COMPARISON OF EASE OF INTUBATION OF POLYVINYL ENDOTRACEAL TUBE AND BLOCKBUSTER™ ENDOTRACHEAL TUBE THROUGH LMA BLOCKBUSTER™

Submitted in partial fulfillment of

Requirements for the degree of

M.D.ANAESTHESIA (BRANCH – X)

Of

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

CHENNAI

K.A.P.V. GOVT. MEDICAL COLLEGE

TRICHY

May 2019

CERTIFICATE

This is to certify that this dissertation entitled **"COMPARISON OF EASE OF INTUBATION OF POLYVINYL ENDOTRACEAL TUBE AND BLOCKBUSTER™ ENDOTRACHEAL TUBE THROUGH LMA BLOCKBUSTER™"** Submitted by **Dr. MAYA MENON** appearing for **M.D.ANAESTHESIA Degree (Branch -X)** examination in **MAY 2019** is a bonafide record of work done by him under my direct guidance and supervision in partial fulfillment of regulations of the Tamil Nadu Dr. M.G.R. Medical University, Chennai. I forward this to the Tamil Nadu Dr. M.G.R. Medical University, Chennai, Tamil Nadu, India.

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DECLARATION

I solemnly declare that the dissertation titled **"COMPARISON OF EASE OF INTUBATION OF POLYVINYL ENDOTRACEAL TUBE AND BLOCKBUSTER™ ENDOTRACHEAL TUBE THROUGH LMA BLOCKBUSTER™"** is done by me at the Department of Anaesthesiology, K.A.P.V. Govt. Medical College, Trichy, during 2016 – 2018 under the guidance and supervision of **Prof. Dr. M.SURESH, M.D., D.A,.** The dissertation is submitted to The Tamil Nadu Dr. M.G.R. Medical University towards the partial fulfillment of requirements for the award of M.D., degree in Anaesthesiology.

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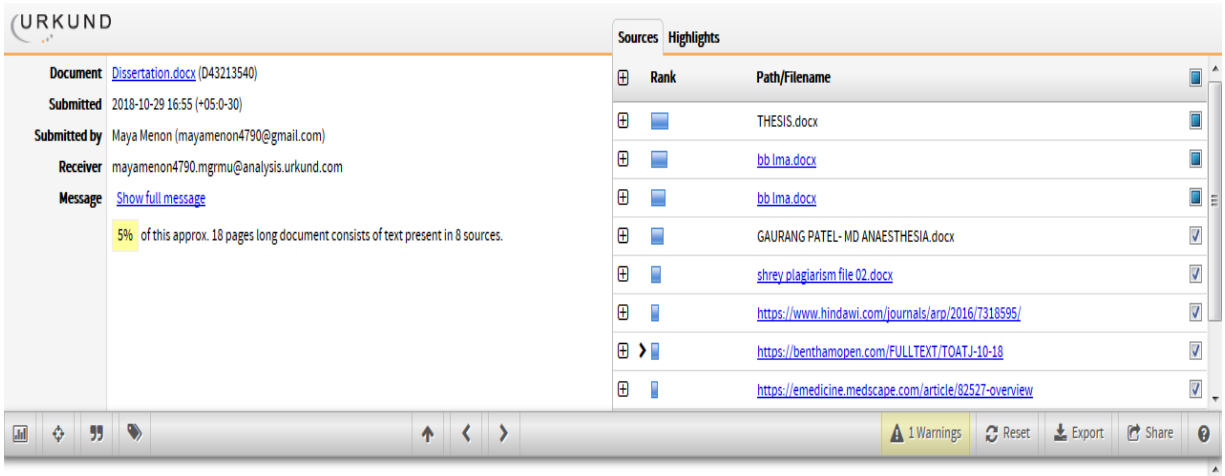

9. It does not stimulate bronchospasm in susceptible patients.

10. Incidence of sore throat and subsequent respiratory tract infection is less when compared to tracheal tube.

11. Smooth emergence from anesthesia.

12. Insertion of LMA does not cause significant bacteremia when compared to nasal intubation.

13. Because of the larger lumen size of the LMA, there is less increase in airway resistance in spontaneous respiration.

DISADVANTAGES;

1. Optimal air leak around the LMA must be limited (average 20-25 cm H2O) to avoid insufflation of the stomach. This restricts the amount of positive pressure that can be applied to the lungs.

2. The LMA is not useful in stenting or maintaining patency in tracheomalacia or a trachea that is compressed or is obstructed at or below the laryngeal inlet.

3. While using an LMA it may be more difficult to differentiate laryngospasm or bronchospasm from in correct placement and more difficult to apply positive pressure to break laryngospasm.

4. There is increased of gastric aspiration, especially in obese patients.

5. LMA is unsafe in prone and jack knife position.

COMPLICATIONS;

1. Accidental dislodgement can occur.

2. Airway obstruction and airway injury.

3. Nerve injury—Palsies of hypoglossal, recurrent laryngeal and lingual nerves have been reported

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Dr. MAYA MENON

INDEX

ABBREVIATIONS

LMA- Laryngeal Mask Airway

ID- Internal Diameter

OD- Outer Diameter

ILMA- Intubating Laryngeal Mask Airway

ETT- Endotracheal Tube

PPV- Positive Pressure Ventilation

PVC- Polyvinyl Chloride

HVLP- High Volume Low Pressure

BB- BLOCKBUSTER™

ASA- American Society of Anaesthesiologists Physical status

FTST- Fastrach Silicone Tube

MPC- Mallampatti Classification

LAT- Latex Armoured Tube

FOB- Fiberoptic Bronchoscope

M- Male

F- Female

HR- Heart Rate

SBP- Systolic Blood Pressure

DBP- Diastolic Blood Pressure

$EtCO_2$- End Tidal Carbon Dioxide

INTRODUCTION

Airway management is the most essential skill that an anesthesiologists has to acquire. The most definite way of securing an airway is by end tracheal intubation. Today we have far advanced from the conventional old red rubber tube. Today there is a whole range of gadgets and accessories that help in endotracheal intubation.

Among all of the gadgets, the most handy and acclaimed is the Laryngeal Mask Airway (LMA).It is a bridge between endotracheal intubation and bag and mask ventilation. Since its invention in 1981 by Dr.Archie Brain[1,2], the classical LMA has undergone many modifications. Today various LMAs are available that can also help in Ryle's tube insertion, intubation via LMA, deep extubation, adjunct in difficult airway[5], and for spontaneous ventilation in short procedures.

An intubating LMA is a supraglottic airway device that allows the passage of an endotracheal tube through it. There has been many modifications of the original classical Fastrach LMA[3]. One of the newer modifications is the BLOCKBUSTER™ LMA[4].It was invented by Prof.MingTian, the president of Chinese Difficult Airway Society and is being increasingly used for cases of difficult intubation.

The LMA has some unique features like its 95 degrees angulated airway that makes ventilation and intubation easier through it. It also has a gastric port and provides better sealing pressures at lower volumes.

A silicone wire reinforced tube with a Touhy-tip named as the BLOCKBUSTER™ tube, is recommended for intubation via the BLOCKBUSTER™LMA. This tube has a soft, flexible, blunt edge that causes less mucosal damage during blind intubation. The LMA can be used as a rescue device for unanticipated difficult intubation and may also be used as an adjunct for LMA guided intubation. It can be used for both blind intubation and also for fiberoptic guided intubation.

In this study I compare the ease of insertion of a conventional Polyvinyl Chloride Tube[6] with a BLOCKBUSTER™ tube for blind intubation via the BLOCKBUSTER™ LMA. A polyvinyl chloride tube is a cheaper and more freely available option and hence this study was conducted in an aim to compare between the intubation characteristics of both tubes.

AIRWAY ANATOMY

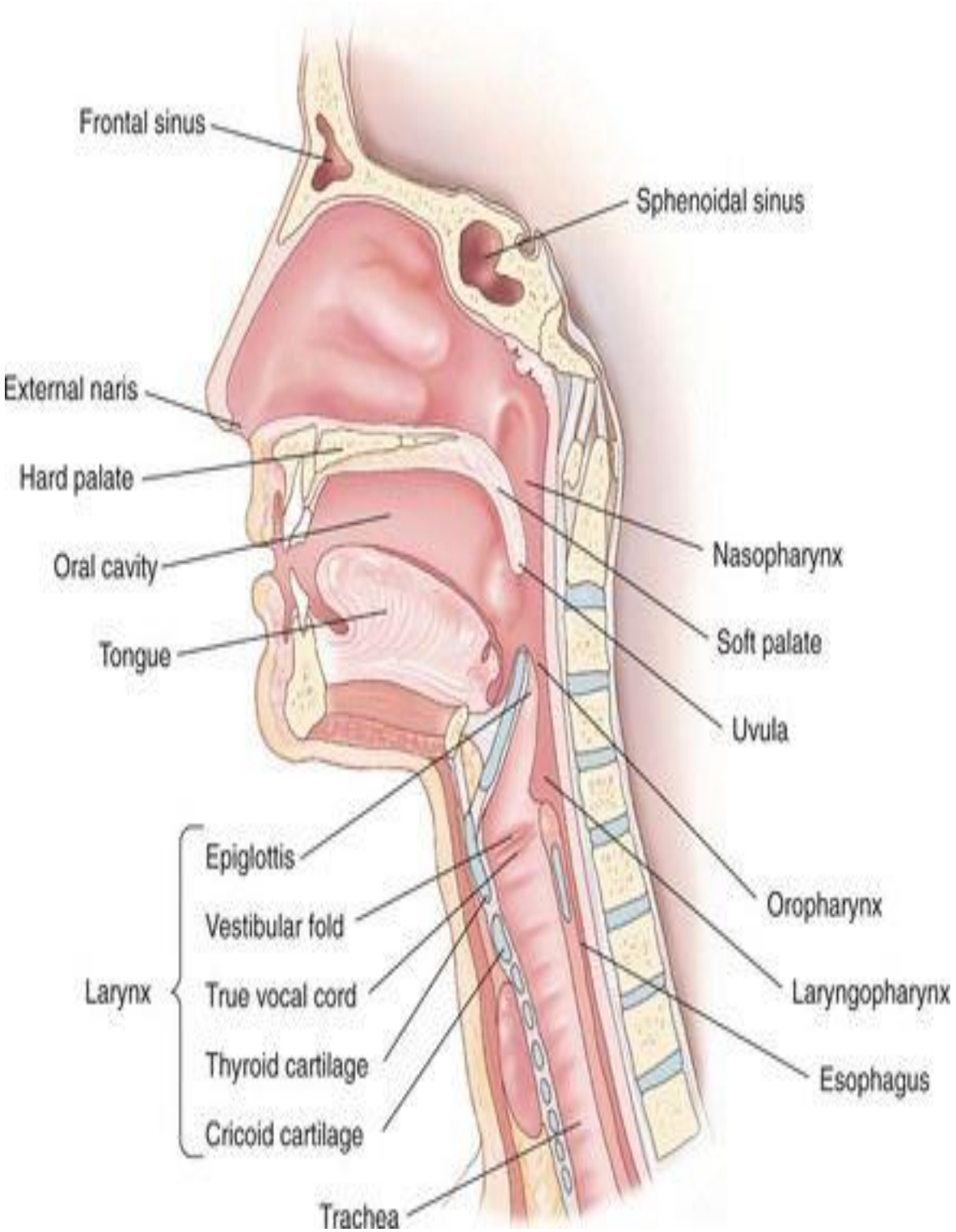
The airway is divided into two parts- the upper and lower airways. The upper airway starts from nostrils and contains the oral cavity and pharynx and ends at the glottis. The lower airway contains the trachea, the main bronchi and the bronchial subdivisions.

ORAL CAVITY

The oral cavity or buccal cavity consists of a narrow vestibule outside the teeth and an inner, large oral cavity proper. The oral cavity proper is bounded in front and laterally by the alveolar arches, teeth and gums; behind it communicates with the pharynx at the oropharyngeal isthmus. Its roof is formed by the hard and soft palates. Its floor is mainly formed by the anterior region of the tongue and the remainder by the mucosa lying on the mylohyoid anteriorly and laterally between the base of the tongue and the internal surface of the mandible on to which it is reflected.

PALATE

The palate or the oral roof is divisible into two regions, the hard plate and soft palate.


Frontal sinus
Sphenoidal sinus
External naris
Hard palate
Oral cavity
Tongue
Nasopharynx
Soft palate
Uvula
Oropharynx
Laryngopharynx
Esophagus
Larynx
Epiglottis
Vestibular fold
True vocal cord
Thyroid cartilage
Cricoid cartilage
Trachea

HARD PALATE

It is formed by the palatine process of the maxillae and the horizontal plates of the palatine bones. It is bounded in front and at the sides by the superior and inferior arches of the alveolar processes and gums and is continuous posteriorly with the soft palate. It is covered with stratified squamous epithelium.

SOFT PALATE

It is a mobile flap suspended from the posterior borders of the hard palate, sloping down and backwards between the oral and nasal parts of the pharynx. It is a thick fold of mucosa enclosing an aponeurosis, muscular tissue vessels, nerves, lymphoid tissue and mucous glands. In its usual position, released and pendant, its anterior surface is concave with a median raphe, its posterior surface is convex and continues with the nasal floor, its anterosuperior border is attached to the hard palate's posterior margin, its sides blend with the pharyngeal wall and its inferior border is free hanging between the mouth and pharynx. A median conical process, the uvula projects downwards from its posterior border.

The arches of the palate curves as two folds of mucosa containing muscle, which descends laterally from each side of palate. The anterior palatal arch, contains palatoglossus muscle which descends to the side of

the tongue at the junction of its oral and pharyngeal parts forming lateral limits of the oropharyngeal isthmus. The posterior palatopharyngeal arch contains the palatopharyngeus muscle and descends on the lateral wall of or pharynx.

Therefore the pharynx acts as a shared pathway for both digestive and respiratory systems. Hence, maintaining pharyngeal patency is essential to ensure proper air entry and gas exchange in unintubated patients.

One of the common causes of desaturation in anaesthetized patients and in patients with decreased consciousness level, is the falling back of tongue onto the posterior pharyngeal wall. It obstructs the pharynx and causes a physical barrier to air entry.

NERVE SUPPLY

The sensory nerve issue from the greater, lesser palatine and nasopalatine branches of the maxillary nerve and also the glossopharyngeal nerve posteriorly. Parasympathetic post ganglionic secretomotor fibres arising from the facial nerve supply the palatine mucus glands via the pterygopalatine ganglion. It is also possible that some parasympathetic fibres pass to the posterior parts of the soft palate

from the glossopharyngeal nerve perhaps synapsing in the otic ganglion. Sympathetic fibres run from the carotid plexus along the arterial branches supplying this region.

All the palatine muscles are supplied by nerve fibres which leave the medulla in the cranial part of accessory nerve and reach the pharyngeal plexus via the vagus and possibly glossopharyngeal nerve except for the tensor veli palatine which is innervated by the mandibular nerve.

PHARYNX

The pharynx is a 12-15cm long muscular tube that extends from the base of skull down to the cricoid cartilage anteriorly and ends posteriorly upto the inferior border of C6 vertebra. It connects the nasal and oral cavities with the larynx and esophagus.

OROPHARYNX

Oropharynx extends from the soft palate to the upper border of the epiglottis. It opens into the mouth through the oropharyngeal isthmus. It's lateral wall consists of the palatopharyngeal arch and palatine tonsils. Posteriorly it is in level with the body of second and upper part of the third cervical vertebrae.

LARYNGOPHARYNX

Laryngeal part of the pharynx extends from the superior border of epiglottis to the inferior border of cricoid cartilage where it becomes continuous with the esophagus. In its incomplete anterior wall is the laryngeal inlet and below this is the posterior surface of the arytenoids and cricoid cartilage. A small pyriform fossa on each side of the inlet is bounded medially by the aryepiglottic fold and laterally by the thyroid cartilage and thyrohyoid membrane.

MUSCLES

Pharynx consists of three constrictor muscles superior, middle and inferior and a trio of muscles descending from styloid processes. It also contains cartilaginous tissue of pharyngotympanictupe and muscles or soft palate like stylopharyngeus, salpingopharyngeus, and palatopharyngeus. All the above mentioned muscles pass obliquely into the muscular wall. The good function of the sphincter is essential for adequate airflow through nasal passages during normal breathing and deglutition.

NERVE SUPPLY OF THE PHARYNX

Innervation is mainly from the pharyngeal plexus. The principal motor element is the cranial part of the accessory nerve, which through vagal branches supplies all pharyngeal and palatine muscles except the stylopharyngeus (glossopharyngeal nerve) and the tensor vali tympani (mandibular nerve). The main sensory nerves are the glossopharyngeal nerve and vagus. The mucosa of nasopharynx is supplied by maxillary nerve via the pterygopalatine ganglion. The mucosa of the soft palate and the tonsil is supplied by the lesser palatine and glossopharyngeal nerve..

