Department of Anesthesia,
Intensive Care and
Pain Management

Comparative Study between Laryngeal Mask Airway Flexible and Endotracheal Tube in Anesthesia for Tonsillectomy

Thesis submitted for partial fulfillment of M.D. degree in Anesthesiology

Presented by:

Mohamed Alaaeldin Abdelmoneem Alhadidy

M.B.B.Ch. – M.Sc. in Anesthesia

Supervised by

Professor Doctor / Amir Ibrahim Salah

Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine - Ain Shams University

Professor Doctor / Ahmed Nagah Elshaer

Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine - Ain Shams University

Doctor / Rania Magdi Mohamed

Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine - Ain Shams University

Doctor / Ghada Mohamed Samir

Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
2015

قسم التخدير والرعاية المركزة
وعلاج الألم

دراسة مقارنة بين إستخدام القناع الحنجري المرن و الأنبوبة الحنجرية في تخدير عمليات إستئصال اللوز

رسالة مقدمة من

الطبيب/ محمد علاء الدين عبد المنعم الحميدي
بكالوريوس الطب والجراحة, ماجستير التخدير
كلية الطب جامعة عين شمس

توطئة للحصول على درجة الدكتوراه في التخدير

تحت إشراف

الأستاذ الدكتور/ أمير إبراهيم صلاح
أستاذ التخدير والرعاية المركزة وعلاج الألم
كلية الطب جامعة عين شمس

الأستاذ الدكتور/ أحمد نجاح الشاعر
أستاذ التخدير والرعاية المركزة وعلاج الألم
كلية الطب جامعة عين شمس

الدكتورة/ رانيا مجدي محمد
مدرس التخدير والرعاية المركزة وعلاج الألم
كلية الطب جامعة عين شمس

الدكتورة/ غادة محمد سمير
مدرس التخدير والرعاية المركزة وعلاج الألم
كلية الطب جامعة عين شمس

كلية الطب
جامعة عين شمس
٢٠15

*First and foremost I thank **ALLAH**, the most Beneficent and the most Merciful for the fulfillment of this work, as a little part of his generous help throughout my entire life.*

*I would like to express my sincere gratitude to **Professor Dr. Amir Ibrahim Salah**, professor of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, who honored me by his great support and his kind supervision.*

*I would like to express my profound gratefulness and sincere appreciation to **Professor Dr. Ahmed Nagah Elshaer**, professor of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University for his encouragement and support revising this work.*

*It has been an honor working under the supervision of **Dr. Rania Magdi Mohamed**, lecturer of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, who sincerely helped me in every way she could.*

*I would like to express my deepest thanks to **Dr. Ghada Mohamed Samir**, lecturer of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, who provided me with intellectual and technical support from the very beginning of this work.*

*Finally, I would like to express my gratitude to **My Parents** who took me by the hand to where I stand now, and to **My Wife**, The major force in my life, pushing me forward to success.*

Mohamed Alhadidy

2015

List of Contents

List of Abbreviations

- **ASA:** American Society of Anesthesiologists
- **B-D gag:** Boyle Davis gag
- **BP:** Blood pressure.
- **ECG:** Electrocardiogram
- **ENT**: Ear, nose and throat.
- **ETT:** Endotracheal tube.
- **HR:** Heart rate.
- **IV:** Intravenous.
- **Kg:** kilogram.
- **LMA Classic:** laryngeal mask airway Classic.
- **LMA Flexible**: laryngeal mask airway Flexible.
- **LMA**: Laryngeal mask airway.
- **MAC:** Minimal alveolar concentration.
- **MAP:** Mean arterial blood pressure.
- **Min:** minute.
- **NETT:** Nasal endotracheal tube.
- **NSAIDs:** Non-steroidal anti-inflammatory drugs.
- **O_2:** Oxygen.
- **OAETT:** Oral armored endotracheal tube**.**
- **OSA:** Obstructive sleep apnea
- **PACU:** Post anesthesia care unit.

List of Abbreviations (Cont.)

- **PAP:** Peak airway pressure.
- **PONV:** Postoperative nausea and vomiting.
- **RAE tube:** Ring-Adair-Elwyn tube.
- **RHD:** Rheumatic heart disease.
- **SD:** Standard deviation.
- **SpO_2:** Pulse Oximeter Oxygen Saturation.
- **URTIs**: Upper respiratory tract infections.
- **Y:** Year.

