

AIRWAY ANATOMY ASSESSMET

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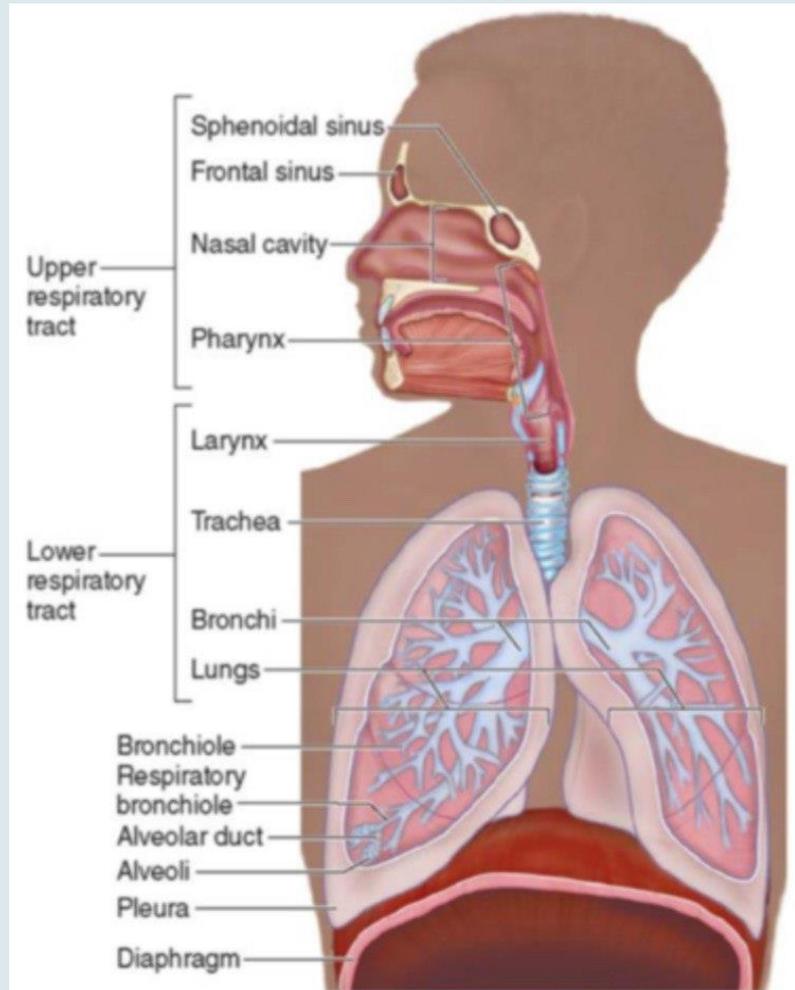


AIR WAY ANATOMY SIGNIFICANCE IN ANESTHESIA AND ICU:

- ACCURATE KNOWLEDGE OF ANATOMY AND PHYSIOLOGY OF THE RESPIRATORY TRACT IS IMPORTANT IN ANESTHESIOLOGY AND CRITICAL CARE FOR SAFE AND SMOOTH CONDUCTION OF ANESTHESIA AND ICU MANAGEMENT AS GENERAL ANESTHESIA , SEDATION AND MUSCLE RELAXATION ARE ASSOCIATED WITH ALTERATIONS IN THE RESPIRATORY FUNCTION AND CARRY WITH THEM AT LEAST A SMALL RISK OF AIRWAY OBSTRUCTION AND APNEA.

AIR WAY IS DEFINED AS A PASSAGE THROUGH WHICH THE AIR/ GAS PASSES DURING RESPIRATION AND DIVIDED:

ANATOMICALLY



FUNCTIONALLY

	Name of branches	Number of tubes in branch
Conducting zone	Trachea	1
	Bronchi	2
		4
		8
		16
	Bronchioles	32
Terminal bronchioles	6×10^4	
Respiratory zone	Respiratory bronchioles	5×10^5
		Alveolar ducts
	Alveolar sacs	

FUNCTIONALLY DIVIDED INTO :

* **CONDUCTIVE ZONE** –TILL TERMINAL BRONCHIOLES

* **RESPIRATORY ZONE** – INCLUDES RESPIRATORY BRONCHIOLES, ALVEOLAR DUCTS, ALVEOLI

ANATOMICALLY DIVIDED INTO :

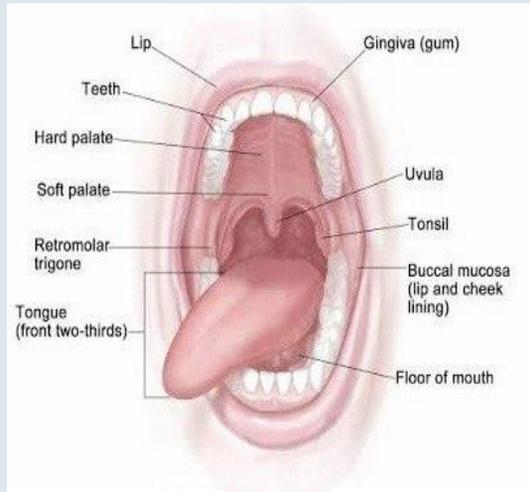
* **UPPER AIRWAY** (NASAL, ORAL, PHARYNX, LARYNX)

MORE VULNERABLE TO OBSTRUCTION

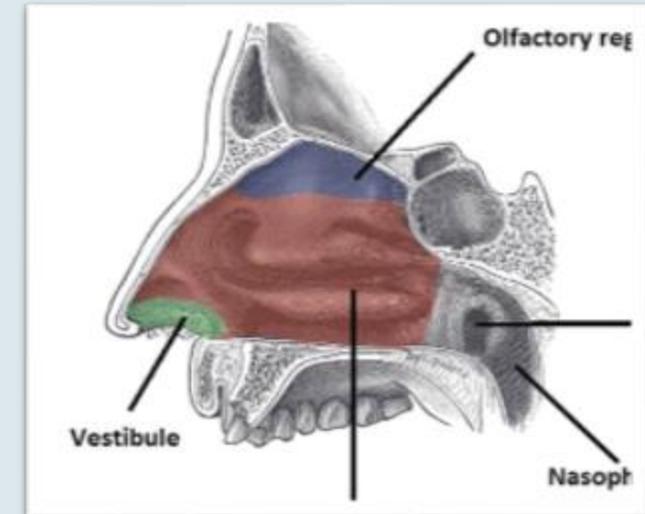
* **LOWER AIRWAY** (TRACHEA, BRONCHI, BRONCHIOLES)



- **Oral cavity :**
 - _ Extending from lips into oropharyngeal isthmus.
 - _ During evaluation for airway assessment, mouth opening must **at least 3 fingers width (> 6 cm)**



- **Nasal cavity :**
 - Extending from nostrils to posterior nasal aperture.
 - _ Divided by nasal septum into 2 halves (right and left)
 - _ Aims in humidification, heating and filtering of inspired air.

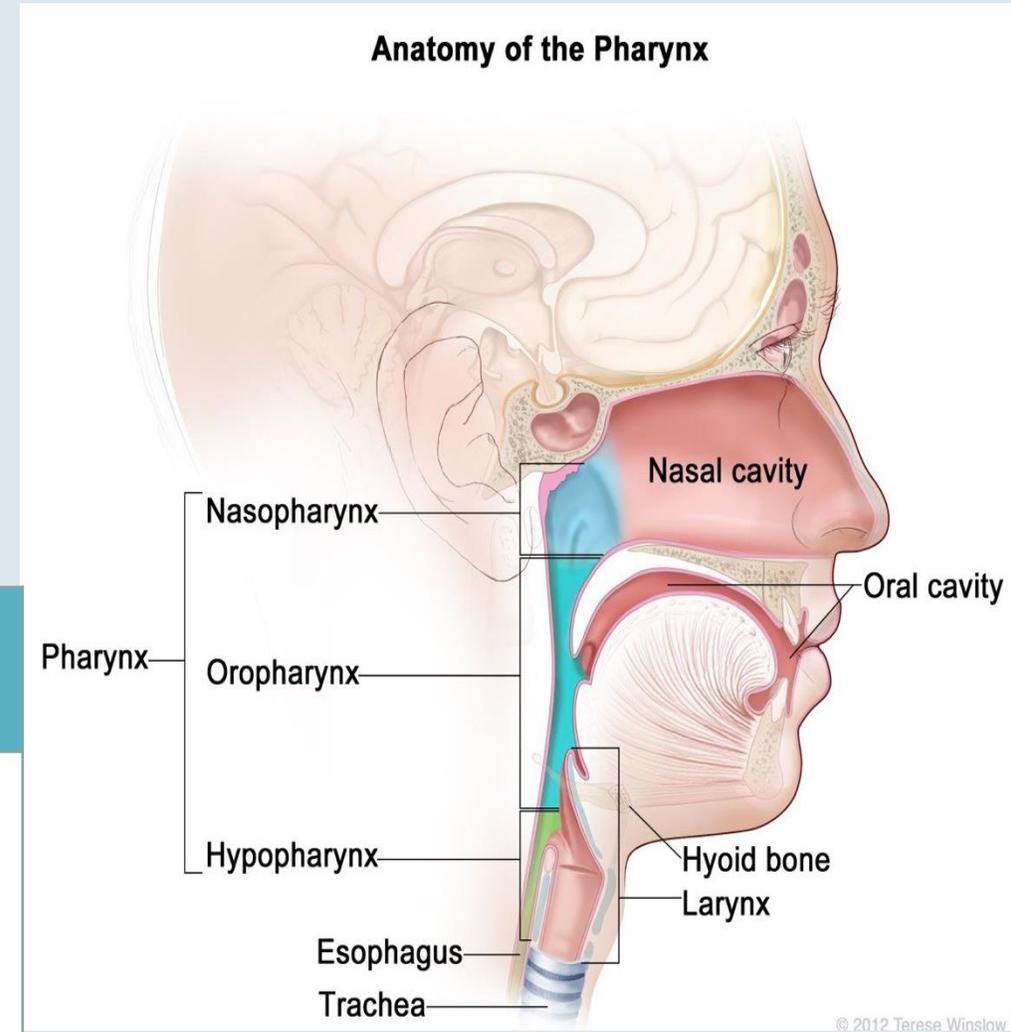


PHARYNX (THROAT)

- A HOLLOW MUSCULAR TUBE INSIDE THE NECK THAT CONNECTS THE POSTERIOR NASAL AND ORAL CAVITIES TO THE LARYNX AND ESOPHAGUS.

