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Introduction

The major responsibility of the anesthesiologist is to provide adequate respiration for the patient. The most vita; element in providing functional respiration is the airway. no anesthetic is safe unless diligent efforts are devoted to maintaining an intact functional airway *(Miller et al., 2000)*.

The laryngeal mask airway (LMA) is an ingenious supraglottic airway device that is designed to provide and maintain a seal around the laryngeal inlet for spontenous ventilation and allow controlled ventilation at modest levels of positive pressure *(Miller et al., 2000)*.

The combitube is another supraglottic airway device that can provide an emergency airway when conventional means are not effective or possible. The combitube has two lumens so that it can function appropriately whether placed in trachea or much more commonly in the esophagus *(Miller et al., 2000)*.

The laryngeal tube is a new supraglottic ventilatory device for airway management. The laryngeal tube has been developed to secure a patent airway during spontenous or controlled ventilation. It consists of a tube with two cuffs proximal one (oropharyngeal) and a distal one (esophageal) and an oval apreature in between the two cuffs that allows for ventilation. There are six sizes of laryngeal tube *(Asai et al., 2003)*.

Aim of Work

This study is aiming to compare the success rates of the laryngeal tube, combitube and laryngeal mask in establishing a patent safe airway allowing mechanical ventilation with least complications.

Airway Anatomy

The term airway in its clinical usage refers to the upper airway, which may be defined as the extrapulmonary airway passage, consisting of the nasal and oral cavities, pharynx, larynx, trachea and principle bronchi *(Barach et al., 2006).*

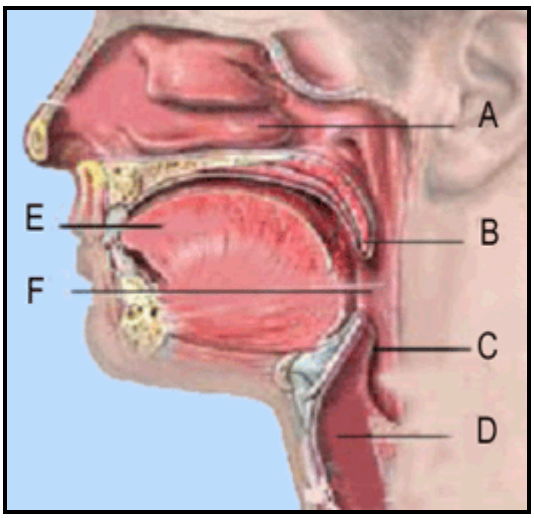

Figure (1): Sagittal section of airway

A = Nasopharynx B = Uvula C = Hypopharynx
D = Larynx E = Tongue F = Oropharynx

There are two openings to the human airway the nose which leads to the nasooharynx and the mouth which leads to the oropharynx, the passages are seprated anteriorly and joined posteriorly in the pharynx *(Morgan et al., 2002)*.

Nose:

The normal airway begins functionally at the nares. As air passes through the nose, the important functions of warming and humidification occur. The nose is the primary pathway for normal breathing unless obstruction by polyps or upper respiratory infection is present. During quiet breathing the resistance to air flow through the nasal passages accounts for nearly two-thirds of the total airway resistance. The resistance through the nose is nearly twice that associated with mouth breathing. This explains why mouth breathing is utilized when high flow rates are necessary as with exercise *(Miller et al., 2000).*

The sensory innervation of the nasal mucosa arises from two divisions of the trigeminal nerve. The anterior ethmoidal nerve supplies the anterior septum and lateral wall whereas the posterior areas are innervated by nasopalatine nerves from the sphenopalatine ganglion. Local anesthesia can be produced by blocking anterior ethmoidal and maxillary nerves bilaterally; however, simple topical anesthesia is usually quite effective *(Miller et al., 2000).*

Pharynx:

The pharyngeal airway extends from the posterior aspect of the nose down to the cricoid cartilage, where the passage continues as the esophagus. An upper area, the

nasopharynx, is separated from the lower oropharynx by the tissue of the soft palate. The principal impediments to air passage through the nasopharynx are the prominent tonsillar lymphoid structures. The tongue is the principal source of oropharyngeal obstruction, usually because of decreased tone of the genioglossus muscle. The latter contracts to move the tongue forward during inspiration and thus acts as a pharyngeal dilator *(Miller et al., 2000).*

Larynx:

Definition:

The larynx connects the lower part of the pharynx with the trachea.

Its function is three fold:

- A valve to guard air passages, especially during swallowing.
- Maintenance of a patent airway.
- Vocalization *(Douglas et al., 1991).*

Description:

- The larynx is about 5 cm long.
- It lies at the level of C3 to C6.
- In cross section at the level of the laryngeal prominence (Adam's appel).

- The larynx is triangular secondary to the shape of the thyroid cartilage.
- At the level of the cricoid cartilage the larynx becomes more round.
- The larynx provides the area of greatest resistance to passage of air to the lungs *(Douglas et al., 1991).*

