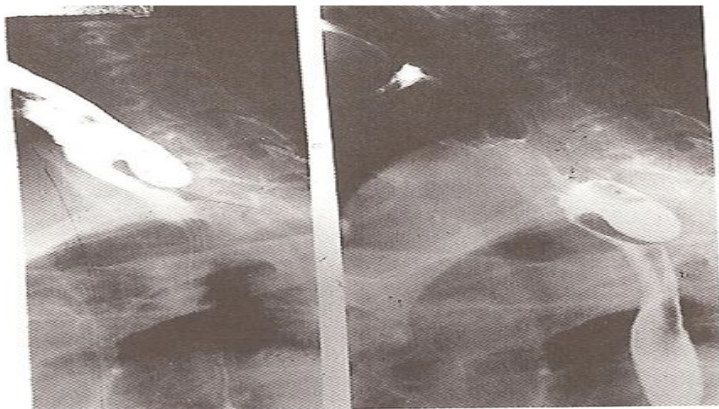
Signs and symptoms	<ul style="list-style-type: none">• wooden floor of the mouth• neck swelling and indurations• drooling• respiratory distress• swollen tongue• dysphagia• trismus
Complications	<ul style="list-style-type: none">➤ airway distress the abscess pushes the tongue upwards -> blocks airway➤ sepsis
Treatment	<ul style="list-style-type: none">• tracheotomy• external drainage• IV ABX

Chronic pharyngitis

Pathogenesis	<ul style="list-style-type: none">• postnasal drip• irritant (dust. Dry heat, smoking, alcohol)• reflux esophagitis• chronic mouth breathing• allergy• granulomatous disease• connective tissue disease• malignancy
Signs and Symptoms	<ul style="list-style-type: none">➤ constant mouth clearing➤ dry throat➤ pharyngeal crusting➤ thick granular wall
Treatment	<ul style="list-style-type: none">• address underlying etiology

zenker's diverticulum: Herniation of the mucosa at killian's triangle due to increase intraluminal pressure

Signs and Symptoms	<ul style="list-style-type: none">• dysphagia• regurgitation of undigested food• aspiration
Diagnosis	➤ Barium swallow
Treatment	<ul style="list-style-type: none">• Cricopharyngeal myotomy.• Diverticulectomy



Aphthous Ulcer: Usually due to stress, stays for a few days and spontaneously resolves.

430 teamwork

- ◆ Bifid uvula (there was a picture in the slides)
- Signs & symptoms: snoring and mouth breathing.
- Sometimes, the adenoid helps close the soft palate. So, before deciding on removing the whole adenoid (adenoidectomy), the doctor should examine the uvula to make sure it's not short or bifid and palpate the soft palate to check for submucosal cleft. If any of the three conditions mentioned are there, it is contraindicated to do an adenoidectomy.



- This picture shows a bifid uvula and soft palate.
- In this case, only the upper part of the adenoid is removed (partial adenoidectomy), while the lower part is kept; to bridge the gap between the soft palate and pharynx in order to prevent velopharyngeal insufficiency and hypernasality.
- Velopharyngeal insufficiency (VPI) is a disorder resulting in the improper closing of the velopharyngeal sphincter (soft palate muscle in the mouth) during speech, allowing air to escape through the nose instead of the mouth which results in hypernasality.