PERIOPERATIVE LARYNGEAL COMPLICATIONS

Essay

Submitted in partial fulfillment for the Master Degree in
Anesthesia

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Dedication

To my parents who gave me

everything I have in my life.

To my wife who supported me.

Abstract

Difficult airways can lead to critical incidents during anaesthesia.In addition to improving prediction of difficult airways, education for management planning and seeking for superior management techniques and airway tools are of the utmost importance in preventing airway complications and catastrophes. Management of complications of the airway is an essential component of emergency medicine. Finally, recent developments in airway management techniques and new airway devices are summarized.

Key word :

Airway complication .

Endotracheal intubation .

Management .

Recent devices .

Abstract

Difficult airways can lead to critical incidents during anaesthesia.In addition to improving prediction of difficult airways, education for management planning and seeking for superior management techniques and airway tools are of the utmost importance in preventing airway complications and catastrophes. Management of complications of the airway is an essential component of emergency medicine. Finally, recent developments in airway management techniques and new airway devices are summarized.

Keywords:

Airway Complications

Endotracheal Intubation

Management

Recent Devices

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List of Abbreviations

RLN	Recurrent Laryngeal Nerve
ASA	American Society of Anesthesiologists
ETT	Endotracheal Tube
GIT	Gastro Intestinal Tract
EBSLN	External Branch of the Superior Laryngeal Nerve
LMA	Laryngeal Mask Airway
VCP	Vocal Cord Paralysis
NPPE	Negative-Pressure Pulmonary Edema
ICP	Intracranial Pressure
TMJ	Temporo Mandibular Joint
SGS	Subglottic Stenosis
LTS	Laryngotracheal Stenosis
GER	Gastroesophageal Reflux
MRI	Magnetic Resonance Imaging
CT	Computed Tomography
CTR	Cricotracheal Resection
LTP	Laryngotracheoplasty
ACS	Anterior Cricoid Split
ICU	Intensive care unit
PEEP	Positive End Expiratory Pressure
IOP	Intra Ocular Pressure
SLP	Speech-Language Pathologist
BVM	Bag-Valve-Mask
COPD	Chronic Obstructive Pulmonary Disease
RIFL	Rigid Intubating Fiberoptic Laryngoscope
TTJV	Transtracheal Jet Ventilation
PLMA	ProSeal Laryngeal Mask Airway
ILMA	Intubating Laryngeal Mask Airway
SOS	Shikani Optical Stylet
AWS	Airway Scope
FOB	Flexible Fiberoscopes

Introduction

Every year, millions of patients undergo laryngoscopy and tracheal intubation as part of their routine anesthetic care. Although this method was only rarely used in our practice before the 1960s, it is now almost as routine as placing a peripheral intravenous catheter. A great deal of attention is devoted to airway management in general (particularly the patient with a difficult airway), but we rarely give much thought to the consequence of intubation in patients with complete, normal (easy) airways.

Tanaka et al. describe measurable changes in the larynx following routine endotracheal intubations. The changes consisted of increased airflow resistance that was attributed to intraoperative swelling of the laryngeal soft tissues in patients who were intubated. Such postoperative laryngeal changes were absent in the patients who received a laryngeal mask airway for anesthesia. It is tempting to dismiss the findings of this study as intuitively predictable or trivial. However, we believe that the findings represent the less severe end of the spectrum of airway injuries caused by tracheal intubation.

Domino et al. analyzed the claims of airway injuries in the American Society of Anesthesiologists closed claims project. Of the 266 claims related to airway injury, 87 involved the larynx, with the most common lesions being vocal cord paralysis, granulomas, arytenoid dislocation, and hematomas. However, 80% of laryngeal injuries were associated with routine (nondifficult) tracheal intubation…, and only 17 of these cases were associated with a difficult intubation. Others have observed serious laryngeal injuries (e.g., vocal cord paralysis, arytenoid cartilage subluxation, laryngeal granulomas, and scars) following short-

term intubation and anesthesia. Paulsen et al. compiled a list of several reports of arytenoid cartilage subluxation. In most of these reports, intubation was performed without apparent difficulty and the patients were intubated for a short period of time. These findings suggest that laryngeal damage was related to intubation and not to duration of surgery. Although there are some differences in opinion with regard to general risk factors, several factors were suggested for arytenoids subluxation, including laryngomalacia, renal insufficiency, acromegaly, chronic glucocorticoid intake, and rheumatoid arthritis.

Anatomy of the airway

A knowledge of anatomy has always played a vital role in medicine, and is especially important in the everyday practice of anaesthesia. The anaesthetist requires a particularly specialized knowledge of anatomy.[1]

Successful airway management requires detailed understanding of upper and lower airway structure and function.

