

**Difficult airway management patterns among Anesthesiologists
practicing in Cairo University Hospitals.**

Thesis Submitted for Fulfillment of

The Master Degree in Anesthesiology by

Kareem Ahmed Taha

(MB, B, CH) Supervised by

Prof. Dr / Neamat Ibrahim Abd Elrahman

Professor of Anesthesia and Intensive Care

Faculty of Medicine, Cairo University

Dr/ Eman Ahmed Fouad

Assistant professor of Anesthesia and Intensive Care

Faculty of Medicine, Cairo University

Dr/ Abeer Ahmed Mohamed

Lecturer of Anesthesia and Intensive Care

Faculty of Medicine, Cairo University

Faculty of Medicine

Cairo University

2015

Acknowledgement

Words cannot adequately express my gratitude to those who helped me to complete this work.

First of all, I thank **GOD** for helping me to accomplish this work.

I would like to express my sincere thanks and deep gratitude and respect to **Prof.Dr. Neamat Ibrahim Abd Elrahman**, Professor of Anesthesiology, Faculty of Medicine, Cairo University, for her great support, kind guidance, meticulous revision and encouragement in performing this work.

I also wish to express my extreme appreciation and gratitude to **Prof. Dr. Eman Ahmed Fouad** ,Assistant Professor of Anesthesiology, Faculty of Medicine, Cairo University, for her faithful supervision, constructive guidance and real interest in the progress of this work.

Many sincere thanks to **Dr. Abeer Ahmed Mohamed**, Lecturer of Anesthesiology, Faculty of Medicine, Cairo University, for her kind advice, meticulous revision, constant help and support throughout every step in this work.

At last but not least, I would like to express my profound gratitude and love for **my parents** for their continuous support, for **my wife** who always does her best to support me and for **Dr Wael Abdelrazik** for helping me a lot.

Abstract

In the anesthesia practice, failure to maintain a patent airway following the induction of general anesthesia is a major concern for anesthesiologists.

Greater efforts and studies are focused on finding either new devices or techniques for management of difficult airway .There is new guidelines for helping anesthesiologists in management of difficult airway.

Management of the difficult airway is one of the most important skills which must be acquired by anesthesiologists as the conduction of general anesthesia depends mainly on this skill.

Keywords:

Difficult airway management - airway devices – ASA algorithm of difficult airway.

CONTENTS

List of figures	IV
List of tables	VI
List of abbreviations	VII
Background and Rationale	1
Chapter (1) Airway Anatomy	4
Chapter (2) Difficult airway causes and prediction	12
Chapter (3) Airway devices and techniques	31
Chapter (4) ASA Guidelines 2013	47
Chapter (5) Methods	70
Chapter (6) Results	77
Chapter (7) Discussion	84
Summary	89
References	91

List of figures

<i>Figure No.</i>	<i>Title</i>	<i>Page No</i>
<i>Figure (1-1)</i>	<i>A, Orophrangeal airway B, Nasopharangeal airway</i>	4
<i>Figure (1-2)</i>	The pharynx	6
<i>Figure (1-3)</i>	The Larynx	8
<i>Figure (1-4)</i>	Sensory Nerve supply of upper airway	10
<i>Figure (2-1)</i>	Severe deformity of the cervical spine	18
<i>Figure (2-2)</i>	Mallampati and Cormack and Lehane views	22
<i>Figure (2-3)</i>	LEMON airway assessment method	25
<i>Figure (2-4)</i>	Laryngoscopic views	28
<i>Figure (3-1)</i>	Macintosh size 3 and 4 (adult) curved blades	32
<i>Figure (3-2)</i>	Wisconsin, Phillips, and Miller straight blades	33
<i>Figure (3-3)</i>	McCoy blade in neutral & activated positions.	34
<i>Figure (3-4)</i>	Distal angled coude tip of various brands of bougie	35
<i>Figure (3-5)</i>	The Trachlight	36
<i>Figure (3-6)</i>	The components of the laryngeal mask airway	38
<i>Figure (3-7)</i>	The LMA Fastrach	39
<i>Figure (3-8)</i>	The AirQ Reusable	40
<i>Figure (3-9)</i>	The Combitube	41
<i>Figure (3-10)</i>	Retrograde intubation kit	43
<i>Figure (4-1)</i>	ASA Algorithm for difficult airway management	69

