A COMPARATIVE EVALUATION OF THE PROSEAL LARYNGEAL MASK AIRWAY, THE LARYNGEAL MASK AIRWAY SUPREME AND THE IGEL IN ANAESTHETIZED UNPARALYZED PATIENTS

A STUDY OF 90 CASES

Dissertation submitted for

Doctor of Medicine, Branch X (Anaesthesiology)

THE TAMIL NADU DR. MGR MEDICAL UNIVERSITY

CHENNAI

APRIL 2013

CERTIFICATE

This is to certify that the dissertation "**ACOMPARATIVE EVALUATION OF THE PROSEAL LARYNGEAL MASK AIRWAY,THE LARYNGEAL MASK AIRWAY SUPREME AND THE IGEL IN ANAESTHETHIZED UNPARALYZED PATIENTS**" is a bonafide record of work done by **Dr.M.LEELAKRISHNAKUMAR**, under my direct guidance and supervision in partial fulfillment of the examination requirements for MD (branch X) Anaesthesiology during the academic period May 2010-April 2013. The observations recorded here represent original work done by the student and found correct.

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Certificate of Approval

This is to certify that the Institutional Ethical Committee of this College unanimously approves the Thesis /Dissertation/ Research Proposal submitted before this committee by Dr. M.LEELA KRISHNA KUMAR, a **POSTGRADUATE IN ANESTHESIOLOGY** in the Department of **ANESTHESIOLOGY**, of Tirunelveli Medical College /Hospital, Tirunelveli titled **"COMPARISON OF PROSEAL LARYNGEAL MASK AIRWAY, LARYNGEL MASK AIRWAY SUPREME AND I GEL IN ANAESTHETIZED NON PARALYSED PATIENTS"** registered by the IEC as 089/ANAES./IEC/2011 dated. 12.8.2011. The Investigator is hereby advised to adhere to all the stipulated norms and conditions of this ethical committee.

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DECLARATION

I, DR.M.LEELAKRISHNAKUMAR declare that the dissertation titled“**ACOMPARATIVE EVALUATION OF THE PROSEAL LARYNGEAL MASK AIRWAY, THE LARYNGEALMASK AIRWAY SUPREME ANDTHE IGEL IN ANAESTHETIZED UNPARALYZED PATIENTS”**has been prepared by me.

This is submitted to The Tamil NaduDr. MGR Medical University, Chennai, in partial fulfillment of the requirement for the award of M.D. Degree, Branch X (ANAESTHESIOLOGY) degree examination to be held in April 2013.

Place: Tirunelveli

Date: DR.M.LEELAKRISHNAKUMAR

ACKNOWLEDGEMENT

I wish to express my sincere thanks to **Prof. Dr.Manoharan** MS., Dean, Tirunelveli Medical College, Tirunelveli, for having kindly permitted me to use the hospital facilities.

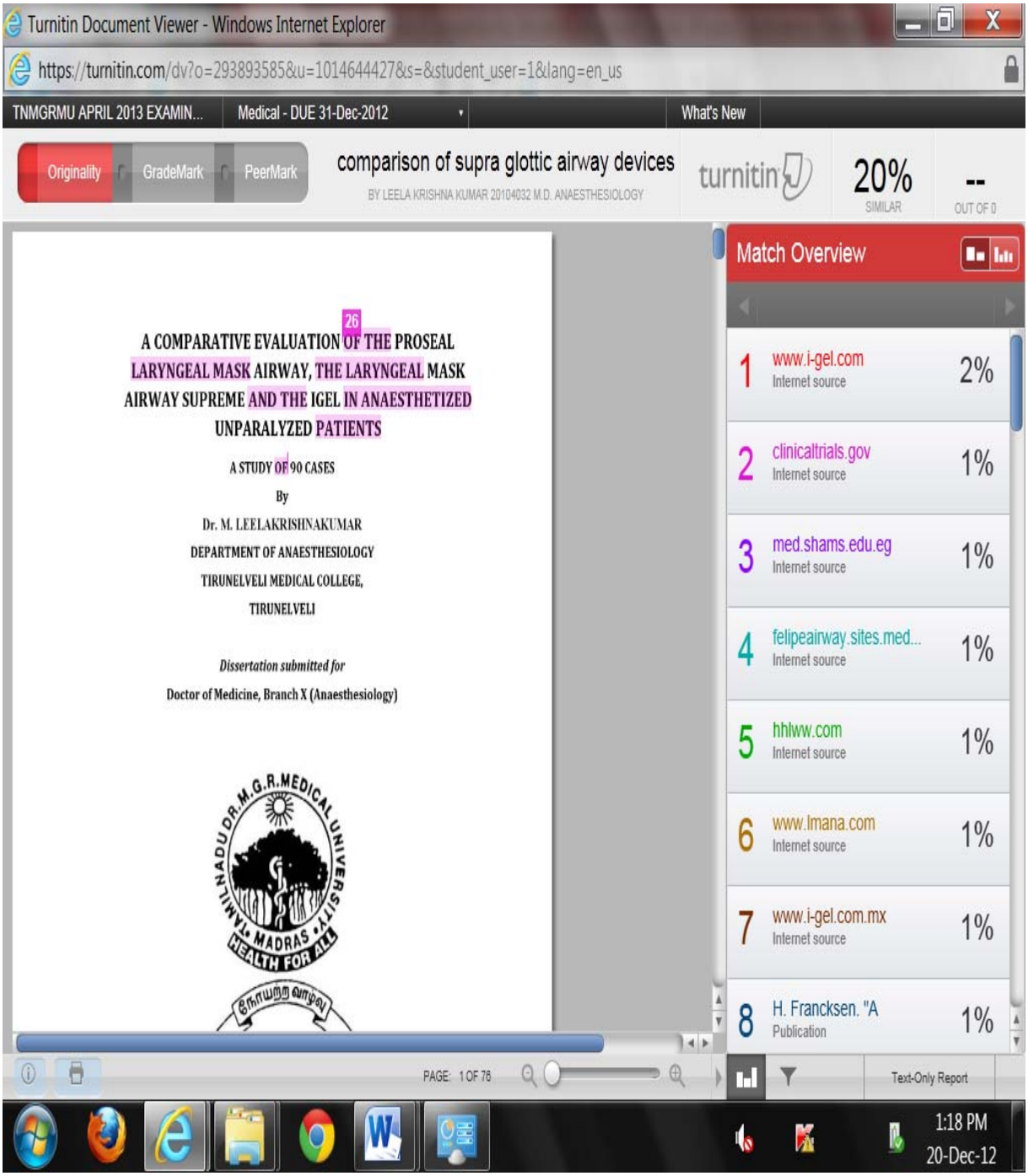
I am deeply indebted to **Prof. Dr. A. Thavamani** MD., DA., Professor and Head of the Department of Anaesthesiology, Tirunelveli Medical College, Tirunelveli for the able guidance, inspiration and encouragement rendered at every stage of this study.