Post ganglionic sympathetic fibres reach the pharyngeal plexus from the superior cervical ganglion. Parasympathetic supply issue from the medulla oblongata chiefly in the glossopharyngeal nerve. The vagus carries branchial efferent fibres for the pharyngeal striated musculature.

LARYNGEAL MASK AIRWAY

HISTORY

In 1981, Dr.Archie Ian Jeremy Brain invented the first supraglottic airway device[1,2]. It represents a novel concept in airway management that allows air exchange through a specially designed mask that fits in the hypopharynx and faces the laryngeal inlet, creating an end –to-end seal.

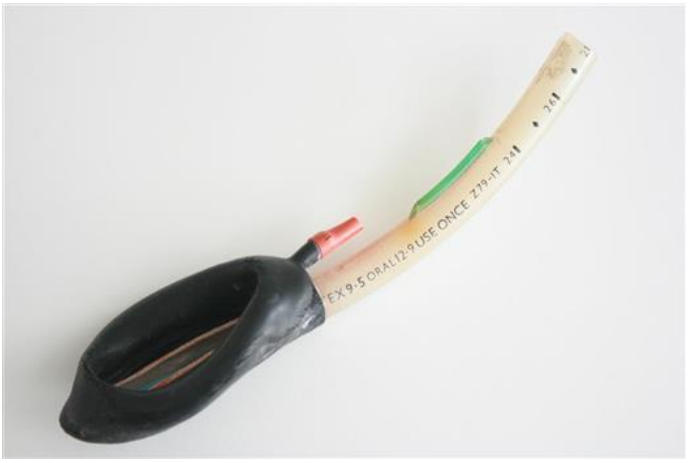
He found that in engineering terms, the solution to this problem of forming a gas tight junction between two tubes is rather unsatisfactory, since it necessarily involves a degree of constriction at the point of junction unless the outer tube (trachea) itself is expanded to compensate. He felt ideally, it is desirable that both tubes are of the same internal diameter at the point of their junction, since this has clear advantages in terms of gas flow without constriction in the tubes. This involves connecting them end to end since the option of expanding the anatomical tube (trachea) is not possible.

Based on the above concepts of the airway, Dr. BRAIN tried to produce an airway, which directly faced the larynx yet it should provide a gas-tight seal. He examined the postmortem specimens of adult male and female larynx to assess how such a joint might be achieved. He examined

the shape of the pharynx by making plaster of paris casts from these specimens (cadavers).). He noted that an air-tight seal could be effected against the perimeter of the larynx posteriorly by an elliptical cuff inflated in the hypopharynx. He named it the laryngeal mask airway which later came to be known as the cLMA or the classic LMA[7].It was a crude affair, with the mask from the Goldman Dental Nasal mask used for dental extractions, with a plastic tube attached to it.[8]All LMA prototypes were invented by Dr.Brain himself. Even after the invention of the cLMA he kept trying to perfect the model and making new modifications upon the older model to make it better.

In 1982, the first clinical studies were conducted using the classical LMA in 23 patients undergoing gynaecological laparoscopic procedures. Insertion and ventilation was successful in all patients, with a seal pressure of 20cm h2o.

DR. ARCHIE IAN JEREMY BRAIN



PROTOTYPE LMA

STRUCTURAL CHARACTERISTICS

The primary structural component of the LMA is medical-grade silicone rubber containing no latex. The LMA consists of a large –bore tubular structure (airway tube) housed proximally with a 15 mm airway adapter, whereas the distal end is attached at a shallow angle to a flattened oval shaped mask.

This mask is bordered by an inflatable cuff attached to a pilot tubing containing a valve and indicator balloon. The opening of the airway tube into the mask is confined by two aperture bars that restrict the epiglottis from herniating into the lumen of the airway tube.

When in proper position, the body of the mask of the LMA is designed to lie in the hypopharynx, with the distal tip of the mask just above the upper esophageal sphincter, the proximal aspect of the mask juxtaposed with the base of the tongue and the sides of the mask facing the pyriform fossae. As the cuff is inflated, a low pressure seal is created around the periphery of the laryngeal inlet.

LMA CLASSIC

DIFFERENT LMA SIZES AVAILABLE AND THEIR SPECIFICATIONS[9,10]

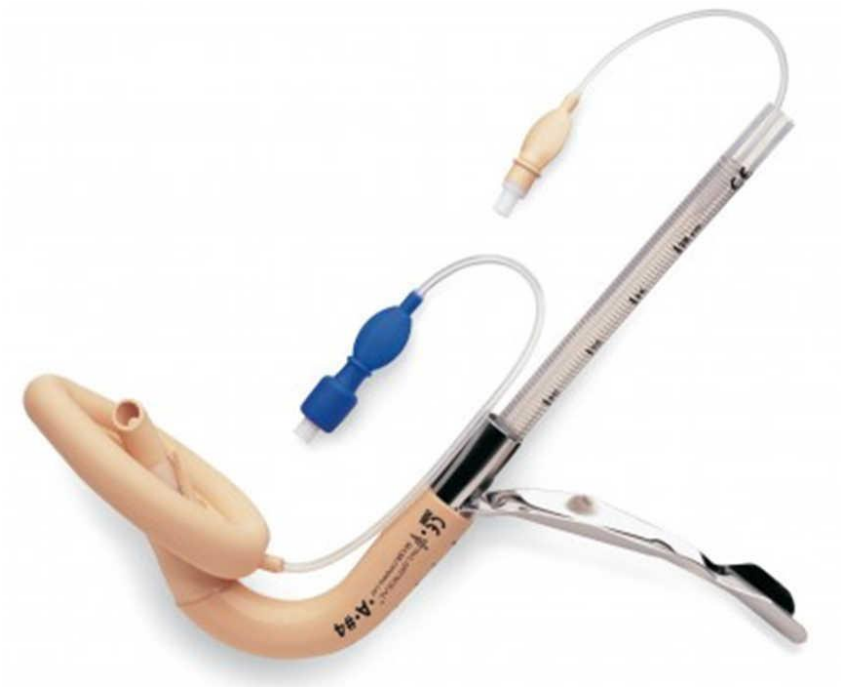
SIZE	ID (mm)	OD (mm)	LENGTH (cm)	CUFF VOLUME-up to(in ml)	PATIENT SIZE
1	5.25	8.2	8.8	4	Neonates/infants upto 5 Kg
1.5	6.1	9.6	10	7	Infants 5-10Kg
2	7	11	11	10	Children 10-20 Kg
2.5	8.4	13	12.5	14	Children 20-30Kg
3	10	15	16	20	Adults 30-50kg
4	10	15	16	30	Adults 50-70kg
5	11.5	16.5	18	40	adults 70-100Kg
6	11.5	16.5	18	50	Large adults >100 Kg

INTUBATING LARYNGEAL MASK AIRWAY[11,12]

LMA-Fastrach (intubating LMA, ILMA) was developed for intubation via it as the LMA classic was too floppy to allow intubation.the standard LMA is not an ideal intubation aid as the airway tube is too narrow to accommodate an adult diameter ETT, too long to ensure a normal length ETT will reach the trachea and not sufficiently rigid to function as a guide to exact alignment of the mask with the glottis. In addition, the mask aperture bars may obstruct passage of the ETT. The LMA- Fastrach could also eliminate the need to distort the anterior pharyngeal anatomy to visualize the laryngeal inlet in cases of difficult intubation and high anterior larynx.

It has a short, curved stainless steel shaft with a 15 mm connector. The shaft is shorter and thicker to allow the insertion of a tube and allows the tracheal tube cuff to pass beyond the vocal cords.The ILMA consists of an anatomically curved, wide bore, stainless steel tube sheathed in silicone which is bonded to a laryngeal mask and a guiding metal handle. It has a single moveable aperture bar, a guiding ramp and can accommodate an 8 mm cuffed endotracheal tube (ETT).

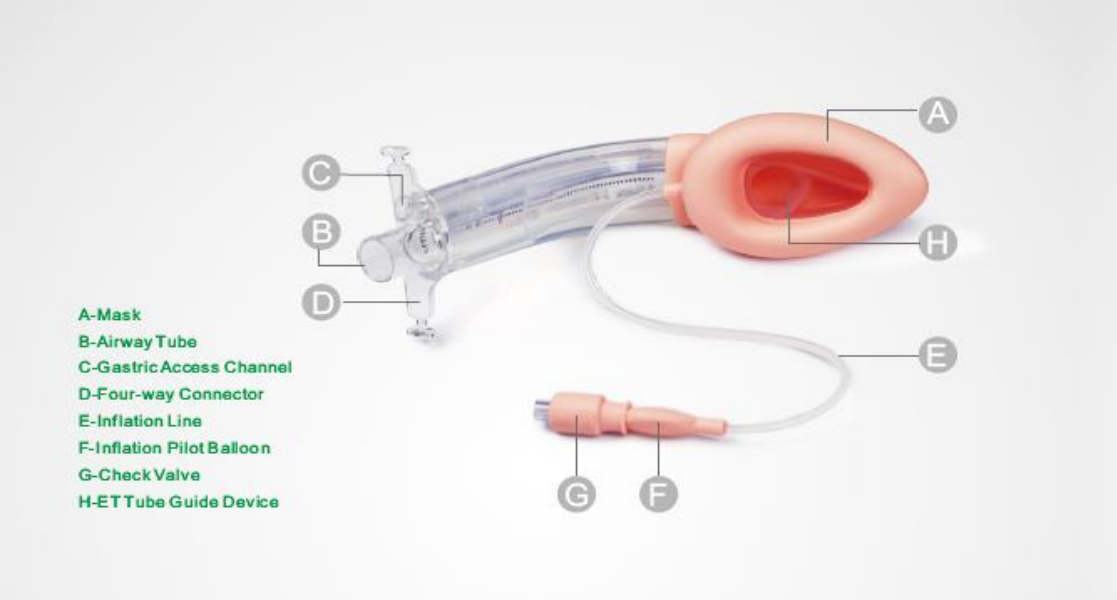
The manufacturers of LMA advocate use of specially designed silicone wire-reinforced tracheal tube Fastrach™ silicone tube (FTST) for tracheal intubation through the ILMA[13]. This tube is straight, soft which follows the curvature of the shaft of the ILMA. They are expensive, less readily available and the lifespan is considerably shorter than that of ILMA itself. There have been few reports of successful tracheal intubation through the ILMA using a conventional as well as reinforced polyvinylchloride tubes, which are cheap, disposable and readily available.



ILMA design features and function

Feature	Function
Rigid stainless steel airway tube	• Permits mask to be guided/steadied during intubation • Short enough to permit TT to pass to correct depth • Good internal: external diameter ratio (13:15 mm) • Autoclavable
Integral 15 mm connector	• Permits use as standard LMA • Avoids danger of accidental disconnection • Permits passage of 8.0 mm cuffed ETT
Anatomical curve of tube	• Permits insertion with mask following same path as with standard insertion technique • Avoids need for head and neck manipulation • Avoids need to insert finger because pressure against palate can be applied externally • Aligns ETT to plane of glottic vestibule • Permits use of straight ETT reducing anterior tracheal wall trauma
Integral tube handle	• Allows device manipulation and steadying during intubation–extubation • Facilitates device insertion–removal
Bevel on proximal end ofstainless steel tube	• Permits mask aperture to be compressed to permit passage via narrow interdental gap
"V"-shaped TT guiding Tube Ramp	• Centring function • Guides tube anteriorly to reduce risk of arytenoid trauma–oesophageal placement
Epiglottic elevating bar	• Acts as epiglottic ramp during insertion • Keeps epiglottis from obstructing airway • Protects and elevates epiglottis during tube passage

BLOCKBUSTER™ LARYNGEAL MASK AIRWAY

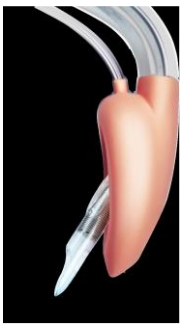


Product	Type	Applicable Patient Weight	Diameter of Block Buster ETT	Diameter of Bronchoscope
BlockBuster™ Laryngeal Mask Airway	3#	30kg-50kg	6.5mm, 7.0mm	5.7mm
	4#	50kg-70kg	7.0mm, 7.5mm	
	5#	70kg-100kg	7.5mm, 8.0mm	

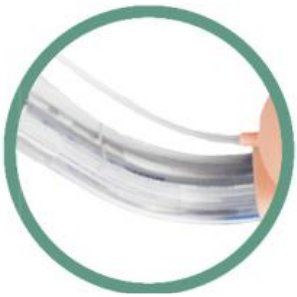
Blockbuster laryngeal mask airway was invented by professor Ming Tian, who is also the co-president of international airway management society. They claim that the LMA has better hypolarynx ventilation and provides a better green channel for intubation via the LMA. Because of the make of the LMA, it is claimed to produce lesser post intubation tachyphonia and reduced aspiration risk due to the gastric port.

Advantages of BLOCKBUSTER™ LMA

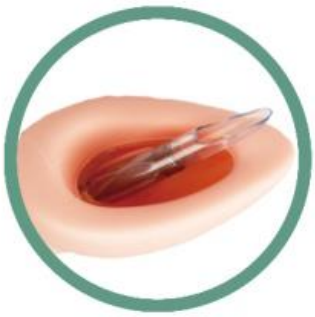
a) The LMA is made of soft silicone which is pliable and causes less trauma.



b) The airway tube is short and more than 95 degrees angulated. It matches the oropharyngeal curve and makes the insertion easier and less traumatic.



c) Guidance device allows the endotracheal tube to be directed towards the laryngeal opening at a 30 degree angle which enhances the success rate of blind intubation.



d) The inlet and outlet of gastric access channels are such that they allow easier insertion of Ryle's tube.

e) The cuff has a rim that acts as a sputum collection device which can collect a small amount of sputum.

f) It has a four way connector that makes it easier to fix it after placement.

g) It has an integrated bite block that prevents airway occlusion by unconscious bites on the LMA

h) Optimal seal pressure - the average seal pressures are around 30cm H_2Owhich is more than the minimum pressure needed in a LMA (25 cm H_2O) to prevent gastric regurgitation.

Milestones in LMA development

After Archie Brain invented the prototype LMA in 1981, the LMA classic started to be available and used from 1968. It further led on to the inventions of LMA-Flexible, which had a wire reinforced shaft, in 1992. The inventions of LMA-Fastrach, in 1997, also popularly known as ILMA, allowed the passage of an ETT through it, thereby facilitating

intubation via an LMA.A further modification was brought about by Ambu, in 2002, with LMAs having preexisting curvatures allowing easier insertion and better ventilation with lesser trauma. In 2012, LMA-BLOCKBUSTER™, was invented in China by Professor Ming Tian, a relatively new modification of the conventional ILMA, claimed to have better success rate for intubation using their BLOCKBUSTER™ tube.

CLEANING

LMA should be cleaned and sterilized before each use. It should be washed immediately after removal, immersed in 8.4% sodium bicarbonate to dissolve secretions before cleaning with warm water. Should be autoclaved with a minimum temperature of 134 degree centigrade. Cuff will be damaged if not completely deflated before autoclaving.

INSTRUCTIONS BEFORE USE

The interior of the tube should be free from obstruction or foreign particles. Exterior should be free from cracks, abrasions. When the tube is flexed at 180 degrees kinking should not occur. The valve should be tested and replaced if the cuff reinflates spontaneously after being completely deflated, or if the cuff has any leak in it.

LARYNGEAL MASK AIRWAY SELECTION AND PREPARATION

Selecting the LMA size depends on the weight of the pt. there is a size chart associated with a LMA that the manufacturer gives, which fits each a person in the size cohort. But according to the working space available inside the mouth, the sizes can vary one up or down.

Prior to inserting the LMA, it must be cleaned according to the manufacturer's guideline and the cuff examined (both in the fully inflated and fully deflated form) for its integrity and symmetry. The LMA cuff must then be evenly deflated to create a mask that is cup shaped, with the tapered rim of the cuff pointing away from the aperture. This is important in helping steer the tip of the mask posterior to the epiglottis during its descent into the hypopharynx. The posterior surface of the mask should be coated with a water-soluble lubricant just prior to insertion so that it easily glides against the palate and posterior pharynx.

