A Dissertation on

COMPARATIVE STUDY ON EXTUBATION STRESS RESPONSE WITH ENDOTRACHEAL TUBE, LARYNGEAL MASK AIRWAY AND REPLACEMENT OF ENDOTRACHEAL TUBE WITH LARYNGEAL MASK AIRWAY.

Submitted to the

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfilment of the requirements

For the award of degree of

M.D. (Branch-X)

ANAESTHESIOLOGY

GOVERNMENT STANLEY MEDICALCOLLEGE & HOSPITAL

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY,

CHENNAI, TAMILNADU

APRIL 2013

CERTIFICATE

This is to certify that the dissertation entitled "**COMPARATIVE STUDY ON EXTUBATION STRESS RESPONSE WITH ENDOTRACHEAL TUBE, LARYNGEAL MASK AIRWAY AND REPLACEMENT OF ENDOTRACHEAL TUBE WITH LARYNGEAL MASK AIRWAY"** is a genuine work done by**Dr.B.SENTHILKUMAR** for the partial fulfilment of the requirements for M.D. (Anaesthesiology) Examination of The TamilnaduDr. M.G.R. Medical University to be held in April 2013, under my supervision and the guidance of**Prof**.**Dr. MATHAN KUMAR**, Professor, Department of Anaesthesiology at Stanley Medical College, Chennai.

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DECLARATION

I, **Dr.B.SENTHILKUMAR**, Solemnly declare that the dissertation, titled **"COMPARATIVE STUDY ON EXTUBATION STRESS RESPONSE WITH ENDOTRACHEAL TUBE, LARYNGEAL MASK AIRWAY AND REPLACEMENT OF ENDOTRACHEAL TUBE WITH LARYNGEAL MASK AIRWAY"**is a bonafide work done by me during the period of MARCH 2012 TO AUGUST 2012 at Government Stanley Medical College and Hospital, Chennai under the expert supervision of**Professor Dr. P. CHANDRASEKAR, M.D, D.A.** Professor and Head, Department Of Anaesthesiology, Government Stanley Medical College, Chennai.

This thesis is submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfilment of the rules and regulations for the M.D. degree examinations in Anaesthesiology to be held in April 2013.

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ACKNOWLEDGEMENTS

I wish to express my sincere thanks to **Prof. Dr.GEETHALAKSHMIM.D; PhD ,**Dean, Government Stanley Medical College and Hospital for having permitted me to utilize the facilities of the hospital for the conduct of the study.

My heartfelt gratitude to **Prof. Dr. P. CHANDRASEKAR M.D., D.A.,** Professor and Head, Department of Anaesthesiology, Government Stanley Medical College and Hospital for his motivation, valuable suggestions, expert supervision and for making all necessary arrangements for conducting this study.

I am greatly indebted **Prof. Dr. R. MATHAN KUMAR, M.D., D.A.,** who guided me throughout the study and offered constructive criticism and suggestions throughout the period of the study.

I thank**Prof. Dr. PONNAMBALA NAMASIVAYAM M.D., D.A., D.N.B.,** for his constant motivation and valuable suggestions in carrying out this study.

I sincerely thank **Prof. Dr. N. KRISHNAN, M. D., D. A** and

Prof Dr. KUMUDHA LINGARAJ M.D ., D.A for their ideas and immense support.

I wish to thank **Head ofDepartment of Surgery**,**Department of urology, Department of obstetrics and gynecology ,Department of otorhinolaryngology,** Government Stanley Medical College for permittingme to conduct the study in the Government Stanley hospital and RSRM lying in hospital .

I express my heartfelt gratitude to Assistant Professor**Dr. SRI VIKRAM PRABHU,M.D,DNB**who had evinced constant and keen interest in the progress of my study right from the inception till the very end and were instrumental in the successful completion of the study.

I wish to thank all Assistant Professors especially**DR.CAROLYN VON MULLAI,M.D.DA,Dr.RAJARAM, M.D.,D.A.Dr. NIRANJAN KUMAR,M.D.D.A, DR.CHITRADEVI, D.A** for their support and encouragement during the study.

I thank Mr. ALBERT JOSEPH, M. Sc., for helping me in statistical analysis.

My sincere thanks to all those post graduates who helped me during this study period.

I thank the staff nurses and theatre personnel, GovernmentStanleyMedicalHospital for their cooperation and assistance.

I owe my gratitude to all the patients included in the study and their relatives, for their whole hearted co-operation and consent.

CONTENTS

INTRODUCTION

General anaesthesia with endotracheal intubation and intermittent positive pressure ventilation is frequently performed in the practice of anaesthesia. Endotracheal intubation (insertion of ETT into the trachea) and extubation (trans laryngeal removal of ETT) are a part of general anaesthesia and both are associated with hemodynamic responses.

Endotracheal extubation is associated with haemodynamic changes due to reflex sympathetic discharge and cough caused by epipharyngealand laryngopharyngeal stimulation. Increase in sympathoadrenal activity results in tachycardia, hypertensionand arrhythmias[1]. This increase inheart rate and blood pressure are usually for a short period of time, variable and unpredictable. This response ismore harmful to patients with systemic hypertension, coronary artery disease or cerebrovascular diseases. Therefore haemodynamic response to tracheal extubation has always been a challenge to anaesthesiologist.

Many pharmacological[2] methods like administration of lignocaine, verapamil, diltiazem before extubation have been studied,but none of them proved to completely abolish extubation stress response .

Non-pharmacological methods like extubation of the patient in deep plane with spontaneous respiration have been studied to reduce the hemodynamic stress response and cough during extubation. Major disadvantage of these methods is that they produce cardiovascular depression and inadequate upper airway reflexes[3].

The laryngeal mask airway is a supraglottic airway device[4]. It is a good alternative to endotracheal tube and face mask for spontaneous or positive pressure ventilation. LMA makesintubation and extubation less stimulating than endotracheal tube. So we replaced ETT with LMA at the end of the procedure and studied extubation stress responses .

Hence the present study was undertaken to compare the extubation stress response withendotracheal tube, laryngeal mask airway and replacement of endotracheal tube with laryngeal mask airway

AIM OF THE STUDY

The aim of the study was to compare theextubation stress response withendotracheal tube, laryngeal mask airway and replacement of endotracheal tube with laryngeal mask airway, in terms of hemodynamic stress responses and respiratory complications duringextubation.

PRIMARY OUTCOME

- Hemodynamic response

SECONDARY OUTCOME

- Cough during extubation
- Sore throat
- Hoarse voice

AIRWAY ANATOMY

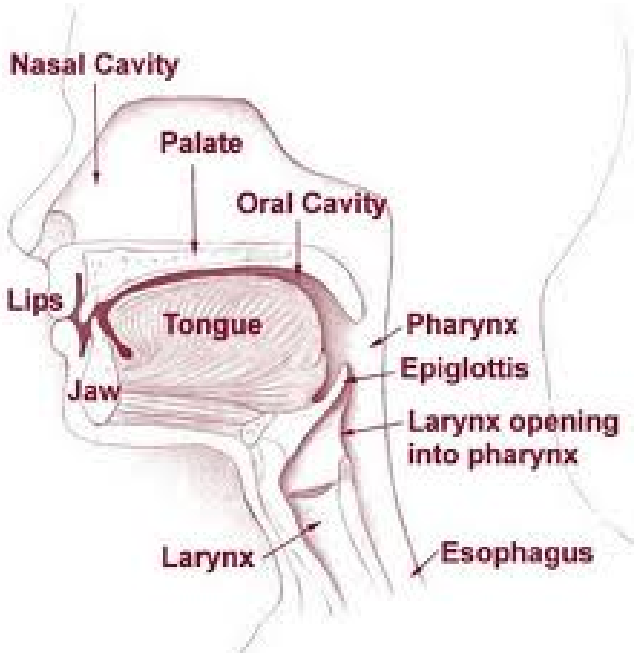
The anatomy[5] of the posterior surface of the tongue, the soft palate,epiglottis,larynx and trachea, with their nerve supply is explained briefly to understand the physiological effects of extubation.

Tongue is a soft mobile organ which bulges upwards from the floor of themouth.The anterior wall of the oropharynx is formed by the posterior part of tongue. The dorsum of the tongue is long and extends from the tip to the base of the epiglottis and forms the glosso-epiglottic fold. A 'V' shaped sulcus terminalis separates the tongue into palatine and pharyngeal parts. The thick mucous membrane covering thetongue in the posterior region is continuous with that of the anterior surface of epiglottis over the median and lateral glosso-epiglottic folds and the valleculae of the epiglottis between them.

Epiglottis issituated posterior to the tongue. It is a leaf shaped perforated plateof elastic cartilage covered by mucous membrane. The upper part is prominently visible posterior to the tongue. Mucous membrane between the front of the epiglottis and back of the tongue is formed by median glossoepiglotticfold .It has a depression on each side, called the epiglotticvallecula. The lateral boundary of thevallecula is formed by a ridge of mucous membrane , the lateral glossoepiglottic

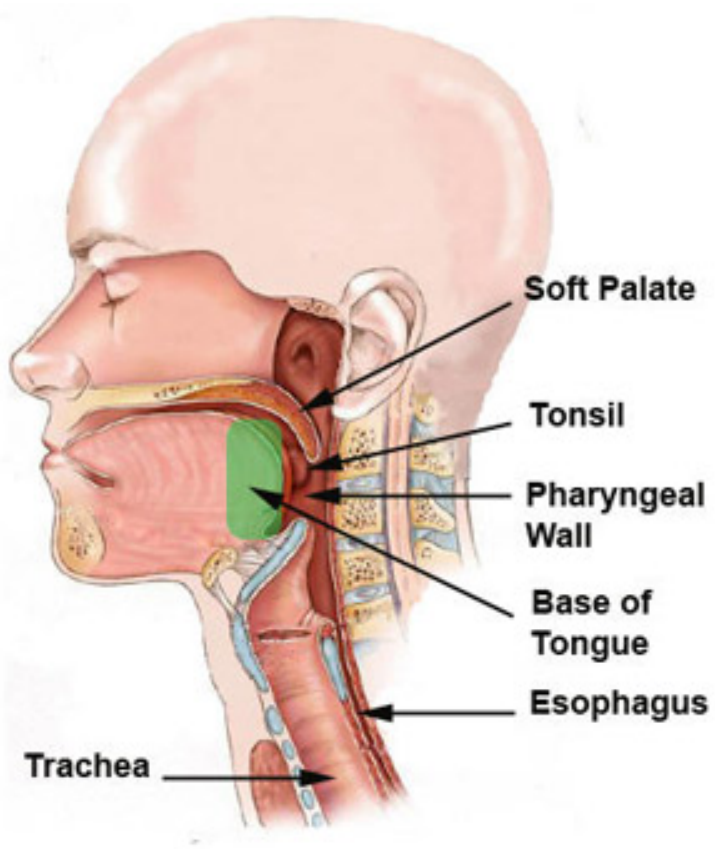
foldand it extends from the margin of epiglottis to the side walls of the pharynx at its junction with the tongue. (Figure 1)

Figure 1



Soft palate is a mobile flap suspended from the posterior border of the hard palate into the pharyngeal cavity. Pharyngeal muscles help to close off the nasopharynx from the mouth in deglutition and phonation .Uvula hangs down from the middle of posterior free border. On each side, it is continuous with the palatopharyngeal arch. (Figure 2)

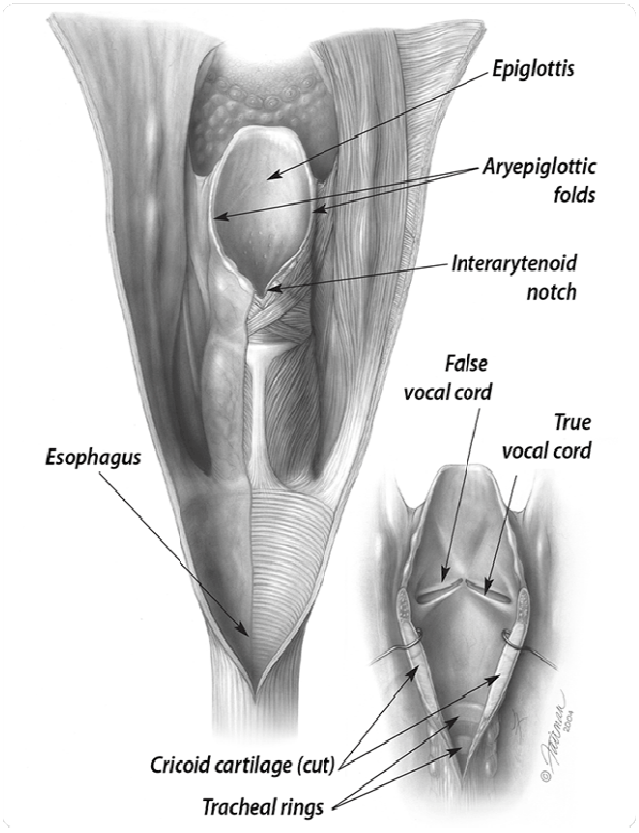
Figure 2



Obliquely sloping inlet of larynx is bounded above by epiglottis , below by arytenoid cartilages , laterally by the aryepiglottic folds and postero-inferiorly by the inter-arytenoid fold. Each aryepiglottic fold is a narrow and a deep fold of mucous membrane that extends posterioinferiorly from the epiglottis to the arytenoid cartilage. It contains the aryepiglotticmuscle . Inferior to the aryepiglotticfold there are two small pieces of cartilage which forms the cuneiform and corniculatetubercules . The interarytenoid fold of mucous membrane

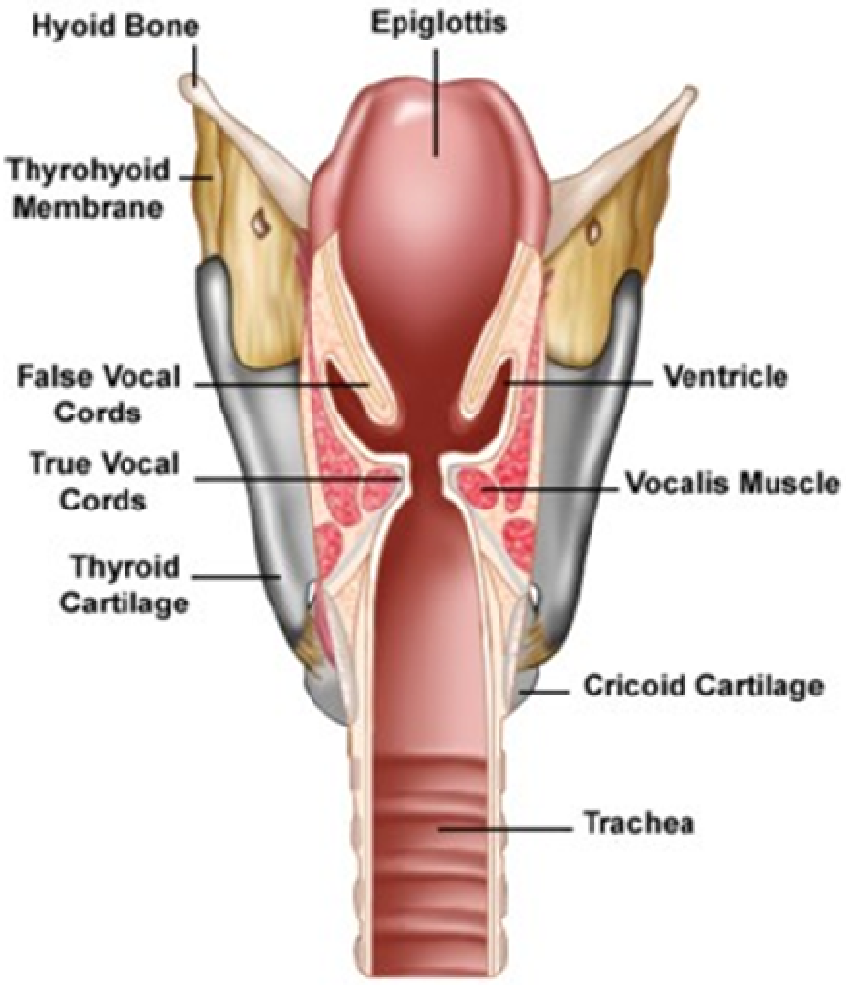
forms the inferior boundary of inlet and encloses the muscle which passes between the posterior surfaces of the arytenoid cartilages.(Figure 3)