<i>Figure (6-1)</i>	Fiberoptic skills among all responders	80
<i>Figure (6-2)</i>	Fiberoptic skills among group of more than 10 years of experience	81
<i>Figure (6-3)</i>	Emergency airway skills	81

List of tables

<i>Table No.</i>	<i>Subject</i>	<i>Page No</i>
<i>(Table -1)</i>	Syndromes associated with difficult intubation	15
<i>(Table -2)</i>	History that suggests difficult airway management	19
<i>(Table -3)</i>	El-Ganzouri scoring system	24
<i>(Table -4)</i>	Wilson score	26
<i>(Table -5)</i>	Modified scoring system for grading of direct laryngoscopy	29
<i>(Table -6)</i>	Components of preoperative airway physical examination	56
<i>(Table -7)</i>	Suggested Contents of the Portable Storage Unit for Difficult Airway Management	59
<i>(Table -8)</i>	Techniques for Difficult Airway Management	64
<i>(Table -9)</i>	Results for Demographic data	77
<i>(Table -10)</i>	Results for airway devices and techniques	79
<i>(Table -11)</i>	Most common choices for difficult airway management	82

List of abbreviations

ASA	American Society of Anesthesiologists
BMV	Bag mask ventilation
CLM	Corazelli-London- McCoy
CTM	Cricothyroid membrane
DI	Difficult intubation
DL	Direct Laryngoscopy
FOB	Fiber-optic bronchoscopy
GA	General anesthesia
ICU	Intensive care unit
ILMA	Intubating laryngeal mask airway
LMA	Laryngeal mask airway
MIAT	Manual axial in-line traction
OR	Operating Room
OSA	obstructive sleep apnea
RSI	Rapid sequence induction
SAD	Supra glottic airway device
SGA	Supra glottic airway
TMJ	Temporo mandibular joint

Background and Rationale

In the anesthesia practice, failure to maintain a patent airway following the induction of general anesthesia is a major concern for anesthesiologists. For securing the airway, tracheal intubation using direct laryngoscopy remains the method of choice in most cases. However, direct laryngoscopic intubation is difficult in 1% - 4% and impossible in 0.05% - 0.35% of patients who have seemingly normal airway⁽¹⁾.

The unanticipated difficult laryngoscopic intubation places patients at increased risk of complications ranging from sore throat to serious airway trauma. Moreover, in some cases the anesthesiologist may not be able to maintain a patent airway, leading to severe complications such as brain damage or death^(2,3,4).

Death and brain damage in claims arising from difficult airway management associated with induction of anesthesia, but not other phases of anesthesia, decreased in 1993–1999 compared with 1985–1992 due to development of additional management strategies for prediction and management of difficult airways improved patient safety.⁽⁵⁾

A difficult airway is defined as the clinical situation in which a conventionally trained anesthesiologist experiences a difficulty with mask ventilation, difficulty with tracheal intubation, or both. Difficult face mask ventilation is a situation in which it is not possible for the anesthesiologist to provide adequate facemask ventilation due to one or more of the following problems: inadequate mask seal, excessive gas leak, or excessive resistance to the ingress or egress of gas. Difficult laryngoscopy is the condition in which it is not possible to visualize any portion of the vocal cords after multiple attempts at conventional laryngoscopy. Difficult tracheal intubation is the condition in which tracheal intubation requires multiple attempts, in the presence or absence of tracheal pathology. Failed intubation is when placement of the endotracheal tube fails after multiple intubation attempts.⁽⁶⁾

As the management of difficult airway remains one of the most relevant and challenging tasks for the anesthesiologist, great efforts and studies are focusing on finding either new devices or techniques for managing this issues and try to implement new guidelines for helping the anesthesiologists in managing these problems in different situations.