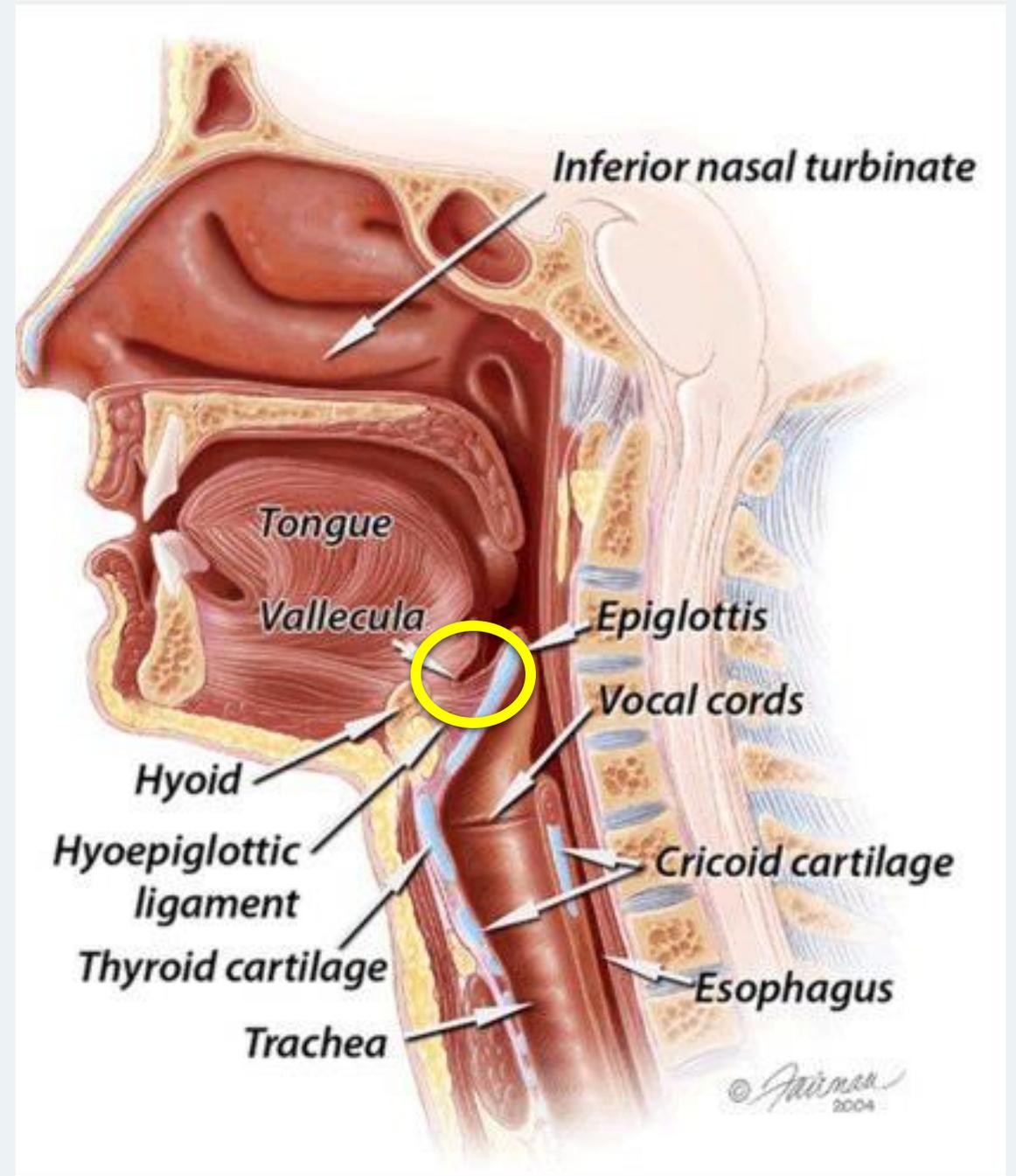
-(12-14) CM IN LENGTH.

Nasopharynx	Oropharynx	Laryngopharynx
Behind the nasal cavity and above the soft palate	Behind the oral cavity, between soft palate and top of hyoid bone	Behind the larynx and below the epiglottis to the beginning of esophagus





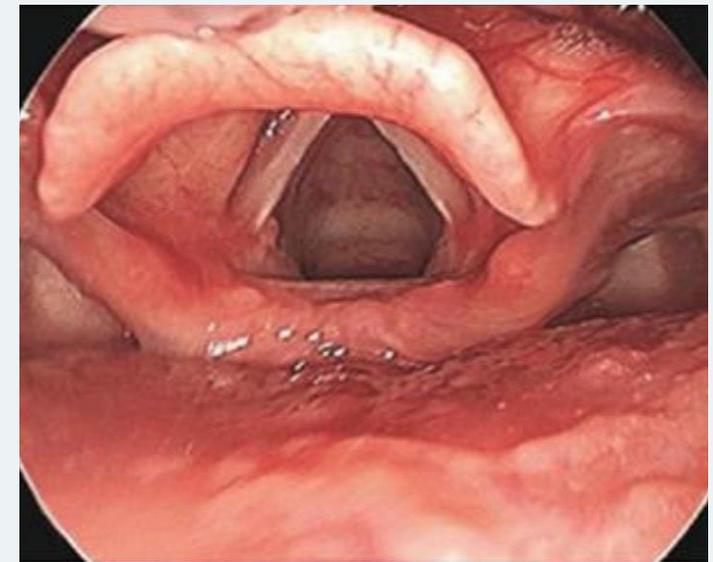
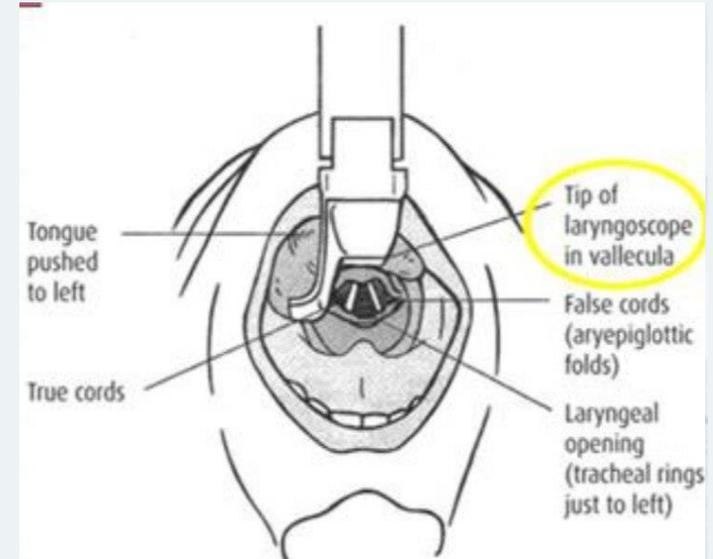
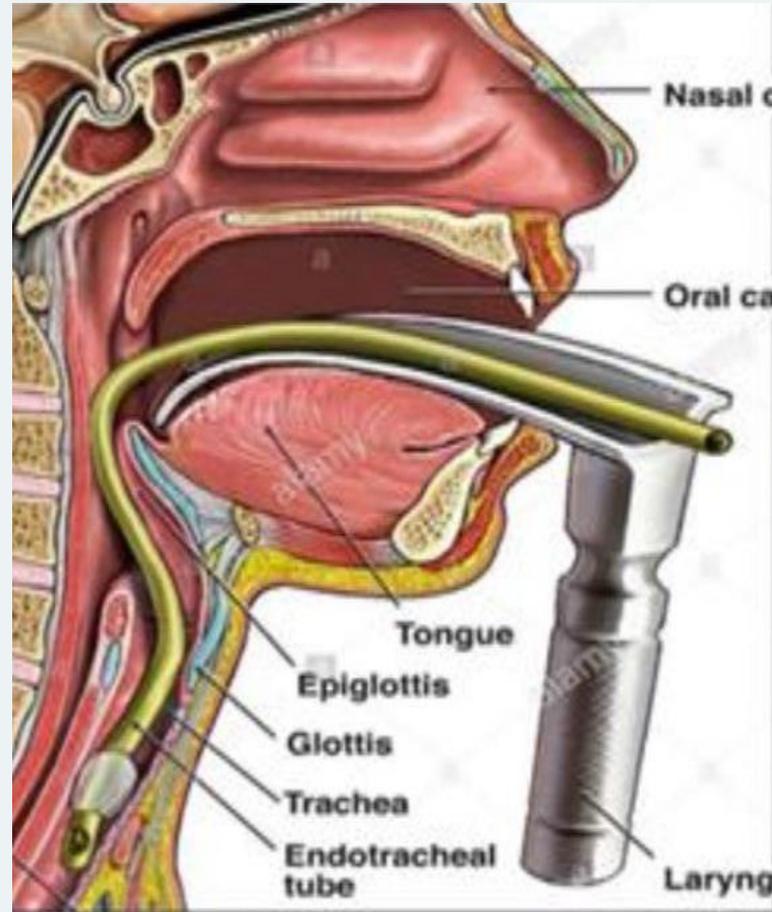
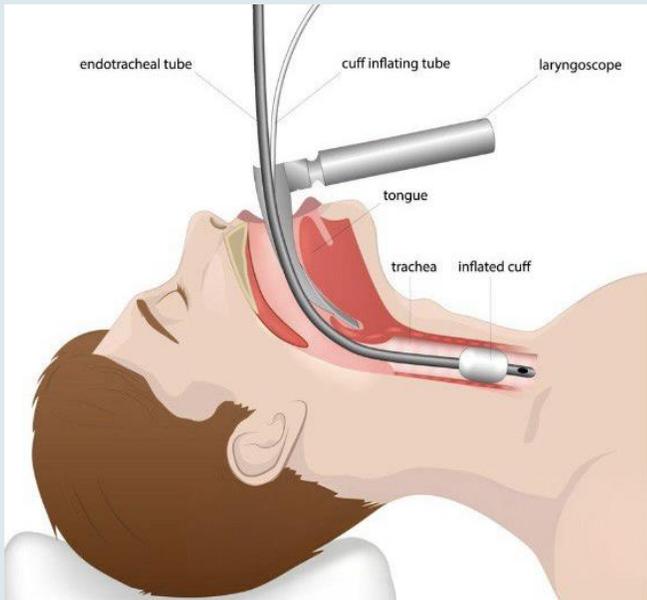
- VALLECULA: A DEPRESSION BETWEEN EPIGLOTTIS AND BASE OF THE TONGUE
*WHERE BLADE OF LARYNGOSCOPE RESTS.