Figure 3



Vocal cords are two folds of mucous membrane stretching antero-posteriorly from the vocal processes of the arytenoid cartilage to the posterior surface of the thyroid cartilage and enclosed within each of them is a band of fibroelastic tissue known as the vocal ligament. The opening between the two vocal cordsforms the glottis which is the narrowest portion of the airways in the adult. (Figure 4)

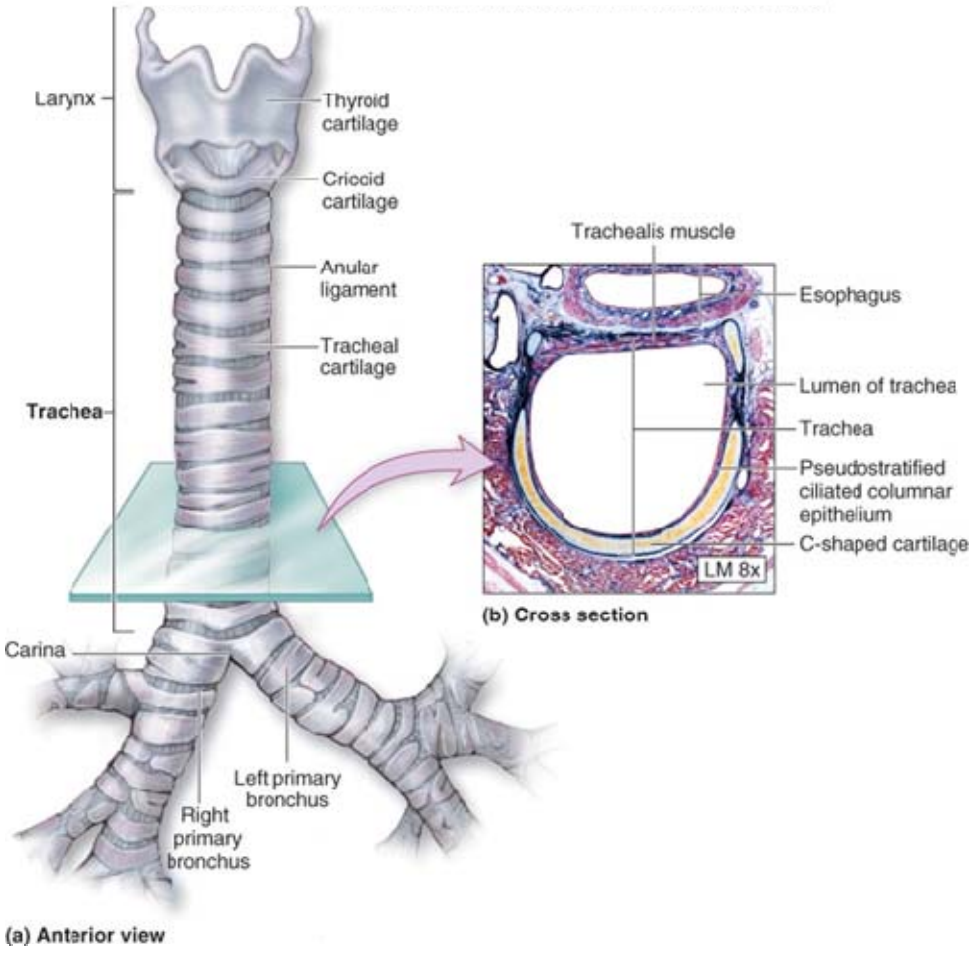
Figure 4



The trachea is a wide tube of 13-15 mm diameter and 11-14 cm in length. Itextends from the larynx and ends at the level of the fourth thoracic vertebra, where it divides into two main bronchi. In newborn the trachea is only 4 cm long. The tracheal architecture consists of a number of horizontal C shaped cartilages, which are joined posteriorly by the

trachealis muscle. Vertically these cartilages are joined to each other by fibro elastic tissue. (Figure 5)

Figure 5



Nerve supply:[5]

Glosso-pharyngeal nerve:

The ninth cranial nerve. It is a mixed nerve. The motor fibres supply the stylopharyngeus muscle and the parasympathetic fibres supply the parotid glands. It descends between the internal and external carotid arteries and after passingbetween superior and middle constrictors of pharynx, it branches into two terminal branches.

The pharyngeal branch consists of

1. One or two branches which supply the mucous membrane of the pharynx, posterior one third of the tongue, anterior surface of the epiglottis, glossoepiglotticfolds, valleculae and pyriformfossa .

2. The larger branch accompanies the pharyngeal branches of the vagus tothe pharyngeal plexus. One of its branches joins a branch of superiorlaryngeal nerve to supply the carotid sinus and the carotid body.

Vagus nerve:

Is also a mixed cranial nerve. In the neck it descends verticallydown betweenthe internal carotid artery and internal jugular vein above and the common carotid artery below. Carotid sheath encloses all the three structures. It gives off numerous branches, three of which supply those areas of the pharynx and larynx which arestimulated by the endotracheal intubation and extubation .

1. Pharyngeal branch :

Forms the large part of the pharyngeal plexus . The pharyngeal branch gets contribution from the branches of the glossopharyngeal nerve and fibresfrom the superior cervical sympathetic ganglion. Pharyngeal plexus supplies the muscles andmucus membrane of the pharynx.

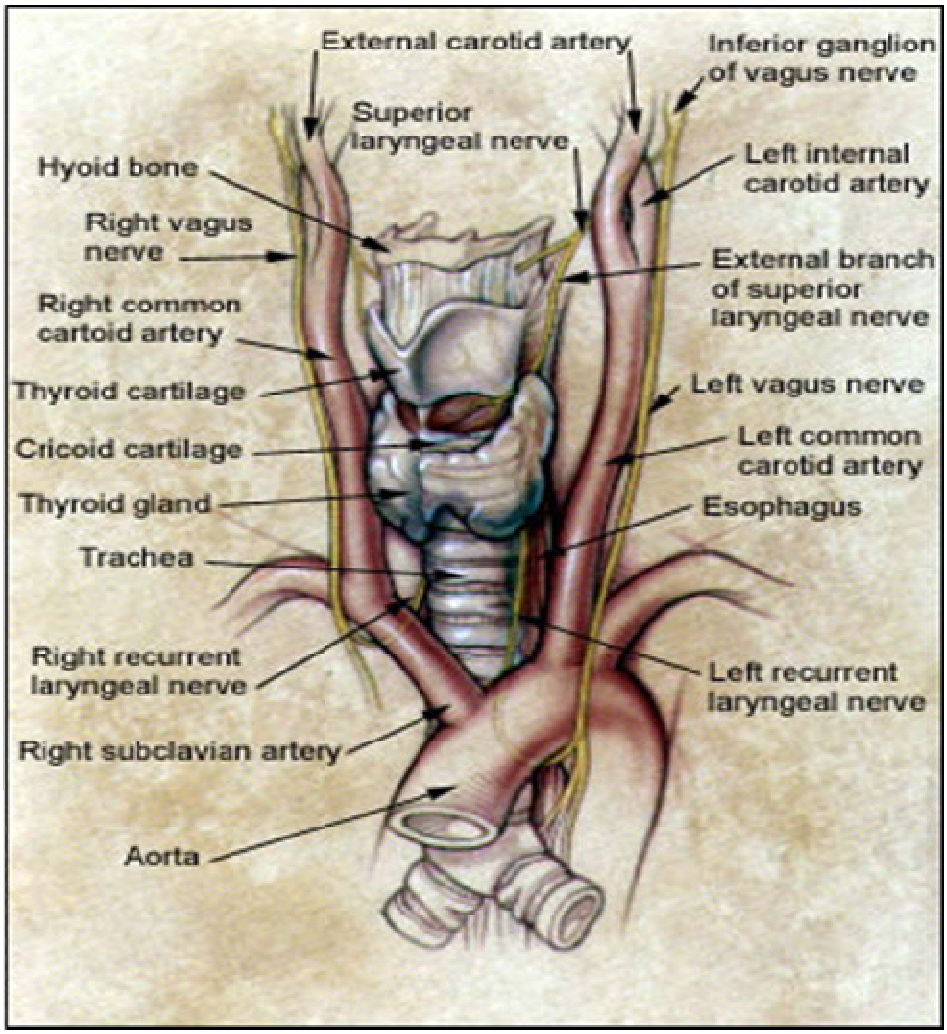
2. Superior laryngeal nerve:

Divides into external and internallaryngeal nerves.

The external branch descends on the anterior aspect of the thyroidcartilage to the cricothyroid muscle to supply the muscle .

The internal branchperforates the thyrohyoid membrane and lies in the submucous plane of pyriformfossa were it supplies the larynx above the level of the glottis.

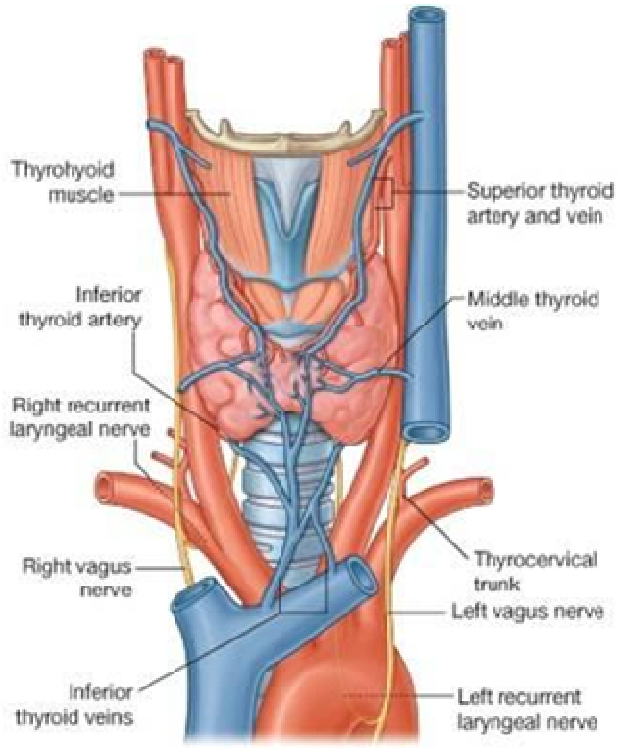
Figure 6



Recurrent laryngeal nerve:

The right recurrent laryngeal nerve hooks around the first partof the subclavian artery, while the left winds around the arch of the aorta.the 2 nerves passes upwards in the tracheo-esophageal groove on either side, lying deep to the lateral lobe of the thyroid gland. Both the nerves enter the laryngeal cavity by piercing the cricothyroid membrane. All intrinsic muscles of larynx apart from cricothyroid muscle is supplied by recurrent laryngealnerve. Sensory supply is to the entire mucous membrane of the laryngeal cavity below the level of the glottis and it also supplies the mucous membrane of the upper part of trachea. (Figure 7)

Figure 7

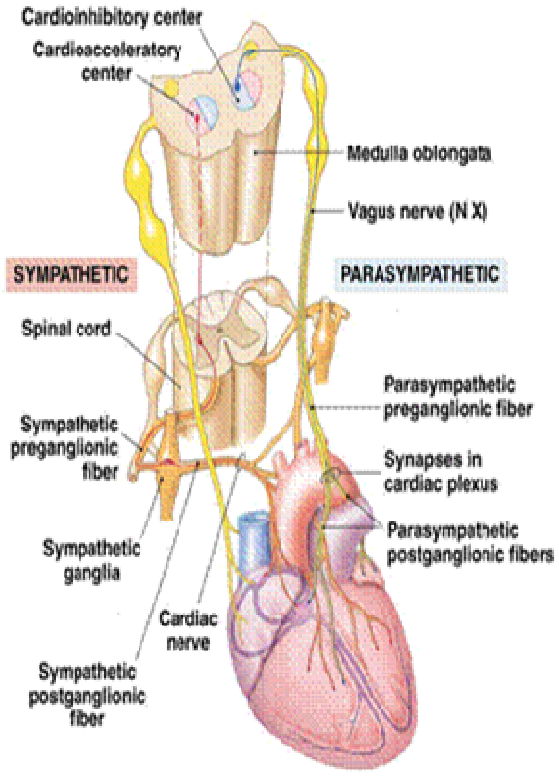


PHYSIOLOGY OF CONTROL OF HEART RATE AND ARTERIAL BLOOD PRESSURE

Innervation of Heart[6]:

The parasympathetic outflow via the vagus has the dominant influence on thenormal control of theheart rate , by a reduction in the rate of discharge from the Sino-atrial node. Increased vagal tone impairs the atrioventricular node conduction, but there is no direct effect upon ventricular contractility. Sympathetic innervation of the heart is viathe cardio accelerator fibres from the upper five thoracicsegments. It increases the rhythmicity of Sino-atrial node and enhances the force and rate of contraction of the heart .The role of Sympathetic system in the control of the heart rate at rest is very little.(Figure 8)

Figure 8



Innervation of the blood vessels :

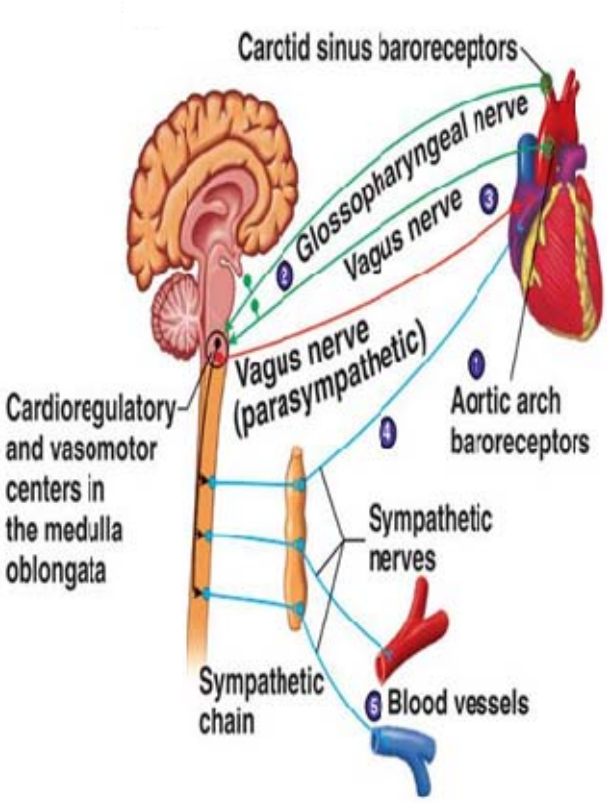
The innervation of the blood vessels is mainly via the sympathetic vasoconstrictor fibres from the thoracolumbar outflow. It controls vascular tone in all the blood vessels except the coronary and cerebral circulation. Innervation to the arterioles, the capillary sphincters and postcapillaryvessels adjusts the resistance of the vessel calibre while efferents tolarger veins increases the capacitance tone. The final pathway

for reflexes that control arterial pressure is by the autonomic nervous system.(Figure 9)

The medullary centres from which they arise are subject to influence from

1. Higher centres
2. Vascular stretch receptors
3. Chemoreflexes
4. Skeletal muscle contraction.

Figure 9



ENDOTRACHEAL TUBE

Intubation of trachea via larynx was first described by **MACEWEN**in 1878.

DAVID S. SHERIDAN invented the modern disposable plastic endotracheal tubes.

Endotracheal tubes are used to administer gases and anaestheticvapours to and fro from patient's lungs. It can be inserted orally and nasally.

Modern endotracheal tubes are made up of Polyvinylchloride(PVC).