TECHNIQUES OF LMA INSERTION

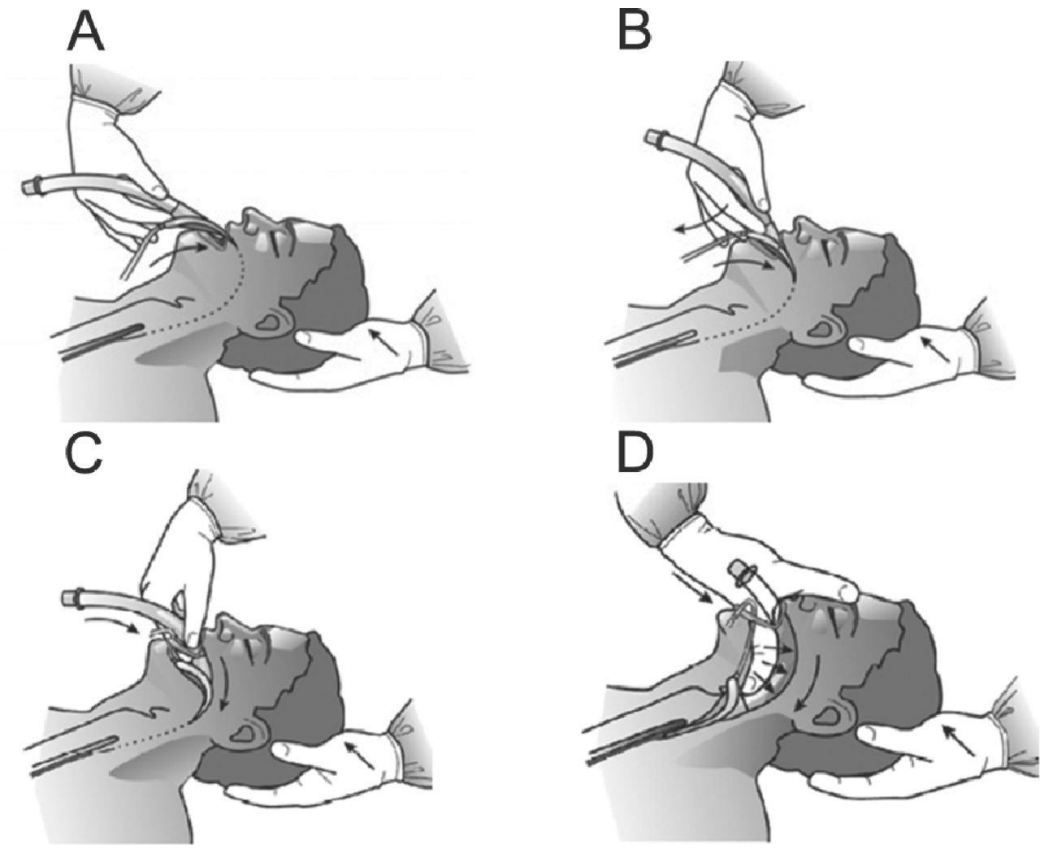
The **standard method** is a midline approach with the cuff fully deflated and the mask aperture facing forward. The dominant hand is used to hold the LMA like a pencil at the distal end of the insertion tube, with the index finger wedged in the groove created by the attachment between the insertion tube and the mask. The LMA is inserted midline into the mouth and the distal end of the mask is juxtaposed against the proximal hard palate so that the tip of the mask is angled caudad. The LMA is then advanced while the index finger applies pressure in a mainly cephalad and slightly posterior fashion. The index finger follows the LMA along the palatopharyngeal arch into the hypopharynx. The opposite hand is used to secure the proximal end of the LMA as the index dinger is removed and the LMA is advanced until resistance is felt. The cuff is gently inflated allowing the mask to conform the shape of hypopharynx.

An alternative technique is the **"Guedel" method**. It involves placing the LMA into the mouth with the device turned 180 degrees from the standard technique so that the mask opening is facing the hard palate. As the mask is advanced into the hypopharynx, it is turned 180 degree. The Guedel method may be more likely to result in damage to the soft tissues in the oropharynx.

Other method is the **partial inflation method** to facilitate insertion to increase the success rate of insertion(96.7 vs. 85.5%) and a shorter time for insertion.(16 vs. 23 sec).

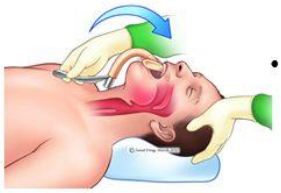
In the **“thumb” technique**, the LMA is inserted into the mouth in a manner similar to the standard technique except that it is the thumb (instead of the index finger) that is wedged in the groove between the mask and the insertion tube and used to apply the driving force to push the LMA against the hard palate and into the oropharynx.

Other method uses a slight **lateral rotation of the LMA** during insertion to help negotiate the angle between the palate and the posterior pharynx. Lubrication should be applied to the posterior surface of the cuff just before insertion taking care to avoid the lubricant getting on the anterior surface.

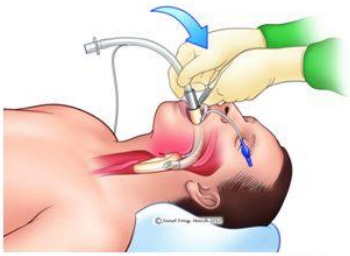


Intubating through the LMA

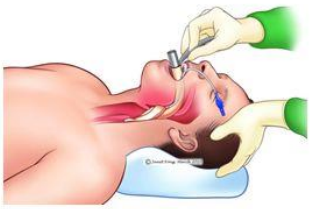
- Place LMA



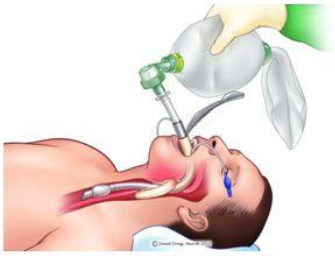
- Size ETT/I-LMA
  - Lubricate tube
  - Test ETT fit



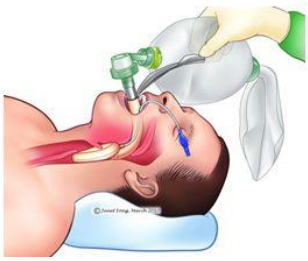
- Insert ETT
- Reattach BVM to ETT
  - Ventilate w/ETCO2



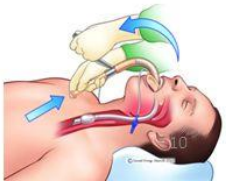
- Advance ETT
  - Applying upward pressure on the LMA
  - Ventilate w/ ETCO2
  - Advance ETT through cords



- Verify placement
  - ETCO2
  - Listen for leak
- Removing the LMA is optional



- Ventilate
  - Relax
- Confirm placement
  - Ventilate w/ ETCO2
  - Confirm tube placement
  - Inflate ETT cuff



INDICATIONS

1. The LMA is indicated for routine securing of a patient airway during general anaesthesia as long as there is no contraindication to the use of the face mask.
2. The LMA is especially useful when tracheal intubation is not necessary or is undesirable (ex. Patients undergoing laser treatment of facial port wine stains, as well as infants or children with tracheal stenosis, bronchopulmonary dysplasia and so forth).
3. It has applications for patients with difficult airways both in facilitating tracheal intubation and in accomplishing lung ventilation where it is impossible to do so by face mask.
4. It provides a suitable airway in patients with limited neck mobility.
5. It can be used for diagnostic laryngoscopy and bronchoscopy
6. It is used in routine elective cases where tracheal intubation is not required or is required only because the surgery interferes with maintenance of the airway with a face mask.
7. It is useful in cases where maintenance of airway with a face mask is difficult such as edentulous patients, facial injuries or burns.
8. It is useful in elective eye surgeries since changes in intraocular pressure are smaller when compared to intubation.
9. The LMA is now being used in anesthesia for MRI.

10. In patients undergoing radiotherapy under general anesthesia, the use of LMA can avoid repeated tracheal intubation

CONTRAINDICATIONS AND LIMITATIONS

The LMA does not protect the trachea from regurgitation and aspiration and is not meant to replace an endotracheal tube when the latter is indicated. Full stomach, non-fasted patients, those with morbid obesity, recent trauma, gastroesophageal reflux, intestinal obstruction are all contraindications. Patients with reduced pulmonary compliance where high positive pressure (>25-30 cm H2O) may be needed for ventilation is also a contra indication. Oral tumors periglottic pathologies. Circumstances where the airway cannot be readily accessed .i.e. head draped and away from the anesthetist, prone position represent a relative contraindication to its use.

PATIENT SELECTION AND PREPARATION

Patients who are at risk of pulmonary aspiration or those with reduced lung compliance are excluded. Children of ASA physical status 1 &2 with no congenital or acquired airway malformations (without airway difficulty) are included in the study.

ADVANTAGES

1. It allows rapid establishment of an airway in the pediatric patient without the necessity for muscle relaxation.
2. Skill of placement is easily learned.
3. Less anesthetic depth is required.
4. It provides a more suitable and trouble – free – airway than the face mask.
5. Unlike the face mask the LMA frees the hands of the anesthesiologist and does not require jaw support.
6. The LMA unlike face mask or endotracheal tube, does not have to be optimally positioned for a suitable airway to be maintained.
7. It does not injure the vocal cords or the trachea and thus does not cause the hemodynamic response associated with intubation.
8. The intracranial and intraocular pressure changes are less during LMA insertion than during intubation.
9. It does not stimulate bronchospasm in susceptible patients.
10. Incidence of sore throat and subsequent respiratory tract infection is less when compared to tracheal tube.
11. Smooth emergence from anesthesia.
12. Insertion of LMA does not cause significant bacteremia when compared to nasal intubation.

13. Because of the larger lumen size of the LMA, there is less increase in airway resistance in spontaneous respiration.

DISADVANTAGES

1. Optimal air leak around the LMA must be limited (average 20-25 cm H2O) to avoid insufflation of the stomach. This restricts the amount of positive pressure that can be applied to the lungs.
2. The LMA is not useful in stenting or maintaining patency in tracheomalacia or a trachea that is compressed or is obstructed at or below the laryngeal inlet.
3. While using an LMA it may be more difficult to differentiate laryngospasm or bronchospasm from in correct placement and more difficult to apply positive pressure to break laryngospasm.
4. There is increased of gastric aspiration, especially in obese patients.
5. LMA is unsafe in prone and jack knife position.

COMPLICATIONS

1. Accidental dislodgement can occur.
2. Airway obstruction and airway injury.
3. Nerve injury—Palsies of hypoglossal, recurrent laryngeal and lingual nerves have been reported after use of LMA.

ENDOTRACHEAL TUBE

Early descriptions of placing an artificial airway started with Andreas Vesalius in1543 placing a reed into the trachea of a pig to treat a pneumothorax and then Benjamin Pugh in1754 performed the first endotracheal intubation to resuscitate a neonate with a leather covered coiled wire[14-17].

With the introduction of ether in the 1840s, undertaking surgical procedures became more common. General anesthesia was primarily provided through a device covering the patient's nose and mouth. The issue of gastric content aspiration was not generally appreciated, and postoperative pneumonia was a common problem. Trendelenburg (1869) is credited with designing the first inflatable cuff, which was a thin rubber bag fitted over the end of a tracheostomy tube, creating a tight seal to prevent aspiration during anesthesia.

Preferring an alternative to tracheostomy, Macewen (1880) described relieving an obstruction by passing an oral tube into the trachea.2 He was also the first to describe administering anesthesia (chloroform) via an orotracheal tube and used a metal tube with a sponge collar placed into the pharynx to prevent aspiration. Eisenmenger (1893)

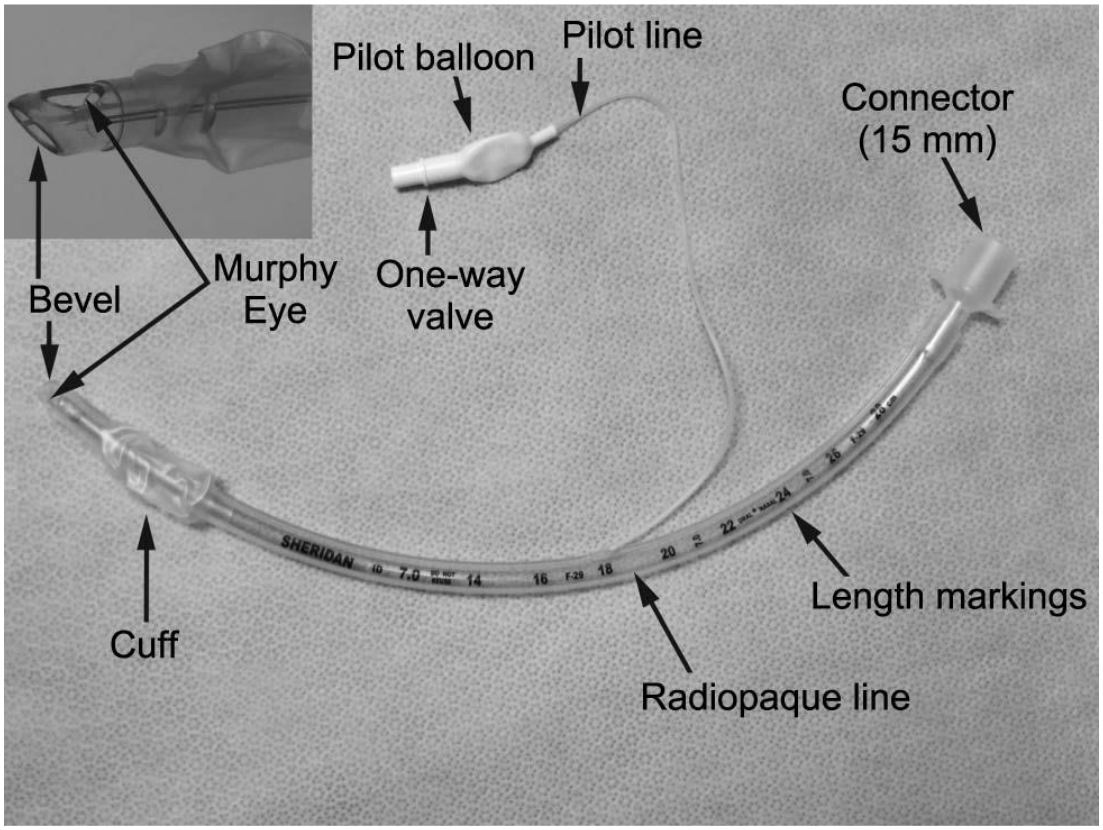
was the first to describe the use of a cuffed ETT, as well as the concept of a pilot balloon to monitor intracuff pressure.

Anaesthesiologist Franz Kuhn made significant contributions in the early 1900s.6,8 He also used metal tubes and preferred the oral route over tracheostomy and popularized orotracheal anesthesia. Rowbotham and Magill (1926) designed larger rubber tubes that allowed bidirectional gas flow through the tube. These tubes were sealed using pharyngeal sponges with hand-sewn gauze pull strings to help with removal.

Guedel (1928) and Waters (1931) reintroduced the inflatable cuff to Magill's rubber tube and are credited with starting a period of ETT design. Their first cuffs were made from the fingers of rubber gloves and from rubber condoms.

The polio epidemic in Europe (late 1950s) and the United States (early 1960s) demonstrated the value of cuffed endotracheal and tracheostomy tubes to apply PPV for respiratory failure. Reusable rubber ETTs and metal tracheostomy tubes with high-pressure low-volume rubber cuffs were the primary airways of the time. As polymer technology advanced, a disposable polyvinyl chloride(PVC) tube with a high-pressure low-volume cuff was introduced in 1968.13 Excessive cuff

pressure reduces regional tracheal blood flow and is associated with lesions such as tracheomalacia, tracheal dilation, and stenosis, as well as tracheoesophageal fistula.[20,21]



POLYVINYL CHLORIDE ENDOTRACHEAL TUBE[18,19](PVC-ETT)

Manufacturers introduced a high volume low pressure(HVLP) PVC-cuffed ETT in the 1970s, which has become the standard ETT in use today. Desirable characteristics of PVC include that it is transparent, nontoxic, and inexpensive and conforms to the patient's anatomy at body temperature.

ANATOMY OF THE STANDARD ENDOTRACHEAL TUBE

ETTs are generally made of PVC, although other materials include rubber, silicone, and metal. Most ETTs used in the operating room or critical care areas have standard design characteristics and features. Markings along the length of the tube denote the number of centimetres from the tip of the tube, helping clinicians gauge initial insertion depth and monitor tube movement. Some tubes also have a mark to help guide proper depth of insertion such that the tube is placed under direct vision, with the vocal cords resting at a single marking or between double line markings on the tube surface.