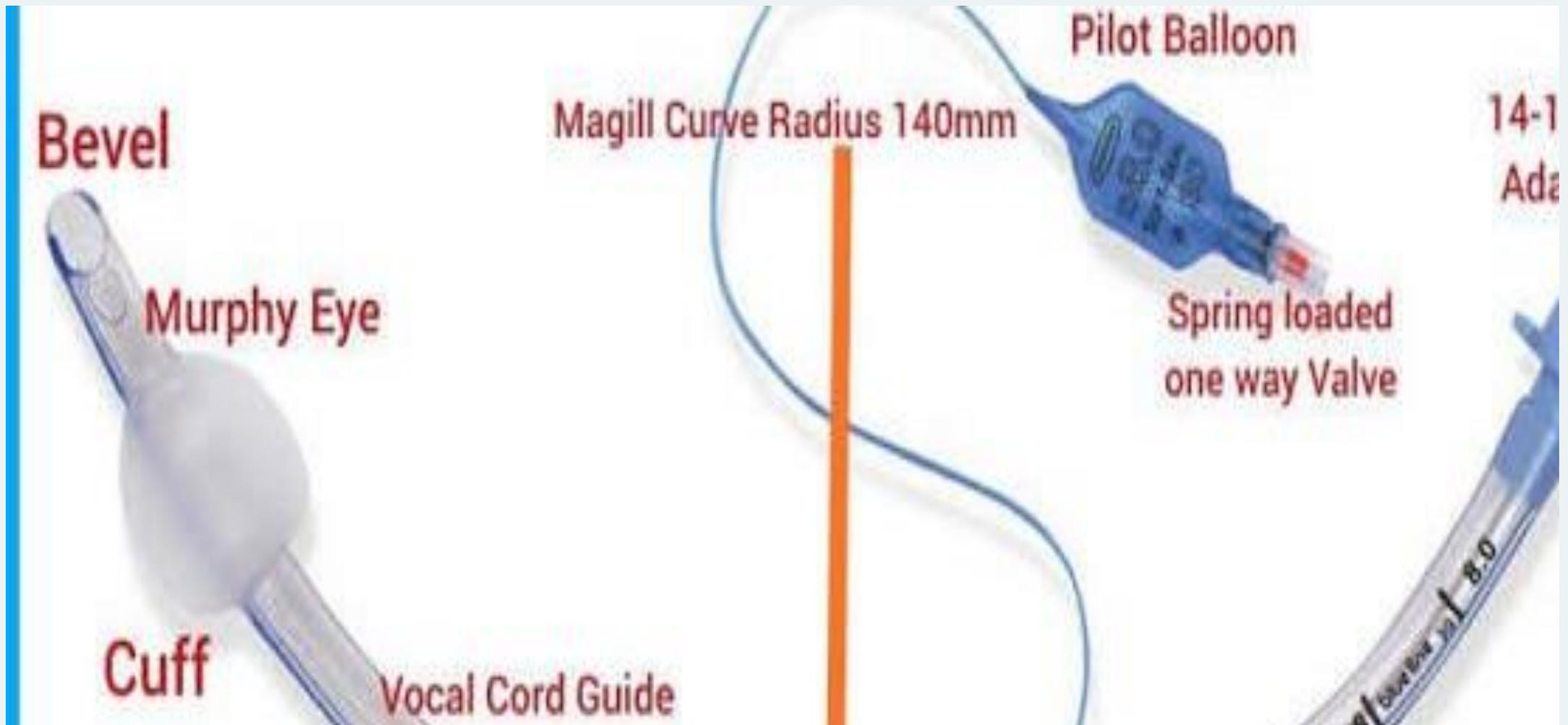


• LARYNGOSCOPY FOR TRACHEAL INTUBATION:

_ ENDOSCOPY OF THE LARYNX TO OBTAIN A GOOD VIEW FOR VOCAL CORDS AND GLOTTIS.

_ USED FOR PLACEMENT OF THE ETT (ENDOTRACHEAL TUBE) INTO THE TRACHEA.





ENDOTRACHEAL TUBE (ETT) IS A TUBE CONSTRUCTED OF POLYVINAL CHLORIDE .
PLACED INTO THE WINDPIPE THROUGH THE MOUTH OR NOSE .

JAW THRUST MANEUVER

In cases of decreased consciousness as in General Anesthesia and due to decreased muscle tone, tongue may be posteriorly displaced into oropharynx obstructing the airway.

- These maneuvers are used to maintain patient's airway.
- performed by placing the index and middle fingers to physically push the posterior aspects of the lower jaw upwards and outwards while their thumbs push down on the chin to open the mouth.



THE HEAD TILT-CHIN LIFT



is used to open the airway by lifting the tongue away from the back of the throat, preventing obstruction and allowing for air to pass to the lungs

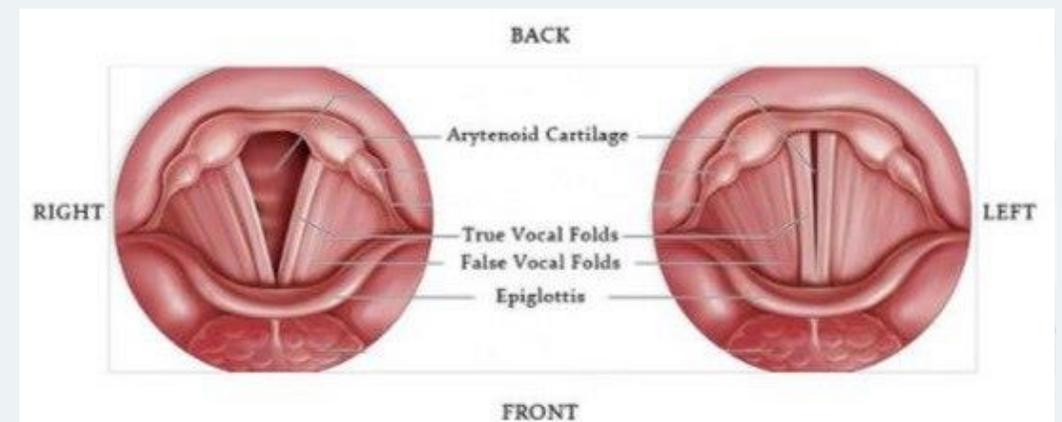
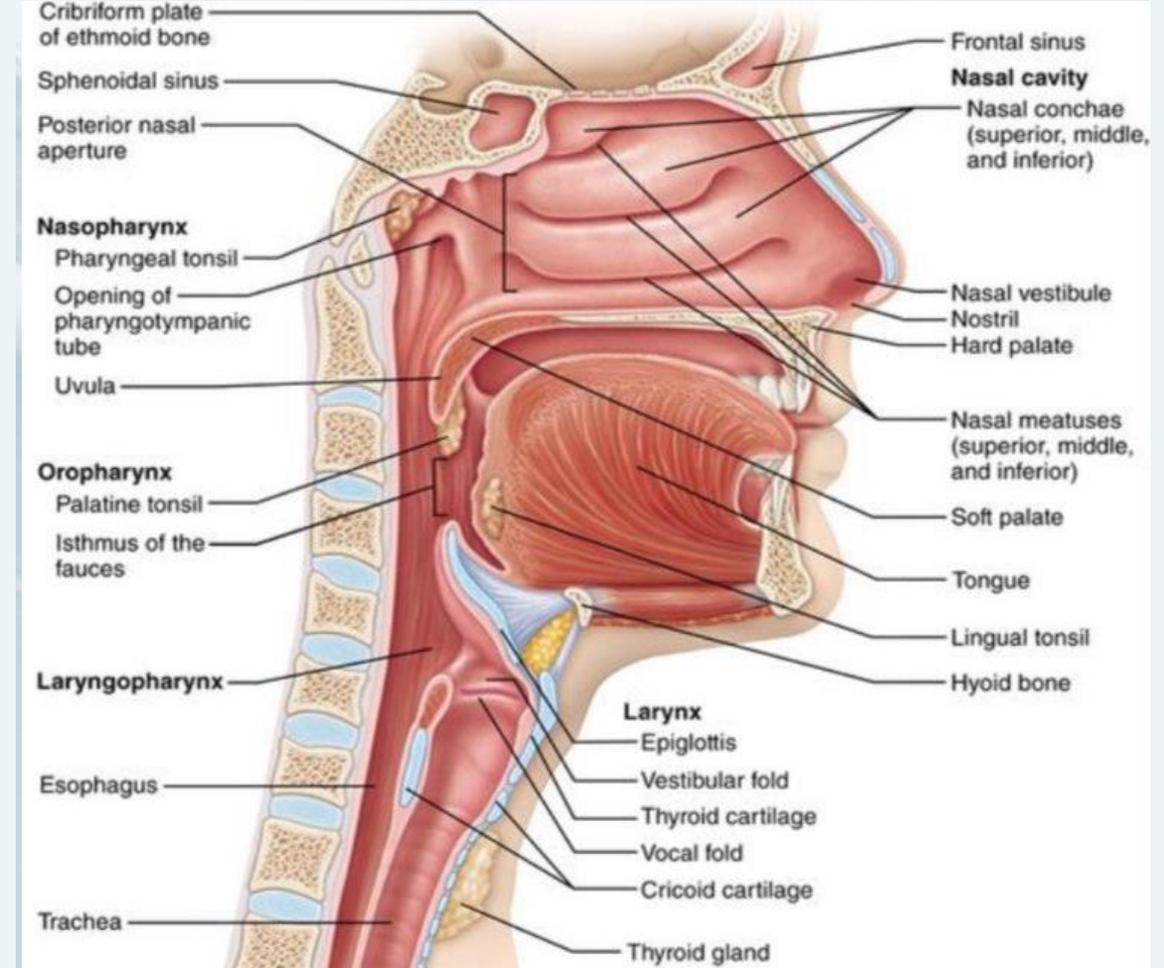
The head tilt-chin lift maneuver consists of two separate maneuvers:

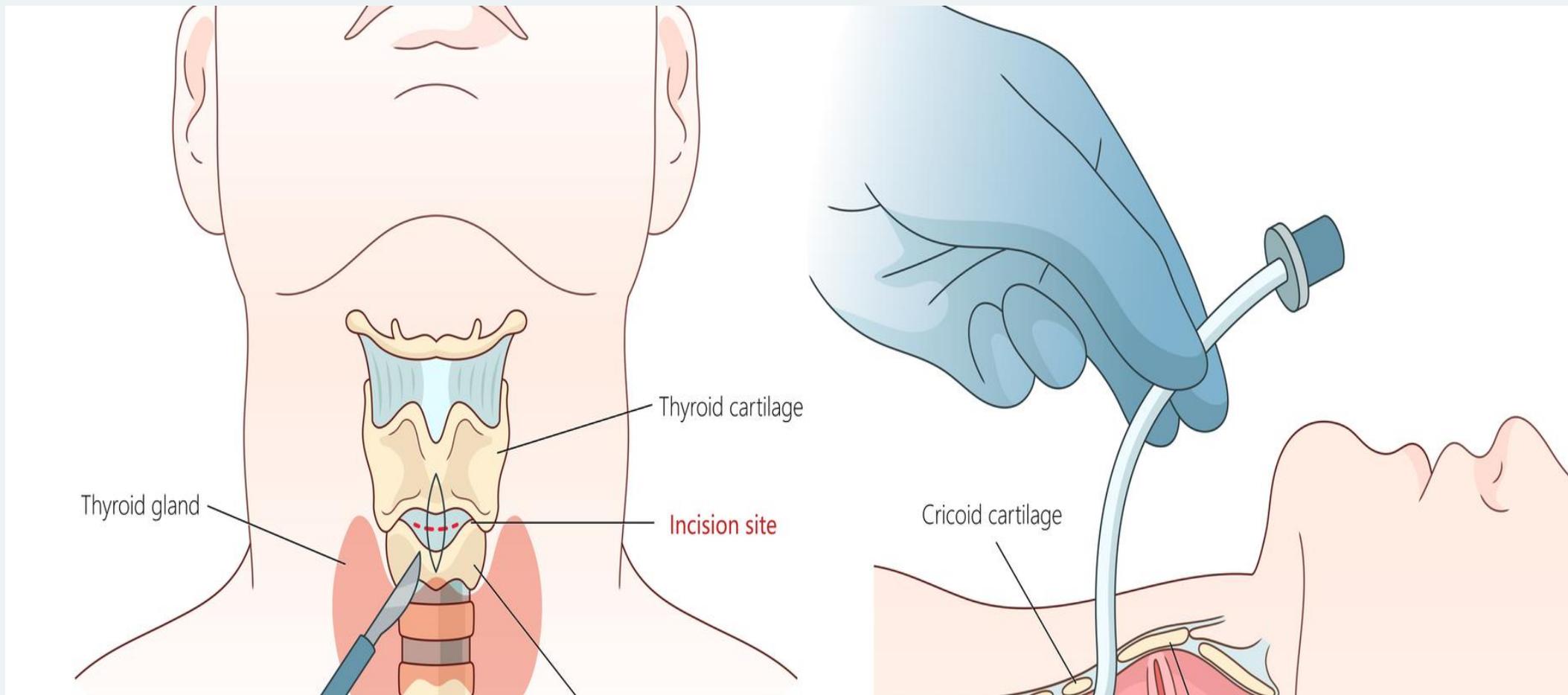
First, one hand is placed on the forehead and is used to rotate the head into a "sniffing" position (i.e., neck fully extended and head tilted backwards).

Second, the other hand is used to lift the chin forward and up.

LARYNX (SOUND BOX)

- _ The passageway for air between the pharynx above and the trachea below.
- _ Extends from **C3-C6** in adults.
- _ It is formed a number of cartilages which articulates by synovial joints and connected together by ligaments and membranes and moved by number of muscles.
- _ Laryngeal cavity has 2 pairs of mucous membrane folds:
 - 1) upper folds = **false vocal cords**
 - 2) lower folds = **true vocal cords**, which could be injured during intubation





CRICOTHYROTOMY:

SURGICAL AIRWAY MADE VIA THE CRICOTHYROID MEMBRANE IN ACUTE EMERGENCY
WHEN OBSTRUCTION **AT OR ABOVE THE LARYNX NOT RELIEVED.**

TRACHEA

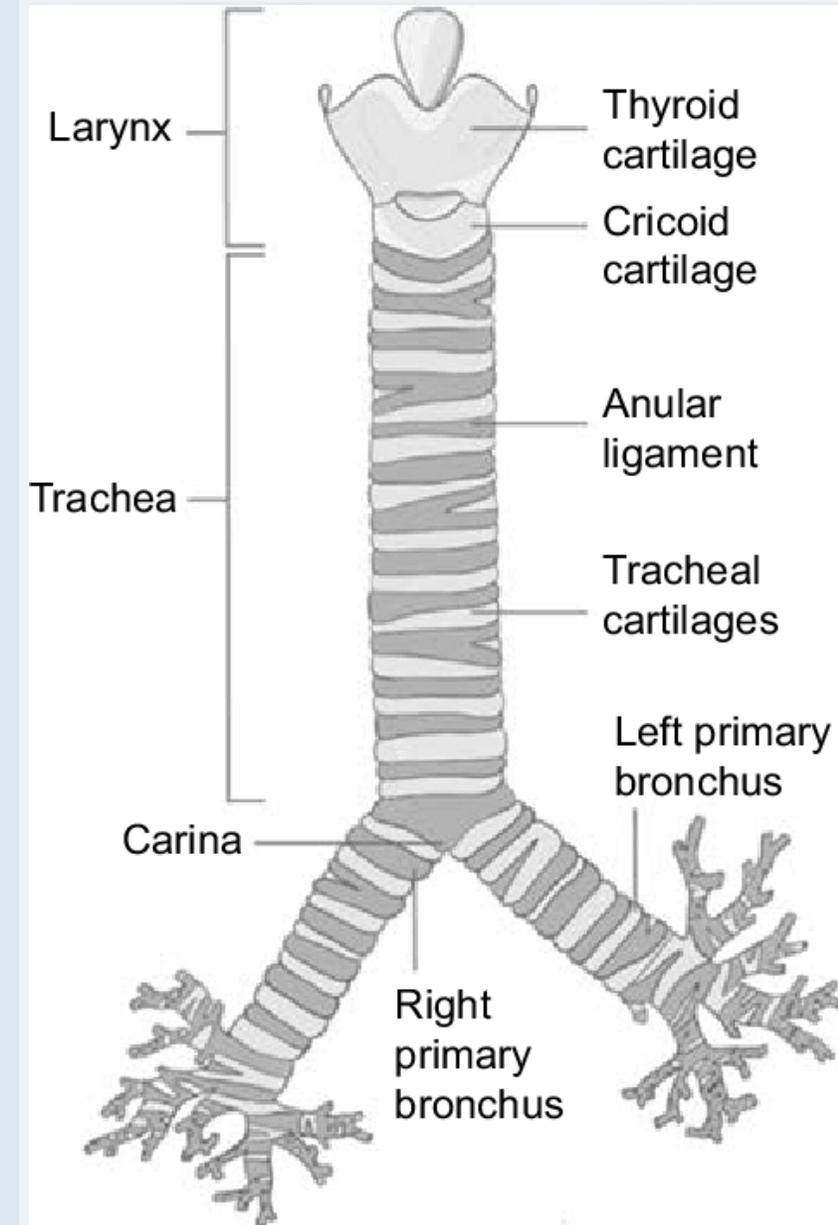
The Trachea is a **mobile** cartilaginous and membranous tube.

_ It begins as a continuation of the larynx at the lower border of the cricoid cartilage **at the level of the 6th cervical vertebra.** _

Trachea ends at the carina by dividing into right and left principal (main) bronchi at the level of the sternal angle (opposite the disc between the fourth and fifth thoracic vertebrae.

_ The carina is a cartilaginous ridge within the trachea at the site of the tracheal bifurcation.

_ In adults the trachea is about 4½ inch (11.25 cm) long and 1 inch (2.5 cm) in diameter.