These tubes have replaced red rubber tubes .They are disposable , inexpensive and have fewer tendencies to kink .They are tissue compatible. They are stiff tubes,which facilitates intubation but softens at body temperature and conforms to patient's airway,reducing pressure at the point of contact.

DESIGN OF STANDARD ENDOTRACHEAL TUBE

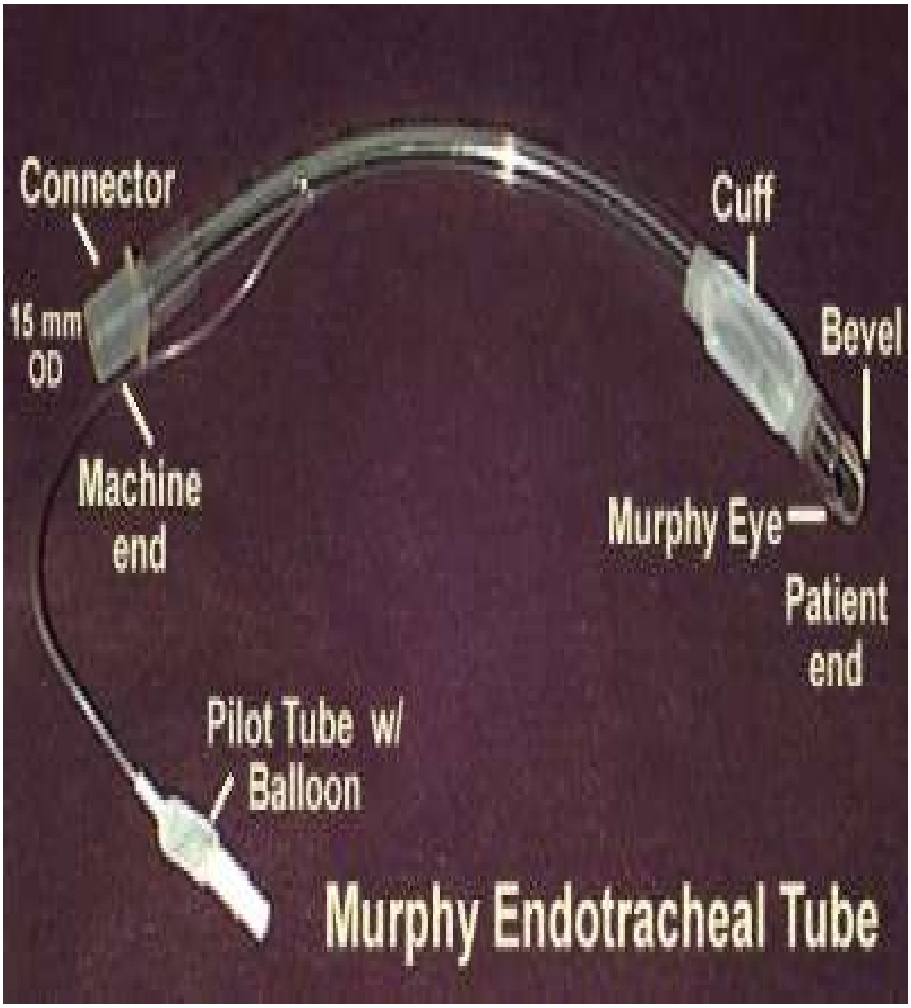
Designed according to AMERICAN SOCIETY FOR TESTING AND MATERIALS STANDARDS (ASTM).

A transparent, single circular lumen tube made up of polyvinylchloride of uniform thickness . It has 2 ends , Patient end(which enters patients trachea) and the machine end (which gets attached to the breathing circuit). A typical ETT is shaped like an arc of a circle with radius of curvature of 140 ± 20 mm. The patient end is slanted and it is called the BEVEL. The angle that the bevel makes with the longitudinal axis of the tube is called the angle of bevel and is 38 ± 10degree . The left facing bevel allows visualization of the tip of the tube as it passes through the vocal cords when introduced with the right hand. There is a hole through the tube on the opposite side of the bevel, called MURPHY'S EYE. It is an alternate pathway for gas flow if bevel gets occluded. ASTM standards specifies that the area of a murphy's eye must not be less than 80% of the cross sectional area of the tube lumen. (Figure 10)

Tracheal tubes without murphy's eye are known as MAGILL TUBES.

The tip of the tube is smooth and hence it is atraumatic.As there is no murphy's eye , the cuff is placed much closer to the tip of the tube , thus decreasing the risk of inadvertent endobronchial intubation.

Figure 10



MARKINGS ON THE TUBE

1. A radio-opaque line placed along the entire length of the tube to determine the position of tube after intubation.
2. Black markings at each centimeter running along outer curvature of the tube indicating distance from the tip of the tube.
3. Tubes are numbered according to their internal diameter in mm.
4. Tubes also mention their outer diameter in mm.
5. IT or Z79-IT indicates tubes tested for tissue compatibility according to ASTM.
6. ORAL or NASAL or ORAL/NASAL.
7. Disposable , single use only or do not reuse
8. Black line above the cuff-is located 3 cm above the cuff, for accurate placement of tracheal tube tip within the trachea.
9. Name or trademark of the supplier.

TRACHEAL TUBE CUFFS

Cuff system of ETT consists of

a) **CUFF:** The cuff is an inflatable sleeve near the patient end of the tube. ASTM standards specify the maximum distance of the cuff from the tip of tube.

b) **INFLATING SYSTEM :** It includes an internal (wall) and an external inflation tube. PILOT BALOON located adjacent to the inflation valve and it gives an idea of the state of inflation and deflation of the cuff.Inflation valve is designed so that it fits the noozle of a standard syringe. One way valve prevents the escape of air once inflated. ASTM standard for external inflation tube requires that its external diameter does not exceed 2.5 mm and it to be attached to the tube at an angle.

USES

1) It creates a seal between the ETT and trachea,preventing aspiration from the pharynx into the lungs.

2) Enables positive pressure ventilation (IPPV).

3) Stabilizes the tip of the tube in the center of the trachea.

TYPES OF CUFFS

1) HIGH VOLUME LOW PRESSURE CUFFS

This cuff has large resting volume and diameter hence pressure is distributed over a large area. It has an advantage that the intracuff pressure closely approximates the pressure on the tracheal wall and hence less damage to the trachea.

The Cuff pressure should be kept < 25 cmH_2O

2) LOW VOLUME HIGH PRESSURE CUFFS

Seen in armoredtubes and red rubber tubes. Exert excessive pressure on the tracheal mucosa and it causesischaemic damage.

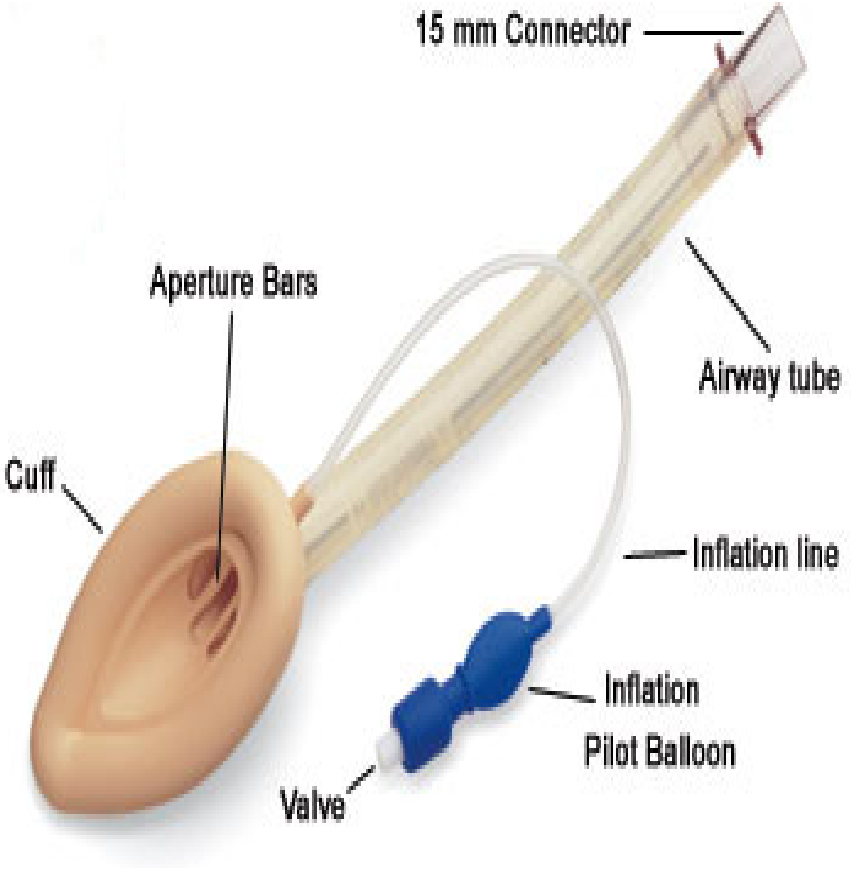
LARYNGEAL MASK AIRWAY

Laryngeal mask airway (LMA)[4] is a minimally invasive airway device designed for airway management in the unconscious patients. It was invented by Dr.Archie brain in 1981. In the year 1988 it came into clinical practice . The inventor developed LMA from the Goldman dental mask which was used as an airway device for dental extractions done under general anaesthesia. Dr. Brain used a diagonally cut portex 10mm endotracheal tube and attached it to the flange of rubber using an acrylic adhesive to form the base of the LMA. This first prototype of LMA was developed in 1981, which was modified in several ways during the seven year period and in 1988 first factory made model came into existence.

Laryngeal mask airway fills the gap between the face mask and endotracheal tube. It is made from medical grade silicone rubber andis reusable . LMA classic has three main components (Figure 11)

1. An airway tube with universal 15mm adapter
2. Inflatable oval shaped laryngeal mask
3. The mask inflation system

Figure 11



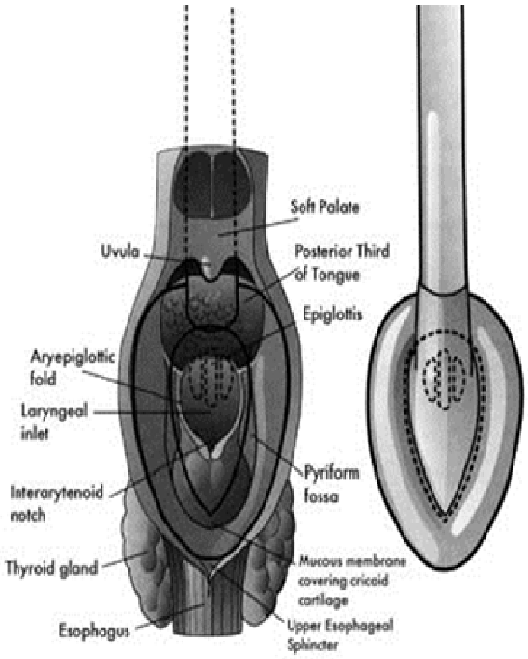
The airway tube is made semi rigid material to facilitate atraumatic insertion. It is slightly curved to match the oropharyngeal anatomy. It is semi-transparent to visualize the condensation and regurgitated material. Along its posterior curvature a longitudinal black line runs to aid in orientation. The distal end of the airway tube opens into the lumen of inflatable mask. It is connected to the mask at a 30^0 angle.

The laryngeal mask is an oval or leaf shaped inflatable structure. It has a semi rigid, concave shield like back plate. The inflatable cuff is attached to the outer rim of the back plate. The inner aspect of the mask has a distal opening through which the airway tube opens into the mask guarded by aperture or epiglottis elevating bars helps in preventing the down folded epiglottis obstructing the airway. The bowl also serves as a reservoir for the secretions and regurgitated fluids. (Figure 12)

The mask inflation system consists of four parts

1. A long narrow inflation line
2. A pilot balloon
3. A white metallic valve made up of polypropylene andit has a spring valve made up of stainless steel .

Figure 12



The signs for correct placement of LMA are

1. Resistance to forward pressure
2. Slight upward and outward movement of airway tube on inflating the cuff.
3. Presence of small swelling in the neck
4. Cuff not visible in the oral cavity
5. Correlation between chest wall movement and bag movement
6. Bilateral equal air entry on auscultation
7. Square wave capnographic trace
8. Fiberoptic confirmation of LMA position.

EXTUBATION

In general anaesthesia tracheal intubation received much importance than trachealextubation . Although many literatures have focussed on tracheal intubation only few reviews have contemplated the area of extubation .the period of extubation may be more treacherous than that of intubation .Complications of the respiratory system comprises a single largest injury as reported by ASA closed claims study. Timing and technique are influenced by the balance between the residual effect of anaesthetic drugs and recovery of airway reflexes. Complications like hypoventilation , hypoxia , upper airway obstruction , laryngospasm , bronchospasm , cough , aspiration and cardiovascular response occur during extubation .Immediately after extubation patient should have adequate ventilator drive , normal breathing pattern , intact airway reflexes and normal pulmonary function.

Coughing/Bucking

Cough occurs more frequently during tracheal extubation.Bucking is a more forceful and often protractedcough that physiologically mimics aValsalvamanoeuvre. Coughing may be particularly troublesome during extubation and cannot be entirely prevented. Coughing causes abrupt increases in intraocular and intracranial pressures due toincrease in intrathoracic pressure that decreases venous return to the right atrium. Increased intraabdominalpressure due to bucking may cause abdominal wound separation.

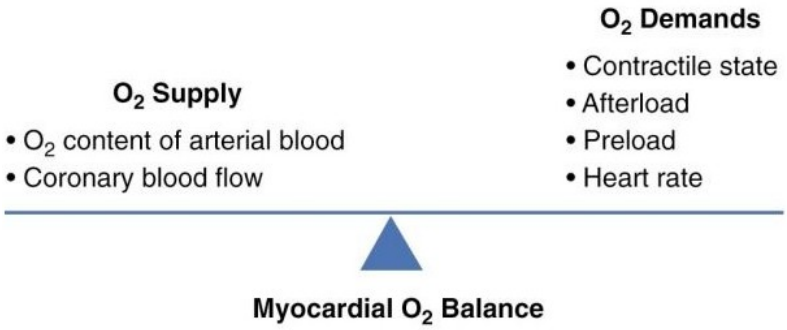
Bucking results in decrease in functional residual capacity, decrease in minute ventilation which leads to atelectasis and hypoxemia. It takes a longer time for the lung to reexpand after atelectasis. Avoiding bucking during extubation is an art and clinical skill that hallmarks smooth extubation.

Cardiovascular Effects of Extubation

Tracheal extubation causes cardiovascular complications like arterial hypertension, tachycardia and dysrhythmias, lasting 5 to 15 min.These effects are alarming but normally transient. They may be detrimental to patientswith coronary artery disease as they experience a

significantdecrease in ejection fraction after extubation.Coughing leads to increases in intrathoracic pressure which interfereswith venous return to the heart.Coughing during extubation significantly increases systolic pressure, diastolic pressure and arterial pulse pressure. Epinephrine levels were significantly increased from 0.9 to 1.4 pmol/mL afterextubation.

Myocardial insufficiency



Myocardial oxygen balance is maintained by the close relationship between myocardial oxygen supply and demand. Factors that decrease the oxygen supply or increase the oxygen demand lead to myocardial ischemia.

Extubation causes stimulation of laryngeal and pharyngeal structures which are innervated by glossopharyngeal and vagus nerve. They in turn stimulate the sympathetic nervous system to increase epinephrine and norepinephrine levels. They produce coronary vasoconstriction which decreases coronary oxygen supply[7]. Increase in heart rate due to sympathetic stimulation increases the myocardial oxygen demand. Sympathetic discharge increases the peripheral vascular resistance which in turn increases the after load of left ventricle

increasing the oxygen demand. Patients with coronary artery disease are vulnerable to this extubation response.

Extubation Criteria

To predict adequacy of respiratory functionafter extubation,it depends on subjective and objective factors.