A radiopaque continuous marking imbedded in the length of the tube allows the distal tube tip to be identified on a chest radiograph to confirm appropriate depth of the tube. The tip of the tube is designed with a slant or bevel facing to the left side at the tip of the tube. Because the tube is generally introduced on the right side of the standard left-handed laryngoscope, the left-sided bevel allows better visualization of the area ahead of the tube and easier passage through the vocal cords.

Opposite the bevel, there is generally an additional side hole called the Murphy eye. Its purpose is to allow passage of gas and ventilation should the tip of the tube become obstructed, as may occur when up against the tracheal wall or with mucus plugging. Most tubes have a cuff, an

inflatable balloon near the end of the tube that surrounds its circumference and forms a seal against the wall of the trachea. The cuff helps prevent secretions and fluid from leaking down into the trachea and lungs and gas from leaking around it during PPV.

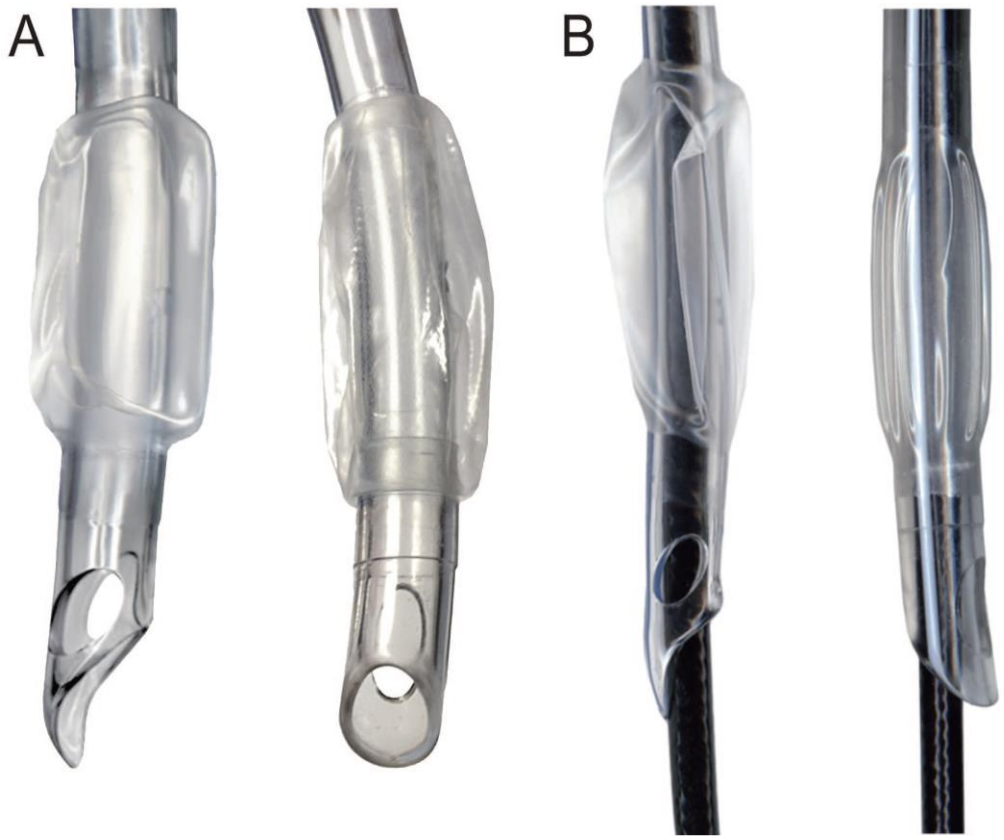
The cuff is attached to a smaller inflatable balloon via a hollow catheter called the pilot line. The balloon, referred to as the pilot balloon, resides outside the patient and acts as a tactile gauge of cuff pressure, as well as a small reservoir to help reduce minor changes in intracuff pressure. A one-way valve attached to the pilot balloon prevents gas from escaping the cuff and provides a connect or to attach a syringe or pressure-monitoring device.

All tubes have a standard adapter that allows a variety of respiratory or anaesthesia equipment to be attached to the tube. The connector at one end has a standardized external diameter of 15 mm to attach to equipment and the other end sized to snugly pressure-fit into the tube.

SPECIAL TUBES

Parker Flex-Tip tubes[22,23]

Orotracheal and nasotracheal fiberoptic intubation generally involves placing a fiberoptic bronchoscope into the trachea and then blindly advancing a preloaded ETT over the scope. This method has been associated with complications and challenges related to the design of the standard ETT, particularly tissue trauma and inability to redirect and pass by anatomic structures. To help address this, the Parker Flex-Tip tube (Parker Medical, Englewood, Colorado) has a soft, flexible, hemispherical,curved tip pointing toward the center of the distal lumen of the tube, rather than the straight, stiff,right-sided tip of the standard ETT. The curved tip hugs fiberoptic scopes (as well as bougies and exchange catheters) more tightly than other tubes, and it has been associated with a greater incidence of initial success and faster tube passage than a standard ETT. During nasotracheal intubation, the Parker Flex-Tip has been associated with less tissue trauma, bleeding, and nose pain as long as its bevel and tip do not face or contact the turbinates or septum. Case reports associate the Parker Flex-Tip with less subglottic impingement on the tracheal wall during nasotracheal intubation and easier passage over a bougie tube exchanger.

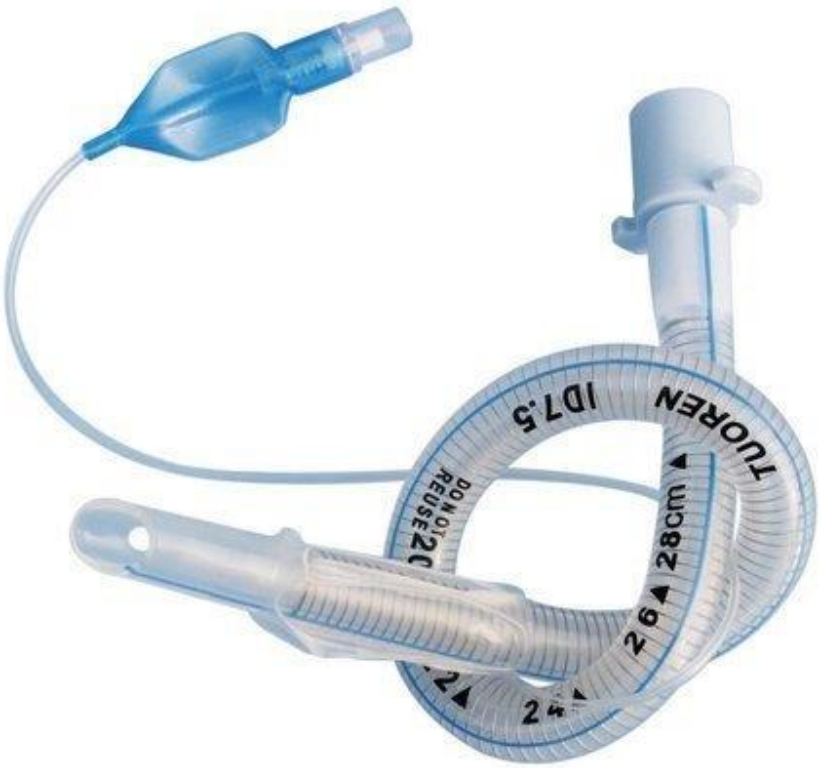


PARKER FLEX TIP TUBES

REINFORCED TUBES[24]

Wire-reinforced or armoured ETTs incorporate a series of concentric steel wire rings embedded in the wall of the tube along its entire length. These are designed to make the tube flexible and resist kinking with positioning. They are promoted for use in head and neck surgery, where surgical positioning may require bending and movement of the ETT. They are also useful for intubating through a mature tracheostomy stoma or a surgically divided airway (as in tracheal reconstruction), where the flexibility of the tube allows less interference with the surgical field. Although kink-resistant, these tubes are not kink-

or obstruction-proof. Unfortunately, if the tube is crimped or kinked, it cannot return to its normal shape and must be changed.



AIM OF THE STUDY

To compare during insertion through BLOCKBUSTER™ LMA, of Polyvinyl Chloride endotracheal tube and BLOCKBUSTER™ endotracheal tube

1. Overall success rate

2. Hemodynamics during intubation

3. Time taken for intubation

4. No. Of attempts for successful intubation

5. Manoeuvers used for intubation

6.Post-operative complications

INCLUSION CRITERIA

- ASA gr I & II
- Patients of either sex
- MPC score I & II
- Patients weighing between 30kg – 70kg

EXCLUSION CRITERIA

- ASA gr III & IV
- Patients with loose dentures
- MPC gr III & IV
- Patients weighing <30kg or >70kg

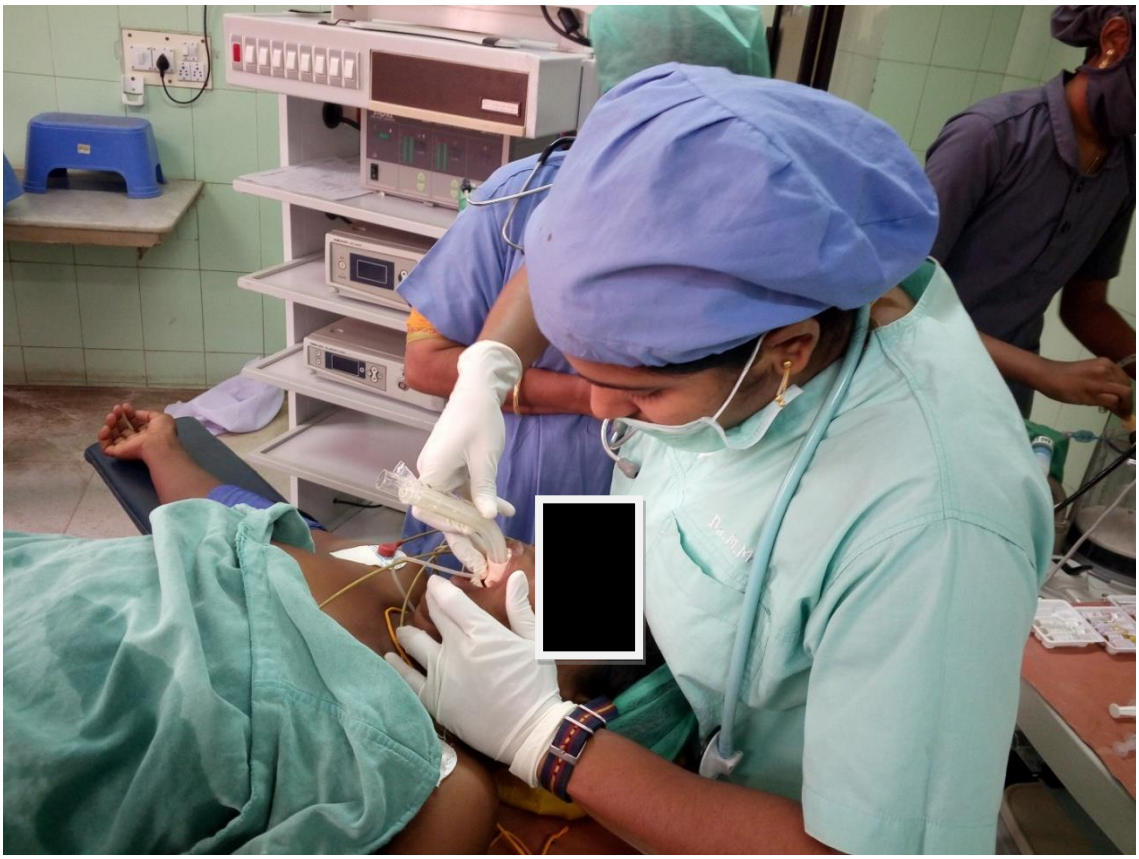
MATERIALS AND METHODS

After getting ethical committee clearance, 50 patients of either sex, who were undergoing various elective surgical procedures, of ASA I and II were included in the study.

All patients were given T.Alprazolam 25mg on the night before surgery. Informed consent was obtained from the patients included in the study. The patient was weighed and the size of LMA to be used was determined.

- On the day of surgery, premedication with Inj.Glycopyrrolate 0.2 mg iv and Inj.Midazolam 1mg i.v was given. The type of tube to be used was selected using sealed envelope method. Group I was to be intubated with PVC tube and was named the PVC group (n=25) while Group II was to be intubated with the BLOCKBUSTER™ tube and was named the BB group (n=25).
- Analgesia is to be provided with Injection Fentanyl 2mcg/kg i.v.
- The patient is to be induced with Injection Thiopentone 5mg/kg i.v.

- Relaxation obtained with Injection vecuronium 0.1 mg/kg and ventilated for 5 minutes with O2 5L and sevoflurane 2%.
- An LMA BLOCKBUSTER™ of appropriate size (3 OR 4) is introduced into the patient and cuff is inflated with appropriate amount of air (max 30mL). Correct placement of laryngeal mask is confirmed with chest inflation, the presence of equal bilateral air entry, a square wave capnography and no oropharyngeal leak with peak airway pressures ≥20 cm H2O.



- If any one of the above criteria were not met, the LMA was repositioned, removed and reinserted or changed to a different size. If ventilation continued to be a problem, patient was excluded from the study. After successful placement of the LMA, anaesthesia was maintained with 1-2% sevoflurane and 66% nitrous oxide in 33% oxygen and vecuronium bromide.

- A lubricated endotracheal tube, either a polyvinyl chloride endotracheal tube or a BLOCKBUSTER^{TM} tube, is inserted via the laryngeal mask airway, and the patient is intubated. Correct placement of endotracheal tube in the trachea is confirmed with equal bilateral air entry and capnograph tracing.

- When intubation is successful,the laryngeal mask airway is removed and the connector is placed at the machine end of the tube and the tube is connected to the anesthesia machine.
- The ease of tracheal intubation was judged by the time taken to intubate the trachea (time from disconnection of the breathing circuit from the LMA-BLOCKBUSTER to confirmation of tracheal tube placement by auscultation and display of a square-wave capnography trace) and the number of attempts to achieve successful intubation.
- In each patient, intubation through the LMA-BLOCKBUSTER was limited to three attempts.
- Intubation was considered successful on the first attempt if tracheal tube could be passed without any resistance through the LMA.
- If resistance was encountered, according to the length at which resistance was encountered, different maneuvers were used including twisting of the tracheal tube or/and Chandy's maneuver to align the bevel and this was considered second attempt.
- If still intubation was not successful, up and-down movement of the tracheal tube was tried and this was considered as third attempt.
- Following successful tracheal intubation, the LMA was removed using the standard technique and the stabilizing rod.

- When intubation was unsuccessful after three attempts, the procedure was abandoned and tracheal intubation was performed under direct laryngoscopy.
- All maneuvers used were recorded as well as the number of attempts required for successful intubation.
- Post-operative complications like sore throat,nausea and hoarseness were recorded in the immediate post-operative period, one hour after extubation, 4 hours after extubation and 8 hours after extubation.

REVIEW OF LITERATURE

1. 1.**Megha.U.Sharma***et al*[25], compared the endotracheal intubation through LMA-Fastrach and compared the intubation characteristics of Wire Reinforced Silicone endotracheal tube vs. PVC tube between 200 patients of ASA I & II. They found that the rate of successful tracheal intubation and hemodynamic responses to intubation by the two groups were comparable. But the time taken for intubation and maneuvers used for intubation were more for the PVC group. They concluded that PVC tube can be safely used for intubation through Intubating LMA (ILMA).

2. In the study conducted by **Veena.R.Shah***et al*[26], comparing the PVC endotracheal tube with the silicone Wire Reinforced endotracheal tube for intubation through ILMA, in which they compared 60 patients of ASA I & II with normal airways, they found that the overall success for Fastrach Silicone tube was 96.63% and for PVC it was 93.33%. The time taken for intubation using PVC tube was 22.42 ±8.5seconds(s) compared to 18.6 ±6.8s in Fastrach Silicone tube (FTST) group. Incidence of sore throat was also higher in PVC group (21.4%) as compared to FTST group

with 6.8%. they concluded that blind intubation by PVC tube is a feasible alternative to FTST in patients with normal airway.

3. In a study by **Sunitha Kuruvadi***et al*[27] of 30 patients of ASA I & II comparing between the intubation of PVC and ILMA tube through LMA Fastrach in MPC 3 & 4 patients showed that successful intubation in PVC group was 50% and in ILMA group was 70%. The incidence of sore throat was higher in the PVC group with 40% compared to 6.6% in ILMA group. The time taken for intubation was also longer in PVC tube group compared to the ILMA tube group. Incidence of esophageal intubation was high in patients intubated with ILMA tube.

