Recent updates of Basic and Advanced Airway Management during Anesthesia in Adults

An Essay

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List of Abbreviations

Abb.	Full term
ARDS	*Adult Respiratory Distress Syndrom*
ASA	*American Society of Anesthesiologists*
AWS	*Airway Scope*
B.U.R.P	*Backwards-Upwards-Rightwards-Pressure*
BLS	*Basic Life Support*
BMI	*Body mass index*
BMV	*Bag-Mask Ventilation*
CAFG	*Canadian Airway Focus Group*
CICO	*Can't intubate, can't oxygenate*
CICV	*can't intubate can't ventilate*
COPD	*Chronic Obstructive Pulmonary Disease*
CSF	*Cerebrospinaal fluid*
DAM	*Difficult Airway Management*
DAS	*Difficult airway society*
DCI	*Display Control Interface*
DL	*Direct laryngoscope*
DMV	*Difficult mask ventilation*
DTI	*Difficult tracheal intubation*
ECG	*Electrocardiogram*
ETC	*Esophagotracheal Combitube*
ETI	*Endotracheal intubation*
ETT	*Endotracheal tube*
EzT	*Easy Tube*
F	*French*
FAST	*Flexible Airway Scope Tool*
Fastrach-D, LMA-D	*Fastrach laryngeal intubation mask disposable*

List of Abbreviations (Cont...)

Abb.	Full term
FFE	Flexible Fibreoptic endoscopy
FFI	Flexible Fibreoptic intubation
FPS	First-Pass Success
ICP	Intracranial pressure
ID	Inch diameter
IDS	Intubation Difficulty Scale
I-Gel	Intersurgical gel
KTP	Potassium titanyl phosphate
LCD	Liquid crystal display
LMA	Laryngeal mask airway
MAC	Minimal alveolar concentration
MMP	Mallampati
MV	Mask ventilation
NAP4	4th National Audit Project
NPA	Nasopharyngeal airway
NPO	Nothing per oral
OPA	Oropharyngeal airway
OSA	Obstructive sleep apnea
PEAE	Preoperative endoscopic airway evaluation
PEEP	Positive end-expiratory pressure
POGO	Percent of glottic opening
RCT	Randomised controlled trial
RPS	Retropharyngeal space
RUB	The right upper lobe bronchus
S	Second
SAD	Supraglottic airway device
SGA	Supraglottic airway

List of Abbreviations (Cont…)

Abb.	Full term
SLIPA	*Streamlined Liner of Pharyngeal Airway*
SOS	*Seeing Optical Stylet*
TMD	*Thyromental distance*
Tulip GT	*Tulip Guedel tube*
TV	*Television*
VIP	*Vasoactive intestinal peptide*
VL	*Video laryngoscope*
VT	*Tidal volume*

Introduction

In the early 1990s, failed oxygenation was found to be the main cause of death during anesthesia, since then, several major efforts have been made to reduce the incidence; the societies for airway management were founded, guidelines about difficult airway management have been formulated, new reliable airway devices have been developed, and oximetry and capnography have become widely available ***(Asai and O'Sullivan, 2016).***

Airway-related complications are one of the commonest causes for anesthesia-related morbidities and mortalities, while improvements in patient monitoring, airway devices, and clinical protocols and training have reduced the risk associated with a difficult airway, these changes have not reduced the incidence of unexpected difficult airway in clinical practice ***(Cattano et al., 2013).***

A difficult airway is a clinical situation in which a conventionally trained anesthesiologist experiences difficulty with facemask ventilation, tracheal intubation, or both ***(Hagberg, 2014).***

Difficult or delayed intubation, failed intubation, and 'can't intubate can't ventilate' (CICV) accounted for 39% of all events and events during anesthesia. Aspiration then extubation problems followed tracheal intubation in frequency of reported complications ***(Cook et al., 2011).***

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

Management of the airway is continually evolving, with a plethora of new devices continuously being developed. In the midst of these new technologies, the basics of airway management sometimes get overlooked. Things such as upper airway assessment, optimal head positioning, manual maneuvers to open the upper airway, use of simple airway adjuncts, and expert bag- mask ventilation (BMV) are all basic, essential, and potentially life-saving respiratory therapy skills ***(Davies et al., 2014).***

Expertise and familiarity, as well as the benefits and limitations of a device, influence airway management strategies. Although most anesthetists are keen to play with new toys, once the novelty wears off they will only use airway management tools regularly if they are effective, the successful use of any advanced airway management device depends on operator skill, judgment and patient selection ***(Rajendram and Kale, 2016).***

AIM OF THE WORK

The aim of this essay is to identify and discuss the upper airway anatomically and physiologically, knowing the different methods and scores used for evaluating the airway, and review basic & advanced airway devices properties then show their uses in different aspects in anesthesia.