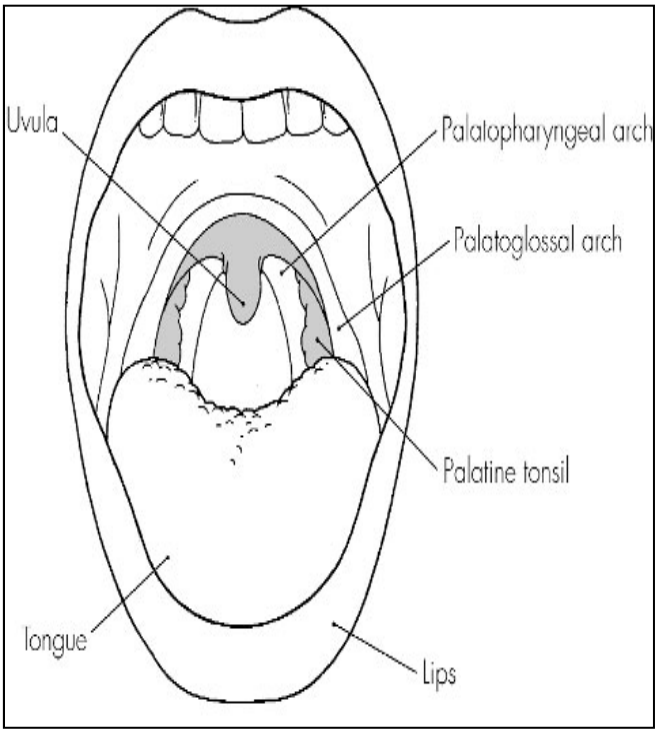
UPPER AIRWAY

The human upper airway has two openings: the nose and the mouth.The floor of the nose is the roof of the mouth.The nose leads to the nasopharynx and the mouth leads to the oropharynx. Both are separated anteriorly by the Palate, these two passages join posteriorly in the Pharynx. At the base of the tongue, the epiglottis separates the oropharynx and the laryngopharynx/hypopharynx. The larynx extends from the lower part of the pharynx to the trachea. [2]

The Mouth:

The mouth is made up of the vestibule and the mouth cavity, the former communicating with the latter through the aperture of the mouth. [3]

The Palate: The palate forms the roof of the mouth and the floor of the nasal cavity. [3]



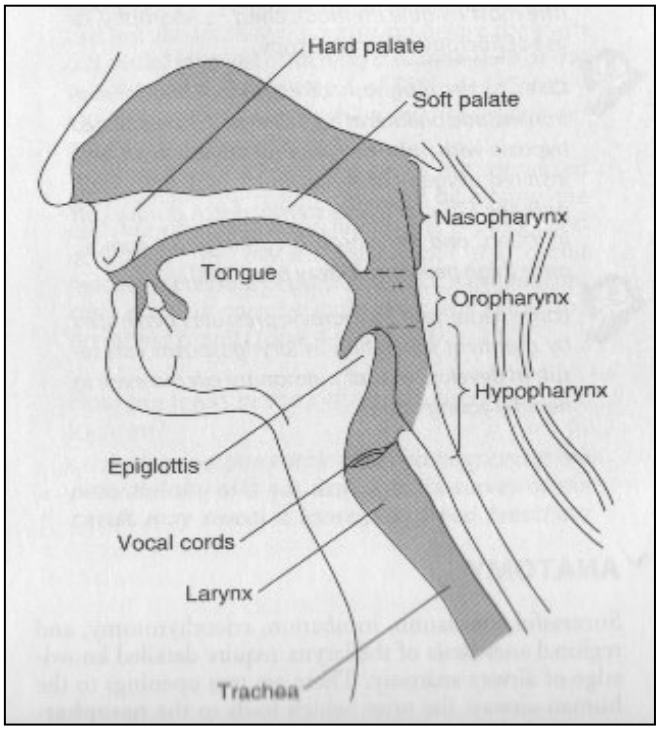


Fig.(1): Anatomy of the mouth

Fig.(2): Anatomy of the airway

The Nose: The peripheral olfactory organ or organ of smell consists of two parts: an outer, ***the external nose,*** which projects from the center of the face; and an internal***, the nasal cavity,*** which is divided by a septum into right and left nasal chambers. [3]

Anatomy of the pharynx:

The pharynx is that part of the digestive tube which is placed behind the nasal cavities, mouth, and larynx which conveniently divide it into three parts, termed the nasopharynx, oropharynx and laryngopharynx, respectively. [4]

It is a musculomembranous tube, somewhat conical in form, with the base upward, and the apex downward, extending from the under surface of the skull to the level of the cricoid cartilage in front, and that of the sixth cervical vertebra behind. [5]

A)The Nasal Part of the Pharynx (pars nasalis pharyngis; nasopharynx): lies behind the nose and above the level of the soft palate.

B)The Oral Part of the Pharynx (pars oralis pharynges; oropharynx): reaches from the soft palate to the level of the hyoid bone.

C)The Laryngeal Part of the Pharynx (pars laryngea pharyngis; laryngopharynx): Reaches from the hyoid bone to the lower border of the cricoid cartilage, where it is continuous with the esophagus.