I express my gratitude to **Prof. Dr. A. Balakrishnan**, MD., Professor of Anaesthesiology, for his able assistance and guidance in doing this project.

I extend my thanks to **Prof. Dr. V. Nalini** M.D., and **Prof. Dr**. **K.Sevagamoorthy** MD., Associate Professors of Anaesthesiology for their valuable advice and encouragement to conduct this study. I express my profound thanks to **Dr.C.SankaranM.D**., Assistant Professor of Anaesthesiology for his valuable assistance and guidance to perform this study.

I am also thankful to all the Assistant Professors and Senior Residents for their guidance in doing this project.

Last but not the least, I gratefully acknowledge the patients for submitting themselves for this study.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comparison of supra glottic airway devices
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INTRODUCTION

Supraglottic Airway Devices (SAD) have become a standard fixture in airway management. These devices sit outside the trachea but provide ahandsfree means of achieving a gas-tight airway. The first successful supraglottic airway device, the Laryngeal Mask Airway (LMA)-Classic, became available in 1989. Many varieties of supraglottic devices are developed after the overwhelming success of the laryngeal maskairway (LMA).

Supraglottic devices use both inflatable and noninflatable cuff that fit into thepharynx and laryngopharynx and gives anoropharyngeal airway seal. The structuretheseairway gadgets provides an effective seal over the larynx of the patients. But one of the major limitations of these types of airways is the lack of airway protection from regurgitation especially in patients withoutfasting, pregnant patients, & and patients who have increased airway resistance.Supraglottic devices have reducedhemodynamic response during airway stimulation. In this study we tried to compare the performance of three supraglottic devices, the LMA Proseal , I gel and LMA Supreme.

A quite number of studies have been done by using muscle relaxant for SAD insertion. Gasteiger et al, eschertzhuber et al, saraswat et al have used muscle relaxant for SAD insertion. In most of the studies only two SADs have been compared. Also mostly in anaesthetized paralyzed patients.In this study we used three devices in anaesthetizednon paralyzed patients during induction.

AIM OF THE STUDY

To study the

1. *Effective oropharyngeal leak pressure*
2. *Time taken for insertion*
3. *Number of attempts for insertion*
4. *Hemodynamic responses*
5. *Ease of gastric tube insertion*
6. *Complications*

HISTORY OF SUPRAGLOTTICAIRWAYDEVICES

Dr. A. I. J. “Archie” Brain was the prime one to recognize the principleof the LMA in1981 when, like many British clinicians, he provided dental anesthesia via a Goldman Nasal Mask.Scores ofBrain's prototypes are displayed in the Royal BerkshireHospital, Reading, England, where they provide a detailed record of the evolution of the LMA.The first study and paperregarding the laryngeal mask airway, presented in 1983 in the British Journal ofAnaesthesia ,experiment studied only 23 patients andfocussedpoor attention. The next study regarding SADused 118 patients published in the heading of “development and trials of a new type of airway” and.

.During the year 1988, the supraglottic now known as the “Classic” LMA was officially released in England. Eventhoughthe classic LMA was immediately came into the market in england, FDA approved its use in America only in 1991.

ANATOMY OF THE UPPER AIRWAY

PHARYNX

The pharynx is a made up of a broad tube of musculature and fibrous tissue that forms the common pathway of the airway and gastrointestinal tracts.It comprises of three divisions, the nasopharynx, oropharynx and laryngopharynx. It extends from base of skull (base of occipital bone) to the beginning of the oesophagus corresponding to 6^{th} cervical vertebra (C_6).

The nasopharynxprimarily has a gas transport function.The oropharynx beginsafter the soft palate and ends at the beginning of epiglottis. The laryngopharynx (hypopharynx) starts and ends in between the C4 and C6 vertebrae, begins at the top of the epiglottis, and ends at the level of inferior border of the cricoid cartilage, at that point it tapers and continuous as esophagus. This is section of pharynx that is related to the insertion and seat of SADs.

PHARYNGEAL CONFORMATION DURING ANAESTHESIA

When a person is given general anaesthesia in the lying down position, the airway becomes obstructed due to loss of muscle tone of pharyngeal muscles and the tongue falling behind to obstruct the pharynx and the airway.The soft palate and epiglottis may plays an function in the obstruction of upper airway and pharynx.TheLMAprovides an effective measure of relieving obstructionof the airway.

LARYNGEAL CARTILAGES

The framework of larynx is made of 9 cartilages. These are the unpaired and paired cartilages.the unpaired ones are the thyroid, cricoid, and epiglottis and the paired ones are the arytenoids, the corniculates cartilages, and the cuneiforms.Of which epiglottis is important in terms of supra glottis airway device function.

EPIGLOTTIS

The epiglottis is an unpaired cartilage of the larynx that functionally separates the oropharynx and laryngopharynx. It prevents aspiration by covering the glottis during swallowing. It is in the shape of a leaf. It is attached to lower end of thyroid cartilage by means of the thyro-epiglottic ligament. The upper part of the epiglottis is free and covered by mucous membrane. The depressions on the either side of the median epiglottic fold iscalledas the vallecula. It is a common site for lodgement of the foreign body. It is the most common airway structure that interferes with the proper placement of the supraglottic airway devices.