4. **Sharma***et al.*studied the number of attempts, time taken, and manoeuvres employed to accomplish tracheal intubations in 200 patients of ASA I & II. Patients were randomly allocated to one of the two groups: Group I: Cuffed PVC tube and group II LMA Fastrach Wire Reinforced Silicone ETT by sealed envelope method. In group I, 96% patients were successfully intubated (90% in the 1st attempt, 5% in the 2nd attempt, and 1% in the 3rd attempt). In group II, the success rate was 97% (95% in 1st attempt and 2% in 2nd attempt). Mean time for successful tracheal intubation was

significantly higher in group I than in group II (14.7s and 10.04s, respectively). The adjustment manoeuvres were significantly higher in group I (28%) than in group II (3%) [1].

5. In a study by **Brain***et al*., tracheal intubation with silicone tube was successful in 149 of 150 (99.3%) patients. 75(50%) at the first attempt, 28 (19%) required one adjusting manoeuvre, 21(14%) required two, 18 (12%) required three and seven (5%) required four attempts. They used different manoeuvres to achieve high success rate, which include the up and down manoeuvre, optimizing the airway, change of size, raising the mask upwards, partial withdrawal, rotating the bevel, adjusting head-neck position, and adding air to the cuff.

6. **Ferson***et al*[28]., studied blind intubation through the LMA-Fastrach using non-disposable, silicone endotracheal tubes. It was attempted in 200 cases and was successful in 193 (96.5%). Blind intubation was achieved on the first attempt in 151 cases (75.5%). On the remaining blind intubation attempts, successful intubation was achieved on the second, third, fourth, and fifth attempts in 28 (14.0%), 7 (3.5%), 5 (2.5%), and 2 cases (1.0%), respectively. In seven cases (3.5%), blind intubation through the LMA- Fastrach

failed after five attempts, and fiberoptic guided intubation was successful on the first attempt.

7. **Kundra***et al*[29]. evaluated the success rate of blind tracheal intubation through the ILMA by using the LMA Fastrach™ silicone wire-reinforced tracheal tube (FTST), the Rusch polyvinyl chloride tube (PVCT), and the Rusch latex armoured tube (LAT). Blind tracheal intubation through the ILMA was successful in 96% of patients with a maximum of 2 attempts, and more frequent success was demonstrated in Groups PVCT and FTST when compared with Group LAT. Overall, 74.6% of patients had successful tracheal intubation on the first attempt. Tracheal intubation was accomplished more frequently in Groups PVC Tube and FTST (86%) than in Group LAT (52%). This study demonstrates an overall success rate with the PVC Tube that is similar to that with the FTST (96%).

8. **Joo and Rose**[30], in 1998, compared tracheal intubation using direct laryngoscopy, ILMA with fiberoptic guidance (ILMA-FOB) and ILMA without fiberoptic guidance (ILMA-Blind) using PVC tracheal tube. They studied 30 patients in each group and success rate with ILMA blind technique was 97%.

9. **Kihara***et al*[31].in 2000 compared tracheal intubation with the Macintosh Laryngoscope versus blind intubation via the ILMA using a straight, silicone tube; In their study, ILMA intubation was successful in 94%. The average time for intubation was 57 s. Incidence of mucosal injury and esophageal intubation was higher (26%), whereas incidence of sore throat and hoarseness were similar among groups.

10. **Kapila***et al*[32]. (1995) achieved a 95% success rate with a Portex PVC tube. They conducted a study on 100 ASA I/II patients scheduled for elective surgeries. 72% were intubated at the 1st attempt with no manipulation, 21% with 2 or more attempts with manipulation.

11. **Shetty***et al*[33].in 2005, studied Intubating Laryngeal Mask Airway (ILMA) for blind endotracheal intubation in 75 ASA I & II patients undergoing Spine or Orthopaedic Surgery under general anaesthesia. In their study they were able to intubate 96% of the patients via ILMA. The mean time for successful intubation via the ILMA was 19.08s .

In an independent study conducted by TUOREN Co, comparing between the intubation of BLOCKBUSTER tube and PVC tube and reinforced flexometallic tube for intubation via LMA-BLOCKBUSTER, the success rate for blind tracheal intubation for Blockbuster tube was 83% for first time and 12% for 2nd attempt. The time required for intubation of PVC tube was significantly longer than Reinforced tube and Blockbuster tube ($P<0.001$). No difference was seen between Reinforced flexometallic tube and Blockbuster tube during time for intubation.

STATISTICAL ANALYSIS

Statistical analysis was done by SPSS software version 16. The comparison were done using Chi- Square test and Students T-Test.

RESULTS

Group I: PVC tube

Group II: BLOCKBUSTER™ tube

DEMOGRAPHICAL DATA

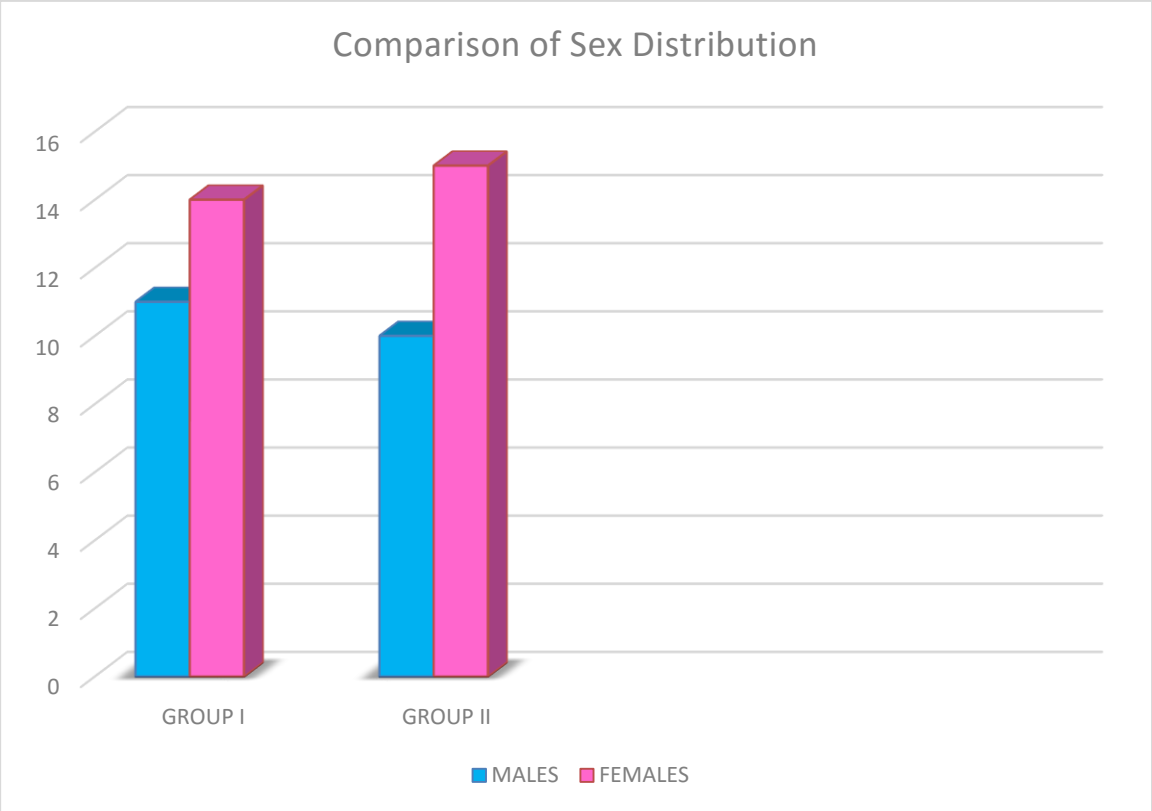
- Both groups were matched for age, weight and sex.
- The mean age for group I was 33 and mean age of group II was 30.

  P = 0.19 >0.05 Not significant
- Mean weight in both the groups were 49kg.

  P = 0.97 > 0.05 not significant
- The two groups were matched for sex distribution.

  Group I: M= 11 F=14

  Group II: M= 10 F= 15

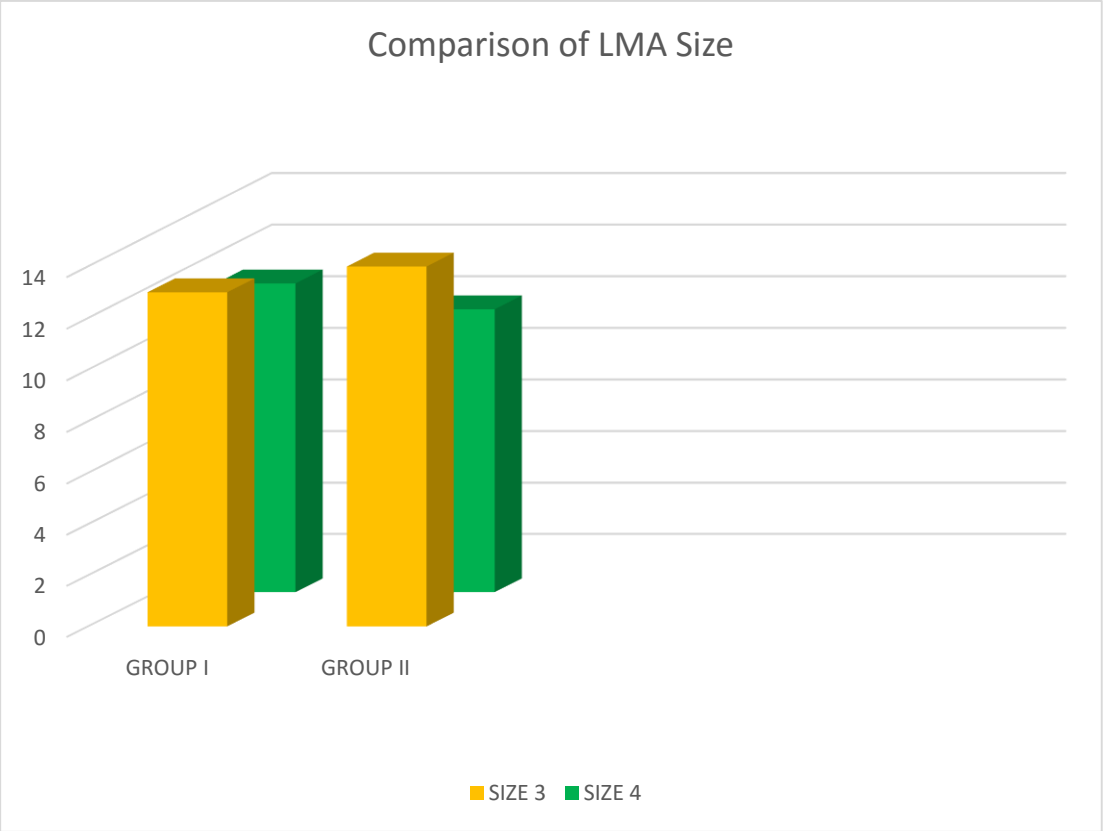


- LMA size used for both groups were also matched.

  Group I: #3: 13 #4: 12

  Group II: #3: 14 #4: 11

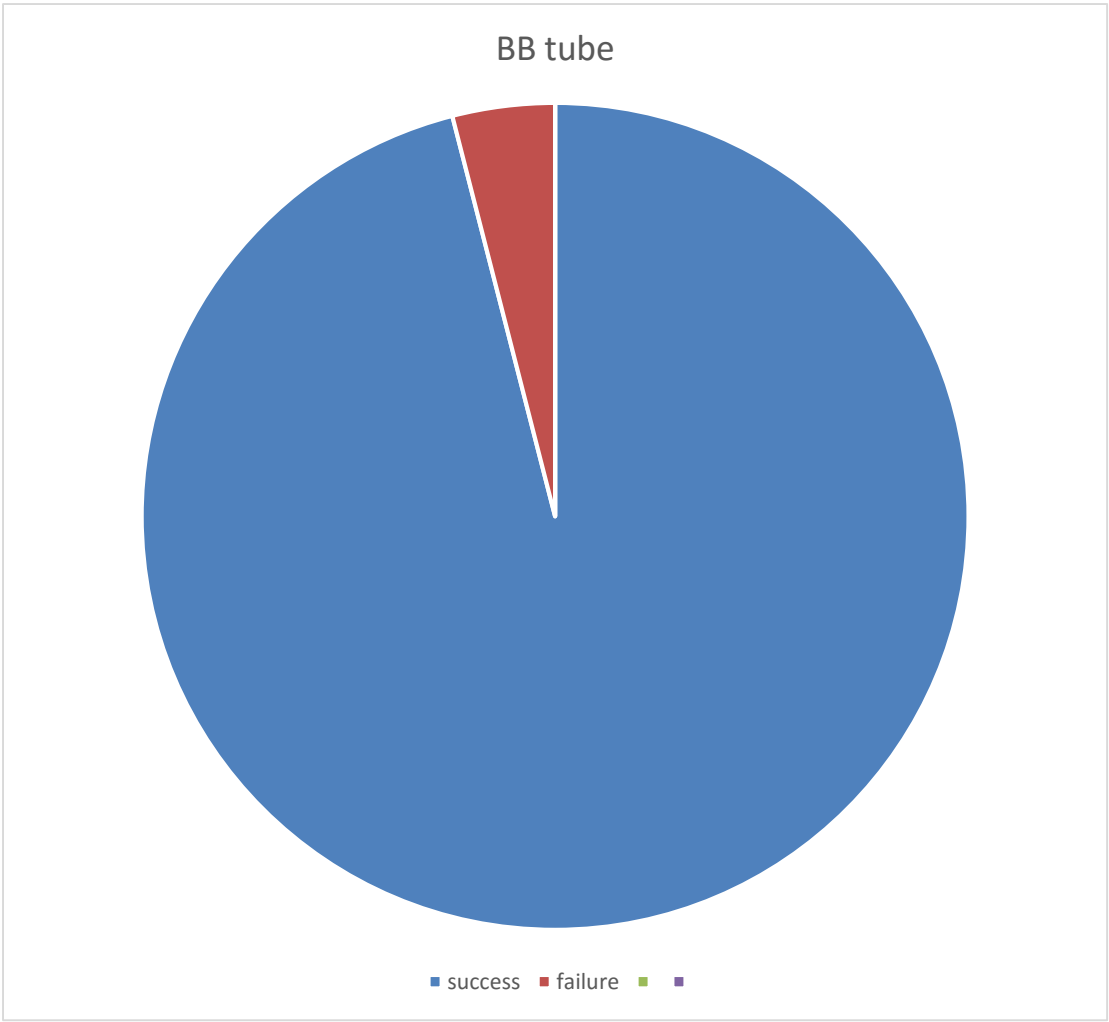
  P= 0.78 > 0.05 not significant

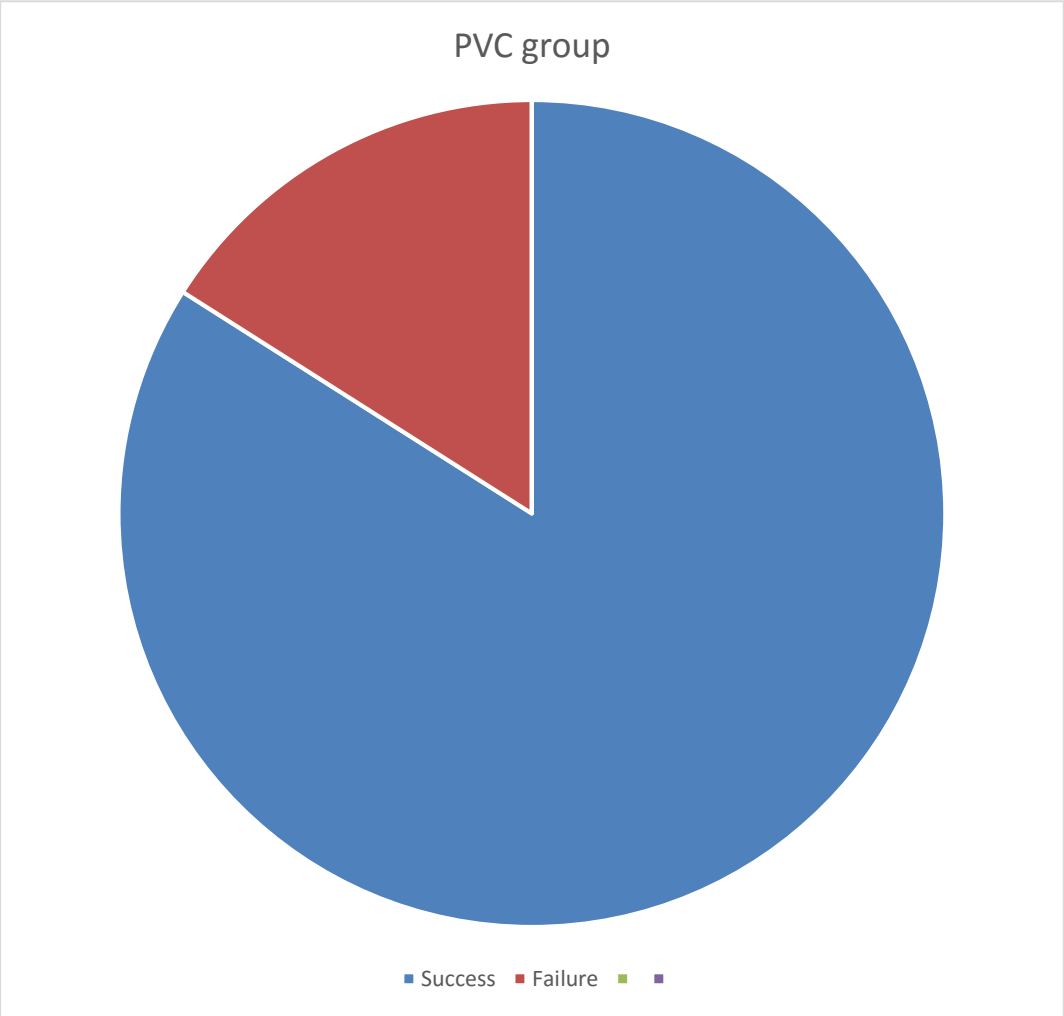


- Overall success:

  Blind tracheal intubation was successful in

  - 21/25 patients in PVC group- 84%
  - 24/25 patients in BB group- 96%


BB tube
success
failure


PVC group
Success
Failure

- Time taken for LMA insertion:

Mean time for LMA insertions were

- In Group I: 39±10s
- In Group II: 37± 5s

By T-Test the difference was found to be not significant. (P=0.46>0.05)

- Time taken for Insertion of Tube

Mean time for intubation via LMA was

- In Group I(**PVC**): **55.38±23.22 seconds**
- In Group II(**BB**) : **33.29±5.4 seconds**
- P<0.05 Significant

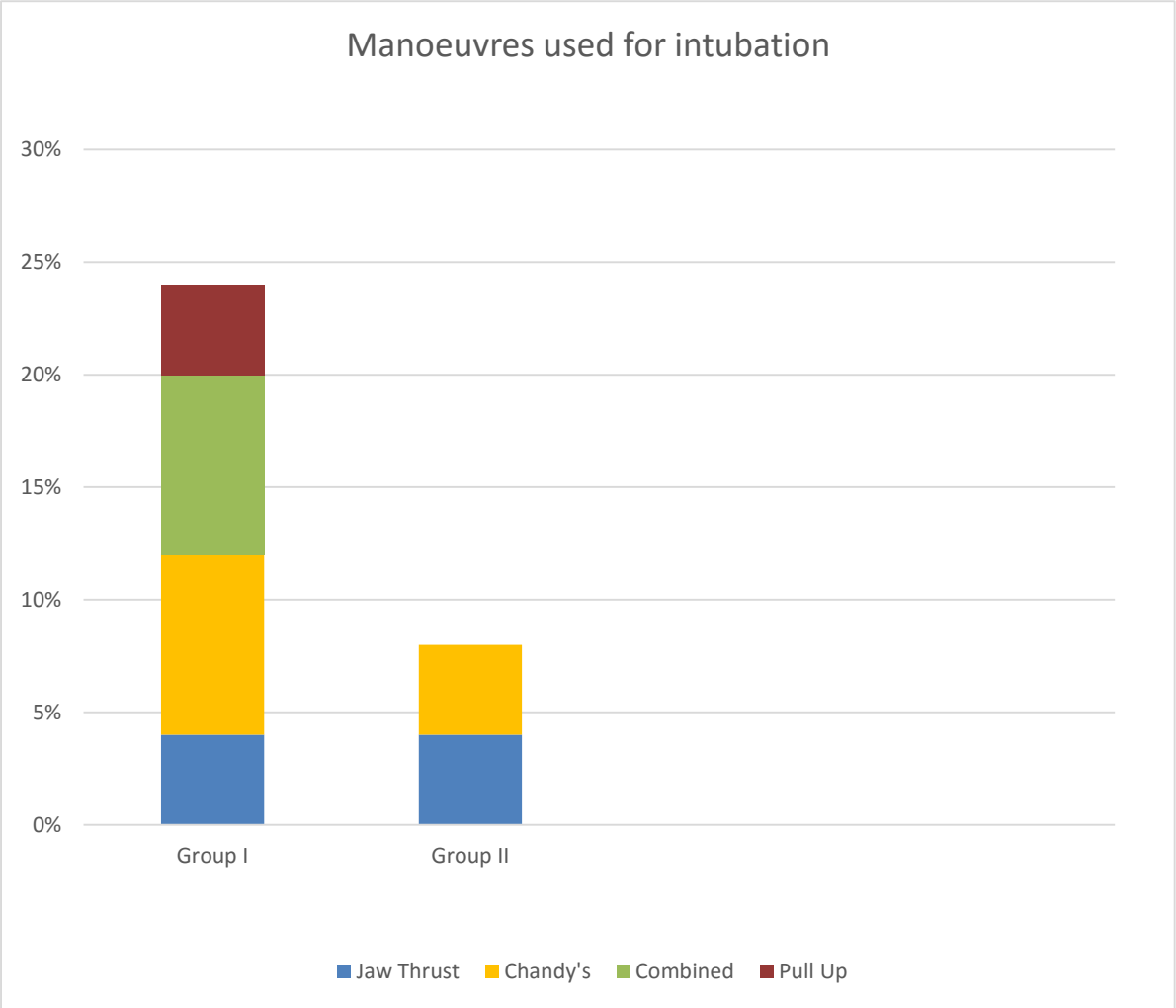
- Number of attempts for LMA insertion
  - P= 0.83 > 0.05

    Insignificant

- Number of attempts for intubation
  - P= 0.006 >0.05

    Significant

- Manoeuvres used for intubation
  - For Group I (PVC) :**28%** patients required some manoeuvers for successful intubation
    - Jaw thrust- 4%
    - Chandy's- 8%
    - Combined jaw thrust and Chandy's- 8%
    - Pull up- 4%
  - For Group II (BB) : **8%** patients required manoeuvres for successful intubation
    - Jaw thrust- 4%
    - Chandy's- 4%


Manoeuvres used for intubation
30%
25%
20%
15%
10%
5%
0%
Group I
Group II
Jaw Thrust
Chandy's
Combined
Pull Up

HEMODYNAMICS

- Pre-operative :

  HR (Heart Rate), SBP (Systolic Blood Pressure), DBP (Diastolic Blood Pressure), SpO_2 and $EtCO_2$ (End Tidal CO_2) were comparable between both the groups and P value was insignificant.

- During LMA insertion:

  HR, SBP, DBP, SpO_2 and $EtCO_2$ were comparable between both the groups and P value was insignificant.

- After LMA insertion:

  HR, SBP, DBP, SpO_2 and $EtCO_2$ were comparable between both the groups and P value was insignificant

- During intubation:

  - Heart Rate:

    - Group I:

      Mean HR was 100± 14 bpm

    - Group II:

      Mean HR was 85± 10 bpm

  The P value was 0.00 < 0.05 **Significant**

  - SBP

    - Group I:

      Mean SBP was134± 13 mmHg

    - Group II:

Mean SBP was 116±7 mmHg

The P value is 0.00<0.05 **Significant**

- ❖ DBP
  - Group I:

    Mean DBP was 88±11 mmHg
  - Group II:

    Mean DBP was 76±7 mmHg

    P=0.00<0.05 **Significant**
- ❖ SpO_2

  Comparable between both the groups and P value is insignificant

- ➢ <u>One min after intubation</u>
  - ❖ Heart Rate:
    - Group I:

      Mean HR was 98± 14 bpm
    - Group II:

      Mean HR was 84± 10 bpm

  The P value was 0.001< 0.05 **Significant**
  - ❖ SBP
    - Group I:

      Mean SBP was 129±15 mmHg
    - Group II:

Mean SBP was 114± 10 mmHg

The P value is 0.00<0.05 **Significant**

- ❖ DBP
  - Group I:

    Mean DBP was 82±10 mmHg
  - Group II:

    Mean DBP was 71±6 mmHg

    P=0.00<0.05 **Significant**
- ❖ SpO_2 and $EtCO_2$ was comparable between the two groups and there was no significance for the P value.

➢ <u>5 minutes after intubation</u>

- ❖ Heart Rate:
  - Group I:

    Mean HR was 88± 15 bpm
  - Group II:

    Mean HR was 81± 11 bpm

  The P value was 0.07 > 0.05 **Not significant**
- ❖ SBP
  - Group I:

    Mean SBP was 117±12 mmHg
  - Group II:

Mean SBP was 112± 7 mmHg

The P value is 0.11>0.05 **Not significant**

- ❖ DBP
  - Group I:

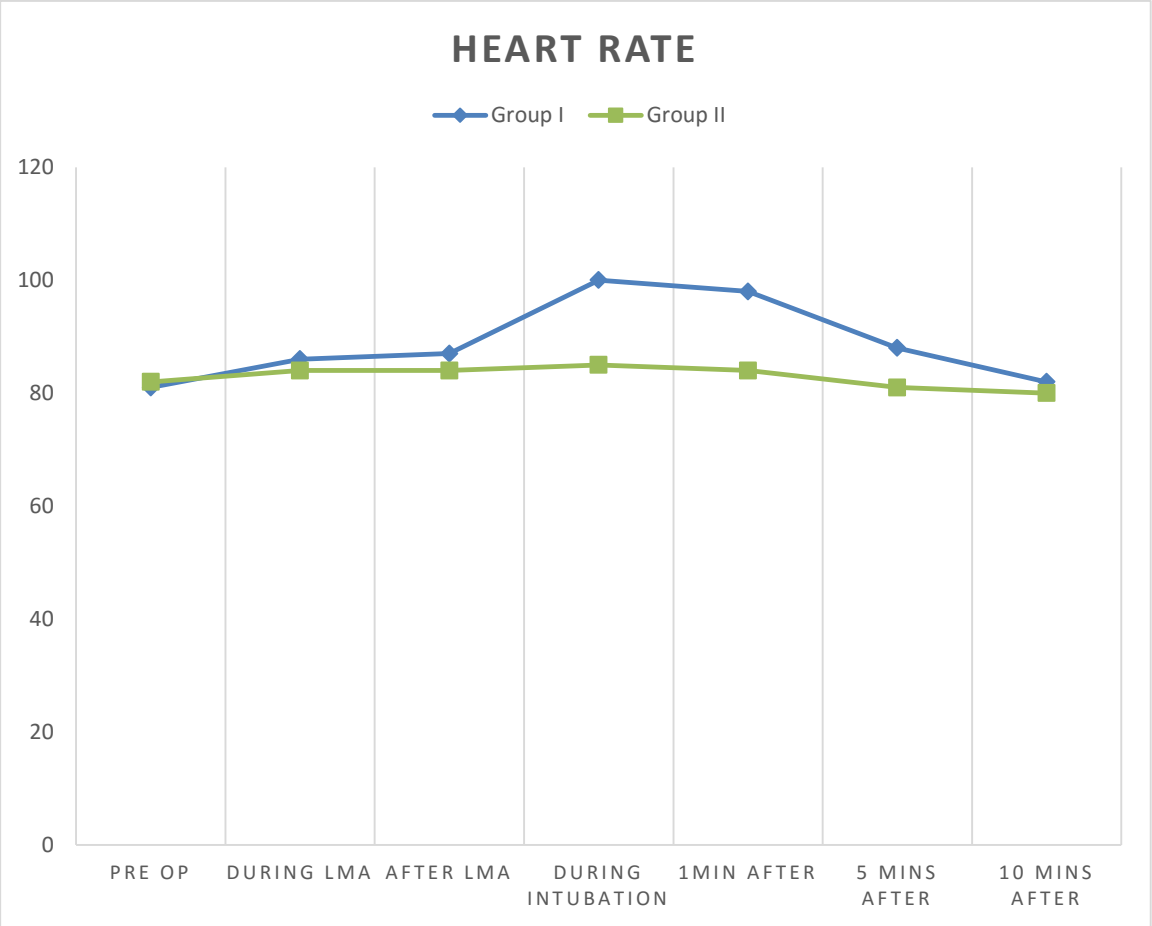
    Mean DBP was 77±7 mmHg
  - Group II:

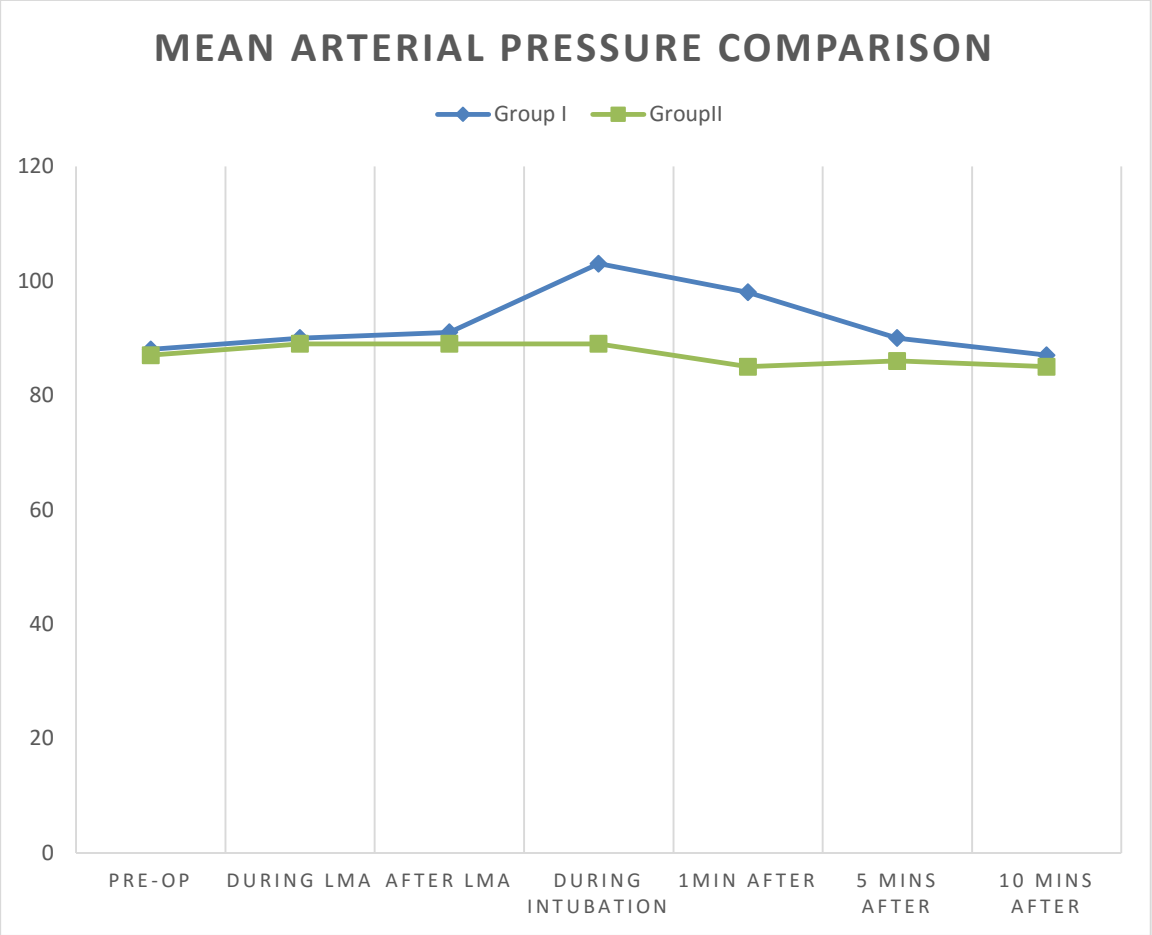
    Mean DBP was 73±8 mmHg

P=0.11>0.05 **Not significant**

- ❖ SpO_2 and $EtCO_2$ was comparable between the two groups and there was no significance for the P value.