List of Figures

List of Tables

Comparative study between laryngeal mask airway Flexible and endotracheal tube in anesthesia for tonsillectomy.

Amir I Salah, Ahmed N Elshaer, Rania M Mohamed, Ghada M Samir, Mohamed A Alhadidy.

Abstract:

BACKGROUND:

Endotracheal tube (ETT) is the standard means to secure the airway in children undergoing tonsillectomy. However, endotracheal intubation is not without risk**.** This has been challenged by the introduction of the laryngeal mask airway Flexible (LMA Flexible). It does not kink, less traumatic during insertion and better tolerated during emergence. The aim of this study is to compare the use of laryngeal mask airway flexible (LMA Flexible) and endotracheal tube (ETT) in tonsillectomy to determine whether using the (LMA Flexible) can reduce the incidence of airway complications compared with (ETT) without compromising airway protection and improves recovery without affecting surgical access.

METHODS:

60 children, aged 4-12 years and scheduled to undergo tonsillectomy, were randomly assigned to 3 groups; 20 in Group (A) where the airways were secured with LMA Flexible, 20 in Group (B) where the airways were secured with oral armored endotracheal tube (OAETT) and 20 in Group (C) where the airways were secured with nasal endotracheal tube (NETT). We registered Insertion characteristics, insertion time, surgical access, number of adjustments of Boyle Davis gag, surgical time, hemodynamic responses, extubation time, recovery time and incidence of complications

RESULTS:

The LMA Flexible was easier to insert with less number of attempts for correct placement (*p* value = 0.04) with no need for Neuromuscular blocking agents compared to endotracheal intubation (*p* value = **0.03**). There was little difference between LMA and ETT use as regards surgical access and adequate visualization and there was no difference in mean procedure time between groups (*p* value = 1). But we found that LMA Flexible use had significant lesser extubation time and recovery time than ETT (*p* value =0.025). Also our study showed more stable hemodynamics in LMA Flexible group than ETT groups, with lower frequencies of postoperative cough bronchospasm, laryngospasm, and laryngeal edema and lower incidence of soft tissue and teeth trauma in LMA flexible group, With lower incidence of airway soiling by blood compared to ETT (*p* value <0.001). Also no significant differences in postoperative nausea or vomiting in LMA Flexible group when compared to ETT groups (*p* value =0.6) with a significantly lower incidence of sore throat both in recovery room and 24 hours later in LMA Flexible group when compared to ETT groups (*p* value <0.001).

CONCLUSION:

The use of LMA Flexible during anesthesia for tonsillectomy does not appear to have any major disadvantages compared to the use of the ETT under the same conditions. In fact LMA Flexible may be superior for some outcome variables. So LMA Flexible is a well-tolerated and effective alternative to the ETT in anesthesia for tonsillectomy.

Introduction

Tonsillectomy remains one of the most commonly performed surgeries carried out in children. One of the main goals of anesthesia during this procedure is to establish and protect the airway. Although it is a common procedure, it presents risks and challenges for both the surgeon and the anesthetist. Although these children are often fit, anesthesia for such cases can be associated with significant morbidity and mortality and should not be taken lightly ***(Lalwani et al., 2013).***

Endotracheal intubation is the standard means to secure the airway in children undergoing tonsillectomy. However, endotracheal intubation is not without risk. Complications of endotracheal intubation include laryngeal trauma and edema, injury to the teeth and lips, cardiovascular stimulation, bronchospasm, Laryngospasm, endobronchial and esophageal intubation ***(Junior et al., 2012).***

The laryngeal mask airway (LMA) was introduced in 1983 as an alternative to the endotracheal tube (ETT). In 1990, the reinforced laryngeal mask was presented, intended for use during surgical procedures involving the mouth and throat. Several factors motivate the use of the LMA in tonsillectomy. The LMA is typically placed without neuromuscular blocking agents, which

may result in faster emergence in short procedures. The LMA can remain in place until emergence, protecting the glottis from blood and secretions. The LMA is less stimulating to the trachea, which may be advantageous in children with tonsillitis who have chronic upper respiratory infections, however disadvantages of the LMA have also been reported, including trouble visualizing the surgical field, as well as leaking or kinking, which lead to difficulty in ventilation, problems with oxygenation in comparison to the ETT ***(Hettige et al., 2014).***

Aim of the Work

The objective of this study was to compare the use of laryngeal mask airway flexible (LMA Flexible) and endotracheal tube (ETT) in tonsillectomy to determine whether the use of the LMA Flexible can reduce the incidence of airway complications without compromising airway protection and improves recovery without affecting surgical access compared with ETT.