CAVITY OF LARYNX

The laryngeal cavity lies between the inlet of the larynx to inferior border of cricoid cartilage.Two folds will be seen in the laryngeal cavity, the upper one is vestibular folds or the false vocal cords, the lower one is the lower vocal folds or the true vocal cords. The area lying between the true vocal cords is the rimaglottidis, orglottis. The pyriform sinus is the part of larynx lying on the either side of thearyepiglottic fold.

MALLAMPATTI CLASSIFICATION

Class I - uvula, faucial pillars, soft palate and hard palate are visible.

Class II - tip of uvula not visible.

Class III - the soft palate and the hard palateseen.

Class IV -the hard palate alone is visible

Class I and II are considered to easy intubation.

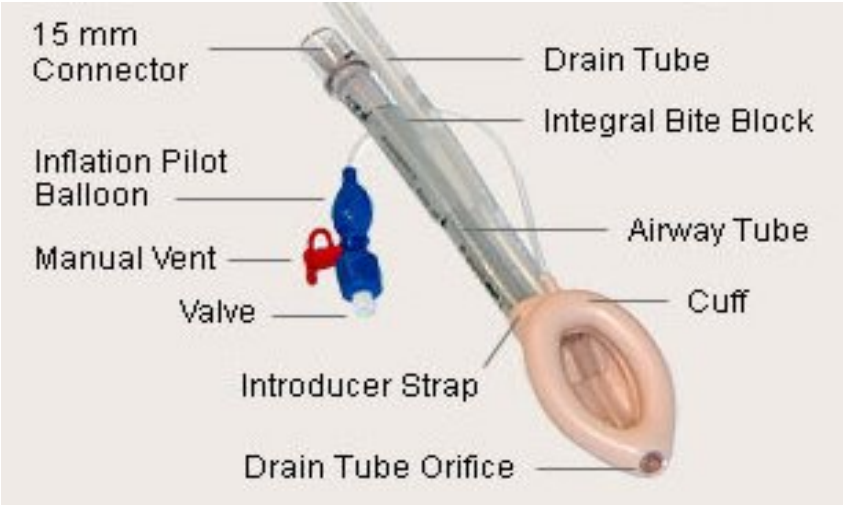
Class III and IV like to have difficult intubation.

SUPRAGLOTTIC AIRWAY DEVICES

TYPES

1. Laryngeal mask airway classic
2. Laryngeal mask airway unique
3. Proseal Laryngeal mask airway
4. Laryngeal mask airwayfastrach
5. Laryngeal mask airwayC-trach
6. AmbuLaryngeal mask airway
7. Intubating Laryngeal Airway
8. Laryngeal Tube Airway
9. Laryngeal tube suction
10. Perilaryngeal airway
11. Streamlined Pharynx Airway Liner
12. I Gel
13. Laryngeal mask airway supreme

PROSEAL LMA



The LMA-Proseal has four main parts: the cuff, inflation line with pilot balloon, airway tube, and drain (gastric access) tube. All components are made from silicone and are latex-free.

Proseal LMA is a laryngeal mask airway device with analtered cuff to improve the seal and a drain tube to

1) Prevent aspiration
2) Facilitate gastric tube insertion
3) Prevent gastric insufflation

It is available in six sizes.

LMA Size	Patient Size (kg)	Maximum Cuff Inflation Volume (mL)	Maximum Gastric Tube Size (French)	Maximum Fiberoptic Scope Size (mm)	Length of Drain Tube (cm)	Largest Tracheal Tube (ID in mm)
1.5	5 to 10	7	10	—	18.2	4.0 uncuffed
2	10 to 20	10	10	—	19.0	4.0 uncuffed
2.5	20 to 30	14	14	—	23.0	4.5 uncuffed
3	30 to 50	20	16	—	26.5	5.0 uncuffed
4	50 to 70	30	16	4	27.5	5.0 uncuffed
5	70 to 100	40	18	5	28.5	6.0 cuffed

Special Features:

The airway tube of the LMA-ProSeal is short and small in terms ofdiameter than that of the LMA-Classic and is wire reinforced, which makesit more flexible and prevents it from kinking. The depth of the mask of LMA-ProSealmore than that of LMA-Classic and does not have epiglottic aperture bars. There is a bite block between the tubingsat the level where the teeth would contact the device.

When the LMA-ProSeal is properly positioned, the conical tip of the cuff lies posterior to cricoid cartilage. It allows liquids and gases to escape from stomach, decreases danger of stomachdistension and lung aspiration, allows devices to pass into the esophagus, and provides information about the LMA–ProSeal position.The drain tube prevents the epiglottis from occluding the airway tube, eliminating the need for epiglottic bars. The LMA-ProSeal has a second dorsal cuff. This pushes the mask forwards to provide aneffectiveseal around the inlet of larynx andhelps to stabilize the device in place. The dorsal cuff is not present on sizes $1^1/_2$ to $2^1/_2$.

Insertion Methods:

Introducer Technique:

The tip of the metal introducer is inserted into the strap at the top of thecuff. The airway and drainage tubes are folded around the introducer blade and into matching slots on either side of the introducer. Lubricant should be placed on the posterior tip. The tip is then pressed against the hard palateand maneuvered to spread the lubricant along the hard palate. If the palateis high, a slightly lateral approach may be needed. The cuff is thenslidedinward, keeping pressure against the palatethe introducer is kept close to the chin. The cuff should be observed to make certain that it has not folded over. The introducer is swung inward in a smooth circular movement.

The jaw can be pulled downward by an assistant or pushed downward with the middle finger until the cuff has passed the teeth. The LMA-ProSeal is advanced until resistance is felt. The non-dominant hand should be used to stabilize the airway tube as the introducer is removed by following the curvature backward out of the mouth, taking care to avoid damage to the teeth.