While the inability to visualize the vocal cords is a common factor preventing successful intubation, many devices are now available to circumvent the problems typically encountered with a difficult airway using conventional laryngoscope such as endotracheal tube guides, lighted stylets, supra-glottic airway devices and rigid/video assisted laryngoscopes. Also different alternative techniques have been described to manage difficult airway such as awake intubation under topical anesthesia, fiber-optic intubation, retrograde intubation and percutaneous tracheostomy. ⁽⁷⁾

In addition to the new airway devices and techniques that help in management of difficult airway, practical guidelines for managing difficult airway in different situations such as anticipated difficult airway, unanticipated difficult airway with adequate mask ventilation, unanticipated difficult airway with inadequate mask ventilation became of great importance, on top of them is the practice guidelines developed by the American Society of Anesthesiologists (ASA). These practice guidelines are systematically developed recommendations that assist the practitioner and patient in making decisions about health care. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints. Practice guidelines are not intended as standards or absolute requirements. Practice guidelines are subject to revision as warranted by the evolution of medical knowledge, technology, and practice. They provide basic recommendations that are supported by analysis of the current literature and by a synthesis of expert opinion, open forum commentary, and clinical feasibility data. ⁽⁸⁾

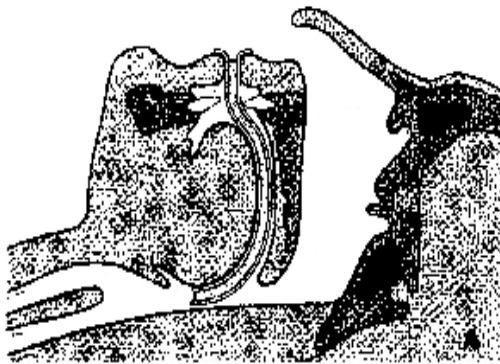
Objectives

- To determine the airway management choices in three different difficult airway situations presented in the ASA Algorithm for Management of the Difficult Airway.
- To determine the availability of different airway devices for anesthesiologists practicing in Cairo University Hospitals.
- To determine the familiarity of anesthesiologists practicing in Cairo University Hospitals with the use of different airway devices and techniques.
- To observe how anesthesiologists practicing in Cairo University Hospitals will manage different scenarios and to evaluate whether a simulation teaching session improves their adherence to the American Society of Anesthesiologists (ASA) difficult airway algorithm.

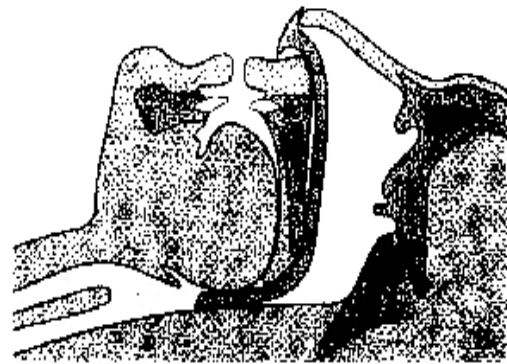
Chapter 1

Airway Anatomy

There are two openings to human airway, nose and 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, epiglottis prevents aspiration by covering the glottis during swallowing (figure 1-1) ⁽⁹⁾



(Figure 1-1) A, Oropharyngeal airway ⁽⁹⁾



B, Nasopharyngeal airway ⁽⁹⁾

Tongue

It consists of a buccal and pharyngeal portions, separated by V-shaped groove surface (sulcus terminalis). Under aspect of tongue bears median frenulum linguae. Lingual veins are on either side of it Lingual nerve and lingual artery are medial to the vein but not visible. ⁽⁹⁾

Muscles of the tongue:

There are two groups:

- Intrinsic muscles that alter shape of tongue.
- Extrinsic muscles which move the tongue, they include styloglossus (retracts) genioglossus (protrudes) hypoglossus (depresses) and palatoglossus (narrow oropharynx). ⁽⁹⁾

Nerve supply of tongue:

- Sensory: it is innervated by trigeminal nerve for general sensations
- Motor : all muscles are innervated by hypoglossal nerve except palatoglossus which is supplied by vagus nerve.⁽⁹⁾

Blood supply of tongue:

Lingual branch of external carotid artery.⁽⁹⁾

Clinical features:

Damage of hypoglossal nerve is detected clinically by hemiatrophy tongue and deviation towards paralysed side.

