

Difficult Airway Management Devices

Essay Submitted For Partial Fulfillment of the Master
Degree in Anesthesiology

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٢٠٠٩

بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

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INTRODUCTION

The fundamental responsibility of an anesthesiologist is to maintain adequate gas exchange. In order to do this, the airway must be managed in such a way that it is almost continuously patent. Failure to maintain a patent airway for more than a few minutes results in brain damage or death. Thus, it is not surprising that more than 80% of all respiratory-related closed malpractice claims involve a brain damaged or dead patients.

It has been estimated that inability to successfully manage very difficult airways has been responsible for as many as 30% of deaths totally attributable to anesthesia. In any patient, the greater the degree of difficulty in maintaining airway patency the greater the risk of brain damage or death (*Miller, 1999*).

William Maceven first performed tracheal intubation 120 years ago in a patient who had a large tumour in his oropharynx. Several more years would elapse before this technique became a routine procedure during general anesthesia. Although a large number of individuals contributed to the evolution of this technique, two very important events sparked the routine use of endotracheal anesthesia; the introduction of Macintosh laryngoscope and

the neuromuscular blocking agent (*Benumof*, 1994).

Tunstall was the first to articulate that we should develop a more organized approach to airway management when he introduced the concept of the "difficult airway drill", when dealing with airway difficulties in obstetric patients (*Miller*, 2000).

From the 1st guidelines on the management of difficult airway that were published by the American Society of Anesthesiologists (ASA) in 1993 till the last one on 2003 several types of airway devices were included. Together with other devices that have been developed in the past years represent an important subject that an anesthesiologist should know.

Therefore, the aim of this essay is to discuss the management of the difficult airway which needs a quick preview of the anatomy of the airway passages, going through the pathophysiology of the difficult airway, knowing the different methods and scores used for evaluating the airway and finally presenting the different devices that have been used to manage these difficult airway passages.

Chapter (١)

ANATOMY OF THE AIRWAY

The human airway could be divided by an imaginary line passing through the larynx at the level of the vocal cords into upper airway including "oral and nasal cavities, pharynx and supra-glottic part of the larynx" and lower airway including "sub-glottic part of the larynx, trachea, right and left main bronchi and bronchopulmonary segments (*Hutton, ٢٠٠٧*).