Digital Method

The digital method for insertion is similar to the introducer method.The tip of the index finger is placed at the meeting point of the cuff and the airway tube. As the index finger passes into the mouth, the finger joint is extended and the LMA-Proseal is pressed backward towards the hard palatewhile maintaining the head in the sniffing position with the other hand. Depending on patient and the person doing the insertion, the finger may have to be inserted to its whole extent before a definite resistance is felt. The nondominant hand should be used to stabilize the LMA as the finger is withdrawn.The thumb may be used to aid insertion when it is difficult to get accesstothe patient from behind. The thumb is inserted into the strap.

Guided Method

With this technique, a lubricated stylet, bougie, fiberopticendoscope,suction catheter, lightwand, or gastric tube is first placed through the drain tube.This method avoids folding the tip backward. It is more successful and less traumatic than using the introducer tool or digital methods. This method has been used for patients with known difficult airways.

Cuff Inflation:

After the insertion of LMA-ProSeal, the cuff is inflated with air to achieve an cuff pressure of 60 cm H_2O. During insertion and cuff inflation, the anterior part of the neck must be noted for the forward movement of cricoid cartilage. This indicates correct placement of LMA. The cuff volume required for the LMA-ProSeal to form anoropharyngealseal is lower than for the LMA-Classic.

Tracheal Intubation through the LMA-ProSeal:

Tracheal intubation through the LMA-ProSeal requires a long narrow tracheal tube or an airway exchange catheter. After the LMA-ProSeal is removed, a larger tube can be substituted, if necessary.

Use:

The LMA-ProSeal can be used for both spontaneous and controlled ventilation, but is more suited for controlled ventilation. The oropharyngealseal pressure is higher than with the LMA-Classic in adult and children, making it a better choice for situations where higher airway pressures are required, where better airway protection is desirable, and for surgeries where intraoperative stomach decompression is needed. Case reports show no aspiration of gastric

contents despite regurgitation or vomiting unless the LMA-ProSeal is malpositioned. However, aspiration has been reported with malpositioning.

It may be easier to place the LMA-ProSeal than the LMA-Classic during manual in-line neck stabilization. It has been used in cases of known difficult airway and has been successfully used after failure with an LMA-Classic.

Problems with the LMA-ProSeal

The LMA-Proseal is less suitable as an intubation device than the LMA-Fastrach because of the narrower airway tube. The high resistance associated with the smaller lumen may make it less suitable for use with spontaneously breathing patients than other devices. LMA-ProSeal may be somewhat more difficult and take slightly longer to insert than the LMA-Classic in adults, although overall success is equivalent. The incidence of intraoperative complications and postoperative sore throat are similar. In children, the ease of insertion is similar to the LMA-Classic. The LMA-ProSeal requires a greater depth of anesthesia for insertion than does the LMA-Classic.

The LMA-ProSeal can cause airway obstruction after insertion, either by compressing the supraglottic and glottic structures or by cuff infolding. Removing air from the cuff or placing the patient in the sniffing position may relieve the obstruction.

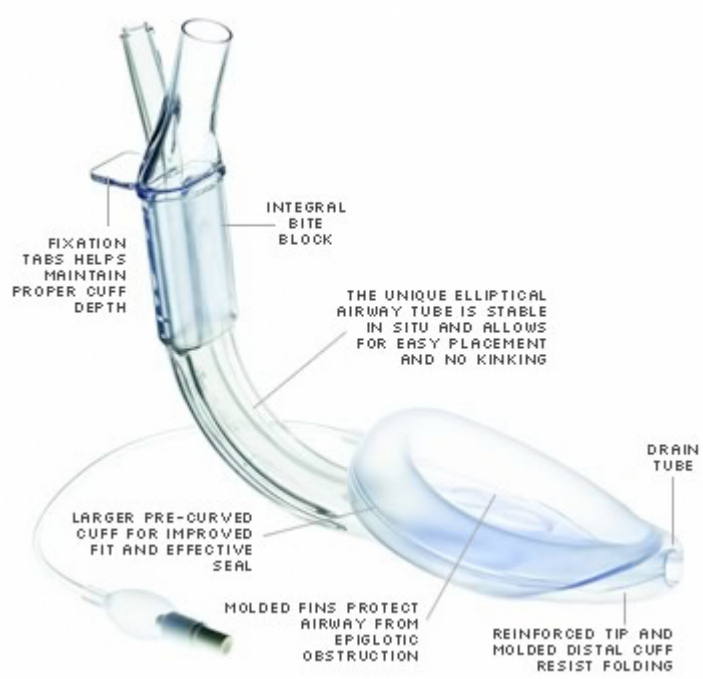
Improper placement of airway leads to leakage of air into the esophagus. Esophageal insufflation can occur simultaneously with venting from the drainage tube during controlledventilation with malposition. This may result in inadequate ventilation.

It may not be possible to insert a gastric tube in some patients. This may be due to selection of too large a tube, inadequate lubrication, using a cooled gastric tube, cuff overinflation, or malpositioning.

The LMA-ProSeal is relatively contraindicated for intraoral surgery because the drainage tube is vulnerable to occlusion, and the larger cuff could interfere with the surgical field.

The proseal laryngeal mask airway has a shorter life span than the LMA-Classic.

LMA SUPREME:



The Laryngeal Mask Airway Supreme is a new supra glotticdevice that incorporatesthe features of LMAProSealand the LMA Fastrach.

LMA supreme is designed in such a way that the cuff a higherairway effective seal pressure than LMA Classic, and a drain tube thatpromotes thedrainage of the stomach contents, and easy insertion of the routine gastric tubes. These factors are meant to reduce the gastric insufflation, regurgitation, and

subsequent pulmonary aspiration. These properties of the laryngealmask airways aretheoretic advantages, and suggestive of greater protectionwith regard to aspiration pneumonitis. Consequently, theyhave been used for the airway management in patients withincreased risk of pulmonary aspiration and in patientswhere a higher airway sealing pressure is needed.