Subjective clinical criteria:

- Responds to oral commands
- Clear oropharynx / hypo pharynx
- Intact gag reflex
- Sustained head lift for 5 seconds
- Adequate pain control
- Minimal end-expiratory concentration of inhaled anaesthetics

Objective criteria:

- Vital capacity > 10ml/kg
- Peak voluntary negative inspiratory pressure > 20 cmH_2O
- Tidal volume > 6 ml/kg
- TOF ratio > 0.9

Deep Versus Awake Extubation

Extubation may be performed before or after recovery of consciousness. Deep extubation involves the prior reversal of neuromuscular blockade and resumption of spontaneous ventilation under deep plane. Deep extubation decreases the adverse responses due toextubation such as hypertension, dysrhythmias, coughing, laryngospasm and increased intraocular pressure or intracranial pressure. The main disadvantage of extubating the patient in deeper plane is unable to protect his airway against obstruction and aspiration. If it is not done in a proper way it can result in laryngospasm[8]. Deep extubationis also associated with prolonged sedation.

REVIEW OF LITERATURE-PREVIOUS STUDIES

Historical Review:

Laryngoscopy,endotracheal intubation as well endotrachealextubation is accompanied by significant hypertension, tachycardia and arrhythmias.

1) **AnisBaraka MD**[9] first recognized these hemodynamic responses as early as in 1978. He postulated that the disturbances in cardiovascular system were reflex in nature and mediated by the vagus. He studied that lidocaine in the dose of 2mg/kg can be used successfully in children, to prevent or to control extubationlaryngospasm. The mechanism by which lidocaine blocks the laryngospasm reflex arc is by a central interruption of the reflex pathway or direct peripheral action on the sensory or the motor nerve endings .These responses are transitory, variable and unpredictable and are much morecommon in hypertensive patients than in normotensive individuals.

2) **MILLER et al**[8] hemodynamic stimulus is associated with increase in plasma adrenaline concentration parallel with the increase in blood pressure. There is a positive correlation between the increase in the plasma concentration of norepinephrine and rise in HR and

MAP.At the end of anaesthesia after tracheal extubation, there was an increasein heart rate and plasma concentrations of epinephrine. This increase in epinephrineconcentration during and after surgery may represent a physiological response totrauma and surgery. This transient increase in HR and MAP isof littlesignificance inhealthy individuals, but may be hazardous to patients withhypertension, myocardial insufficiency or cerebrovascular disease.

3) **RoofaMushtaq et al**[10] studied cardiovascular responses to extubation of ETT and LMA removal in normotensive patients.40 patients of age group 35-65 years, posted for elective surgical procedures were studied. Hemodynamic parameters observed were HR,MAP,RPP measured at 1minute,2minute,3minute ,5minute and 10 minutes after ETTextubation and removal of LMA . It was observed that the cardiovascular responses increased significantly and was prolonged in ETT patients as compared to LMA group.

4) **Asaiet al**[11] conducted a randomised clinical study on the incidence of respiratory complications due to extubation of ETT in patients who underwent elective general anaesthesia. Common complications that occurred during extubation of endotracheal tube were cough(7.2%), desaturation(3.2%) ,airway obstruction(2.8%).

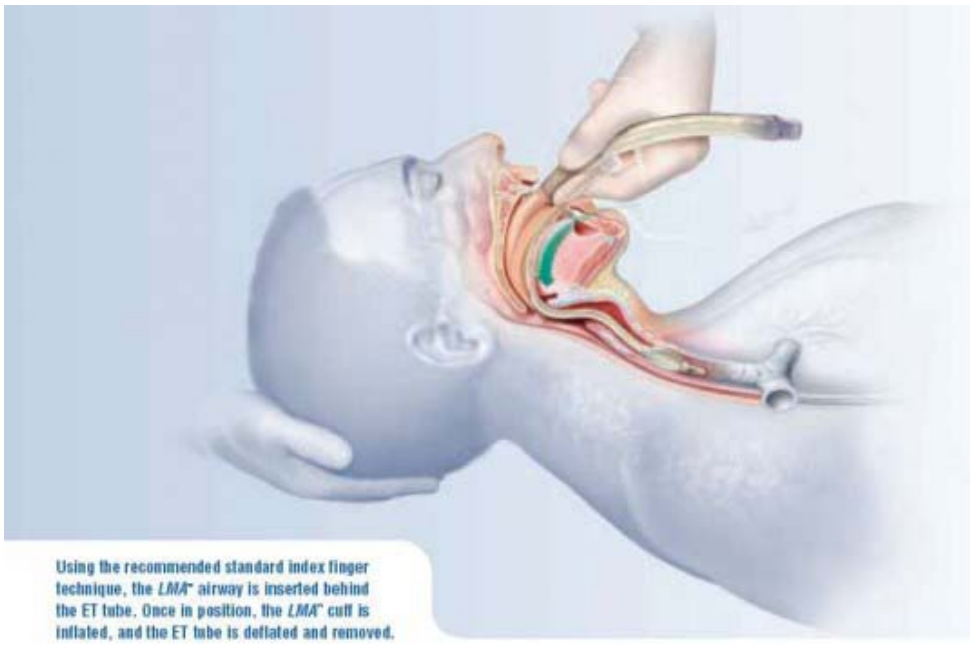
5) **Fujii et al**[1]studied the haemodynamic changes due to extubationof ETT and LMA removal in normotensive and hypertensive patients. In a randomized clinical trial of 40 patients in each group, he monitored changes in HR, MAP and RPP before and 1 minute , 3 minute, 5 minute and 10 minutes after extubation of ETT and LMA removal . LMA removal is associated with less hemodynamic changes than extubation of ETT in both normotensive and hypertensive patients

6) **Seung.H.Yu et al**[12] did a prospective randomized controlled trail to compare the airway complications associated with ETT extubation and LMA removal. ETT extubation resulted in greater incidence of hoarse voice, laryngospasm, coughing and sore throat when compared with removal of LMA.

7) **Bailey et al**[13]studied the technique of insertion oflaryngeal mask airway and its use in recovery.The exchange of an endotracheal tube for a laryngeal mask airway at the end of long surgical procedures provides an excellent airway during emergence from anaesthesia for a patient who is fasted. Laryngeal mask airway when properly inserted provides a clear airway without desaturation, coughing, bucking /straining and minimal

cardiovascular response that facilitates smooth return of consciousness. (Figure 13)

Figure13



8) **Dob et al**[14] did a comparative study in 52 ASA I and II patients on safety and efficacy of theGuedel airway with laryngeal mask airway during the recovery of middle ear surgery . Ability to maintain the airway was graded. Incidence of coughingwas noted. Arterial oxygen saturation (SpO2) was continuously monitored by using a pulseoximeter. LMA group showed ahigher ease of airway maintenance scores and cough was minimal. The LMA group had higher mean SpO_2 at 0 and 1 minute than the Guedel airway group.

9) **K. Koga et al**[15] did a study onrespiratory complications associated with extubationof ETT,timing of tracheal extubation and use of the LMA duringemergence from anaesthesia. He did a randomized clinical study in 60 patients comparing respiratory complications that occurred during extubationin 3 groups . In Group A ETT was extubated when the patient was fully awake. In Group B tracheal extubation was done while the patient was still anaesthetised and in Group C laryngeal maskairway was inserted under deep anaesthesia before tracheal extubation and the lungs were ventilated through the laryngeal mask after tracheal extubation.Bucking and desaturation wasseen more in awake group. Incidence of airway obstruction was more with anaesthetised group. In LMA group incidence of respiratory complications was lower when compared to other 2 groups.Use of aLMA after extubationof ETT resulted in reduced incidence of respiratory complications during emergence from anaesthesia.

10) **Christopher Davis et al**[16] studied two groups of 80 patients of age group 18-75 years who required surgery under general anesthesia with tracheal intubation. In the ETT group, the tube was left in place; in the LMA group, the endotracheal tube was removed 20 to

30 minutes before the end of surgery and was replaced by an LMA, with all replacements successfully completed. Neuromuscular block was reversed, and sevoflurane discontinued.37 ETT patients reported coughing after five minutes without the ETT, only seven of the LMA patients coughed (P<0.001).The coughing of patients following emergence from anesthesia has been a concern of anesthesiologists and surgeons, as well as the patients themselves.A quick endotracheal tube–laryngeal mask airway replacement at the end of surgery could significantly reduce the risk for complications.

11) Ma HN et al [17]investigated the effect of exchange of endotracheal tube for a laryngeal mask airway (LMA) on intratrachealextubation stress response under deep anaesthesia level after surgery in elderly patients with hypertension. 40 hypertension patients aged from 65 to 78 years scheduled for elective upper abdominal surgery were divided into 2 groups, one was extubatedintratracheal tube when being awake and the other was extubated and exchanged for LMA under deep anaesthesia. The data ofMAP, HR , SPO_2 , ETCO2and rate pressure product (RPP) were recorded before induction of anesthesia (T0), suction (T1) and at 0 (T2), 5(T3), and 10 (T4) and 15 min (T5) after extubationof tracheal tube or LMA in two

groups. Blood samples were taken at T(0), skin incision, T(2), T(3), for determination ofserum concentrations of blood glucose and cortisol. Compared with LMA group, MAP, HR and RPP were significantly higher at T(1), T(2), T(3) than T(0) in ETT group. The incidenceof glossoptosisin ETTgroup was significantly higher than those in LMA group. Complications such as cough, bucking, breath holding during the recovery stage in group ETT were more when compared to LMA group. Compared with the baseline value, blood glucose and cortisol concentration level were significantly increased inETT group than in LMA group.

12) **Joseph R Brimacombe et al** [18]reported thatCoughing and gaggingdue to ETT at the end of anaesthesia results in acute hemodynamic changes, rise in intraocular and intracranial pressure and hypoxia. By exchanging ETT for LMA decreases the incidence of these problems during extubation.

MATERIALS

The materials needed for the study includes,

1. Drugs for general anesthesia

    a. InjectionGlycopyrollate

b. Injection Midazolam

c. Injection Fentanyl

d. InjectionPropofol

e. InjectionSuxamethonium

f. InjectionAtracurium

g. Injection Neostigmine

2. Appropriate size face masks

3. Appropriate size laryngoscopes

4. Appropriate sizeEndotracheal tubes

5. Laryngeal mask airway size = 3 & 4

6. Working suction apparatus

7. Monitors – Pulse oximeter, ECG, NIBP

8. Intravenous fluids and intravenous cannula

9. Circle system

10. All emergency drugs

STUDY METHODS

This study was a randomized comparative study conducted in Government Stanley hospital, Chennai during the period of March 2012 to August 2012 . After obtaining clearance from the Institutional Ethical Committee of the Stanley Medical College, Chennai, a pilot study was done to define study population and to decide on inclusion and exclusion criteria.

A target population of 90 patients was decided.After proper screening of patients forthe inclusion and exclusioncriteria,they were informed about the purpose of the study and theprocedure on the day before surgery. A written informed consent was obtained from the patient.

The sample size[19] calculated based on the formula given in monographers on statistics and applied probability.

Formula:

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 2s^2}{d^2}$$

$Z_{1-\alpha/2}$ = 1.96 (5% alpha level of significance)

$Z_{1-\beta}$=0.842 (80% power)

d = difference between two means

$S = S_1+S_2 / 2$

On entering the values, the mean HR observed in the pilot study for extubation of ETT was 85.68 ± 7.02 beats per minute and extubation with LMA it was 82.37 ± 5.85 beats per minute

$N = (1.96 + 0.842)^2 \times 2 \times (7.02+5.85/2)^2 / (85.68-82.37)^2$

$N = 7.85 \text{ X } 2 \text{ X } (12.87/2)^2 / (3.31)^2$

N = 649.98 / 10.95

N = 59.35

Sample size taken as 60 patients , 30 in each group.

CRITERIA FOR SELECTION

INCLUSION CRITERIA

1. Age group 20-60 years
2. ASA I or ASA II
3. Elective surgeries done under general anaesthesia

EXCLUSION CRITERIA

1. Obesity
2. Craniofacial anomalies
3. Hyperreactive airway.

The study population were randomly assigned to three groups labeled as A, B and C. Each group was allotted 30 patients. Randomization was achieved by allotting lots with alphabets A , B and C. Patients with lot A assigned to Group A. Those with lot Bassigned to Group B. Those patients with lot C assigned to Group C .

Pre-anaesthetic evaluation was done on the evening before surgery.

A routinepreanaesthetic examination was conducted assessing

- General condition of the patient
- Nutritional status and weight of the patients
- a detailed examination of the cardiovascular system.
- a detailed examination of respiratory system
- Other associated diseases.

The following investigations were done in all patients

- Haemoglobin estimation
- Clotting time and bleeding time
- Blood sugar Random
- Blood urea
- Serum creatinine
- Serum electrolytes
- Urine examination for albumin, sugar and microscopy
- Standard 12-lead electrocardiogram
- X-ray chest / screening of the chest

All patients were tested for any hypersensitivity reaction to local anaestheticsand informed consent was obtained from all the patients.All patients were kept nil per oral from 12 midnight on the day of surgery.

All the patients were premedicated with Tablet Diazepam 10mg &Tablet Ranitidine150 mg orally at bed time the previous day.

On arrival of the patient to the operating room, a 18 gauge intravenous cannula was inserted and a Ringer lactate infusion wasstarted. The patients were connected to multichannel monitor which records heartrate, noninvasive blood pressure (NIBP), end tidal carbondioxide concentration,continuous ECG monitoring and oxygen saturation.

The base line HR, MAP and $SPO_2$was monitored.

InjectionGlycopyrrolate 10mcg/kg , Injection Midazolam 0.05mg/kg and InjectionFentanyl 2mcg/kg was given IV to all thepatients before induction as a premedication.

Preoxygenation was done with 100% oxygen for 3 minutes.

Anaesthesia was induced with InjectionPropofol 2mg / kg and Injection succinylcholine 1.5 mg/kg to facilitate endotracheal intubation .

Anaesthesia was maintained using 66% nitrous oxide and 33% of oxygen, with sevoflurane 1%-2% . After the recovery of patients from succinylcholine further neuromuscular blockade was maintained with InjectionAtracurium 0.1mg/kg .

Group A=Patients were intubated with appropriate size endotracheal tube, after completion of surgery patients wereextubated with endotracheal tube.

Group B=Patients were inserted with appropriate size Laryngeal mask airway and laryngeal mask airway was removed at the end of surgery.

Group C=Patients were intubated with appropriate sized endotracheal tube, surgery continued with endotracheal tube , 20 minutes before the end of surgery with patient under deep anaesthesiawith adequate muscle relaxation (TOF=2 twitches), following oropharyngeal suctioning , the endotracheal tube was removed and an appropriate sized laryngeal mask airway was inserted and its cuff inflated. The patient was ventilated through laryngeal mask airway and it was removed when the patient was fully conscious.

At the end of surgical procedure patient was reversed with inj. Neostigmine 0.05mg/kg and inj. Glycopyrrolate 0.01mg/kg. ETT and LMA were removed in a fully awake plane after thorough oral suctioning.

After extubation, all the patients were observed on the operating table for 10 minutes with oxygen through face mask 5 L/min. Then the patients were shifted to the recovery room, where they were monitored for 30 minutes with oxygen supplementation. Then the patients were reviewed by the anesthesiologist and send to the post-operative ward.

Monitoring :

The following cardiovascular parameters were recorded in all the patients.

- Heart rate (HR) in beats per minutes (BPM)

- Mean arterial blood pressure (MAP)

- Saturation (SPO2)

- End tidal carbon dioxide (ETCO2)

The above parameters were noted as below.

1) Baseline parameters

2)5 minutes before reversal

3) 1 minute, 3 minute, 5 minute and 10 minutes after extubation.

The observations were noted by an independent observer, who did not know about the aim and outcome of the study.

The quality of tracheal extubation was evaluated using a five point ratingscale.

1 - No cough or strain

2 - Very smooth, with minimal coughing

3 - Moderate coughing

4 - High degree of coughing or straining

5 - Poor extubation, very uncomfortable.