Review of literature

I. Anatomy of the upper airway

Upper airway is a compartment that has two openings: the nose which leads to the nasopharynx and the mouth which leads to the oropharynx. These passages are separated anteriorly by the palate, but they join posteriorly in the pharynx (figure 1) ***(Butterworth et al., 2013).***

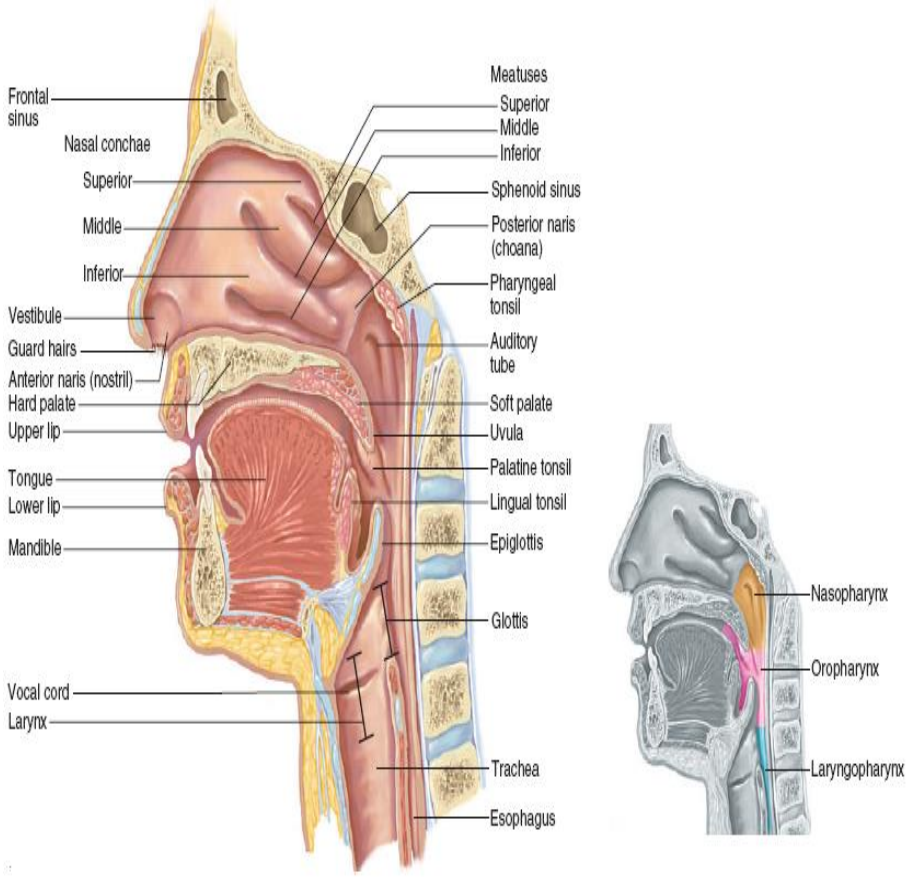

Figure (1): Anatomy of the Upper Respiratory Tract ***(Ellis et al., 2004).***

A. The nose:

The nose is divided into external nose and nasal cavity. The external nose is formed by an upper framework of bone, a series of cartilages in the lower part, and a small zone of fibro-fatty tissue that forms the lateral margin of the nostril (the ala). The nasal cavity is subdivided by the nasal septum into two separate compartments that open to the exterior by the nares and into the nasopharynx by the posterior nasal apertures or choanae ***(Ellis et al., 2004)***.

Each side of the nose is formed by a roof, floor, medial wall and lateral wall. The roof slopes upwards and backwards to form the bridges of the nose (the nasal and the frontal bones) then has a horizontal part (the cribriform plate of the ethmoid), and finally a downward sloping segment (the body of sphenoid). The floor is formed by the palatine process of the maxilla and the horizontal plate of the palatine bone. The medial wall (nasal septum) formed by septal cartilages, the perpendicular plate of the ethmoid and the vomer. The lateral wall is made up of the nasal aspect of the ethmoidal labyrinth above, the nasal surface of the maxilla below and in front and the perpendicular plate of the palatine bone behind (figure 2) ***(Ellis et al., 2004)***.