The LMA Supreme has some similar characteristicsto the LMA Proseal. It is introduced in the late 2007, it is considered to be the most advanced supraglottic airway device.

SIZE	WEIGHT AND AGE GROUP (kg)	CUFF VOLUME (ml)	SIZE OF GASTRIC TUBE (Fr)
1	Neonates/infants < 5 kg	5	6
1.5	Infants 5-10 kg	8	6
2	Infants 10-20 kg	12	10
2.5	Children 20-30 kg	20	10
3	Children 30-50 kg	30	14
4	Adults 50-70 kg	45	14
5	Adults 70-100 kg	45	14

Features:

- Single use
- Anatomic curve that facilitates easy insertion
- The tip of the deflated LMA supreme points more anteriorly than a deflatedLMAunique, making it less likely to fold back on itself during insertion
- A gastric tube to allow gastric drainage
- A high volume/ low pressure cuff which generates higher seal pressure
- A built-in bite block and fixation tab to help secure the airway
- An oval airway cross section for improved stability of the airway

The LMA Supreme is a new supraglotticdevice which has the features of both the LMA Proseal (high seal cuff, gastric access and biteblock – to facilitate ventilation, airway protection and airway obstruction, respectively) and the LMA Fastrach (fixed curved tube and guiding handle – to facilitate insertion and fixation) and the LMA Unique (single use – prevention of disease transmission).

The supreme LMA has a curved shaft. The mask of which isoval-shaped to mimic the shape of the mouth and toreduce movement in the pharynx.The cuff of the supreme LMA supreme has been improved to prevent airway obstruction fromdown folding of epiglottis and epiglottis fins have been incorporated to preventairway obstruction from epiglotticdown folding.

INSERTION TECHNIUE:

The LMA supreme was inserted with cuff fully deflated using a single handed rotational technique. Since the shaft is rigid with one single swiping movement it can be easily inserted into the pharynx.

Special features:

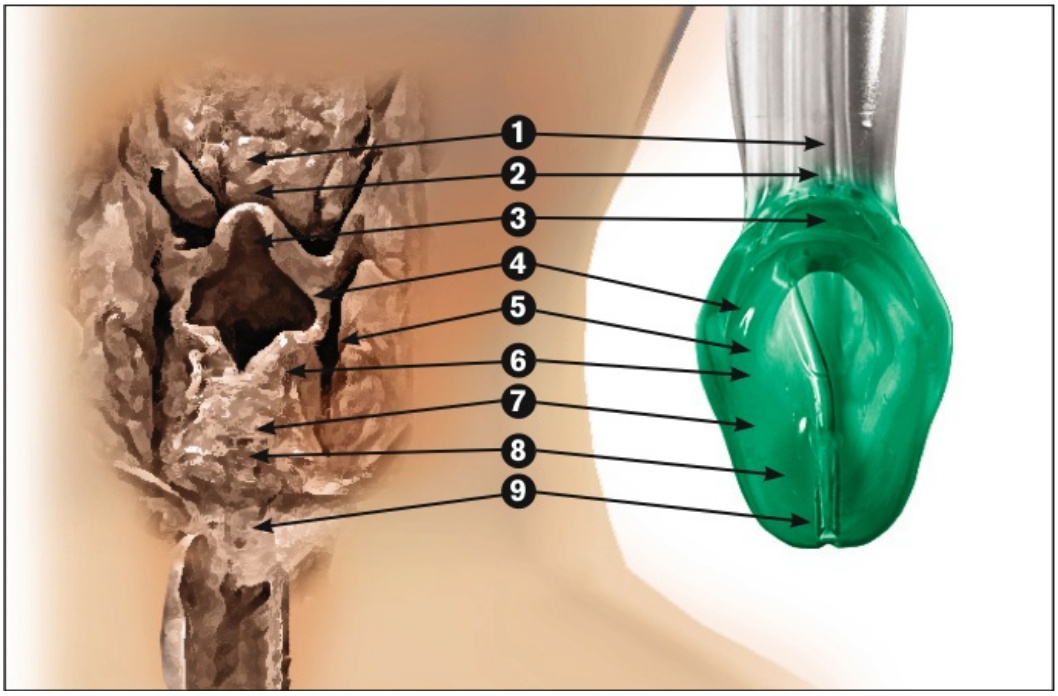
Epiglottic rest:

It is an artificial like epiglottis and it has a protective ridge that helps preventing the epiglottis from down-folding or obstructing the distal opening of the airway. The epiglottic ridge at the proximal end of the bowl rests at the base of the tongue, thus keeping the device from moving upwards out of position and the tip from moving out of the upper oesophagus.

Buccal cavity stabilizer:

The buccal cavity stabiliserhas a rigid curve and easily adapts into shape to the oropharyngeal curvature of the patient. It is anatomically widened, not rounded but flat and curved to eliminate the potential for rotation, thereby reducing the risk of rotation and slipping of the airway. It also provideslongitudinal strength to aid insertion.

I GEL:



1. Tongue
2. Base of tongue
3. Epiglottis
4. Aryepiglottic folds
5. Piriform fossa
6. Posterior cartilages
7. Thyroid cartilage
8. Cricoid cartilage
9. Upper oesophageal opening

The I-gel is a recent supraglottic airway device with a noninflatablecuff used in anaesthesia. The I-gel airway is made of soft gel-like, transparent medical grade thermoplastic elastomer called SEBS (Styrene Ethylene Butadiene Styrene).

The soft gel like non-inflatable cuff is designed in such a way that the mask perfectly fits ontoperilaryngeal anatomy. The mask of the I gel manufactured in such a that it forms a mirror image of the perilaryngeal anatomy. This design is meant to produces a perfect leak proof seal. The oropharyngealsealpressure createdby I gel is effective for both spontaneous ventilation and controlled ventilation.

The I-gelproduces a mirror impression of perilaryngeal anatomy without producing any trauma or airway morbidity or without any distortion.This accurate position provides reliable oropharyngeal seal and therefore no cuff inflation is necessary.