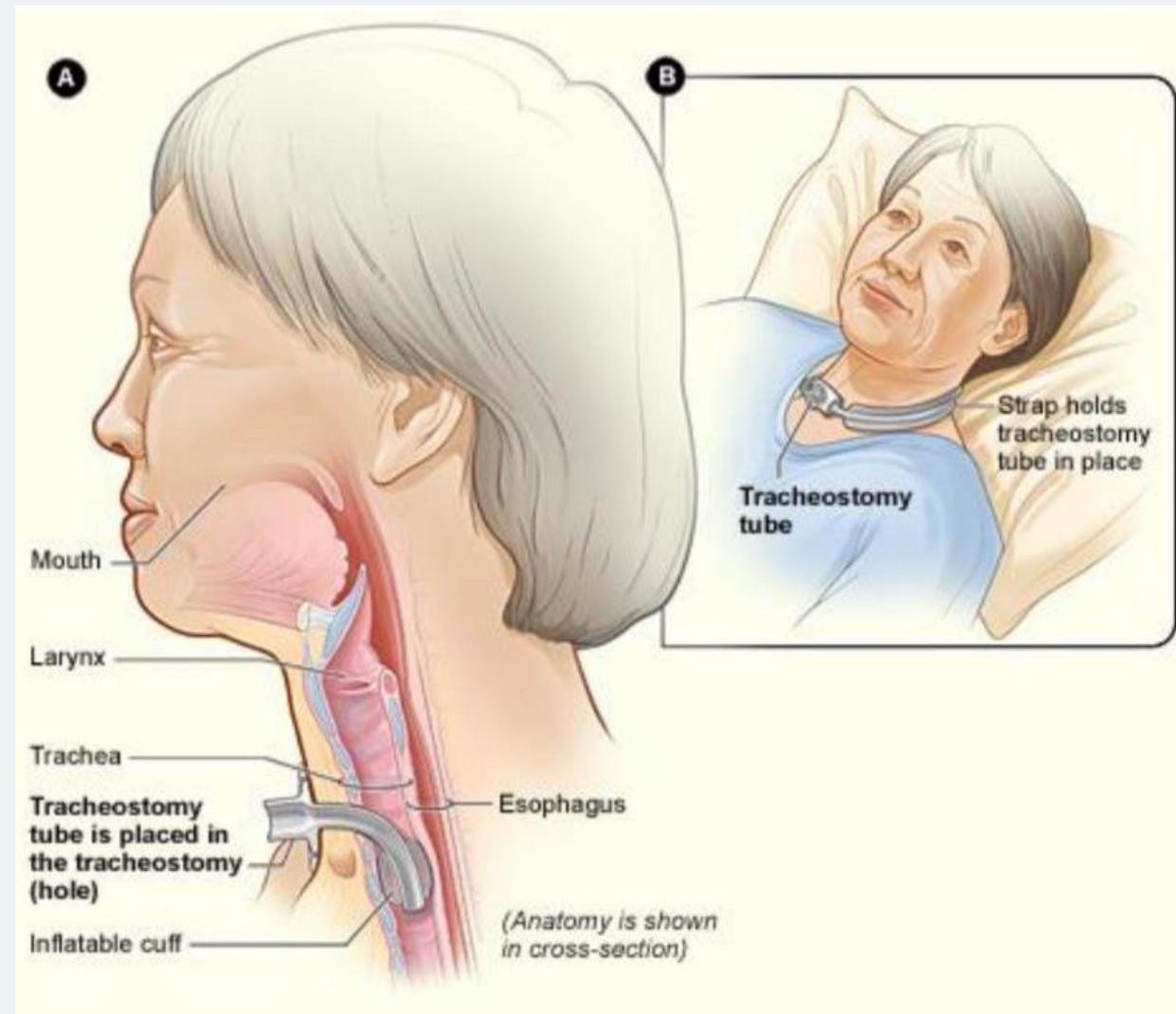


Tracheostomy:

- tracheostomy is an opening (made by an incision) through the neck into the trachea (windpipe).
- A tracheostomy opens the airway and aids breathing.
- may be done in an emergency, at the patient's bedside or in an operating room.
- Anesthesia (pain relief medication) may be used before the procedure.

❖ Levels of tracheostomy:

- .1 High level at first tracheal ring.
- .2 Mid-level at second tracheal ring.
- .3 Low level at third tracheal ring.





INDICATION OF TRACHEOSTOMY

Respiratory obstruction

- Infection .
- Trauma .
- Laryngealedema.
- Neoplasm.
- Foreign body.
- Bilateral abductor paralysis.

Retained secretion

- Inability to cough.
- Respiratory muscles spasm .
- Respiratory muscle paralysis.
- Coma of any cause: head injury.
- Painful cough.
- Chest injuries-Multiple rib fractures, pneumonia
- Aspiration of secretion.

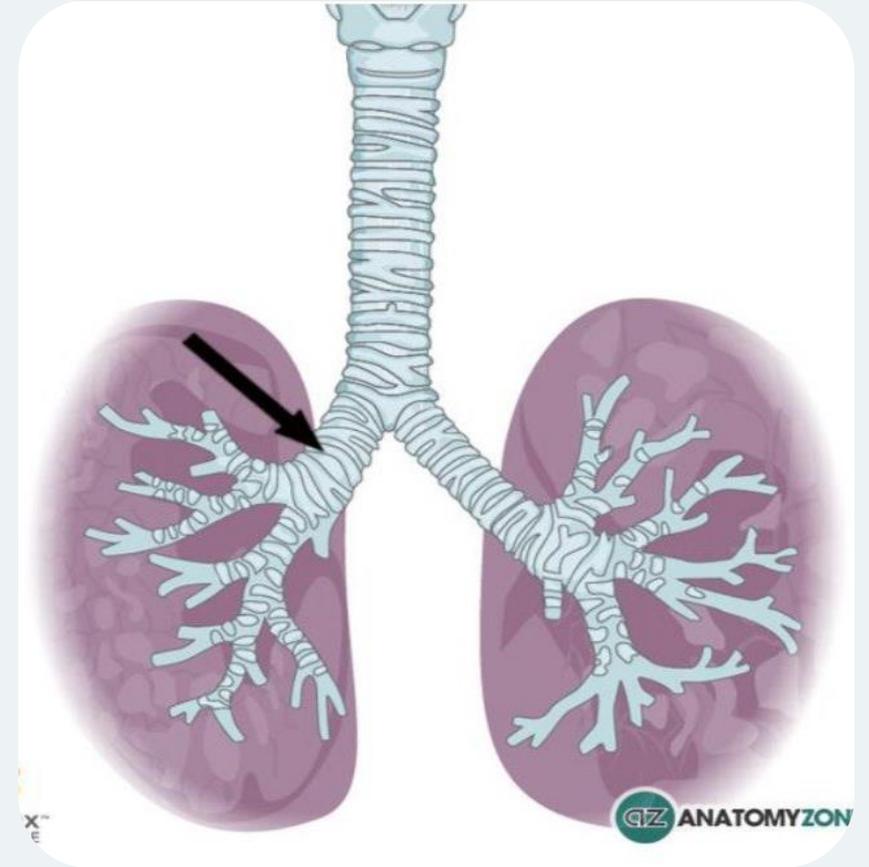
Respiratory Insufficiency

Chronic lung conditions as emphysema, chronic bronchitis, Bronchiectasis , atelectasis



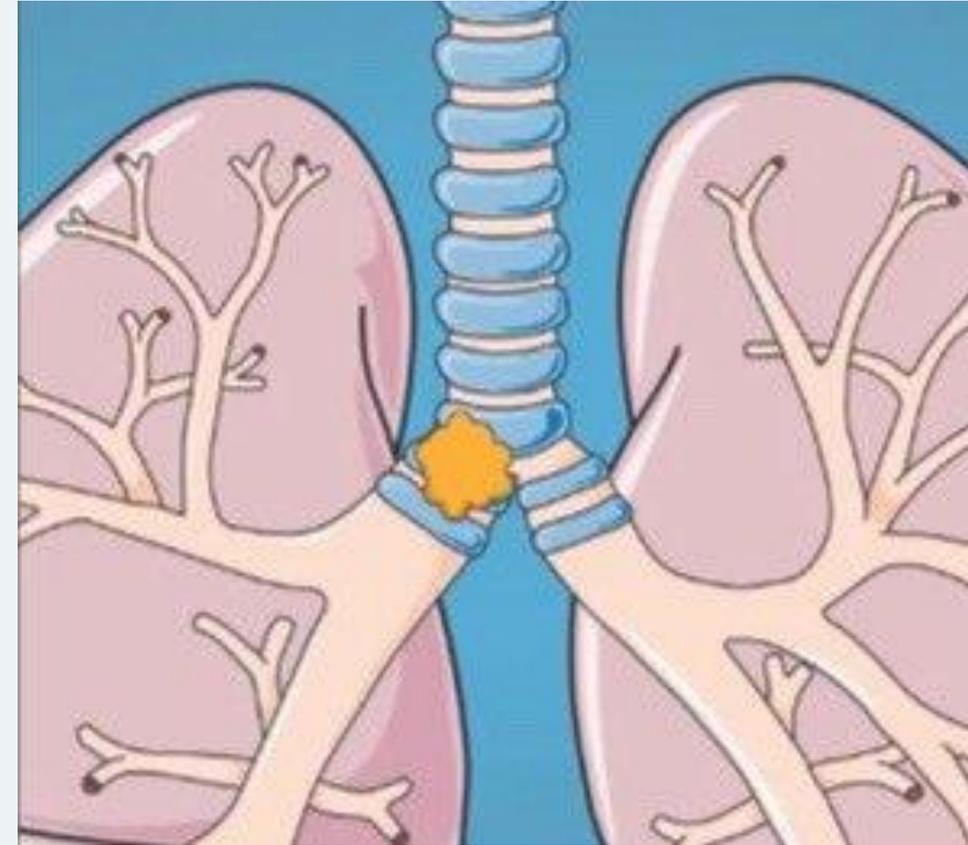
BRONCHI

- _ Right bronchus is shorter and wider and is more vertical than the left bronchus.
- _ Foreign bodies usually enter the right bronchus.



CARINA CLINICAL SIGNIFICANCE

- Foreign bodies that fall down the trachea are more likely to enter the right bronchus.
- The mucous membrane of the carina is the most sensitive area of the trachea and larynx for triggering a cough reflex.





AIRWAY ASSESSMENT

- History
- Local examination
- Specific tests
- Radiological presentation



Definition:

Airway assessment is the first step in successful airway management.

* Several anatomical and functional manoeuvres can be performed to estimate:

1- **difficulty of endotracheal intubation** (account 17% of respiratory related injury and result in significant morbidity and mortality).

2- **Oesophageal intubation.**

3- **Inadequate ventilation .**

- 28% of anaesthesia related death are secondary to the inability to mask ventilate or intubation



- PREDICTOR OF DIFFICULTY ENCOUNTERING VENTILATION MASK :



- BEARDED MAN.

- MASK SEALING DIFFICULT DUE TO RECEDING MANDIBLE SYNDROMES WITH FACIAL ABNORMALITY BURN STRICTURE AND TREACHER COLLINS SYNDROME .ETC

- OBESITY, UPPER AIRWAY OBSTRUCTION

- ADVANCED AGE



- WHY IT IS NECESSARY?

TO DIAGNOSE THE POTENTIAL FOR DIFFICULT AIRWAY FOR :

1- OPTIMAL PATIENT PREPARATION .

2- PROPER SELECTION OF EQUIPMENT AND TECHNIQUE.

3- PARTICIPATION OF PERSONNEL EXPERIENCED IN DIFFICULT AIRWAY MANAGEMENT.