Incidence of complications

a. Gastric insufflation, detected by visualization of epigastric region for distension

b. Laryngospasm

c. Airway obstruction.

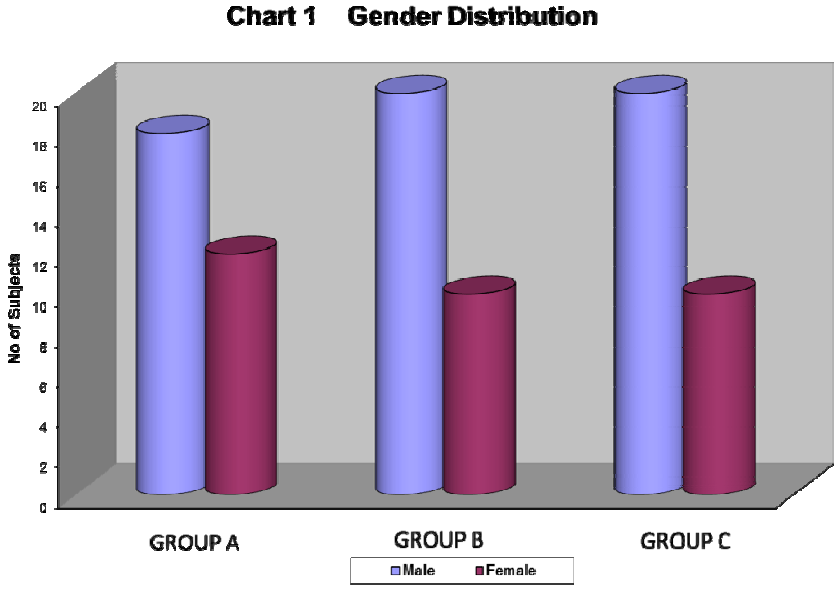
STATISTICAL ANALYSIS

The data were analysed using SPSS (Statistical Package for Social Science) Version 16.01. The data collected were scored and analyzed, Continues variables were presented as mean with Standard deviation (Sd) and categorical variables were presented as frequency and percentages. Student t-test and Analysis of Variance (Anova) were used for testing the significance of all the variables (Mean &Sd). Chi-square test was used to compare proportions. All the Statistical results were considered significant at P value < 0.05.

OBSERVATION & RESULTS

Table-1Gender distributionamong 3 groups

Sex	Group (A) N=30		Group (B) N=30		Group (C) N=30	
	N	%	N	%	N	%
Male	18	60	20	66.70	20	66.70
Female	12	40	10	33.30	10	33.30
Chi-square Value	0.39					
p-value	0.82					

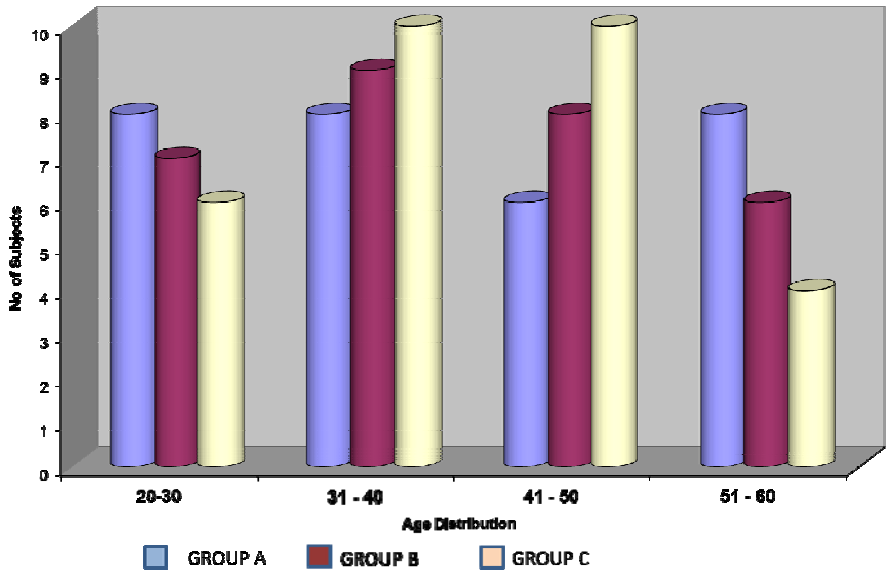


Among 30 patients in each group, in GroupA 18 were male and 12 were female. In Group B 20 were male and 10 were female ,in Group C 20were male and 10 were female patients.In terms of gender distribution there was no statistically significant (p value = 0.82)difference between the 3 groups.

Table-2Age distribution among 3 groups

Age	GROUP A	GROUP B	GROUP C	Total
Mean (sd)	40.93 (10.37)	40.40 (9.84)	39.77(9.45)	40.37(9.80)
Min	25	23	24	23
Max	56	56	58	58
Range	31	33	34	35
p-value	0.90			

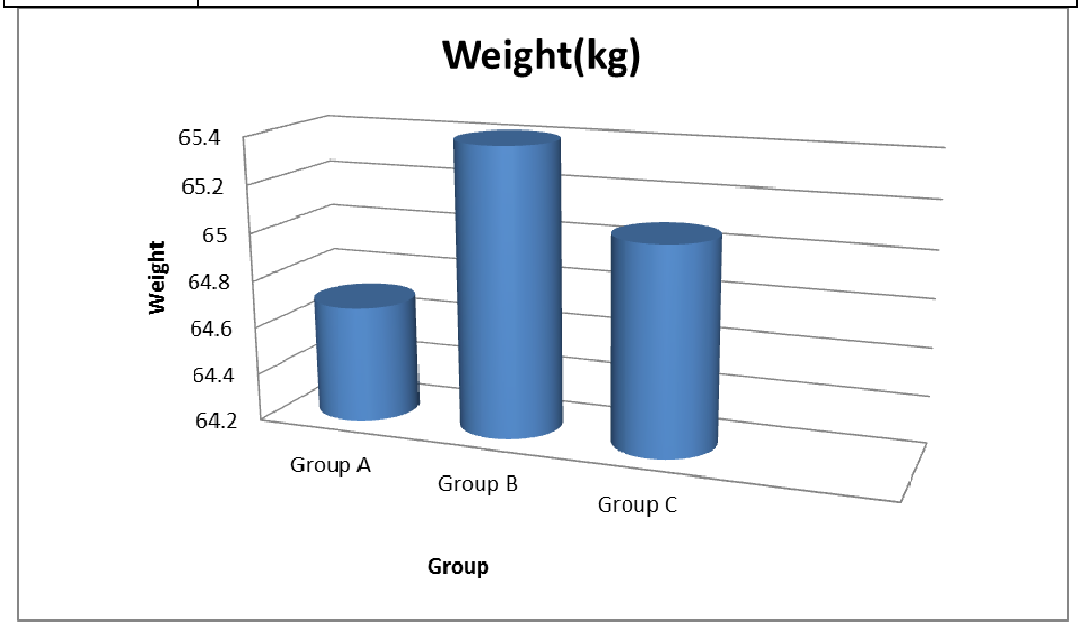
Chart 2 Age Distribution



In Group A minimum age was 25years and the maximum age was 56 years , in Group B minimum age was 23 and the maximum age was 56 years , in Group C minimum age was 24 and the maximum age was 58. All the 3 groups had comparable age distributions.

Table-3Weight Distribution among 3 groups (Kilogram)

	GROUP A	GROUP B	GROUP C	Total
Mean (sd)	64.69 (6.80)	65.40 (7.30)	65.06 (7.10)	65.45 (6.69)
Min	52	52	55	52
Max	75	78	76	78
Range	23	26	21	26
p-value	0.70			



In Group A the minimum weight was 52 kg and the maximum weight was 75 kg (mean=64.69kg) . In Group B the minimum weight was 52 kg and the maximum weight was 78 kg (mean=65.40). In Group C the minimum weight was 55 kg and the maximum weight was 76 kg (mean=65.06). There was no statistically significant (p value = 0.70) difference in weight distribution among the 3 groups.

Table-4 Heart rate distribution among 3 groups

HR	Group A	Group B	Group C
	Mean (Sd)	Mean(Sd)	Mean (Sd)
Baseline	85.17 (6.90)	88.27 (5.85)	86.30 (6.08)
5mins before reversal	79.17 (4.37)	78.70 (5.06)	78.87 (4.42)
Minute 1	102.93 (5.84)	85.67 (5.75)	86.53 (6.30)
Minute 3	95.60 (16.84)	81.40 (4.26)	82.33 (3.77)
Minute 5	94.10 (5.94)	78.47 (4.79)	79.93 (3.90)
Minute10	90.63 (5.19)	77.43 (4.09)	77.97 (3.95)

In group A ,the baseline HRwas 85.17 beats/minute , 5 minutes before reversal it was 79.17 beats/minute , 1 minute after extubation it was 102.93beats/minute , a rise in mean HR = 23 beats/minute and subsequently elevated Heart rate started settling down , at 3 minutes after extubation it was 95.60 beats/minute , 5 minutes after extubation it was 94.10 beats/minute , 10 minutes after extubation it was 90.6beats/minute.

In group B , the baseline HR was 88.27 beats/minute , 5 minutes before reversal HR was 78.70 , 1 minute after extubation HR was 85.67 a rise in HR = 7 beats/minute , 3 minutes after extubation HR was 81.40 , 5 minutes after extubation HR was 78.47 , 10 minutes after extubation HR was 77.43 beats/minute.

In group C , the baseline HR was 86.30 beats/minute , 5 minutes before reversal HR was 78.87 , 1 minute after extubation HR was 86.53 a rise in HR = 8 beats/minute , 3 minutes after extubation HR was 82.33 , 5 minutes after extubation HR was 79.93 , 10 minutes after extubation HR was 77.97 beats/minute.

Chart 4 HR SCORE

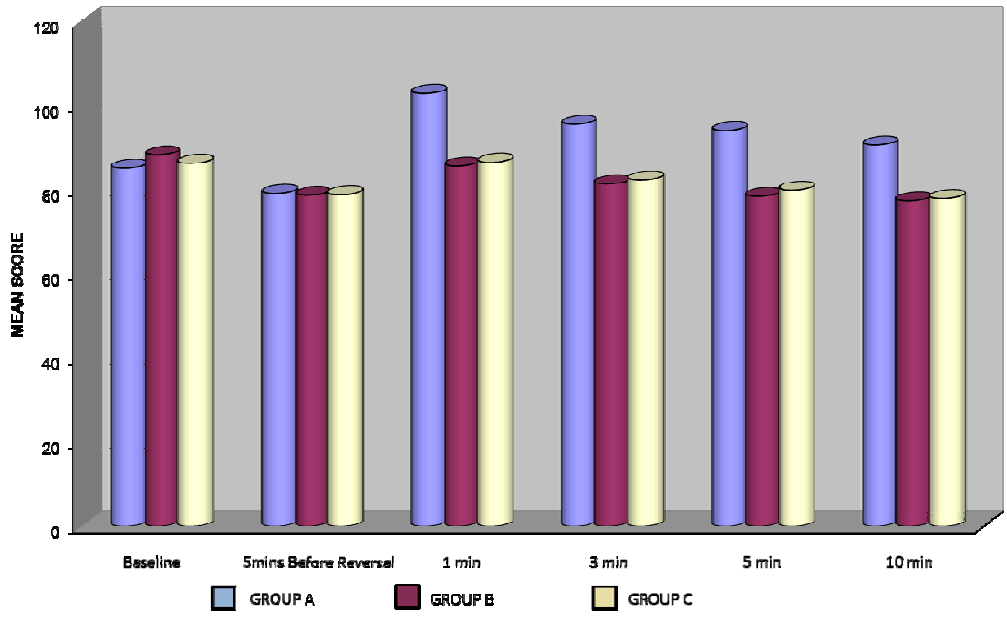


Chart showing trend of HR among Group A , Group B and Group C at baseline , 5 minutes before reversal , 1 minute , 3 minute , 5 minute and 10 minutes after extubation .

Table-5 Comparison of Heart rate between 3 groups

HR	A Vs B	A Vs C	B Vs C
	t-value	**t-value**	**t-value**
	(p-value)	(p-value)	(p-value)
Baseline	1.88 (0.07) *	0.68 (0.50) *	1.28 (0.21) *
5mins before reversal	0.38 (0.70) *	0.26 (0.79) *	0.14 (0.89) *
Minute 1	11.54 (0.0001)	10.45 (0.0001)	0.56 (0.58) *
Minute 3	10.94 (0.0001)	4.21 (0.0001)	0.90 (0.37) *
Minute 5	11.22 (0.0001)	10.93 (0.0001)	1.30 (0.20) *
Minute 10	10.94 (0.0001)	10.64 (0.0001)	0.51 (0.61) *

*** Not Significant**

While comparing heart rate between group A and group B, baseline (1.88) and 5 minutes (0.38) before reversal HR was not statistically significant (p value= >0.05) . Heart rate at 1minute (0.0001),3minute (0.0001),5 minute (0.0001) and 10 (0.0001) minutes after extubation was statistically significant (p value=0.0001)

While comparing heart rate between group A and group C, baseline (0.68) and 5 minutes before reversal (0.26) HR was not statistically significant (p value=>0.05) . Heart rate at 1minute(10.45),3minute (4.21),5minute (10.93) and 10 minutes (10.64) after extubation was statistically significant (p value=0.0001).

While comparing heart rate between group B and group C , there was no statistically significant difference (p value=>0.05) in heart rate values at baseline(1.28) , 5 minutes before reversal (0.14) , 1minute (0.56),3minute (0.90),5 minute (1.30) and 10 minutes (0.51) after extubation.

Table-6Mean Arterial Pressure distributionamong 3 groups

MAP	Group A	Group B	Group C
	Mean(Sd)	Mean(sd)	Mean(Sd)
Baseline	93.27 (5.08)	94.57 (6.70)	92.40 (5.88)
5mins before reversal	92.87 (4.57)	86.10 (5.03)	86.37 (65.32)
Minute 1	101.93 (6.02)	90.87 (6.03)	89.70 (4.94)
Minute 3	97.27 (5.67)	86.83 (4.97)	85.60 (3.97)
Minute 5	93.27 (4.73)	84.10 (4.92)	82.30 (5.40)
Minute10	90.07 (4.09)	82.43 (5.20)	81.47 (3.95)

In group A , baseline MAP was 93.27 mmhg , 5 minutes before reversal MAP was 92.87mmhg , 1 minute after extubation MAP was 101.93 , a rise in mean MAP of 9 mmhg and subsequently elevated MAP started settling down , at 3 minutes after extubation MAP was 97.27 , 5 minutes after extubation MAP was 93.27 and 10 minutes after extubation MAP was 90.07 mmhg.

In group B , baseline MAP was 94.57 mmhg , 5 minutes before reversal was 86.10 mmhg , 1 minute after LMA removal MAP was 90.87 mmhg, 3 minutes after LMA removal MAP was 86.83 mmhg , 5 after LMA removal MAP was 84.10 mmhg and 10 minutes after LMAremoval MAP was 82.43 mmhg.

In group C , baseline MAP was 92.40 mmhg , 5 minutes before reversal MAP was 86.37 mmhg , 1 minute after LMA removal MAP was 89.70 mmhg , 3 minutes after LMA removal MAP was 85.60 mmhg , 5 minutes after LMA removal MAP was 82.30mmhg and 10 minutes after LMA removal MAP was 81.47 mmhg .