Advantages of a supraglottic airway witha noninflatable cuff:

1.easierinsertion

2.minimal risk of tissue compression

3.stability after insertion (i.e. no position changewith cuff inflation)

The I-gelis designed as a latex free, sterile, single patient use device.The I gel has a epiglottic ridge and rigid flat shaft that aids in stability after insertion and provides a vertical stability.

INSERTION TECHNIQUE:

Insertion of the I-geldoes not require any maneuver. The patient is placed in the ‘morning sniffing’ position with extension of head and flexion of neck. The device is held at the middle of the shaft with concavity facing anteriorly. The soft mask of the I gel is inserted in to the mouth in the direction towards the hard palate. The device advanced downwards and backwards with a continuous movement until a definitive resistance is felt.

I gel can be used a conduit for endotracheal tube. The tip of the I-gel willbe located into the upper esophageal opening, providinga conduit via the gastric channel to the esophagus andstomach. This allows for suctioning, passing of

anasogastric tube and can facilitate venting.I-gel does not have any epiglottic/aperture barslike some other supraglottic devices. I-gel has anartificial epiglottis called the ‘epiglottis blocker’ whichprevents epiglottis from down-folding.

I-gel is available in seven sizes 1, 1.5, 2, 2.5, 3, 4, 5.

Size	**Age group**	**Weight**
1	Neonate	2-5kg
1.5	Infant	5-12kg
2	Small pediatric	10-25kg
2.5	Large pediatric	25-35kg
3	Small adult	30-60kg
4	Medium adult	50-90kg
5	Large adult	90+kg

Anaesthesia and LMA insertion:

Insertion of the SADs sufficient general or topical anesthesia to obtund the airway reflexes. A depth similar to that necessary for inserting an oropharyngeal airway but not as deep as is needed for tracheal intubation is required. Absence of a motor response to a jaw thrust is a reliable method for assessing the adequacy of anesthesia for LMA insertion. Greater depth is needed for inserting the LMA-Proseal than for the LMA-Classic.

Assessment of Function of the Laryngeal Mask Airway
➢ Observation of airway pressure and chest movement with a manual ventilation ➢ Reservoir bag refill during expiration ➢ Capnograph ➢ Auscultation over the neck ➢ Cuff leak pressure ➢ Expired tidal volume and flow-volume loop ➢ Examination with a flexible fiberoptic laryngoscope

Cuff Inflation and Assessing Position and Function:

An effective seal depends on the size and position of the LMA, inflation of the cuff, low airway resistance, and high pulmonary compliance. Poor initial function may be caused by laryngospasm or bronchospasm. Withdrawal followed by readvancement (the up-down maneuver) may improve position and function of the LMA.

The cuff should be inflated in case of Proseal LMA and LMA supreme to a pressure of approximately 60 cm H_2O. A cuff pressure gauge is recommended for proper inflation pressure. Cuff pressure can be estimated by a subjective feel of the tension in the pilot balloon. A spherical pilot balloon is an indication that there is too much gas in the cuff.

The cuff should be inflated over 3 to 5. This usually causes slight upward movement of the airway tube, and a slight bulging at the front of the neck is commonly seen. There should be a smooth oval swelling in the neck and no cuff visible in the oral cavity.Cuff size is probably more important than inflating volume in determining the seal, so upsizing the LMA may provide a better seal than adding more air to the cuff of a smaller LMA.

If positive-pressure ventilation is to be used, the leak pressure should be greater than 20 cm H_2O (30 cm H_2O with the LMA-Proseal). If spontaneous respiration is to be used, the leak pressure should be greater than 10 cm H_2O. This is the approximate pressure of fluid at the posterior pharyngeal wall if the oral cavity is flooded. Until spontaneous respiration has resumed, it may be helpful to occlude the nose and seal the mouth around the tube to allow positive-pressure ventilation.

The airway sealing pressure is determined by observing the pressure gauge in the breathing system as the bag is squeezed and the pressure increases. Several methods can be used to determine the leak pressure. A stethoscope can be placed just lateral to the thyroid cartilage. Another method is to listen over the mouth for a noise when the bag is squeezed. Carbon dioxide may be detected by placing the sample line in the oral cavity. Another method is determining a steady airway pressure after closing the adjustable pressure limiting (APL) valve in the circle system.

It may be possible to improve the seal by adding more air to the cuff (if the maximum recommended volume has not been injected) or by flexing or rotating the head and neck slightly. The leak pressure will be higher if the head and neck are flexed or rotated. Higher pressures may be achieved by applying pressure on the front and/or side of the neck, by applying continuous forward pressure on the LMA, or by lifting the handle of the LMA-Fastrach.

Indications that the LMA is properly positioned include normal breath sounds, chest movements, pressure-volume loops and volume monitoring not showing a leak, and carbon dioxide waveforms with positive-pressure ventilation. If the patient is breathing spontaneously, normal reservoir bag excursions and absence of signs of obstruction are indications of proper placement. A fiberscope or rigid endoscope can be inserted through the LMA to confirm its position and rule out airway obstruction. X-ray or MRI can also be used to confirm the position. An esophageal detector device can be used, although its utility has been questioned.

Intraoperative Management:

During surgery, airway patency and correct LMA orientation should be verified at regular intervals. The patient's upper abdomen should be periodically observed for signs of distention and epigastric auscultation performed. A lighter level of anesthesia than would be required if a tracheal tube were used is usually possible. If laryngospasm, wheezing, swallowing, coughing, straining, or breath holding occurs, anesthesia should be deepened or muscle relaxants administered. An aerosol can be administered by using an LMA.

NITROUS OXIDE AND CUFF:

Nitrous oxide and carbon dioxide can diffuse into the cuff, increasing intracuff pressure and volume. Cuff volume increases less with the LMA-Unique than with the LMA-Classic. The increase in volume may cause airway obstruction. Inflating the cuff with nitrous oxide will avoid this increase.The manufacturer recommends that cuff pressure be checked periodically with a pressure gauge, transducer, or other device and adjusted to keep it at approximately 60 cm H_2O. If the balloon feels tense and bulging the pressure may be excessive.