If deeply anesthetized person is laid on his back, posterior aspect of tongue drops back to produce laryngeal obstruction, this could be prevented by tonsil position or pushing mandible forwards by pressure on angle of jaw.⁽⁹⁾

Soft palate

Palate is a partition which separates nasal cavity from oral cavity and made of two parts:

- Hard palate which is a bony septum between nose and mouth.
- Soft palate which is a flesh septum between nasopharynx and oropharynx.

Function of soft palate:

- During respiration soft palate is relaxed allowing passage of air.
- During deglutition it becomes elevated so that its posterior border becomes in contact with posterior wall of the pharynx, thus preventing food and fluids from passing into nasopharynx.

Muscles of soft palate :

Tensor palati, Levator palati. Palatoglossus, palatopharyngeus and musculus uvulae.

Nerve supply

Sensory:

Soft palate is supplied by lesser palatine nerve.

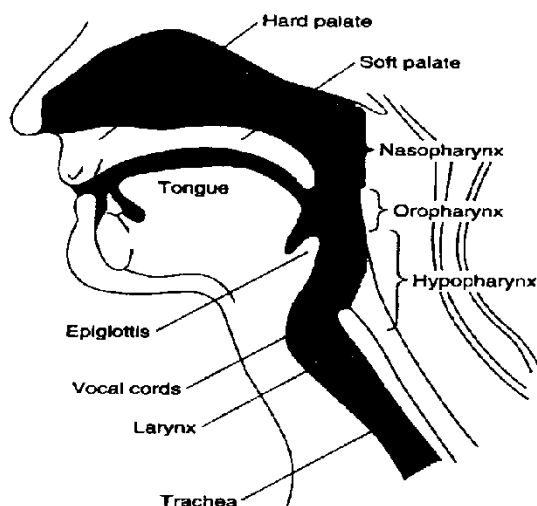
Hard palate is supplied by greater palatine nerve. See later in (figure 1 – 4).

Motor:

All muscles are supplied by cranial accessory nerve through the vagus except tensor palati which is supplied by mandibular nerve. ⁽⁹⁾

Pharynx

Pharynx is a musculofascial tube, acts as common entrance to respiratory and alimentary tract (Figure 1-2). It is divided into three parts:



(Figure 1 – 2) The pharynx ⁽⁹⁾

Nasopharynx:

It lies above soft palate which cuts it from rest of pharynx during deglutition of food through nose.

Two important structures lie in this compartment:

- Orifice of pharyngotympanic or auditory tube (Eustachian canal).
- Nasopharyngeal tonsil (adenoids).⁽⁹⁾

Oropharynx:

It lies behind mouth and tongue. It extends from uvula of soft palate above to tip of epiglottis below. Its most important contents are palatine tonsils. There is three fold sensory nerve supplies, glossopharyngeal nerve posterior palatine branch of maxillary nerve.

Laryngopharynx:

Extends from tip of epiglottis to termination of C6 vertebra. The inlet of larynx defined by epiglottis, aryepiglottic folds and arytenoids lay anteriorly. Larynx itself bulges into this part of pharynx.

Nerve supply of pharynx:

Pharyngeal branch of glossopharyngeal IX and trigeminal V contains the sensory and motor supply respectively.

Sensory innervation of nasopharynx by V.⁽⁹⁾

Larynx

Larynx has a triple function:

- That of an open valve in respiration.
- That of a partially closed valve in phonation.
- That of closed valve closing trachea and bronchial tree during deglutition.

Structures which form its framework are epiglottis, thyroid cartilage, cricoid and arytenoids. It is slung from hyoid bone by thyrohyoid membrane and thyrohyoid muscle.