Anatomy of the larynx:

The **larynx** or **organ of voice** is placed at the upper part of the air passage. It is situated between the trachea and the root of the tongue. On either side of it lie the great vessels of the neck. Its vertical extent corresponds to the fourth, fifth, and sixth cervical vertebræ, but it is placed somewhat higher in the female and also during childhood. [6]

Size of the larynx: is almost the same in boys and girls till puberty. After puberty the antero posterior diameter of the larynx virtually doubles in males.

Dimensions of larynx: [6]

Sex	Length	Transverse Diameter	Antero Posterior Diameter
Male	44mm	43mm	36mm
Female	36mm	41mm	26mm

Table (1-1): Dimensions of larynx:

Laryngeal framework:

The framework of the larynx is formed by cartilages. These cartilages are linked by ligaments and membranes. They move in relation to one another by

the action of two groups of muscles i.e. Intrinsic and Extrinsic muscles. The mucosal lining of the larynx is continuous above with that of pharynx and below with that of trachea.

Cartialges of larynx (cartilagines laryngis): [6]

Are nine in number, three single and three paired.

1.Thyroid cartilage: Is more or less shaped like a shield. It is the largest of the laryngeal cartilages.

Ligaments attached to the thyroid cartilage:

***Thyroepiglottic ligament*:** is a slender elastic ligament connecting.

Vestibular ligament: Also known as the **false vocal cord**.

Vocal ligament: Also known as the **true vocal cord** is responsible for the generation of voice. [7]

2.Cricoid cartilage: Is the only complete cartilage in the whole of the respiratory pathway. It is shaped like a signet ring.

3.Arytenoid cartilages: Are small paired cartilages placed close together on the upper and lateral borders of the cricoid lamina. These cartilages are pyramidal shaped.

4.Corniculate cartilages: are small conical nodules of fibroelastic cartilage articulating with the apices of arytenoid cartilage.

5.cuneiform cartilages: are two small elongated fibroelastic cartilage one in each margin of the aryepiglottic fold.

6.Epiglottis:It is a leaf shaped fibroelastic cartilage which projects upwards behind the tongue and the body of the hyoid bone.

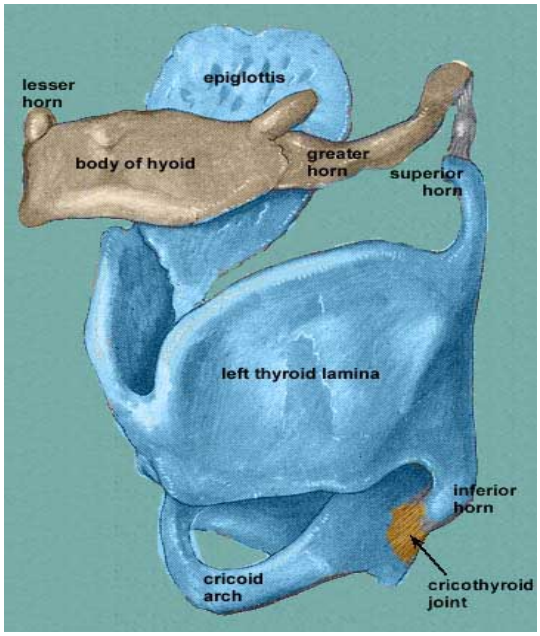


Fig.(3): Anterolateral view of Laryngeal cartilages

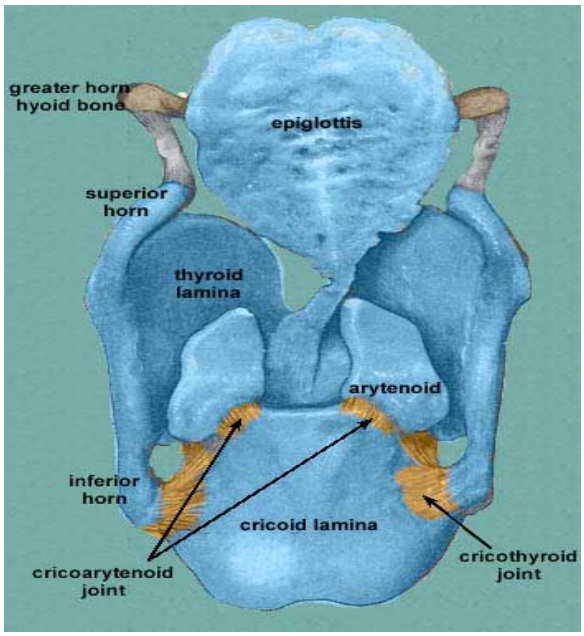


Fig.(4): Posterolateral view of Laryngeal cartilages

Ligaments of larynx: [6]

Can be divided into Extrinsic and Intrinsic ligaments**.**

Extrinsic ligaments:

Are ligaments that connect the laryngeal cartilages to the hyoid bone above and trachea below.

- ***Thyrohyoid membrane*** :stretches between the upper border of the thyroid and the upper border and posterior surfaces of the body and greater cornua of the hyoid bone.
- ***Cricotracheal ligament*** :Unites the lower border of the cricoid cartilage with the first tracheal ring.
- ***Hyoepiglottic ligament*****:** connects the epiglottis to the back of the body of the hyoid bone.