CHART 5 MAP SCORE

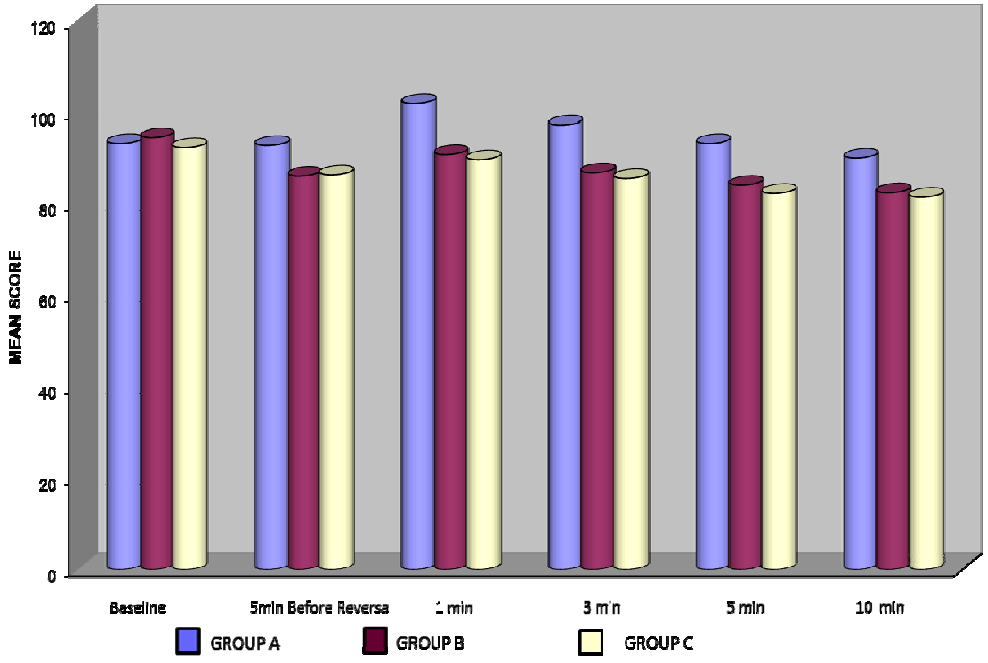


Chart showingtrend of MAP of Group A, Group B and Group C at baseline , 5 minutes before reversal , 1 minute , 3 minute , 5 minute and 10 minutes after extubation .

Table-7Comparison of MAP among 3 groups

MAP	A Vs B	A Vs C	B Vs C
	t-value	**t-value**	**t-value**
	(p-value)	(p-value)	(p-value)
Baseline	0.85 (0.40)*	0.61 (0.54)*	1.33 (0.19) *
5mins before reversal	0.38 (0.70) *	0.35 (0.75) *	0.20 (0.84) *
Minute 1	7.11 (0.0001)	8.61 (0.0001)	0.82 (0.42)*
Minute 3	7.71 (0.0001)	9.23 (0.0001)	1.09 (0.28)*
Minute 5	7.36 (0.0001)	8.36 (0.0001)	1.35 (0.18)*
Minute10	6.32 (0.0001)	8.23 (0.0001)	0.81 (0.42)*

*** Not Significant**

While comparing Mean arterial pressure between group A and group B , at baseline(0.85) and 5 minutes before reversal (0.38) mean arterial pressure was not statistically significant (p value=>0.05) . Mean arterial pressure at 1minute (7.11),3 minute (7.71),5 minute (7.36) and 10 minutes (6.32) after extubation of ETT / LMA removal was statistically significant (p value=0.0001)

While comparing Mean arterial pressure between group A and group C , at baseline (0.61) and 5 minutes (0.35) before reversal mean arterial pressure was not statistically significant (>0.05). Mean arterial pressure at 1minute (8.61),3minute (9.23),5 minute (8.36) and 10 minutes (8.23) after extubation of ETT / LMA removal was statistically significant(p value=0.0001)

While comparing mean arterial pressure between group B and group C , there was no statistically significant difference (p value = >0.05) in mean arterial pressure values at baseline (1.33), 5 minutes before reversal (0.20), 1minute (0.82) ,3minute (1.09) ,5minute (1.35)and 10 minutes (0.81) after LMA removal.

Table- 8SPO2 among 3 groups

SPO2	GROUP A	GROUP B	GROUP C	ANOVA	
	Mean (sd)	Mean (sd)	Mean (sd)	F-value	p-value
Baseline	99.47 (0.57)	99.57 (0.57)	99.67 (0.48)	1.02	0.36 *
5minbefore reversal	99.33 (0.66)	99.07 (0.64)	99.03 (0.62)	1.99	0.14 *
Min 1	99.47 (0.63)	99.23 (0.63)	99.37 (0.62)	1.06	0.35 *
Min 3	99.47 (0.63)	99.23 (0.63)	99.37 (0.62)	1.07	0.35 *
Min 5	99.43 (0.50)	99.43 (0.50)	99.27 (0.52)	1.80	0.24*
Min 10	99.57 (0.50)	99.37 (0.56)	99.20 (0.55)	1.95	0.16*

*** Not Significant**

Saturation values at baseline (0.36), 5 minutes before extubation(0.14), 1minute (0.35),3minute (0.35),5minute (0.24) and 10 minutes (0.16) after extubation of ETT / LMA removal was found to have no statistically significant (p value = >0.05) difference among the 3 groups.

Table- 9ETCO2 among 3 groups

	GROUP A	GROUP B	GROUP C
Mean (sd)	32.10 (1.52)	32.73 (1.76)	32.47 (1.46)
Min	28	28	30
Max	34	35	35
Range	6	7	5
p-value	0.30		

ETCO2values after extubation / LMA removal was found to have no statistically significant (0.30) difference among Group A (1.52), Group B (1.76) and Group C (1.46).

COMPLICATION

Table- 10Cough among 3 groups

	GROUP A		GROUP B		GROUP C	
	N	%	N	%	N	%
No	7	23.33	29	96.67	28	93.34
Yes	23	76.67	1	3.33	2	6.66
Chi squre	57.61					
p-value	<0.0001					

In Group A 76 % of the patients had cough during and after extubation / LMA removal .In Group B and Group C , only 3.33% and 6.66% of patients had cough . It was statistically significant (<0.0001).

Chart 6 Complications

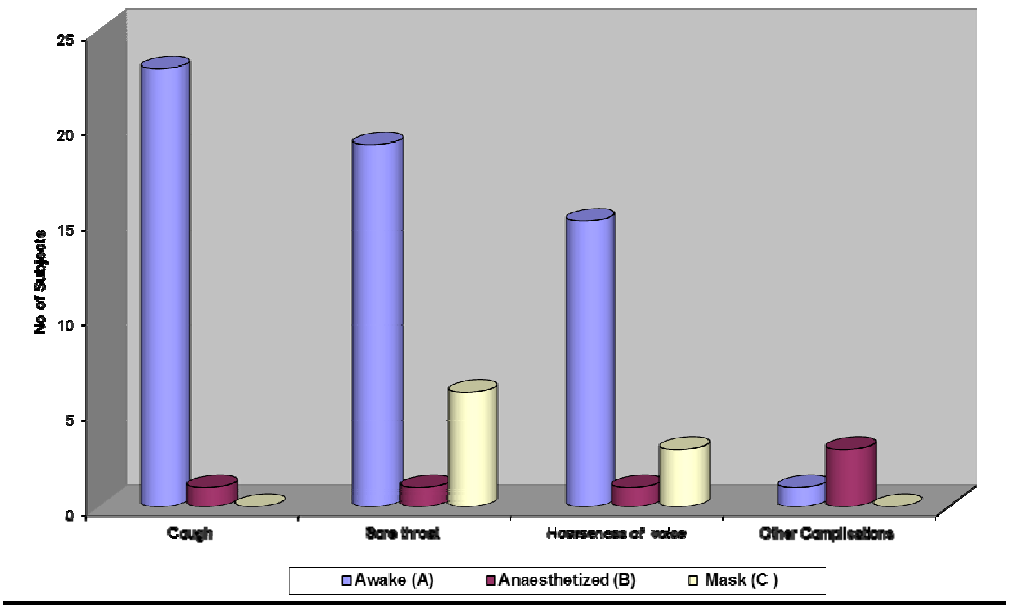


Table-11 **Complication of Sore throat among 3 groups**

	Awake (A)		Anaesthetized (B)		Mask (C)	
	N	%	N	%	N	%
No	11	36.67	29	96.67	24	80.60
Yes	19	63.33	1	3.33	6	19.40
Chi squre	28.02					
p-value	<0.0001					

In Group A 63.33% of the patients had sore throat ,when compared to Group B 3.33% and Group C10 % .

It was statistically significant(p value <0.0001).

Table- 12Hoarseness of voice among 3 groups

	GROUP A		GROUP B		GROUP C	
	N	%	N	%	N	%
No	15	50.00	29	96.67	27	90.00
Yes	15	50.00	1	3.33	3	10.00
Chi squre	22.95					
p-value	<0.0001					

In group A 50% of the patients had hoarseness of voice when compared to group B 3.33% and group C10 % .

It was statistically significant (p value <0.0001)

Table- 13Other Complications among 3 groups

	GROUP A		GROUP B		GROUP C	
	N	%	N	%	N	%
No	29	96.67	27	90.00	29	96.67
Yes	1	3.33	3	10.00	1	3.33
Chi squre	3.66					
p-value	0.16					

One patient in Group A developed bronchospasm after extubation. Two patients in Group B and one patient in Group C had blood staining

of the LMA. One patient in group B had gastric insufflation. All these complications were not statistically significant between 3 groups.

DISCUSSION

In anesthesia, tracheal intubation always received much importance with respect to management of airway, but tracheal extubation did not receive the due emphasis. Problems occurring during and after tracheal extubation are significant. ASA closed claims study reportsthat adverse outcome involving respiratory system comprises the single largest class of injury(**MILLER et al**[8]).

Tracheal extubation causes significant increases in HRand MAP which persists into the recovery period. These hemodynamic changes during extubationmay lead to an imbalance between the myocardial supply and demand in patients with coronary artery disease. Normotensive patients tolerate these adverse events hypertensive patients show an exaggerated response which may lead to myocardial ischaemia , cardiac decompensation, pulmonary edema and cerebrovascular hemorrhage

Precise mechanism for these changes may be due stimulation of laryngeal and pharyngeal structures during extubation which causes cough and strain , both of them produce tachycardia and hypertension due

to reflex sympathetic discharge , which causes increase in epinephrine concentration.

Several methods of extubationhave been studied to attenuate the hemodynamic and cough response. Extubation of the patient in a deeperplane of anaesthesia by inhalational agents is an older method to reduce extubation response. Disadvantage of using this method is that it causes depression of cardiovascular and respiratory system and also leads to prolonged sedation which has difficulty in protecting upper airway.
(**SWATI KARMARKAR et al**)[3].

Many pharmacological agents like lignocaine , verapamil, diltiazem , esmolol are used to attenuate the hemodynamic responses during extubation , but they are direct myocardial depressants which produces significant decreases in blood pressure. They have a significant impact in immediate post-operative period.
(**S.MANANDHAR B.D.JHA et al)**[2].

Dr . ARCHIE BRAIN[4]in 1981 invented laryngeal mask airway at royal London hospital. LMA is an effective tool in securing airway in patients for elective surgery. Its insertion does not require visualization of vocal cords or penetration of larynx. It causes less stimulation of

laryngeal and pharyngeal structures during insersion and removal. LMA insertion leads to minimal hemodynamic pressor response and coughing than with routine endotracheal tube during extubation.

Inour study we have compared the extubation stress response with ETT , LMA and replacing ETT with LMA before extubation.Study was a, randomized comparative study conducted in Government Stanley hospital, Chennai during the period of March 2012 to August 2012.

In Group A , patients were intubated with appropriate size endotracheal tube, after completion of surgery,endotracheal tube was extubatedwhen the patient was fully awake.

In Group B,Patients were inserted with appropriate size Laryngeal mask airway and laryngeal mask airway removed when the patient was fully awake.

In Group C , Patients were intubated with appropriate sized endotracheal tube, surgery continued with endotracheal tube , 20 minutes before the end of surgery with patient under deep anaesthesia with adequate muscle relaxation (TOF = 2 twitch) , following oropharyngeal suctioning ,the endotracheal tube was removed and an appropriate sized laryngeal mask airway was inserted and its cuff inflated. The patient

wasventilated through laryngeal mask airway and it was removed when the patient was fully awake.

Patients were monitored for changes in HR,MAP,SPO2 and COMPLICATIONS during baseline, 5 minutes before reversal , 1,3,5 and 10 minutes after extubation / removal of LMA.

Groups were comparable for age , sex , gender , weight , saturation and ETCO2.Since the groups are proved to be statistically similar any difference in other parameters is not an incidental finding.

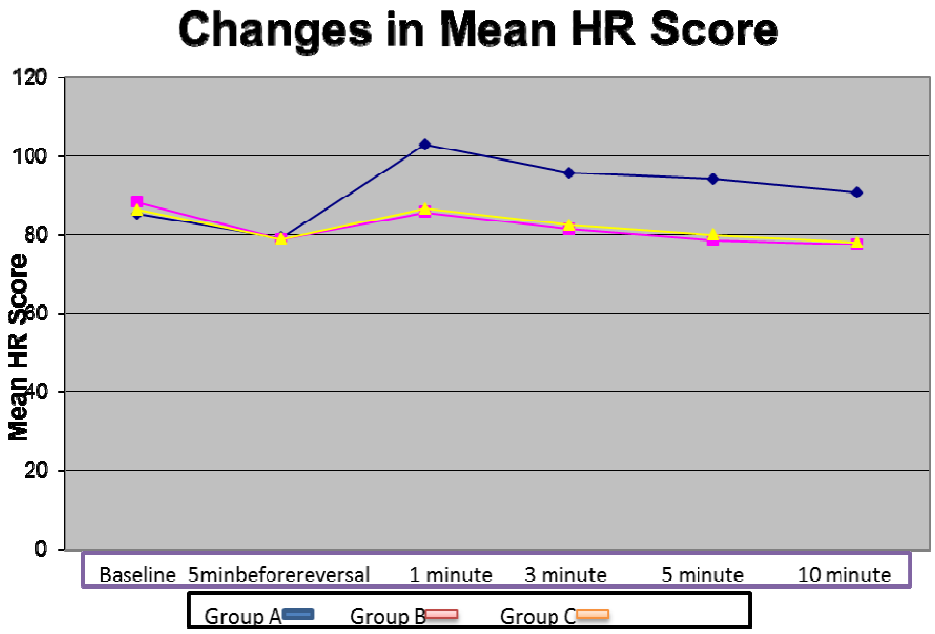
In our study we found changes in HR at 1,3,5 and 10 minutes after extubation was significantly (pvalue=<0.0001) more in ETT (group A) when compared to LMA removal (group B).

ROOFA MUSHTAQ MD[10] in his study also observed that HR at 1,2,3,5 and 10 minutes increased significantly and was prolonged in the ETT group as compared to LMA group.

In ourstudy we foundchanges in MAP at 1minute ,3minute ,5minute and 10 minutes after extubation was significantly(pvalue=0.0001) more in ETT (group A) when compared to LMA removal (group B).

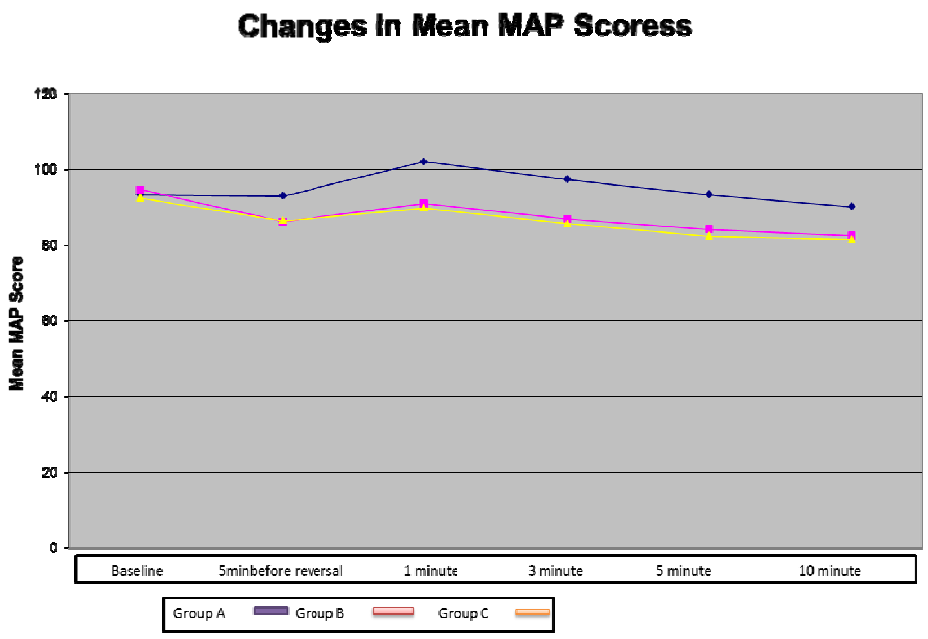
FUJII ET AL[1]observed that LMA removal was associated with less hemodynamic changes than extubation of ETT .