DURING CONTROLLED VENTILATION

The LMA can be used with controlled (including mechanical) or spontaneous ventilation. Patient outcome has been found to be similar in nonparalyzed patients with positive-pressure ventilation or spontaneous breathing. If positivepressure ventilation is used, the peak inspiratory pressure should be kept below 20 cm H_2O (30 cm H_2O with the ProSeal). Higher pressures may result in a leak around the mask, gastric distention, and operating room pollution. Changes in the ventilatory pattern to reduce tidal volume and using muscle relaxants may result in a lower peak pressure. If higher pressures are required, consideration should be given to exchanging the LMA for an endotracheal tube. If cricoid pressure is applied, the airway pressures at which the patient is ventilated can often be increased to over 30 cm H_2O without gastric insufflation occurring.

Pressure control ventilation , with or without PEEP, which is available on never anesthesia ventilators, may be the mode of choice for controlled ventilation with the laryngeal mask because it allows a lower peak pressure for the same tidal volume with less leak around the LMA. For patients breathing spontaneously, pressure-support ventilation improves gas exchange and reduces the work of breathing. The work of breathing can also be reduced by using CPAP.

OROPHARYNGEAL SEAL AND LEAK

A sudden increase in leakage, snoring, or other sounds often signals the need for more muscle relaxation, although other causes such as LMA displacement, light anesthesia causing glottic closure, airway obstruction, a leaking cuff, and a decrease in lung compliance. Adding air to the cuff will not always correct a leak and may make it worse by increasing tension in the cuff and pushing it away from the larynx. Sometimes, removing some air from the cuff will help.

If regurgitation occurs, the first sign may be the appearance of fluid traveling up the LMA tube. Breath holding or coughing may occur. The patient should be placed in the head-down position, the breathing circuit disconnected, and the airway tube suctioned. It may not be necessary to remove the LMA, although preparations for tracheal intubation should be made and the patient intubated, if indicated.

Inserting a nasogastric tube behind a non-Proseal LMA can be aided by using a nasal airway or a flexible endoscope to displace the LMA forward.

Emergence from Anesthesia:

It is important that the bite block or roll of gauze be left in place until the LMA is removed to maintain patency and prevent damage to the LMA. Cuff deflation should be performed only when the LMA is removed. If the cuff remains inflated as the LMA is removed, a greater mass of secretions will also be removed, but this technique increases the incidence of blood staining. Taking off a glove that was worn when the LMA was removed and inverting it over the device will minimize the spread of contamination.

Keeping the LMA in place during transfer to the postanesthesia care unit (PACU) will maintain a patent airway, while leaving the anesthesia provider's hands free for other tasks. During recovery, supplementary oxygen can be delivered with the LMA in place by using a T-piece or other device. With the T-piece, respiration may be assisted manually by intermittently occluding the expiratory limb.

There is controversy regarding the optimal time for LMA removal. It should either be removed with the patient in a deep level of anesthesia or when full recovery of airway reflexes has occurred. Leaving the LMA in position until airway reflexes have recovered and the patient can phonate or open his or her mouth on command, as recommended by the manufacturer, will ensure maintenance of a secure airway. The onset of swallowing is a useful predictor that such a level of wakefulness is imminent.

The LMA should not be removed during a light level of anesthesia. If swallowing and airway reflexes are not present, secretions in the pharynx may enter into the larynx, provoking laryngospasm, coughing, or gagging. Removing the LMA while the patient is anesthetized or coincident with signs of rejection but before the patient responds to commands, can increase the incidence of gastroesophageal reflux.

Removing the LMA while the patient is under deep anesthesia will decrease the incidence of coughing, breath holding, and bronchospasm. It may be highly desirable in some situations, such as after intraocular surgery. It should not be performed in a patient known to be difficult to intubate. Deep extubation has been

associated with airway obstruction, regurgitation, and laryngospasm. Damage to the LMA is less frequent when the LMA is removed under deep anaesthesia.

Most studies show that in children, removal when awake may result in a higher incidence of airway problems (laryngospasm, coughing, breath holding, bronchospasm) compared with removal while deep. However, a similar or higher incidence of airway problems in children with deep removal has been reported by some investigators.

The patient should be left undisturbed, other than administering oxygen and monitoring of vital parameters.The patient is not turned into his or her side unless there is an indication because this may cause premature rejection of the LMA. It is not essential to remove secretions in the upper pharynx because the secretions are collected over the mask of the device which can easily removed if the LMA is removed without deflating the airway. LMA is not removed before the patient is able to swallow effectively. Suctioning through the LMA should not be performed unless there is evidence of gastric contents in the tube.

REVIEW OF LITERATURE

1. Uppal et al in their study compared I gel and LMA unique in anaesthetized paralyzed persons and proved that the time taken for insertion of I gel is significantly shorter than LMA unique.

2. Belena et al evaluated the safety and efficacy of LMA supreme during gynaecologic laparoscopic surgeries and concluded that insertion was successful in all the cases, mean oropharyngeal seal pressure was around 31.

3. Brain et al in their study compared LMA proseal and LMA classic and found that there is no difference insertion, trauma, quality of the airway and oropharyngeal seal pressure was significantly higher than LMA classic.

4. Theiler et al in their study evaluated the use of I gel in 2049 patients and concluded that success rate of insertion was 93%, the mean airway leak pressure was 28cm h20.

5. Sebastian et al in their study compared I gel, LMA Supreme and laryngeal tube suction and found that insertion success rate was found to be higher for I gel and LMA supreme than laryngeal tube suction. But insertion time and airway leak pressures was similar in all the three groups.

6.Saraswat et al in their study compared proseal LMA and endotracheal tube in patients undergoing laparoscopic surgeries in general anaesthesia and found that there was no failure of insertion, no airway morbidity and proseal LMA can be an reliable alternative to endo tracheal tube.