LEMON

1- Look:

Examination of the airway look for:

- Short immobile muscular neck.
- Receding mandible.
- Protruding maxillary incisors .
- Long high-arched palate.
- Loose or capped, Missing teeth.
- Enlarged tonsils & tongue.
- Tumor that could obstruct air flow.
- Limited temporomandibular joint mobility.

DIFFICULT AIRWAY ASSESSMENT

LOOK EXTERNALLY

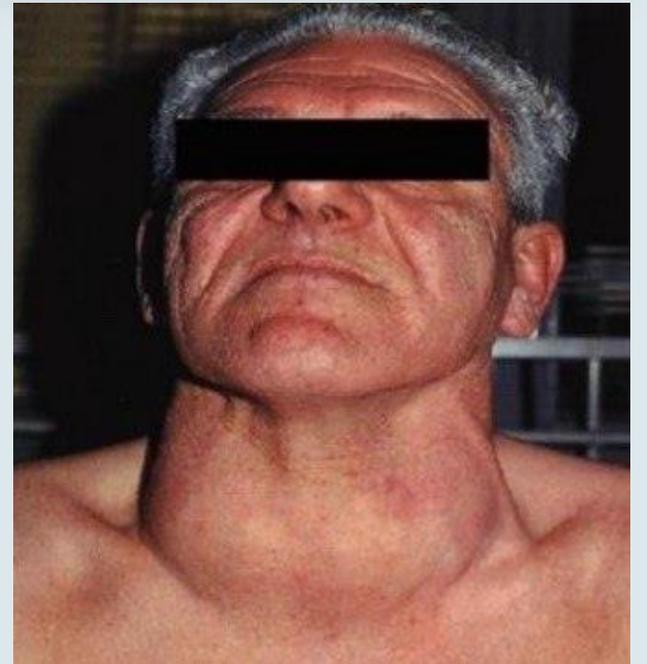
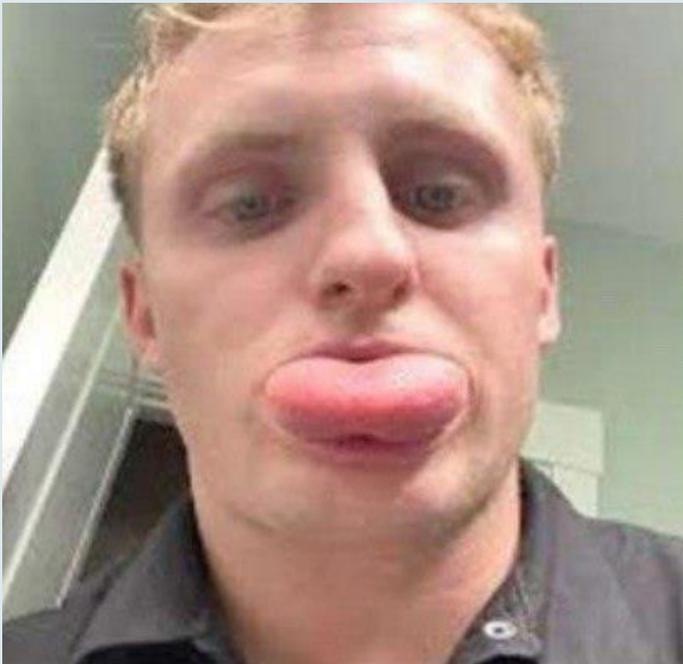
EVALUATE (3-3-2 RULE)

MALLAMPATI SCORE

OBSTRUCTED AIRWAY

NECK MOBILITY

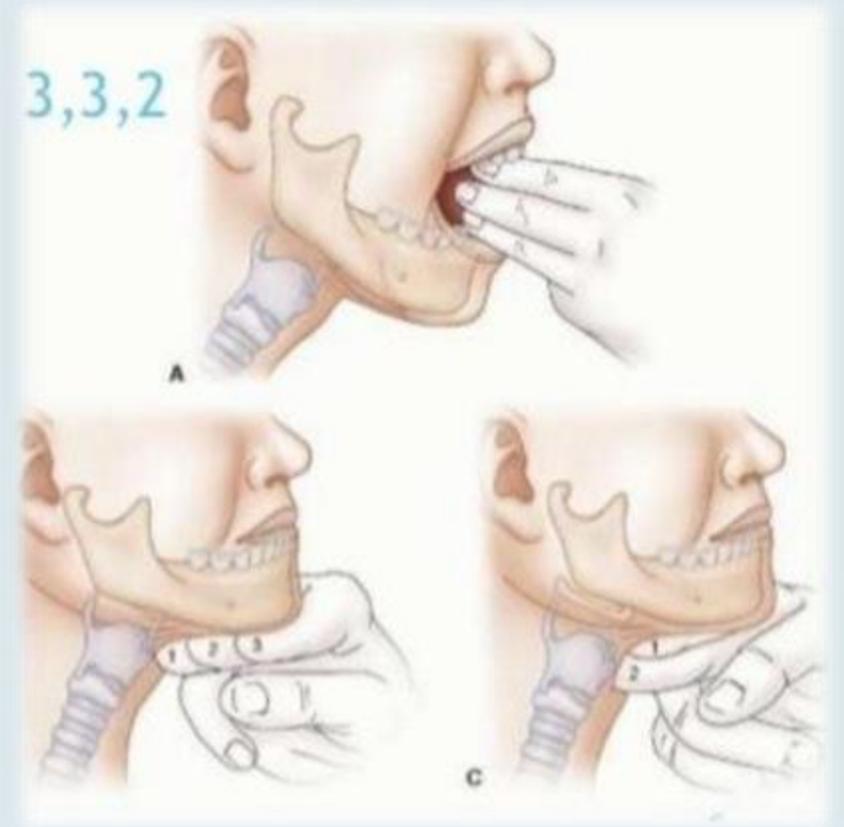




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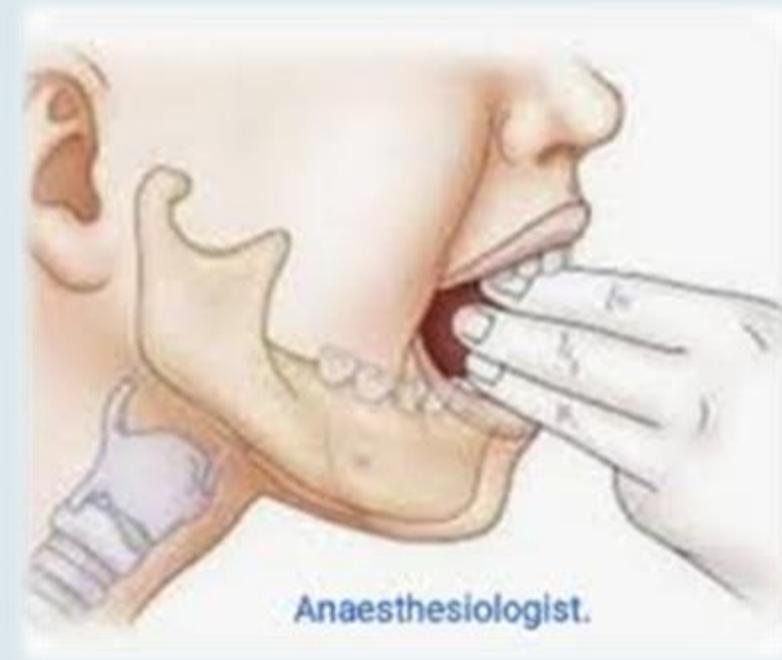
2- Evaluate (3 3 2)

1. Mouth Opens at least three finger widths (>6cm).
2. Thyromental distance Three finger widths (>6cm).
3. hyomental distance Two finger widths.



Inter - incisor Gap (mouth opening):

- _ Inter - incisor distance with maximal mouth opening
- _ Minimum acceptable value > 5 cm
- _ Significance:
 - < 3 cm: difficult laryngoscopy
 - < 2 cm: difficult LMA insertion



Thyromental distance (pail's test)

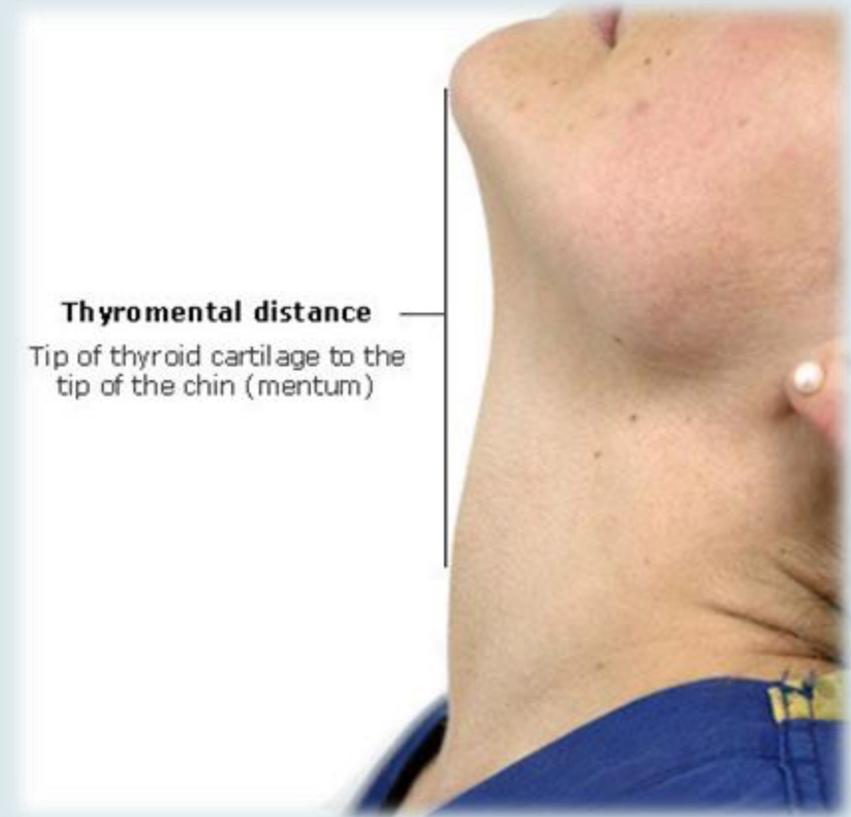
_ Distance from the tip of thyroid cartilage to inside of the mentum

.Neck full extended / mouth closed.