In our study HR at 1minute ,3 minute ,5 minute and 10 minutes after extubationwas significantly(p value=0.0001) more with ETT (Group A)than with replacing ETT with LMA (group C).



Bailey et al[13]observed that technique of exchange of endotracheal tube for laryngeal mask airway during emergence from anaesthesia had minimal cardiovascular response when compared to ETT extubation.

In our study MAP at 1minute ,3minute ,5 minute and 10 minutes after extubation was significantly(p value=0.0001) more with ETT (group A) than with replacing ETT with LMA (group C).



Ma HNet al [17] in his study found out that exchange of tracheal tube for LMA under deep anaesthesia during recovery stage can decrease the cardiovascular stress response during the recovery stage.

Joseph Brimacombe et al [18] in his study concluded that exchanging endotracheal tube for LMA reduces coughing and gaging during emergence of anaesthesia there by reducing acute hemodynamic changes, rise in intraocular pressure and intracranial pressure.

In our study we found no statistically significant changes in HR and MAP at baseline , 5 minutes before reversal , 1minute , 3 minute , 5 minute and 10 minutes after removal of LMA between LMA (group B) and ETT replaced with LMA (group C).

In our study cough during and after extubation was significantly (p value=0.0001) more with ETT (group A) when compared with LMA (group B) andreplacing ETT with LMA(group C).

BAILEY ET AL [13]in his study he observed that when Laryngeal mask airway when properly inserted provided a clear airway without coughing, bucking /straining that facilitates smooth return of consciousness.

In our study complication after extubation such as sore throat and hoarseness of voice was significantly(p value=<0.0001) more with ETT (group A) when compared with LMA (group B).

Seung.H.Yu et al[12]in his study observed that the use of the LMA resulted in a significantly lower incidence of postoperative hoarseness of voice, sore throat and cough during emergence than while using ETT.

Thus for surgeries requiring prolonged duration of general anaesthesia it is ideal to place an ETT for airway management and 20 minutes before the end of the procedure replacing ETT with LMA under deep plane reduces the extubation stress response.

SUMMARY

The study " COMPARATIVE STUDY ON EXTUBATION STRESS RESPONSE WITH ENDOTRACHEAL TUBE, LARYNGEAL MASK AIRWAY AND REPLACEMENT OF ENDOTRACHEAL TUBE WITH LARYNGEAL MASK AIRWAY"was carried out at Stanley Medical college and hospital , Chennai , from MARCH 2012 TO AUGUST 2012.

The groups were comparable for Age , Sex , Weight .

Our observations were

1) There was a marked rise in Heart rate at 1 , 3 , 5 and 10 minutes after ETT extubation (group A) , when compared to removal of LMA (group B) and replacing ETT with LMA before extubation (group C).

2) There was a marked rise in Mean arterial blood pressure at 1 , 3 , 5 and 10 minutes after ETT extubation (group A) , when compared to removal of LMA (group B) and replacing ETT with LMA before extubation (group C).

3) Increased incidence of cough ,sorethroat and hoarseness of voice after ETT extubation (group A) , when compared to removal of LMA (group B) and replacing ETT with LMA before extubation (group C).

4) There was no significant difference in HR and MAP values at baseline , 5 minutes before reversal and at 1 , 3, 5 and 10 minutes after removal of LMA between LMA (group B) and ETT replacing LMA (group C).

CONCLUSION

Many pharmacological and non-pharmacological methods have been used to attenuate hemodynamic stress response and cough during extubation,but none are satisfactory .

Replacement of Endotracheal tube with Laryngeal Mask Airway 20 minutes before the end of procedure is a simple and effective method to attenuate extubation stress response with endotracheal tube.

It is ideal to have an Endotracheal tube to maintain the airway for prolonged surgical procedures requiring general anaesthesiawith positive pressure ventilationand by replacing Endotracheal tube with Laryngeal Mask Airway at the end of prolonged surgeries we can have the combined advantage of both Endotracheal tube and smoother emergence due to Laryngeal Mask Airway.

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PROFORMA

Serial no: Date:

Name: I P no:

Age/Sex: Weight:

ASA:

Diagnosis: Surgery:

Group: A/B/C LMA/ETTSize:

MONITORING :

		Post Extubation / LMA removal				
Variable	Baseline	5 min before reversal	1min	3min	5min	10min
HR						
MAP						
SPO2						

$ETCO_2$:

Cough episodes:

Sore throat:

Hoarseness:

Other Complications:

Anaesthesiologist signature

EXCEL SHEET - DATA

S. No	NAME	AGE/SEX	WEIGHT	IP No	DIAGNOSIS	PROCEDURE	A S A	GROUP	BASELINE		
									HR	MAP	SPO2
1	MURUGAN	48/M	68	10068	B/LINGUINALHERNIA	B/L HERNIOPLASTY	~~I~~	A	86	84	99
~~2~~	SARANYA	23/F	56	11028	FIBROADENOMA	EXCISION BIOPSY	I	B	90	80	100
3	SAKTHI	38/M	64	11096	HYDROCEPHALUS	VP SHUNT	I	C	76	74	99
4	M.ASLAM	50/M	74	10091	B/LINGUINALHERNIA	B/L HERNIOPLASTY	II	B	78	90	98
5	ARUMUGAM	52/M	65	11006	B/LHYDROCELE	B/LEVERSIONOFSAC	I	B	90	104	99
6	AYANAR	40/M	68	11040	LEFT CSOM	MASTOIDECTOMY	I	A	78	94	100
7	KUMARAVEL	42/M	70	11106	LEFT CSOM	MASTOIDECTOMY	I	C	84	92	100
8	MANI	38/M	75	11119	RIGHT CSOM	MASTOIDECTOMY	I	B	92	98	100
9	RADHA	29/F	58	11096	B/LFIBROADENOMA	EXCISION BIOPSY	I	A	104	90	100
10	SUGANTHI	25/F	55	11046	RT FIBROADENOMA	EXCISION BIOPSY	I	C	98	86	100
11	LAKSHMI	56/F	60	11092	CA BREAST RT	M R M	III	A	89	102	99
12	MURUGAMMAL	52/F	54	11112	CA BREAST LT	M R M	III	B	90	104	99
13	SHANTHA MARY	52/F	58	11098	CA BREAST RT	M R M	III	C	94	96	100
14	SUNDARRAJ	36/M	72	10086	LT URETERIC CALCULI	U R S	I	B	84	98	100
15	BHARATHI	36/F	58	11028	URETERIC CALCULI	LITHOTRIPSY	I	C	90	94	100
16	LEO MARTIN	38/M	66	11049	URETERIC CALCULI	U R S	I	A	84	90	100
17	DHAMU	40/M	64	11152	PELVIC CALCULI	LITHOTRIPSY	I	C	86	98	99
18	SUGUMAR	52/M	73	11065	B P H	TURP	II	A	78	104	98
19	KRISHNAN	56/M	64	11152	B P H	TURP	II	C	75	102	99
20	MANIKANDAN	42/M	78	11061	BLADDER GROWTH	BIOPSY	III	B	89	98	100
~~21~~	KAMASHI	36/F	56	11058	URETERIC CALCULI	U R S	I	B	96	104	99
22	VANITHA	34/F	52	11107	URETERIC CALCULI	U R S	I	A	86	98	100
23	BHARATHAN	45/M	68	11064	B P H	TURP	I	A	78	98	100
24	FRANSIS	48/M	72	11120	B P H	TURP	I	C	85	102	99
25	GOVINDAN	52/M	73	11093	B P H	TURP	I	B	87	104	100
26	SARASWATHI	48/F	61	11025	URETERIC CALCULI	U R S	I	C	96	102	100
27	MANIMEGALAI	46/F	59	11108	URETERIC CALCULI	U R S	I	B	90	98	100
28	KALIYAMMAL	42/F	54	11025	URETERIC CALCULI	B/L LITHOTRIPSY	I	A	85	96	99
29	MAHENDRAN	36/M	66	11126	STRICTURE URETHRA	RECONSTRUCTION	I	C	82	98	99
30	SATISH	30/M	64	11165	STRICTURE URETHRA	RECONSTRUCTION	I	B	87	95	100

S. No	BEFORE EXTUBATION		HR				MAP				SPO2				ETCO2	COUGH	SORE	HOAR	COMPLI
	HR	MAP	1 MIN	3 MIN	5 MIN	10 MIN	1 MIN	3 MIN	5 MIN	10 MIN	1 MIN	3 MIN	5 MIN	10 MIN			THROAT	SENESS	CATIONS
1	75	88	88	106	97	94	90	110	104	96	100	100	100	100	33	+	+	+	
~~2~~	72	70	76	84	80	75	70	75	72	70	100	100	100	100	32				
3	68	70	70	76	80	78	74	80	76	76	100	99	99	99	35			+	
4	70	76	66	75	70	72	80	86	84	88	99	99	99	99	32				
5	68	84	80	75	76	75	92	86	88	84	100	100	100	100	30				
6	74	90	104	96	90	94	104	96	90	92	99	100	99	99	28	+	+	+	
7	84	82	90	86	80	76	91	86	80	82	99	100	100	100	30		+		
8	85	90	88	82	76	75	93	90	88	90	99	99	99	99	34				+
9	82	94	110	104	96	98	98	96	90	96	98	99	99	100	30	+	+		
10	86	86	90	85	80	76	90	85	82	83	100	99	100	99	35				
11	88	94	110	108	112	96	106	98	96	90	100	99	100	99	32	+	+		
12	80	90	92	86	80	82	98	90	88	90	99	99	100	99	34				
13	87	90	90	85	80	84	92	88	86	90	99	100	99	99	35				
14	78	88	86	80	76	84	96	92	94	90	99	99	100	99	31				
15	77	92	84	80	75	78	88	90	86	84	99	100	99	99	32				
16	84	94	96	100	94	90	102	96	98	90	100	100	100	100	34	+	+	+	
17	85	88	90	86	84	80	92	90	94	88	99	100	100	100	33				+
18	79	102	108	98	102	96	110	106	98	96	99	98	99	99	32	+	+	+	
19	86	90	92	85	84	87	96	88	92	84	99	99	100	99	34				
20	80	92	90	85	78	80	96	98	90	88	99	100	100	100	33				
~~21~~	85	88	92	86	80	76	94	88	89	85	99	100	99	99	34				+
22	76	86	98	90	92	88	96	90	88	90	100	100	99	99	32	+			
23	75	94	108	110	99	96	106	100	98	90	99	100	99	100	30	+			
24	84	90	92	86	82	85	96	90	92	88	99	100	99	100	32		+	+	
25	78	86	86	80	76	72	98	90	88	84	98	99	99	99	28				+
26	80	90	90	84	80	76	90	86	80	82	98	99	99	98	32				
27	84	86	86	80	76	72	92	86	80	78	98	98	99	99	34				
28	80	90	98	102	96	90	104	96	90	92	99	100	99	99	32	+	+	+	
29	77	90	86	80	72	76	94	88	86	80	98	99	99	100	31		+		
30	76	88	82	76	80	76	90	86	80	84	99	100	99	99	32				

S. No	NAME	AGE/SEX	WEIGHT	IP No	DIAGNOSIS	PROCEDURE	A S A	GROUP	BASELINE		
									HR	MAP	SPO2
31	BALAKRISHNAN	56/M	68	11138	CA PENIS	PARTIAL AMPUTATION	III	A	72	102	99
32	NAGARAJ	38/M	72	11256	LT HERNIA	HERNIOPLASTY	I	B	86	98	99
33	SEENU	33/M	73	11259	UMBLICAL HERNIA	ANATOMICAL REPAIR	I	C	90	96	100
34	RAJAN	40/M	76	11048	B/LHYDROCELE	B/L EXCISION OF SAC	I	B	86	92	100
35	RAVI	46/M	68	11206	INCISIONAL HERNIA	REPAIR	II	C	84	98	99
36	VINOTH	30/M	66	11210	EPIGASTRIC HERNIA	ANATOMICAL REPAIR	I	A	92	90	100
37	CHANDRAN	45/M	73	11098	B/LINGUINALHERNIA	B/L HERNIOPLASTY	I	C	86	94	100
38	VARALAKSHMI	27/F	54	11107	FIBROADENOMA	EXCISION BIOPSY	I	A	92	88	100
39	PRABHA	26/F	55	11099	FIBROADENOMA	EXCISION BIOPSY	I	B	96	90	100
40	MADHAVI	52/F	57	11112	CA BREAST	M R M	III	A	84	98	99
41	SHANKAR	46/M	66	11201	# MID HUMERUS	PLATING	I	B	96	92	99
42	HUSSAIN	32/M	74	11094	# BB FOREARM	PLATING	I	C	90	92	100
43	DARWIN	28/M	70	11140	SUPRACONDYLAR#	K WIRE	I	B	84	90	100
44	THANGAVEL	42/M	68	11103	B/LHYDROCELE	B/LEVERSIONOFSAC	I	A	80	98	99
45	SUMATHI	36/F	56	11097	UMBLICAL HERNIA	REPAIR	I	C	87	92	100
46	GAYATHRI	25/F	52	11125	FIBROADENOMA	EXCISION BIOPSY	I	B	92	94	100
47	MADHAVAN	41/M	68	11078	LT INGUINAL HERNIA	LT HERNIOPLASTY	I	C	81	90	99
48	KRISHNASWAMY	48/M	72	11124	LT VARICOCELE	LIGATION	II	B	86	92	100
49	PRABHU	40/M	73	11114	RT VARICOSE VEIN	SF LIGATION	I	C	92	94	100
50	GOPAL	52/M	68	11085	B/L VARICOSE VEIN	SF LIGATION	II	A	84	92	99
~~51~~	MAHESH	36/M	66	11205	POPLITEAL A DISEASE	BYPASS	II	B	85	104	99
52	VARADHARAJAN	58/M	64	11156	FEMORAL A DISEASE	BYPASS	II	C	68	98	100
53	GANESAN	56/M	66	11180	POPLITEAL A DISEASE	BYPASS	II	A	70	98	99
54	ASLAM	36/M	72	11208	DEFORMED EAR LOBE	REPAIR	I	B	92	98	100
55	SURENDAR	28/M	76	11254	DEFORMED EAR LOBE	REPAIR	I	C	88	90	100
56	MOHANBABU	26/M	74	11157	AVULSION PINNA	RECONSTRUCTION	I	A	90	88	100
57	SASIKALA	48/F	58	11259	CA BREAST	M R M	III	C	86	84	100
58	VANAJA	54/F	54	11234	CA BREAST	M R M	III	A	78	94	99
59	BHAVANI	56/F	55	11208	CA BREAST	M R M	III	B	92	90	99
60	SUDHA	24/F	57	11209	FIBROADENOMA	EXCISION BIOPSY	I	C	88	86	100