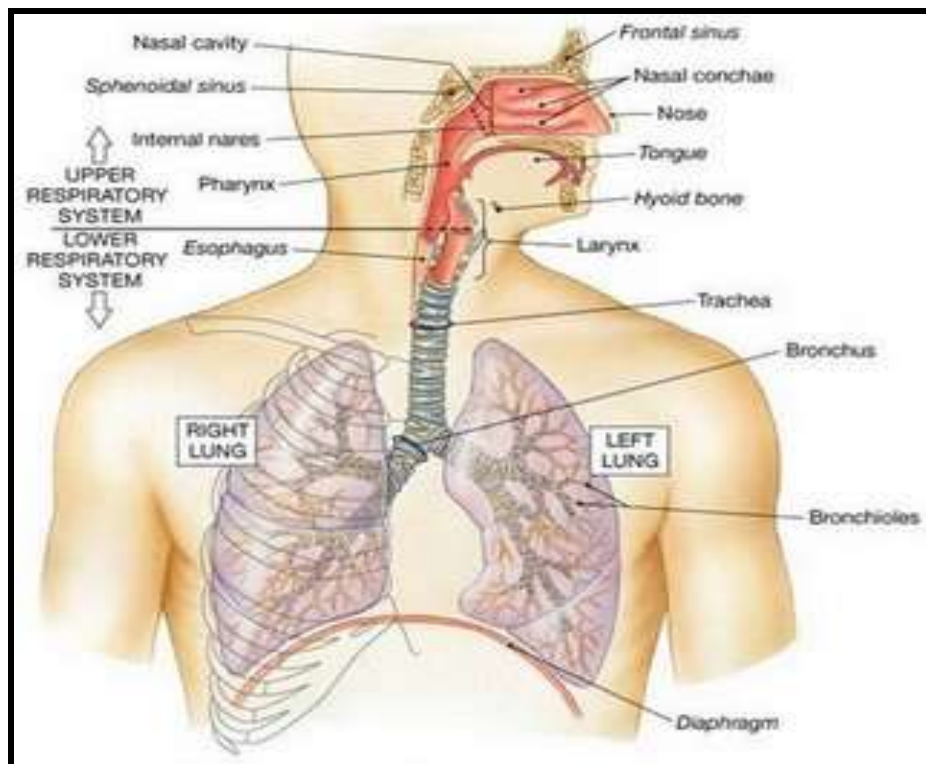


Figure (١): The Human Airway

A) The Upper Airway:

There are two openings to the human airway, the nose and the mouth. The former leads to nasopharynx and the latter leads to oropharynx. They are separated anteriorly by palate, but joined posteriorly at the base of the tongue where the epiglottis prevents aspiration by covering the glottis during swallowing (*Hutton, ٢٠٠٢*).

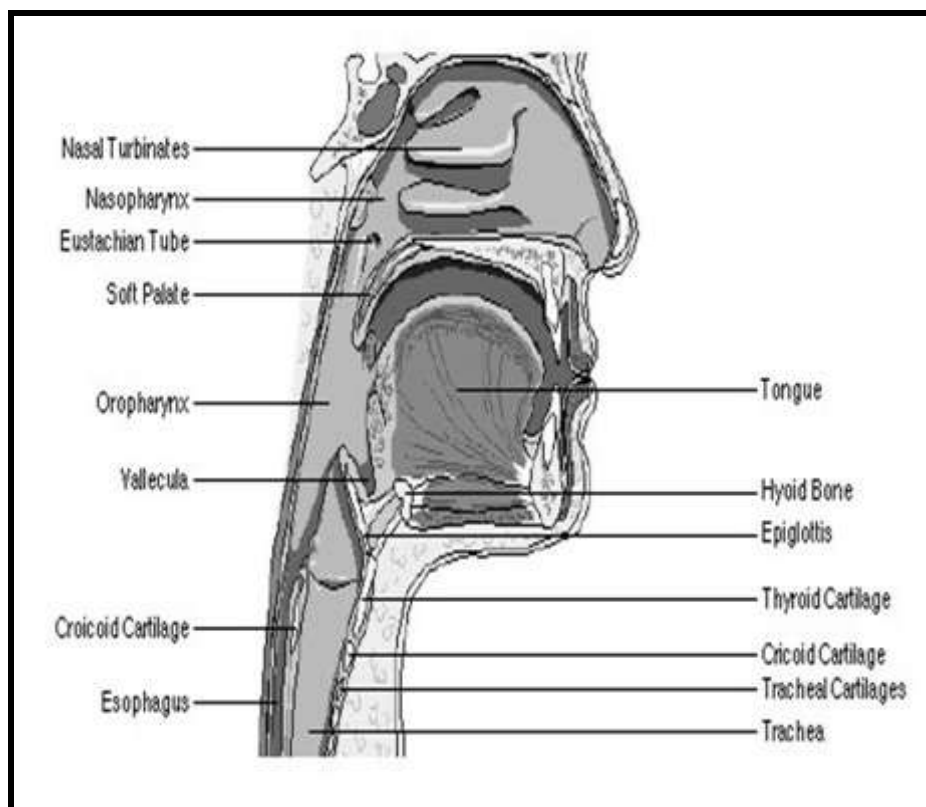


Figure (٢): Sagittal section in Nasal Cavity, Mouth, Pharynx and Larynx

Nasal cavity:

It is divided into right and left halves by nasal septum. They open on the face through nostrils. They open posteriorly into the nasopharynx through the posterior nasal aperture.

Nerve Supply of the Nose:

The mucous membrane of the nose is innervated by olfactory nerve fibers which carry smell sensation, and by ophthalmic division of trigeminal nerve which carries ordinary sensations.

Blood Supply of the Nose:

It is supplied by branches of maxillary artery (*Hutton, ٢٠٠٧*).