>**6.5cm** : no problem with laryngoscopy & intubation.

6-6.5 : difficult laryngoscopy but possible.

< **6cm** :laryngoscopy is impossible.



Hyomental Distance

_ Measured from the mentum to the top of the hyoid bone >2 fingers.

_ The position of the hyoid bone marks the entrance to the larynx.

- <2 = Less space to displace tongue tend to be more difficult to intubate.



LEMON

3- Mallampati score :

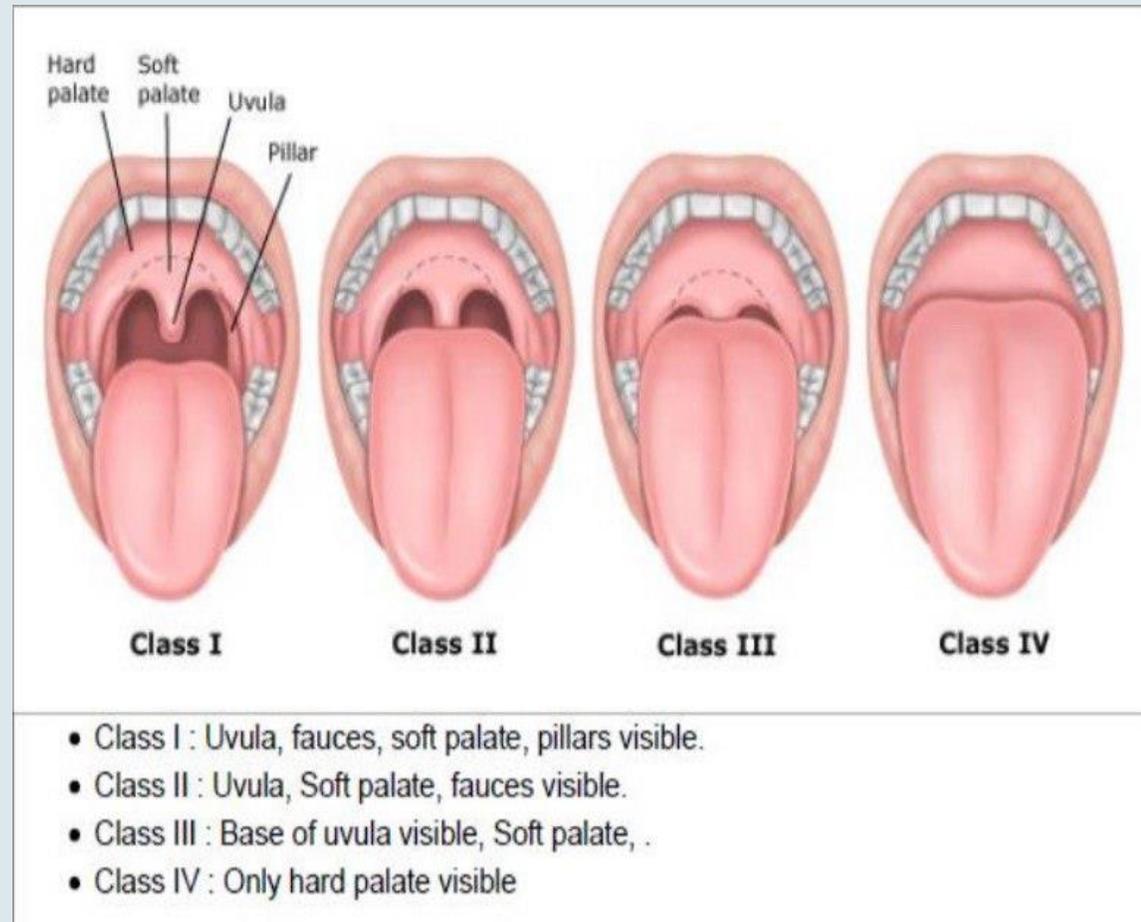
-The assessment of the size of tongue relative to the size of pharyngeal opening to predict intubation difficulty.

_ Performed with patient in a sitting position, head neutral, mouth open wide and tongue protruding to the maximum.



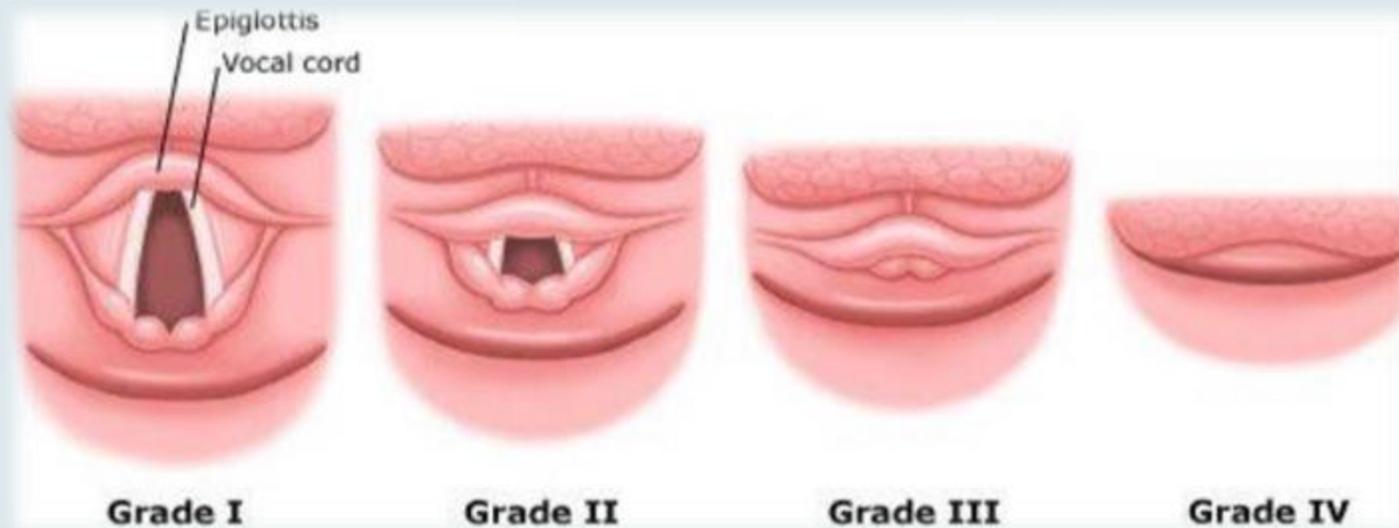
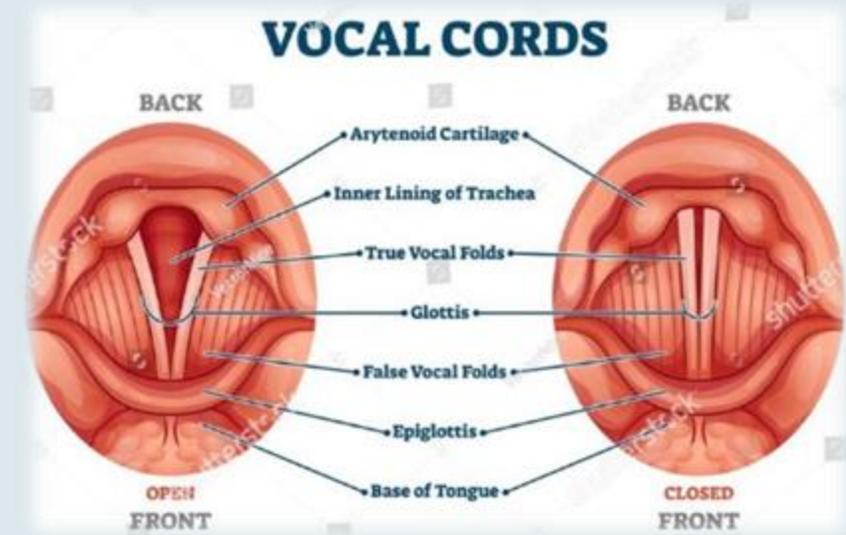
- Mallampati score :

- Class I: 46% prevalence (No Difficult intubation)
- Class II: 40% prevalence (No Difficult intubation)
- Class III: <13% prevalence (Moderate Difficult intubation)
- Class IV: <1% prevalence (Severe Difficult intubation)



• Cormack Grading (Laryngoscopic View Grades)

- **Grade 1:** Full view of glottis.
- **Grade 2:** Only posterior extremity of glottis seen or only arytenoid cartilages.
- **Grade 3:** Only epiglottis seen.
- **Grade 4:** Neither glottis nor epiglottis seen (very rare)



LEMON

4- Airway obstruction:

-Partial or complete blockage in any part of the airway resulting in a decreasing the ability to ventilate.

- Airway obstruction can be either acute or chronic, examples:

1)Tongue.

2)foreign body.

3)trauma (burn, bleeding).

4)Infections (epiglottitis).

5)allergic reactions.

6)tumors.

7)abscess (Peritonsillar abscess, Retropharyngeal abscess).