S. No	BEFORE EXTUBATION		HR				MAP				SPO2				ETCO2	COUGH	SORE	HOAR	COMPLI
	HR	MAP	1 MIN	3 MIN	5 MIN	10 MIN	1 MIN	3 MIN	5 MIN	10 MIN	1 MIN	3 MIN	5 MIN	10 MIN			THROAT	SENESS	CATIONS
31	84	96	110	106	104	100	110	112	104	98	100	99	99	99	33	+	+	+	
32	75	88	84	80	76	74	94	88	82	80	98	99	99	99	34				
33	72	90	80	84	82	76	90	86	80	82	99	100	99	99	32		+		
34	75	88	84	76	72	75	90	86	88	80	98	99	99	100	31				
35	80	88	88	82	80	76	92	86	80	76	98	99	98	98	33		+	+	
36	78	90	102	98	96	90	98	92	90	88	100	100	99	100	34				
37	75	92	84	76	80	72	90	84	78	80	99	98	99	99	32				
38	77	88	98	102	90	88	96	92	86	84	98	99	100	99	30				
39	78	82	84	76	70	72	88	80	76	82	99	99	100	99	34				
40	84	94	106	110	100	96	108	104	96	90	100	100	99	100	32	+	+	+	
41	80	88	88	80	76	80	90	86	82	82	99	98	99	99	32				
42	78	84	86	80	76	75	88	86	80	84	100	99	99	100	32				
43	72	80	80	76	75	72	86	80	82	78	99	98	99	100	35				
44	84	90	106	96	90	88	98	92	90	90	100	99	100	99	34	+			
45	75	86	80	82	78	80	90	86	80	82	99	100	100	99	32				
46	70	84	76	74	72	76	88	84	80	76	98	99	100	99	34				
47	76	82	84	80	75	72	86	80	76	75	99	100	99	99	33				
48	84	80	90	85	78	80	88	84	80	76	100	99	100	100	35				
49	78	80	85	86	80	75	84	80	76	78	98	99	99	100	32				
50	82	94	106	90	88	92	102	98	90	88	99	100	100	99	34		+	+	
~~51~~	78	86	85	80	82	78	90	88	88	84	99	99	99	98	31				
52	80	90	86	80	78	80	90	86	80	82	99	98	99	99	34				
53	86	94	108	12	98	90	110	102	96	90	99	98	99	100	32	+	+	+	
54	78	86	85	80	76	72	86	80	78	75	99	100	100	100	34				
55	80	90	86	84	80	78	90	86	82	78	98	99	99	99	30				
56	80	98	106	98	90	85	108	96	94	90	99	100	100	100	32	+	+	+	
57	78	86	90	85	80	76	90	84	80	78	99	99	100	100	30				
58	74	104	106	98	96	100	114	102	98	96	100	100	100	100	32	+	+	+	
59	88	90	94	88	90	82	94	90	84	80	99	100	100	99	30				
60	76	88	82	75	78	74	88	80	75	78	99	100	100	99	32				

S. No	NAME	AGE/SEX	WEIGHT	IP No	DIAGNOSIS	PROCEDURE	A S A	GROUP	BASELINE		
									HR	MAP	SPO2
61	MAHESHWARI	28/F	56	11154	FIBROADENOMA	EXCISION BIOPSY	I	A	96	90	100
62	PRABHAKAR	38/M	68	11203	HEMATOCELE	ORCHIDECTOMY	I	C	89	94	100
63	MANI	56/M	66	11218	TESTICULAR CA	ORCHIDECTOMY	II	B	84	104	99
64	HARIHARAN	50/M	72	11109	B/LHYDROCELE	EVERSION OF SAC	II	A	82	96	99
65	KAVITHA	28/F	64	9012	P2L2	PUERPERAL STERILIZATION	I	B	90	86	100
66	ABIRAMI	26/F	66	9045	P2L2	PUERPERAL STERILIZATION	I	C	88	86	100
67	SUGANYA	28/F	67	9155	P2L2	PUERPERAL STERILIZATION	I	A	90	88	99
68	BHAVANI	25/F	62	9089	P2L2	PUERPERAL STERILIZATION	I	C	84	90	100
69	PADMINI	27/F	68	9147	P3L3	PUERPERAL STERILIZATION	I	B	88	86	100
70	YAMUNA	25/F	72	9150	P2L2	PUERPERAL STERILIZATION	I	A	86	88	100
71	DIWAKAR	36/M	68	11247	# HUMERUS	PLATING	I	B	102	100	99
72	PERUMAL	48/M	71	11198	# BB FOREARM	PLATING	II	C	86	92	100
73	MADHAN	40/M	68	11156	# BB FOREARM	PLATING	I	A	87	90	100
74	GOWRI	30/M	75	11211	CSOM RT EAR	MASTOIDECTOMY	I	A	86	90	99
75	ANANDAN	46/M	72	11106	CP LT EAR	TYMPANOPLASTY	I	C	90	88	99
~~76~~	MANOHARAN	50/M	64	11023	URETERIC CALCULI	U R S	II	B	76	90	100
77	DINAKAR	44/M	68	11154	URETERIC CALCULI	U R S	I	C	84	92	99
78	GURUMOORTHY	46/M	66	11207	URETERIC CALCULI	U R S	I	A	80	94	99
79	JANAKI	36/F	60	11221	PELVIC CALCULI	LITHOTRIPSY	I	C	86	94	99
80	KALAIVANI	42/M	64	11218	URETERIC CALCULI	U R S	I	B	74	86	99
~~81~~	GOPAL	40/M	72	11203	HYDROCEPHALUS	VP SHUNT	I	A	92	88	100
82	KATHRESAN	52/M	73	11223	HYDROCEPHALUS	VP SHUNT	II	C	86	90	99
83	NANDHAKUMAR	36/M	66	11236	B/L HERNIA	B/L HERNIOPLASTY	I	A	84	90	100
84	SELVAM	30/M	64	11213	B/LHYDROCELE	B/LEVERSIONOFSAC	I	C	92	96	100
85	THILAGAN	45/M	60	11234	TESTICULAR CA	ORCHIDECTOMY	I	B	90	94	99
86	BHASKAR	36/M	72	11254	LIPOMA LTSHOULDER	EXCISION BIOPSY	I	C	84	90	100
87	SANKAR	40/M	68	11260	DERMOID SCALP	EXCISION BIOPSY	I	B	90	94	100
88	BHAVANI	32/F	64	11275	EPIGASTRIC HERNIA	ANATOMICAL REPAIR	I	A	86	88	100
89	VINITHA	54/F	56	11239	CA BREAST	M R M	III	A	90	94	100
90	EASWARI	52/F	58	11268	CERVICAL LYMPH NOI	EXCISION BIOPSY	II	B	86	84	100

S. No	BEFORE EXTUBATION		HR				MAP				SPO2				ETCO2	COUGH	SORE	HOAR	COMPLI
	HR	MAP	1 MIN	3 MIN	5 MIN	10 MIN	1 MIN	3 MIN	5 MIN	10 MIN	1 MIN	3 MIN	5 MIN	10 MIN			THROAT	SENESS	CATIONS
61	75	90	104	98	96	88	96	94	90	88	100	99	99	99	30	+	+	+	
62	78	86	86	80	75	78	88	84	80	86	99	99	99	99	32				
63	84	95	90	86	80	84	102	92	88	90	100	99	99	99	34				
64	80	104	102	96	88	86	110	102	96	90	98	99	100	100	32	+	+	+	
65	78	84	88	80	75	76	88	84	80	80	99	99	100	99	34				
66	76	88	80	76	82	78	88	82	76	80	99	100	99	99	32				
67	74	90	106	96	90	92	98	90	86	80	100	99	99	100	30	+	+		
68	80	85	84	80	76	75	88	80	82	80	99	100	100	99	34		+		
69	78	88	86	82	80	75	90	86	80	82	99	100	99	100	32				
70	76	96	104	96	90	92	100	96	92	88	99	99	99	100	34				
71	75	94	86	80	85	82	99	96	88	80	100	99	99	99	32				
72	80	90	89	85	84	80	90	88	86	84	99	99	100	99	34				
73	74	88	102	96	90	84	94	88	86	80	100	100	99	100	32	+	+	+	
74	78	94	106	96	90	88	106	98	90	90	99	99	99	99	34	+	+		
75	88	98	110	90	94	88	106	100	98	90	100	100	99	99	32				
~~76~~	80	86	86	84	85	80	90	84	86	85	99	100	100	100	34				
77	78	84	84	80	83	76	88	86	86	80	99	100	99	99	32				
78	72	90	102	96	95	90	100	98	96	90	99	99	100	100	32		+	+	
79	75	84	87	85	80	82	90	88	90	86	100	99	99	99	30				
80	82	86	90	86	80	81	90	84	86	80	99	99	99	99	34				
~~81~~	76	94	104	96	98	90	102	96	95	92	99	100	99	99	32	+			
82	80	80	90	85	80	76	88	86	82	80	100	99	99	100	34				
83	78	92	104	100	92	90	104	96	95	92	99	100	100	100	32	+			
84	77	82	86	88	82	80	90	85	82	80	99	100	99	100	33				
85	84	90	90	86	84	80	96	92	90	92	100	99	99	100	34				
86	77	78	85	80	82	76	86	84	80	76	99	99	100	99	33				
87	84	86	90	88	86	80	90	88	84	80	100	99	99	100	34				
88	80	90	106	100	96	90	98	96	90	88	99	100	100	99	32	+			
89	85	90	90	88	84	78	98	96	92	90	100	99	99	100	34				
90	82	84	90	86	84	85	88	86	80	80	99	100	100	100	30	+	+	+	

நோயாளி தகவல் தாள்

சொருகு குழாய் நீக்கல் மன அழுத்த எதிர்வினையை என்டோ ட்ரக்கியல் டியூப் (ETT), லாரின்ஜியல் மாஸ்க் ஏர்வே (LMA) மற்றும் என்டோ ட்ரக்கியல் டியூபை மாற்றி லாரின்ஜியல் மாஸ்க் ஏர்வே (LMA) செலுத்தும் முறைகளை ஒப்பிடும் ஆய்வு

நோயாளிக்கான தகவல்கள் :

ஆராய்ச்சின் நோக்கமும், ஆதாரங்களும் :

உங்களுக்கு திட்டமிட்டப்பட்டுள்ள இந்த மருத்துவ ஆராய்ச்சி ஆய்வானது, அறுவை சிகிச்சையின் போது என்டோ ட்ரக்கியல் டியூப், லரின்ஜியல் மாஸ்க் ஏர்வே மற்றும் என்டோ ட்ரக்கியல் டியூபை மாற்றி லரின்ஜியல் மாஸ்க் ஏர்வே செலுத்தி சொருகு குழாய் நீக்கல் மன அழுத்த எதிர்வினையை ஒப்பிடும் ஆய்வு.

பொதுவாக இத்தகைய அறுவை சிகிச்சைகளில், சொருகு குழாய் நீக்க-ன் போது சுவாசம் மற்றும் இதயத்துடிப்பில் பல பிரச்சினைகள் ஏற்பட வாய்ப்புள்ளது.

ETT டியூபை மாற்றி LMA செலுத்துவதால் இத்தகைய பிரச்சினைகளை குறைக்கலாம்.

ஆகவே இந்த முறைகளின் நன்மைகள் மற்றும் விளைவுகளையும் ஒப்பிடும் ஆய்வாகும்.

ஆய்வு முறை :

இந்த ஆய்வில் உங்களுக்கு அறுவை சிகிச்சைக்கு முன் இரத்த நாளத்தில் சிறு ஊசி செலுத்தப்பட்டு அதன் மூலம் மயக்க மருந்து கொடுத்து, உங்கள் மூச்சுக் குழாயில் என்டோ ட்ரக்கியல் டியூப், அல்லது லரின்ஜியல் மாஸ்க் ஏர்வே செலுத்தி மயக்கம் கொடுக்கப்படும். அறுவை சிகிச்சை முடியும் முன்பு ETT டியூபை மாற்றி LMA செலுத்தப்படும்.

உண்டாக கூடிய இடர்கள் :

அனைத்து மயக்க மருந்து மற்றும் மயக்க முறைகளுடன் இருப்பது போலவே இந்த முறையிலும் சில எதிர்பாரா இடர்கள் நடைபெறலாம். LMA / ETT செலுத்தும் போது பல் மற்றும் நாக்கில் காயம் போன்ற விளைவுகள் ஏற்பட வாய்ப்புள்ளது.

ஆய்வில் உங்கள் உரிமைகள் :

உங்கள் மருத்துவப் பதிவேடுகள் மிகவும் அந்தரங்கமாக வைத்துக் கொள்ளப்படும். இந்த ஆய்வின் முடிவுகள் அறிவியல் பத்திரிக்கைகளில் பிரசுரிக்கப்படலாம். ஆனால், பெயரை வெளியிடுவது மூலம் உங்களின் அடையாளம் வெளிக்காட்டப்படமாட்டது. இந்த ஆய்வில் உங்களின் பங்கேற்பு தன்னிச்சையானது மற்றும் காரணங்கள் எதையும் கூறாமலேயே நீங்கள் இந்த ஆய்வி-ருந்து எந்த ஒரு நேரத்திலும் விலக்கிக் கொள்ளலாம். எப்படியிருந்தாலும் உங்களுக்கு தகுந்த மயக்க மருந்து கொடுத்து அறுவை சிகிச்சை செய்யப்படும். இந்த ஆய்வில் ஏதேனும் பக்க விளைவுகள் ஏற்பட்டால் உங்களுக்கு முழு சிகிச்சை மருத்துவ குழுவினரால் அளிக்கப்படும்.

நாள் :

நோயாளியின் கையொப்பம்
இடது பெருவிரல் ரேகை
(மருத்துவரால் படித்துகாட்டப்பட்டது)

சுய ஒப்புதல் படிவம்
ஆய்வு செய்யப்படும் தலைப்பு

சொருகு குழாய் நீக்கல் மன அழுத்த எதிர்வினையை என்டோ ட்ரக்கியல் டியூப் (ETT), லாரின்ஜியல் மாஸ்க் ஏர்வே (LMA) மற்றும் என்டோ ட்ரக்கியல் டியூபை மாற்றி லாரின்ஜியல் மாஸ்க் ஏர்வே (LMA) செலுத்தும் முறைகளை ஒப்பிடும் ஆய்வு

ஆராய்ச்சி நிலையம் : அரசு ஸ்டான்- மருத்துவமனை
சென்னை - 600 001.

பங்கு பெறும் நோயாளியின் பெயர் : வயது :

பங்கு பெறும் நோயாளியின் எண் : பா-னம் : ஆண் ☐ பெண் ☐

நோயாளியின் விலாசம் :

நோயாளி இதனை (✓) குறிக்கவும்.

மேலே குறிப்பிடப்பட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும். அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் என்னை இவ்வாய்வில் தன்னிச்சையாகதான் பங்கேற்க அனுமதிக்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் என்னை இவ்வாய்வில் இருந்து விலக்கி கொள்ளலாம் என்றும் அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னை மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். என்னை ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதை பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் என்னை ஈடுபடுத்த முழுமனதுடன் ஒப்புக் கொள்கிறேன். இந்த மயக்க மருந்துகள் மற்றும் மயக்க முறையினால் ஏற்படக்கூடிய பின் விளைவுகள் மற்றும் எதிர்பாராத விளைவுகள் பற்றி எனக்கு விளக்கமாக தெரிவிக்கப்பட்டது. ☐

இந்த ஆய்வில் உங்களுக்கு அறுவை சிகிச்சைக்கு முன் இரத்த நாளத்தில் சிறு ஊசி செலுத்தப்பட்டு அதன் மூலம் மயக்க மருந்து கொடுக்கப்படும். பின்பு ETT முறை அல்லது LMA முறை செலுத்தப்பட்டு அறுவை சிகிச்சை செய்யப்படும், அறுவை சிகிச்சை முடியும் முன்பு ETT டியூபை மாற்றி LMA செலுத்தப்படும்.என்பதை அறிந்து அதற்கு முழுமனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில், என் நலன் கருதியே பங்கேற்கிறேன். ☐

நோயாளியின் கையொப்பம் ..... இடம் ..... தேதி

கட்டைவிரல் ரேகை (இந்த படிவம் படித்து காட்டப்பட்டு புரிந்து கைரேகை அளிக்கின்றேன்)

ஆய்வாளரின் கையொப்பம் ..... இடம் ..... தேதி

ஆய்வாளரின் பெயர் .....