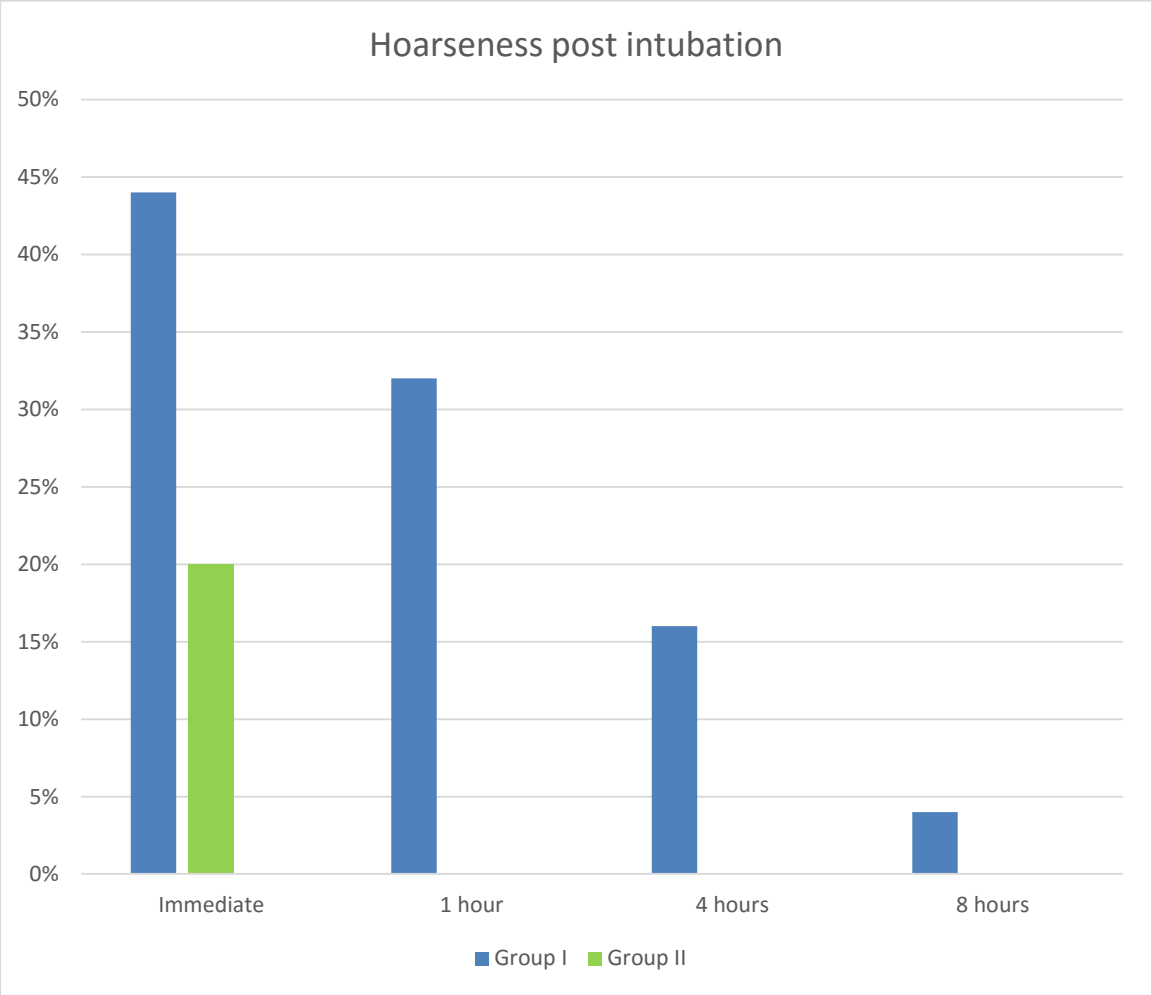
- ➢ <u>10 minutes after intubation</u>
  - ❖ HR, SBP, DBP, SpO2 and EtCO2 were comparable between both the groups and P value was insignificant.


HEART RATE
Group I
Group II
120
100
80
60
40
20
0
PRE OP
DURING LMA
AFTER LMA
DURING INTUBATION
1MIN AFTER
5 MINS AFTER
10 MINS AFTER


MEAN ARTERIAL PRESSURE COMPARISON
Group I
GroupII
120
100
80
60
40
20
0
PRE-OP
DURING LMA
AFTER LMA
DURING INTUBATION
1MIN AFTER
5 MINS AFTER
10 MINS AFTER

POST OPERATIVE COMPLICATIONS

	IMMEDIATE		1 HOUR		4 HOURS		8 HOURS	
	GroupI	**GroupII**	**GroupI**	**GroupII**	**GroupI**	**GroupII**	**GroupI**	**GroupII**
Sore Throat	36%	20%	28%	0%	16%	0%	4%	0%
Hoarseness	44%	20%	32%	0%	16%	0%	4%	0%
Nausea	24%	8%	4%	0%	0%	0%	0%	0%
P value	**Not Significant**		**Significant**		**Significant**		**Not Significant**	


Hoarseness post intubation
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Immediate
1 hour
4 hours
8 hours
Group I
Group II

CONCLUSION

The BLOCKBUSTER™ LMA is a relatively new addition to the LMA family. In the limited studies conducted on it, it has shown promising success for intubation through it, especially using the tube that is manufactured by the same company, the BLOCKBUSTER™ Tube. The BLOCKBUSTER™ Tube is a silicone wire reinforced touhy-tip tube which is pliable and easy to maneuver inside the LMA, thus ensuring better chance of success at intubation.

The Polyvinyl Chloride tube has been in use for years. It is widely available in most of the hospitals, is a cheap one and also has a high volume, low pressure cuff, which is suited for long time intubation. In this study, an attempt has been made to intubate the trachea through the BLOCKBUSTER™ LMA, using both the BLOCKBUSTER™ tube and the conventional PVC tube and to compare the ease of insertion, the hemodynamic changes during intubation and the post-operative complications during the intubation using both of these tubes.

The difficulties due to the conventional tube are probably due to the more obtuse angle of the tip of the PVC tube at which it exits the LMA, compared to the pliable BLOCKBUSTER tube, resulting in

increased impingement of the tip of PVC tube on the anterior part of larynx.

The two groups of patients compared were comparable in all demographical aspects.

The ease of insertion was compared by the time taken for intubation for each tube. On an average, the PVC tube took 55.38±23.22 seconds compared to 33.29±5.4 seconds taken by the BLOCKBUSTER tube.

The time taken for PVC tube insertion is longer, which is consistent with the results shown in studies by **Megha.U.Sharma***et al* and **Veena.R.Shah***et al*for intubation of FTST through ILMA. But the time taken in studies by **Veena.R.Shah***et al* were much lesser than obtained in this study. The longer time could have been due to the relative inexperience with the new equipment. Another reason for longer intubation time could probably be that, in this study, no manoeuvers were used for intubation during the first attempt, in contrast to many other studies, where many maneuvers were used singly or in combination even for the first attempt.

The number of attempts required for successful intubation was also significantly higher for the PVC group, which is also consistent with the other studies. In this study, the PVC tube was inserted with the natural curve facing forward, while in the study by Joo et al, they inserted the PVC tube with the curve facing backwards. Some studies also recommend pre warming the PVC tubes to soften them for easier intubation, though pre-warming was not done in this study. Both these factors may contribute to the increased intubation time for PVC tubes.

Of the cases of successful intubation, 28% in Group I required some manoeuvers for successful intubation while, only 8% required any manoeuvers in Group II. This observation is consistent with the other studies by Megha.U.Sharma et al and Sharma et al.

Group I had a higher HR response and a higher SBP and DBP during intubation and one minute after intubation, compared to Group II. But this increased hemodynamic response got attenuated in the subsequent minutes and was comparable between both the groups during the 5^{th} and 10^{th} minutes. This result contrasts with the one obtained by Megha.U.Sharma et al, who described comparable hemodynamic responses for both the groups. The difference coul probably be due to the better alignment and better hemodynamic profile of the BLOCKBUSTER

tube than the PVC tube, whereby hemodynamic parameters did not alter much from the pre-operative baseline values even during intubation in Group II patients.

SpO_2 was comparable between the two groups at all stages of the procedure and did not fall below 95% during any part of the procedure.

$EtCO_2$ did not fall below 25 or rise above 40 in either groups during the procedure.

Sunitha Kuruvadi *et al* described higher rates of sore throat in PVC group of patients in her study. In this study also patients in the PVC group had significant sore throat and hoarseness for up to 4 hrs post extubation. The incidence of sore throat and hoarseness in immediate extubation period was not found to be significant. After 1 hour of extubation, 28% of Group I patients complained of sore throat and 32% complained of hoarseness of voice. At 8 hours post extubation, only 4% patients in Group I had complaints of sore throat and hoarseness while no patient in Group II had post op sore throat from the first hour post-surgery.

This study had certain limitations. First, the results of the study are only applicable to patients with normal airways. Second, the mask-glottis seating was only ascertained clinically and had no fiberoptic confirmation. Third, as the product is relatively newly launched in the market, there is a dearth of studies with this LMA and hence further studies in more number of patients are required for corroborative evidence.

We conclude from this study that, PVC tubes are a feasible option for intubation via BLOCKBUSTER LMA in patients with normal airways.

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PROFORMA

COMPARISON OF EASE OF INTUBATION OF POLYVINYL ENDOTRACEAL TUBE AND BLOCKBUSTER™ ENDOTRACHEAL TUBE THROUGH LMA BLOCKBUSTER™

Name :

Age/Sex:

Weight :

LMA size: #3 / #4

Tube type: PVC/ Reinforced

	PREOP	DURING LMA	AFTER LMA	DURING ETT	1 MIN AFTER INTUBATION	5MIN	10 MIN	15 MIN
HR								
NIBP								
SPO2								
ETCO2								

1) Time taken total-

   a) LMA –

      (start of LMA insertion to checking of bilateral air entry and capnograph)

b) Intubation-

(time from disconnection of breathing circuit from LMA to the time of successful intubation by bilateral air entry and capnograph)

2) No. of attempts

a. LMA

b. intubation

3) Manoeuvres used

a. LMA

b. Intubation

4) Overall success

a. LMA

b. Intubation

4) Post op complications

	Immediate	1hour	4 hours	8 hours
Sore throat				
Hoarseness				
Nausea				

PATIENT CONSENT FORM

STUDY TITLE:

COMPARISON OF EASE OF INTUBATION OF POLYVINYL ENDOTRACEAL TUBE AND BLOCKBUSTER™ ENDOTRACHEAL TUBE THROUGH LMA BLOCKBUSTER™

STUDY CENTER:

Mahatma Gandhi Memorial Government Hospital, K.A.P.V Government Medical College, Trichy

Participant name:

I.P NO: Age: Sex:

- I confirm that I have understood the purpose of procedure for the above study.
- I have the opportunity to ask any questions and all my questions and doubts have been answered to my satisfaction
- I have been explained about the pitfalls in the procedure.
- I have been explained about the safety, advantage and disadvantage of the technique.
- I understand that my participation in the above study is voluntary and that I have the right to withdraw at any point during the study without disclosing my reasons.

- I understand that my identity will not be revealed in any information released to the third parties or published, unless as required under the law.
- I agree not to restrict the use of any data or results that arise from the study.

Time:

Date:

Sign/thumb impression of patient

Sign of investigator:

Name of investigator:

PATIENT INFORMATION SHEET

INVESTIGATOR: Dr.Maya Menon

PATIENT NAME:

TITLE: COMPARISON OF EASE OF INTUBATION OF POLYVINYL ENDOTRACEAL TUBE AND BLOCKBUSTER™ ENDOTRACHEAL TUBE THROUGH LMA BLOCKBUSTER™

You are invited to take part in this study. We have got the approval of the Institutional Ethics Committee. Since you satisfy the eligibility criteria, you are included in this study. We intend to compare the ease of insertion of two types of endotracheal tube- the Polyvinyl Chloride and BLOCKBUSTER™ tube, when inserted through an LMA.

PURPOSE OF RESEARCH:

For patients undergoing general anaesthesia, endotracheal tube needs to be inserted. BLOCKBUSTER™ LMA is an LMA that allows insertion of an endotracheal tube through it. In this study, we compare the ease of insertion of a Polyvinyl Chloride ETT and a BLOCKBUSTER™ ETT through the LMA

AIMS of the study:

To compare between

1. Overall success rate

2. Hemodynamics during intubation

3. Time taken for intubation

4. No. Of attempts for successful intubation

5. Manoeuvers used for intubation

6. Post-operative complications

THE STUDY DESIGN:

All patients in the study will be divided into two groups-

1. Group 1
2. Group 2

DISCOMFORTS AND RISKS:

- Apnoea and laryngospasm may occur- emergency drugs are readily available.
- Nausea and vomiting may occur.
- Post-operative sore throat and hoarseness may ensue.

This intervention has been shown to be well tolerated by previous studies.

Time:

Date:

Place:

Signature/thumb impression of patient:

Patient name:

Signature of investigator:

Name of investigator:

MASTER CHART

LN	NAME	AGE	SEX	EIGHT	ASA	DIABETY	PREOPERATIVE						DURING LMA INSERTION						AFTER LMA INSERTION						DURING INTUBATION						1 MIN AFTER INTUBATION						5 MINS AFTER INTUBATION						10 MINS AFTER INTUBATION					
							HR	SBP	DBP	MAP	SPO2	TCO	HR	SBP	DBP	MAP	SPO2	TCO	HR	SBP	DBP	MAP	SPO2	TCO	HR	SBP	DBP	MAP	SPO2	TCO	HR	SBP	DBP	MAP	SPO2	TCO	HR	SBP	DBP	MAP	SPO2	TCO	HR	SBP	DBP	MAP	SPO2	TCO
1	STELLA	44	F	45	3	PVC	86	116	64	81.33	98	30	90	110	70	83.33	100		84	120	80	93.33	100	32	90	124	78	93.33	100		79	100	60	73.33	100	33	69	95	60	71.67	100	32	73	100	70	80.00	100	33
2	MANIVEL	47	M	62	4	PVC	108	140	100	113.33	100	30	106	140	90	106.67	100		106	130	90	103.33	100	27	110	130	90	103.33	100		109	130	90	103.33	98	22	96	110	70	83.33	98	22	93	100	70	80.00	100	22
3	SUMATHI	38	F	60	4	PVC	76	120	80	93.33	99	28	83	110	70	83.33	99		84	100	70	80.00	99	32	83	112	70	84.00	100		82	100	70	80.00	99	29	73	100	70	80.00	99	30	74	96	60	72.00	100	30
4	MARIAPPAN	36	M	62	4	PVC	68	140	80	100.00	100	35	76	144	80	101.33	99		70	150	90	110.00	100	35	84	140	90	106.67	98		88	130	90	103.33	99	33	70	120	80	93.33	100	30	64	126	80	95.33	99	32
5	SUNDARI	44	F	46	3	PVC	88	98	66	76.67	100	36	80	101	68	79.00	99		84	102	66	78.00	98	39	98	120	84	96.00	100		106	130	82	98.00	100	38	96	110	70	83.33	98	37	84	110	70	83.33	98	37
6	NAGADEVI	30	F	50	4	PVC	70	130	90	103.33	99	32	80	140	90	106.67	99		86	144	92	109.33	100	33	90	140	90	106.67	99		82	130	90	103.33	99	32	76	130	80	96.67	99	30	80	120	80	93.33	99	32
7	SUNIL	36	M	62	4	PVC	95	140	90	106.67	97	34	101	142	100	114.00	100		98	130	96	107.33	98	36	124	150	107	121.33	99		120	150	100	116.67	99	35	112	140	90	106.67	98	36	96	130	90	103.33	100	33
8	PRASANTH	33	M	58	4	PVC	70	120	76	90.67	100	32	80	130	80	96.67	100		72	120	70	86.67	99	34	96	140	100	113.33	99		102	140	80	100.00	98	32	88	120	70	86.67	99	36	75	110	80	90.00	100	38
9	MONISHA	22	F	39	3	PVC	81	98	66	76.67	98	31	86	110	70	83.33	98		90	115	90	98.33	99	36	94	120	80	93.33	98		90	130	70	90.00	99	30	84	115	80	91.67	100	31	80	110	70	83.33	99	32
10	THARA	21	F	46	3	PVC	78	110	70	83.33	100	30	84	100	70	80.00	100		88	120	70	86.67	100	33	84	110	70	83.33	100		88	100	70	80.00	99	34	87	100	80	86.67	100	31	84	100	70	80.00	100	30
11	ANU KARTHIKA	29	F	33	3	PVC	98	130	74	92.67	100	30	105	120	70	86.67	99		100	120	80	93.33	99	30	117	146	96	112.67	100		108	140	90	106.67	99	29	100	130	70	90.00	98	28	94	124	72	89.33	98	28
12	KANNAKI	43	F	56	4	PVC	74	114	83	93.33	98	30	78	110	70	83.33	100		79	115	72	86.33	99	32	98	130	98	108.67	100		95	132	86	101.33	99	32	88	120	80	93.33	98	35	76	122	82	95.33	99	31
13	PALANIYANDI	35	M	42	3	PVC	66	121	81	94.33	99	38	75	130	80	96.67	99		71	130	70	90.00	100	37	90	150	100	116.67	99		89	144	99	114.00	100	36	67	120	80	93.33	100	37	64	110	70	83.33	100	38
14	MUTHU	40	M	62	4	PVC	70	110	70	83.33	100	31	74	120	78	92.00	100		78	124	77	92.67	100	32	82	140	92	108.00	100		84	137	88	104.33	100	34	79	130	90	103.33	100	30	72	120	80	93.33	100	30
15	THANGARAJ	52	M	60	4	PVC	88	130	90	103.33	98	30	99	130	70	90.00	98		92	120	80	93.33	99	28	120	150	100	116.67	100		122	150	99	116.00	100	29	113	140	90	106.67	97	26	100	130	90	103.33	99	27
16	KRISHNAVENI	26	F	35	3	PVC	90	96	77	83.33	100	33	95	110	70	83.33	99		97	100	70	80.00	100	32	101	120	80	93.33	98		98	110	80	90.00	100	31	94	100	70	80.00	100	33	90	100	60	73.33	100	30
17	THOMAS	28	M	53	4	PVC	84	120	80	93.33	99	30	88	132	78	96.00	99		99	122	86	98.00	100	32	102	144	78	100.00	99		92	140	76	97.33	100	33	80	120	80	93.33	100	31	84	110	70	83.33	99	31
18	KAYAL	33	F	43	3	PVC	100	110	60	76.67	100	25	110	120	66	84.00	100		110	120	70	86.67	98	28	134	152	110	124.00	98		136	141	79	99.67	98	26	122	112	74	86.67	98	26	104	110	70	83.33	98	25
19	SANTHI	35	F	47	3	PVC	96	100	60	73.33	98	34	91	110	64	79.33	99		98	100	70	80.00	100	36	114	126	88	100.67	99		110	120	73	88.67	99	35	101	110	80	90.00	99	34	95	110	70	83.33	99	32
20	PARVATHI	28	F	39	3	PVC	77	120	70	86.67	100	31	78	122	84	96.67	100		80	124	80	94.67	99	30	108	145	86	105.67	100		99	140	80	100.00	100	32	89	132	78	96.00	100	32	80	126	80	95.33	100	30
21	MANICKAM	37	M	55	4	PVC	65	100	60	73.33	100	32	67	104	66	78.67	100		66	105	68	80.33	100	32	91	132	76	94.67	99		92	130	80	96.67	100	33	75	115	81	92.33	100	33	68	110	70	83.33	99	33
22	PRIYA	30	F	41	3	PVC	74	120	70	86.67	98	30	85	126	68	87.33	99		88	129	76	93.67																											
23	RAJESH	18	M	42	3	PVC	81	130	70	90.00	97	29	83	132	76	94.67	97		85	125	68	87.00																											
24	JACOB	19	M	34	3	PVC	90	120	82	94.67	99	32	100	130	90	103.33	99		95	125	86	99.00																											
25	SHIELA	42	F	59	4	PVC	70	100	60	73.33	100	34	74	95	66	75.67	100		75	100	66	77.33																											
							pre						during	lma					after	lma					during	tube					after	tube					5mins						10mins					
1	AJEEBA BEEVI	40	F	62	4	BB	68	120	80	93.33	100	32	76	120	70	86.67	99		72	120	86	97.33	99	32	77	117	86	96.33	99		74	120	90	100.00	99	30	68	110	70	83.33	100	30	70	112	76	88.00	100	30
2	RADHIKA	19	F	40	3	BB	78	100	60	73.33	100	30	75	110	70	83.33	100		78	110	60	76.67	100	33	82	110	70	83.33	99		84	100	60	73.33	100	32	80	95	60	71.67	100	32	76	90	60	70.00	100	30
3	JANAGAN	41	M	60	4	BB	84	130	90	103.33	100	29	88	136	80	98.67	100		88	120	80	93.33	100	30	84	126	90	102.00	100		80	118	75	89.33	100	32	76	120	80	93.33	99	32	74	115	75	88.33	100	32
4	MALATHI	21	F	42	3	BB	100	110	70	83.33	99	25	109	120	80	93.33	99		108	120	70	86.67	100	29	107	120	80	93.33	98		103	116	70	85.33	99	33	105	110	70	83.33	98	26	106	110	80	90.00	100	33
5	RAJESH MARY	56	M	40	3	BB	90	100	60	73.33	100	35	96	120	80	93.33	100		94	110	70	83.33	100	36	98	110	80	90.00	100		92	120	70	86.67	100	36	86	120	80	93.33	100	33	88	112	72	85.33	100	33
6	VALLI	36	F	50	3	BB	78	110	70	83.33	100	36	80	100	70	80.00	98		82	120	80	93.33	99	40	76	110	80	90.00	100		86	100	70	80.00	100	36	90	120	80	93.33	100	35	84	130	80	96.67	99	36
7	KRITHIKA	22	F	45	3	BB	100	120	80	93.33	99	32	92	120	60	80.00	99		96	120	80	93.33	100	35	90	110	70	83.33	99		95	110	70	83.33	99	32	92	115	78	90.33	99	32	92	120	70	86.67	99	35
8	PUSHPA	34	F	65	4	BB	76	130	70	90.00	100	28	82	120	70	86.67	99		80	120	80	93.33	99	31	75	110	80	90.00	100		78	100	60	73.33	99	28	76	116	82	93.33	99	25	81	110	70	83.33	100	25
9	HARIHARAN	30	M	60	4	BB	58	120	80	93.33	99	38	60	126	74	91.33	100		60	120	80	93.33	100	42	62	125	82	96.33	99		58	120	80	93.33	100	40	56	124	82	96.00	100	42	57	110	80	90.00	99	40
10	KANAGA	26	F	36	3	BB	88	110	70	83.33	100	35	96	112	76	88.00	100		80	114	76	88.67	99	33	91	110	70	83.33	99		92	115	68	83.67	98	37	82	110	80	90.00	99	33	85	100	70	80.00	98	33
11	SUSEE PRADEEP	28	M	44	3	BB	71	130	80	96.67	100	34	77	138	82	99.00	99		72	120	70	86.67	98	31	80	123	75	91.00	98		74	120	80	93.33	100	30	75	110	70	83.33	97	33	79	124	80	94.67	99	34
12	SARUMATHI	30	F	58	4	BB	101	100	60	73.33	99	30	82	110	63	78.67	98		88	100	60	73.33	99	36	86	120	70	86.67	98		82	114	72	86.00	99	28	81	100	60	73.33	98	27	76	110	70	83.33	98	30
1	ANITHA	28	F	32	3	BB	83	96	68	77.33	98	35	87	101	57	71.67	100		79	110	70	83.33	100	34	80	115	80	91.67	100		82	120	80	93.33	99	39	75	100	70	80.00	99	35	80	100	70	80.00	100	34
13	VIJAYA	33	F	54	4	BB	80	130	76	94.00	99	29	100	140	90	106.67	99		97	138	88	104.67	98	30	81	127	66	86.33	99		86	124	70	88.00	99	32	79	110	80	90.00	100	36	85	130	70	90.00	100	35
14	VETRI	19	M	40	3	BB	67	100	60	73.33	100	31	70	110	80	90.00	100		70	100	70	80.00	100	36	74	110	80	90.00	100		69	100	60	73.33	100	39	65	110	70	83.33	99	32	62	100	60	73.33	99	31
15	MURUGAN	32	M	64	4	BB	75	124	82	96.00	99	34	81	132	76	94.67	98		80	120	80	93.33	100	35	82	122	70	87.33	99		74	118	68	84.67	99	38	72	120	80	93.33	99	33	77	124	86	98.67	98	33
16	VADIVEL	40	M	66	4	BB	84	110	70	83.33	100	42	85	108	80	89.33	98		92	110	80	90.00	100	35	88	112	77	88.67	100		85	110	70	83.33	98	33	86	110	80	90.00	99	33	82	110	70	83.33	99	32
17	POONKODI	39	F	43	3	BB	92	116	64	81.33	97	32	86	100	70	80.00	99		89	110	80	90.00	98	27	94	120	80	93.33	100		96	120	80	93.33	100	28	90	110	70	83.33	99	25	86	110	80	90.00	100	29
18	SATHYA	27	F	35	3	BB	81	124	82	96.00	100	33	86	122	87	98.67	100		84	130	70	90.00	99	35	88	120	70	86.67	100		84	130	70	90.00	100	33	80	120	80	93.33	100	32	77	110	80	90.00	100	35
19	PREMANATH	28	M	56	4	BB	78	100	60	73.33	100	33	77	100	60	73.33	100		74	110	70	83.33	99	37	78	110	66	80.67	100		74	100	70	80.00	100	34	70	110	80	90.00	100	36	72	110	70	83.33	100	37
20	RAMYA	21	F	38	3	BB	72	96	70	78.67	98	36	78	110	70	83.33	98		75	100	60	73.33	98	35	82	110	70	83.33	99		80	100	70	80.00	98	38	74	100	60	73.33	99	31	72	95	66	75.67	98	35
21	VIJAY	32	M	54	4	BB	96	120	80	93.33	100	39	94	120	80	93.33	96		96	128	69	88.67	98	40	98	120	70	86.67	99		96	114	66	82.00	98	44	94	120	80	93.33	97	40	95	120	70	86.67	100	41
22	HAMID	24	M	60	4	BB	85	120	70	86.67	97	35	92	126	80	95.33	98		90	120	80	93.33	97	30	99	128	85	99.33	99		101	130	70	90.00	99	33	95	120	70	86.67	99	31	90	124	68	86.67	98	30
23	THANGAM KANNU	40	F	39	3	BB	74	130	70	90.00	99	37	78	120	76	90.67	99		83	130	80	96.67	98	35	82	126	88	100.67	100		83	130	70	90.00	99	34	80	120	60	80.00	100	33	74	130	70	90.00	99	30
24	THIRU	17	M	46	3	BB	99	110	80	90.00	100	34	95	100	70	80.00	99		96	110	80	90.00	100	36	100	100	70	80.00	99		97	110	80	90.00	99	35	92	100	60	73.33	100	36	94	100	60	73.33	100	38
25	AMBIKA	45	F	57	4	BB	100	140	90	106.67	98	28	106	150	90	110.00	98		99	134	86	102.00																											
							pre						during	lma					after	lma					during	tube					after	tube					5mins						10mins					

SL.NO	NAME	AGE	SEX	WEIGHT	LMA SIZE	TUBE TYPE	TIME TAKEN FOR LMA	TIME TAKEN FOR INTUBATION	NUMBER OF ATTEMPTS LMA	NUMBER OF ATTEMPTS INTUBATION	MANOEVERS USED LMA	MANOEVERS USED INTUBATION	POSTOPERATIVE COMPLICATIONS											
													IMMEDIATE			1HR			4HR			8HR		
													SORE THROAT	HOARSENESS	NAUSEA	SORE THROAT	HOARSENESS	NAUSEA	SORE THROAT	HOARSENESS	NAUSEA	SORE THROAT	HOARSENESS	NAUSEA
1	STELLA	44	F	45	3	PVC	30	48	1	1	NONE	NONE	NO	YES	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO
2	MANIVEL	47	M	62	4	PVC	88	45	2	1	JAW THRUST	NONE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3	SUMATHI	38	F	60	4	PVC	33	41	1	1	NONE	NONE	YES	YES	NO	YES	YES	NO	YES	YES	NO	NO	YES	NO
4	MARIAPPAN	36	M	62	4	PVC	30	55	2	1	JAW THRUST	none	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	NO	NO
5	SUNDARI	44	F	46	3	PVC	45	115	1	3	NONE	JAW THRUST,	YES	YES	YES	YES	YES	NO	YES	YES	NO	YES	NO	NO
6	NAGADEVI	30	F	50	4	PVC	42	62	1	2		none	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO	NO
7	SUNIL	36	M	62	4	PVC	36	76	1	2		JAW THRUST	YES	YES	YES	YES	YES	NO	YES	YES	NO	NO	NO	NO
8	PRASANTH	33	M	58	4	PVC	37	42	1	1			YES	YES	NO	NO	NO	N	N	NO	N	NO	NO	N
9	MONISHA	22	F	39	3	PVC	36	47	1	1			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10	THARA	21	F	46	3	PVC	37	52	1	2		CHANDYS	YES	YES	YES	YES	YES	Y	NO	NO	N	NO	NO	N
11	NU KARTHIK	29	F	33	3	PVC	34	50	1	2		REINSERT	Y	NO	N	YES	NO	N	Y	NO	N	NO	NO	N
12	KANNAKI	43	F	56	4	PVC	38	48	1	1			N											
13	PALANIYAND	35	M	42	3	PVC	37	42	1	1	ROTATION		N	YES	N	NO	NO	N	N	NO	N	NO	NO	N
14	MUTHU	40	M	62	4	PVC	60	126	2	2	REINSERT	JAW THRUST,CH	YES	YES	YES	YES	NO	N	N	NO	N	NO	NO	N
15	THANGARAJ	52	M	60	4	PVC	39	47	1	2			Y	NO	N	NO	NO	N	N	NO	N	NO	NO	N
16	KRISHNAVEN	26	F	35	3	PVC	37	44	1	1			N											
17	THOMAS	28	M	53	4	PVC	33	50	1	2		PULL UP	N											
18	KAYAL	33	F	43	3	PVC	41	41	1	1			N											
19	SANTHI	35	F	47	3	PVC	35	39	1	1			N	YES	N	N	YES	N	N	NO	N	NO	NO	N
20	PARVATHI	28	F	39	3	PVC	33	43	1	1			N											
21	MANICKAM	37	M	55	4	PVC	35	50	1	2		CHANDYS	N	NO	YES	N	NO	N	N	NO	N	NO	NO	N
22	PRIYA	30	F	41	3	PVC																		
23	RAJESH	18	M	42	3	PVC																		
24	JACOB	19	M	34	3	PVC																		
25	SHIELA	42	F	59	4	PVC																		
1	AJEEBA BEE	40	F	62	4	BB	34	42	1	1		NONE	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2	RADHIKA	19	F	40	3	BB	32	38	1	1		NONE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3	JANAGAN	41	M	60	4	BB	34	40	1	2	NONE	CHANDYS	YES	NO	YES	NO	NO	NO	NO	NO	N	NO	NO	NO
4	MALATHI	21	F	42	3	BB	32	20	1	1			NO	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	NO
5	RAJESH MA	36	M	40	3	BB	35	38	1	1	NONE		YES	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	NO
6	VALLI	36	F	50	3	BB	36	30	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
7	KRITHIKA	22	F	45	3	BB	48	27	2	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
8	PUSHPA	34	F	65	4	BB	34	31	1	1			YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	N
9	HARIHARAN	30	M	60	4	BB	37	36	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
10	KANAGA	26	F	36	3	BB	35	30	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
11	SUSEE PRAD	28	M	44	3	BB	39	34	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
12	SARUMATH	30	F	58	4	BB	36	33	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
1	ANITHA	28	F	32	3	BB	30	29	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
13	VIJAYA	33	F	54	4	BB	48	36	2	1			N	Y	NO	NO	NO	NO	NO	NO	N	NO	NO	N
14	VETRI	19	M	40	3	BB	32	30	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
15	MURUGAN	32	M	64	4	BB	40	36	2	1	REINSERT		N	Y	NO	NO	NO	NO	NO	NO	N	NO	NO	N
16	VADIVEL	40	M	66	4	BB	38	45	1	2		JAW THRUST	Y	Y	Y	NO	NO	NO	NO	NO	N	NO	NO	N
17	POONKODI	39	F	43	3	BB	37	28	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
18	SATHYA	27	F	35	3	BB	35	33	1	1			N	NO		NO	NO	NO	NO	NO	N	NO	NO	N
19	PREMANAT	28	M	56	4	BB	50	34	2	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
20	RAMYA	21	F	38	3	BB	39	31	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
21	VIJAY	32	M	54	4	BB	36	34	1	1			N	NO	NO	NO	NO	NO	NO	NO	N	NO	NO	N
22	HAMID	24	M	60	4	BB	45	30	1	1			N	Y	NO	NO	NO	NO	NO	NO	N	NO	NO	N
23	THANGAM	40	F	39	3	BB	40	27	1	1			N	NO	NO	N	N	NO	NO	NO	N	NO	NO	N
24	THIRU	17	M	46	3	BB	33	36	1	1			N	NO	NO	N	NN	NO	NO	NO	N	NO	NO	N
25	AMBIKA	45	F	57	4	BB																	NO	N