PARTIAL & COMPLETE AIRWAY OBSTRUCTION SYMPTOMS:

1) Partial:

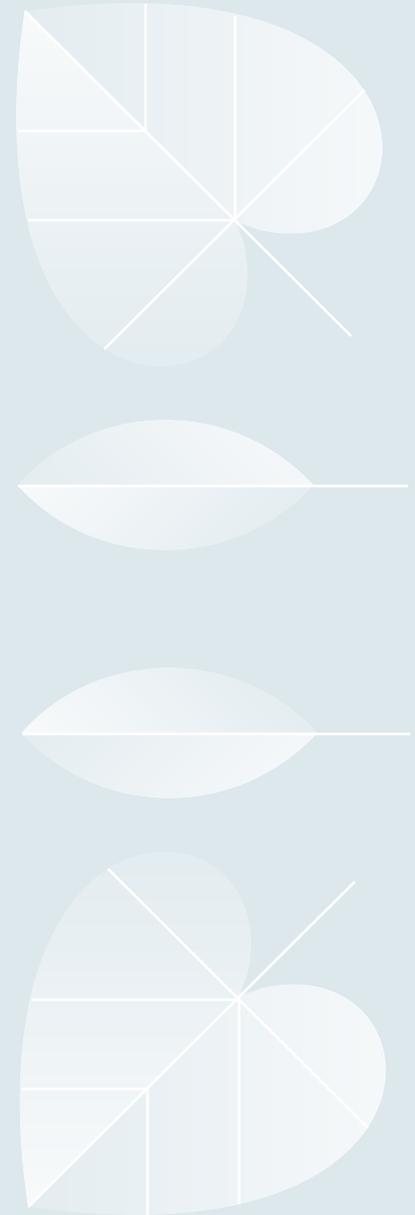
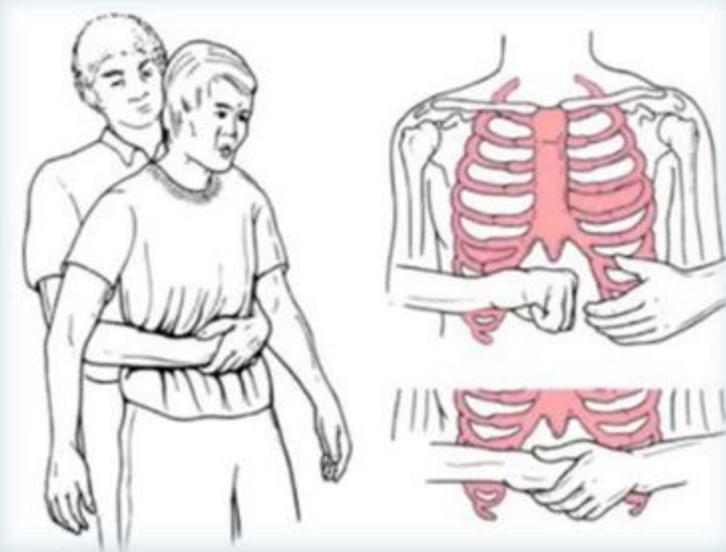
- Noisy breathing (stridor, snoring).
- Coughing.
- Retraction of the sternum.
- Hypoxemia.
- Hypercarbia.

2) Complete:

- Lack of any air movement.
- Lack of breath sounds with stethoscope.
- Retraction of the sternum and rib cage.
- Choking sign (hands clutched throat).
- Cyanosis.
- Hypoxemia.
- Hypercarbia

Airway obstruction management:

1. Quick history and clinical examination can help in determining the site of obstruction.
2. Investigation: X-ray, CT and bronchoscopy.
3. Heimlich manoeuvre: sub diaphragmatic abdominal thrust create an artificial cough and expel a foreign body from airway.
4. Head-tilt\ chin-lift: contraindication in suspected cervical injury.
5. Jaw thrust manoeuvre.
6. Surgical intervention.



LEMON

5- Neck mobility:

_ Ideally the neck should be able to extend back approximately 35° .

_ the best position for intubation is the **sniffing position**.

_ Atlanto-occipital movement assesses neck mobility

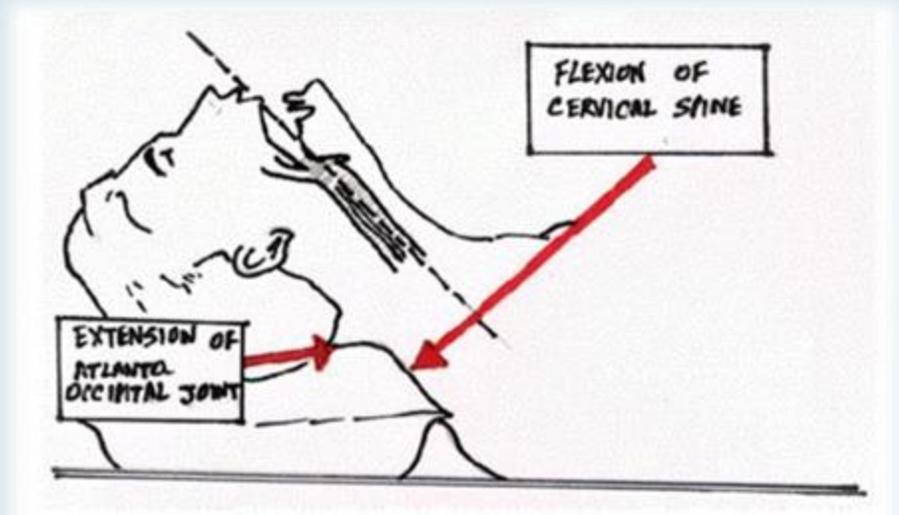


Figure 1: Sniffing position, how a pillow is used to create flexion at the atlanto-axial and extension at the atlanto-occipital joint.



1 Patient ... 3 Axes

Oral Axis (OA)

Pharyngeal Axis (PA)

Laryngeal Axis (LA)

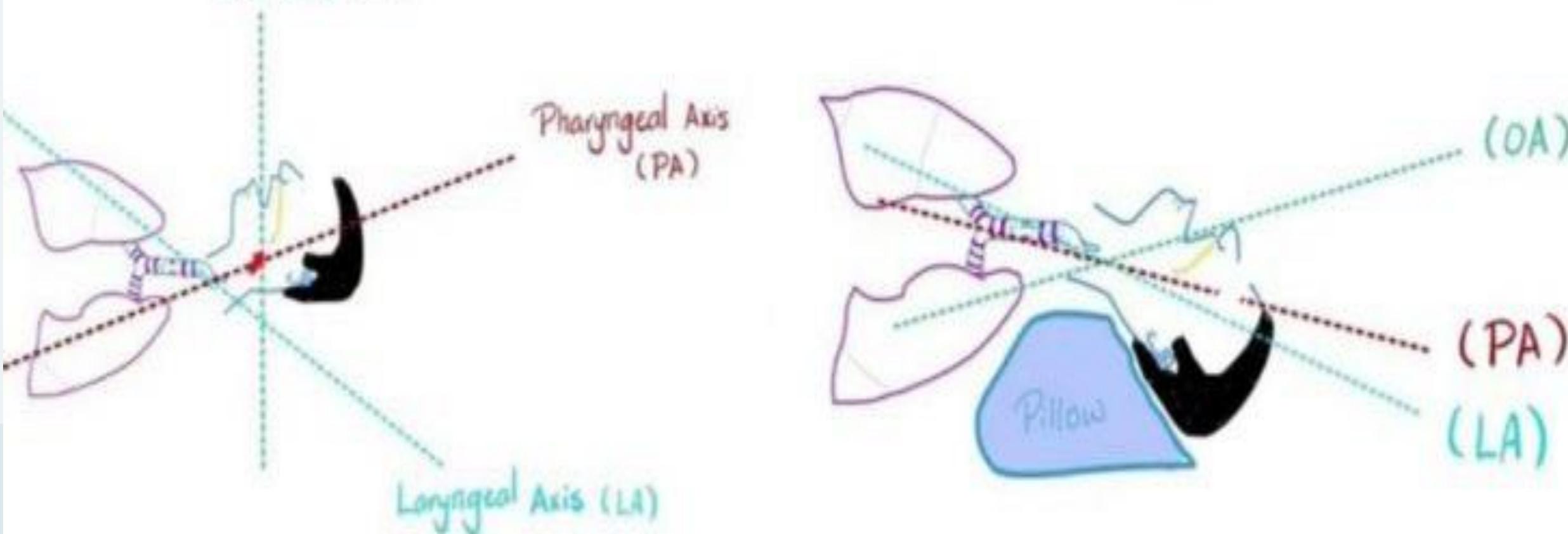
Alignment

(OA)

(PA)

(LA)

Pillow

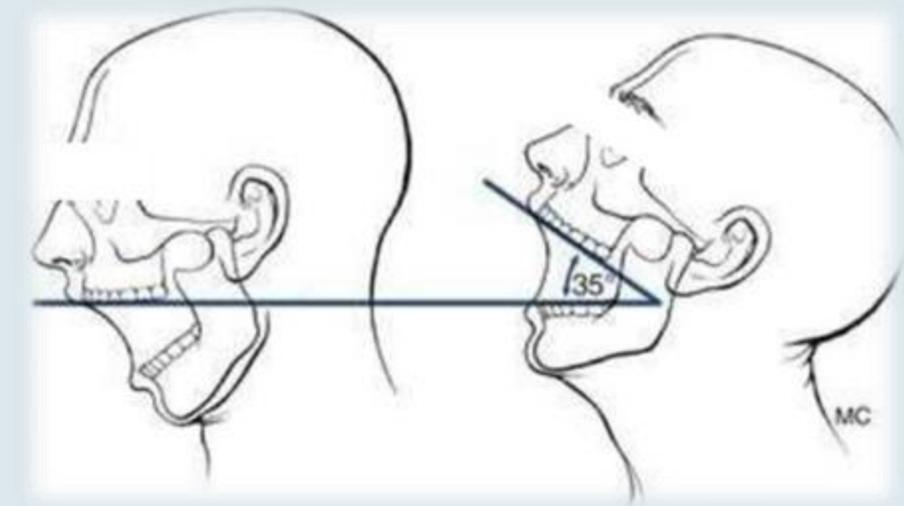


ATLANTO-OCCIPITAL MOVEMENT:

— THE PATIENT IS ASKED TO HOLD HEAD ERECT, FACING DIRECTLY TO THE FRONT, THEN HE IS ASKED TO EXTEND THE HEAD MAXIMALLY AND THE EXAMINER ESTIMATES THE ANGLE TRAVERSED BY THE OCCLUSAL SURFACE OF UPPER TEETH.

-VISUAL ASSESSMENT OR USING A GONIOMETER:

- **GRADE (1)** >35 DEGREES
- **GRADE (2)** 22-34 DEGREES
- **GRADE (3)** 12-21 DEGREES
- **GRADE (4)** <12 DEGREES



- ASSESSES FEASIBILITY TO MAKE THE OPTIMAL

INTUBATION POSITION WITH ALIGNMENT OF ORAL, PHARYNGEAL, AND LARYNGEAL AXES INTO A STRAIGHT LINE.

Problems :

- Cervical Spine Immobilization
- Ankylosing Spondylitis
- Rheumatoid Arthritis
- Halo fixation (use to hold head and neck so that the bones of spine (vertebrae) can heal from trauma or surgery)



THANK YOU

لا تنسوا أهلنا في غزة من دعائكم