Tongue:

It consists of a buccal and pharyngeal portions, separated by V-shaped groove (sulcus terminalis). The under aspect of tongue bears median frenulum linguae with lingual veins on each side of it and lingual artery medial to the vein, but not visible.

Muscles of the tongue:

There are two groups; intrinsic muscles that alter the shape of the tongue and extrinsic muscles which move the tongue, they include styloglossus (retracts), genioglossus

(protruds), hyoglossus (depresses), and palatoglossus (narrows oropharynx).

Nerve supply of the tongue:

Sensory; by trigeminal nerve for general sensations.

Motor; all muscles are innervated by hypoglossal nerve except palatoglossus supplied by vagus nerve.

Blood supply of the tongue:

It is supplied by lingual branch of the external carotid artery (*Larson, ٢٠٠٦*).

The palate:

Palate is the partition which separates the nasal cavity from the oral cavity and made of two parts; hard palate, which is a bony septum between nose and mouth and soft palate, which is a flesh septum between nasopharynx and oropharynx (*Ellis, ١٩٩٧*).

Muscles of soft palate:

There are two muscles; tensor palati muscle and levator palati muscle.

Nerve supply of the palate:

Sensory nerve supply; soft palate is supplied by lesser palatine nerve and hard palate is supplied by greater palatine nerve.

Motor nerve supply; All muscles of palate are supplied by cranial root of accessory nerve through the vagus nerve except tensor palati which is supplied by mandibular nerve (*Ellis, ١٩٩٧*).

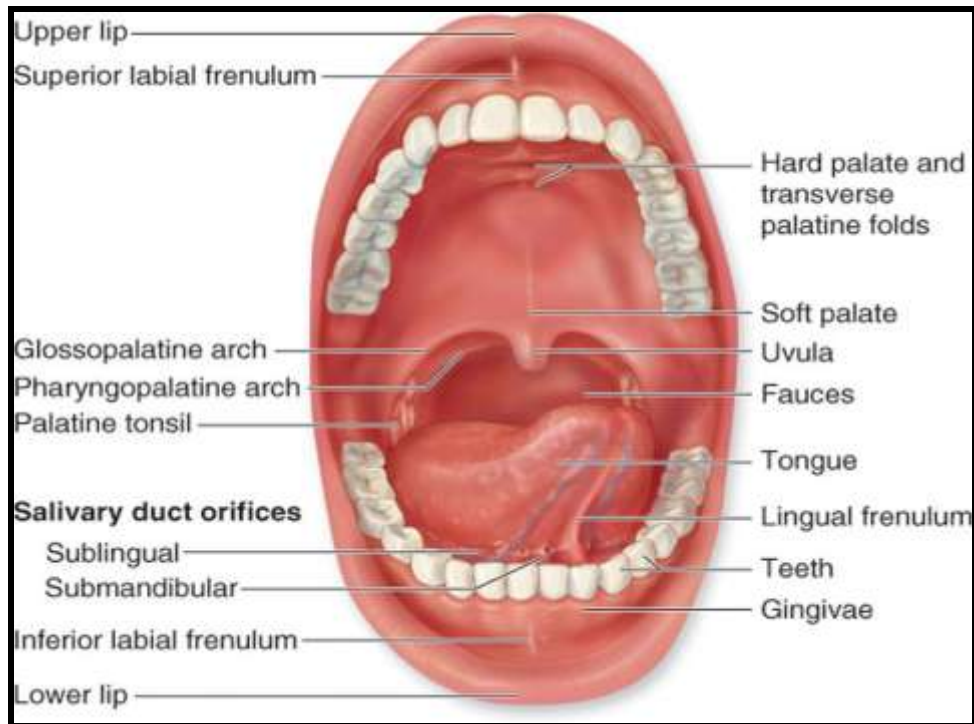


Figure (٢): Front view of the mouth showing Tongue, Hard and Soft palate

Pharynx:

Pharynx is a musculofacial tube, acts as a common entrance to respiratory and alimentary tracts. It is divided into three parts (*Gal, ٢٠٠٩*).