Chapter 1

UPPER AIRWAY ANATOMY

Knowledge of anatomy is essential to the study of airway management. First, anatomical considerations are helpful in diagnosing certain problems, such as the position of a foreign body in a patient with airway obstruction. Second, since some procedures involved in establishing and maintaining an airway are performed under emergency conditions, little if any time may be available for reviewing anatomy. Third, in many procedures involving the airway, such as tracheal intubation, anatomical structures are only partially visible. As a result, one must recognize not only the structures in view but also their spatial relationship to the surrounding structures. This chapter reviews basic airway anatomy, discusses some clinical correlates. Normal respiration involves a highly detailed neurophysiologic process that results in the exchange of inspired and expired air through various anatomic structures. An understanding of these structures is important to the clinician involved in maintaining or reestablishing the normal airway. The following anatomic discussion focuses on the features crucial for the establishment and maintenance of a tracheal airway ***(Isaacs and Sykes, 2002)***.

1- The Nose

The nasal profile consists of the root, dorsum, tip and columella, with the other sections of the nose consisting of the ala, alar sulcus and nostrils. These features are supported by underlying nasal structure consisting, besides bone, of cartilage, muscles, subcutaneous fat and possibly a ligament. The nasal skeleton consists of the nasal bones and the frontal processes of the maxillae. The anterior nasal spine projects from the medial superior border of the maxilla in the nasal cavity floor and is variable in shape and length. Internally, although the nasal cavity is formed by several bones, only the nasal bones, maxillae, vomer and ethmoid bones support the nasal cartilaginous skeleton. This comprises several cartilages, the septal cartilage, the bilateral (greater) alar and lateral cartilages and varying numbers of lesser alar and sesamoid cartilages ***(Anderson et al., 2008)***.

The nasal septum supports the other cartilages and soft tissues of the nose and strengthens the nasal framework by dividing the nasal cavity in two. Structurally, the vomer and the perpendicular plate of the ethmoid, in conjunction with the septal cartilage, combine to form the nasal septum. Anteriorly, the septal cartilage attaches inferiorly to the anterior nasal spine and superiorly to the lateral cartilages. They are continuous with the septal cartilage along the superior border, separating anteriorly to allow movement during respiration. The lateral cartilages attach to the inferior surface of the nasal bones and may also attach to the frontal process of the maxilla. The position and shape of the alar cartilages is influenced by the height of the nasal septum, although these cartilages do not attach directly to the maxilla. The unique shape of the medial and lateral crura of the alar cartilage forms the columella, the nasal tip in conjunction with the interdomal fat pad, and the outer nostril walls. Between the lateral crura and the frontal process of the maxilla, below the inferior edge of the upper lateral cartilages in the intercartilaginous area are the small lesser alar cartilages ***(Anderson et al., 2008)***.

The nose has a number of important functions, including: respiration, olefaction, filtration, humidification, and is a reservoir for secretions from the paranasal sinuses and the nasolacrimal ducts. Head injury patients should be examined about nasal discharge, which may be cerebrospinal fluid (CSF). Nasotracheal intubation and the passage of nasogastric tubes are relatively contraindicated in the presence of basal skull fractures ***(Benumof and Sniderson, 1999)***.

The lateral walls have a bony framework attached to which are three bony projections referred to as conchae or turbinates **(Fig 1)**. The upper and middle conchae are derived from the medial aspect of the ethmoid; the inferior concha is a separate structure. There are a number of openings in the lateral nasal walls that communicate with the paranasal sinuses and the nasolacrimal duct. A coronal section of the nose and mouth shows the location and relationships of the nasal structures