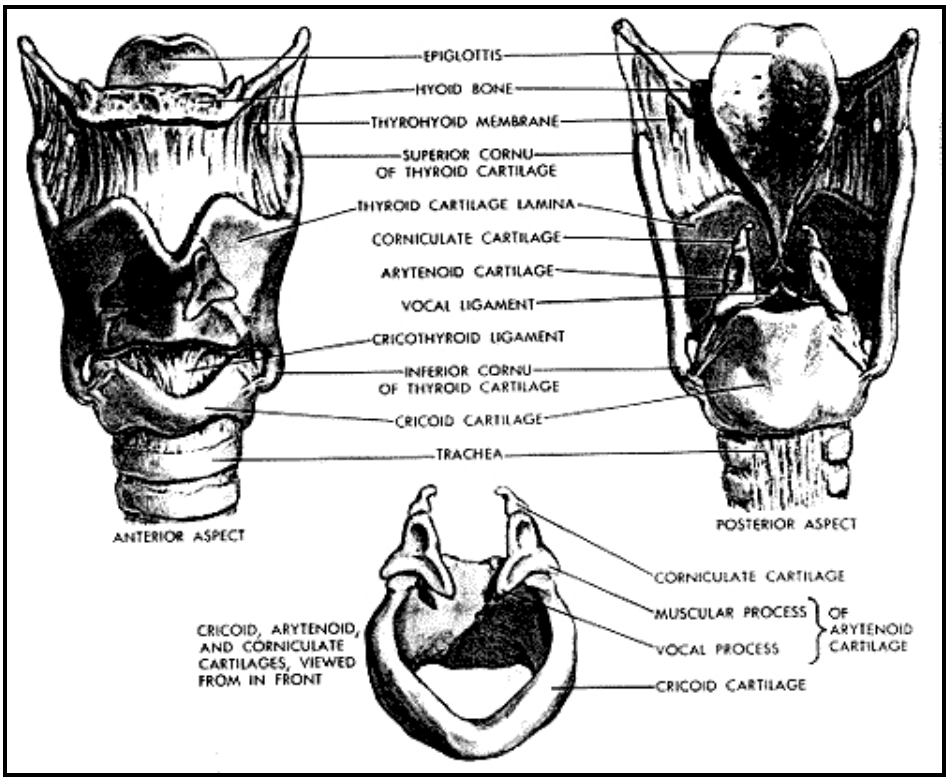

Figure (2): Anatomy of the larynx *(Abrahams et al., 1998)*

Laryngeal skeleton:

The laryngeal skeleton has a total of 9 cartilages pieces.

Table (1): Comparison between paired and unpaired laryngeal cartilages

Paired cartilages	Unpaired cartilages
✓ Arytenoids: shaped like a three sided pyramid that articulates with the upper border of the cricoid lamina.	✓ Thyroid: largest cartilage. Made up of two laminae that are fused anteriorly to form the laryngeal prominence.
✓ Corniculate: at apices of arytenoids cartilage found in the posterior part of the aryepiglottic folds.	✓ cricoid: ring shaped. The posterior part of the cricoid is called the lamina, and the anterior part is the arch. The arytenoids articulates with the lateral parts of the superior border of the lamina, lies at the level of C6 in adults.
✓ Cuneiform: lie in the aryepiglottic folds and is not always present.	✓ Epiglottic: thin and leaf like .it's located behind the root of the tongue and in front of the inlet of the larynx. The mucus membrane covering the epiglottis is continued onto the base of the tongue, forming two depressions called the epiglottic valleculae.

(Douglas et al., 1991)

Cavity of the larynx:

The laryngeal cavity extends from the epiglottis to the lower level of the cricoid cartilage.

The inlet is formed by the epiglottis, which joins to the apex of the arytenoid cartilages on each side by the aryepiglottic folds.

Inside the laryngeal cavity one first encounters the vestibular folds, which are narrow bands of fibrous tissue on each side.

These extend from the anterolateral surface of each arytenoid to the angle of the thyroid where the latter attaches to the epiglottis.

These folds are referred to as the false vocal cords and are separated from the true vocal cords by the laryngeal sinus or ventricle.

The true vocal cords are pale white ligamentous structures that attach to the angles of the thyroid anteriorly and to the arytenoids posteriorly. The triangular fissure between these vocal cords is termed the glottic opening, which represents the narrowest segment of the laryngeal opening in adults.

In young children (<10 years old), the narrowest segment lies just below the cords at the level of the cricoid ring. The mean length of the relaxed open glottis is about 23 mm in males and 17 mm in females. The glottic width is 6 to 9 mm but can be stretched to 12 mm. Thus, the cross-sectional area of the relaxed glottis may be 60 to 100 mm^2 *(Miller et al 2000).*

Joints, ligaments and membranes of the larynx:

Joints include the:

- **Cricothyroid:** articulation between the lateral surfaces of the cricoid cartilage and the inferior horns of the thyroid cartilage.
- **Cricoarytenoid:** articulation between the bases of the arytenoid cartilages and the upper surfaces of the cricoid lamina.

Membranes include the:

- **Thyrohyoid:** membrane, extrinsic ligament connecting the thyroid cartilage to the hyoid bone.

Ligaments include the:

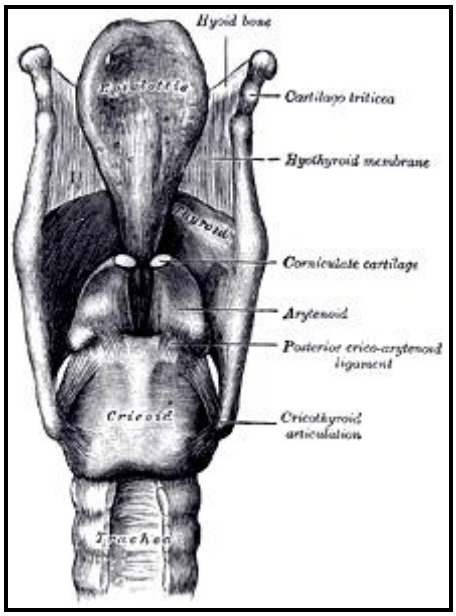

Figure (3): Ligaments of the larynx. Posterior view *(Bannister, 1998)*

- **Cricothyroid and cricotracheal**: connect cricoid to thyroid cartilage and first tracheal ring, respectively.
- **Vocal ligaments**: extends from the thyroid cartilage to the arytenoid cartilage.
- **Vestibular ligament**: extends from the thyroid cartilage to arytenoid cartilage above the vocal fold.

(Douglas et al., 1991)