7.Janakiram et al in their study compared I gel and classic LMA and concluded that success rate of insertion at first attempt was significantly higher for I gel.

8.Francksen et al compared LMA unique and I gel unique in anaesthetized nonparalysed patients and concluded that insertion time and airway leak pressures were comparable in both the devices.

9.Udayambi et al in their compared LMA classic and pro seal LMA and found that the hemodynamic responses was found to minimal with proseal LMA. LMA proseal LMA provided a better seal than LMA classic.

10.Ghannam et al compared proseal LMA and I gel and found that insertion was less for I el and airway leak pressure was higher for LMA proseal.

11. Jindal et al compared LMA classic, I gel and SLIPA and found that I gel provides effective seal for positive pressure ventilation with a minimal hemodynamic response.

12.Gasteiger et al in their study compared insertion of LMA proseal and I gel and found that success rate for insertion was similar for both devices but proseal LMA provided an effective seal for ventilation.

13.Eschertzhuber et al in their study compared LMA supreme and LMA proseal and found that gastric tube placement, ease of insertion was similar for both the devices. Effective airway leak pressure was significantly higher for proseal LMA.

MATERIALS AND METHODS:

Study design:

The study was a randomized, parallel group, prospective, comparative study.

Sample size:

90 Patients (n=90)

RANDOMIZATION:

The study was done on 90 patients in the Department of Anaesthesiology, Tirunelveli Medical College, Tirunelveli from March 2011 to August 2012. After institutional ethical committee clearance and written informed consent, 90 female patients of ASA I and II, belonging to the age group 18 – 40 years and weight 40-60 kg, were randomly chosen using computer generated random numbers.

ALLOCATION:

90 Patients were randomly divided into 3 groups.

Group P ⟶ 30 patients – will receive Proseal LMA

Group S ⟶ 30 patients – will receive LMA Supreme

Group G ⟶ 30 patients – will receive I-gel

MASKING:

Observer blinded study

INCLUSION CRITERIA:

- ASA I, II
- Female sex
- 18-40 yrs
- Weight- 40-60kgs
- Mallampatti class I and II
- Patients undergoing elective surgery under general anaesthesia

EXCLUSION CRITERIA:

- ASA III and IV
- Mallampatti III and IV
- Anticipated difficult airway
- Obesity with BMI > 30
- Patients with lung diseases
- Patients atincreased risk of aspiration
- Patients with irregular dentition

Study method:

Pre-operative evaluation including age, weight, ASA status, base line vital parameters, blood routine investigations, ECG, Chest X-ray were recorded. History regarding previous anaesthesia, surgery/any significant illness, medications and allergy were recorded. Complete physical examination and airway examination was done.

Patients were pre medicated with Inj. Midazolam 0.02 mg/Kg IM and Inj. Glycopyrrolate4mcg/Kg IM 45 minutes before induction. Routine monitoring including ECG, pulse oximetry, noninvasive blood pressure and end tidal carbon dioxide was established. A standard anaesthetic protocol was carried out.

Preoxygenation was done with 100% oxygen via face mask for 3 minutes at tidal volume. Inj. Fentanyl Citrate 3µg/kg iv was administered followed by induction withInj. Propofol3mg/kg. After the loss of eye lash reflex patient's head was positioned neutrally on a 7cm pillow. All the supraglottic airway devices were tested for leak before insertion, and the size chosen according to the patient's weight. The devices were lubricated with 2% lignocaine jelly and inserted to the allotted group as per the standard insertion protocol.Anaesthesia was maintained with O_2 and N_2O at a ratio of 33% and 66% with Halothane 1% and incremental boluses of Inj. Atracurium.

Insertion time- measured from the time between touching the prepared supra glottic airway device after the loss of eyelash reflex until the bilateral confirmed air entry or until the first expiratory tidal volume >200ml.

Two attempts were allowed before considering failure. Failed insertion was defined by

1) Failed passage into the oropharynx

2) Air leak

3)Ineffective ventilation (expired tidal volume < 6ml/kg).

The cuff was inflated after the device is in place. The volume of air injected was according to the manufacturers recommendations. Patient was ventilated with inspired tidal volume of 10ml/kg and a frequency of 15/min and an Inspiratory:Expiratory ratio of 1:2.

Oropharyngeal leak pressure–was calculated by closing the APL valve of the circle system at fixed gas flow of 4 ml/min and noting the airway pressure at which equilibrium is reached. Leak was detected bylistening through ears over the mouth, auscultation over the epigastrium for air entrainment or an end tidal CO2 >6kpa.

Hemodynamic data were collected before induction, during insertion, 1 min after insertion, 3 min after insertion, 5 min after insertion and after removal of the airway device.

Bradycardia defined as heart rate <50/min.

Tachycardia defined as heart rate >100/min.

Hypotension defined as mean arterial pressure < 60mmhg.

Hypertension defined as mean arterial pressure >120mmhg.

Hypoxemia defined as Spo2 < 85%.

A 60 cm long 12-F gastric tube lubricated with 2% lignocaine was inserted through the gastric channel of the airway device.Gastric tube positionwas confirmed by the aspiration of gastric fluid or by auscultation of injected air over the epigastrium.

Ease of NG tube insertion:

Easy insertion-Insertion at first attempt with no difficulty

Difficult insertion– insertion at second attempt

Failed insertion- insertion not possible

After the end of procedure patient was reversed with Inj. Glycopyrrolate andInj. Neostigmine. The device was removed with suction after the patient become conscious and return of airway reflexes.

*Post operative complications*such as

1) Blood staining of the device

2) Coughing or sore throat

3) Dysphagia were noted

STATISTICAL ANALYSIS

Randomization of the three groups was done by matching the age and weight of the patients. Data was analyzed using ANOVA and CHI SQUARE test.Sample size – 30 in each group was determined using the information from previous studies.Sample size was selected to detect a projected difference of 15% between groups with respect to the primary variables oropharyngeal leak pressure, a type I error of 0.05 and a power of 0.9.The distribution of data was determined using Kolmogorov–Smirnov analysis.

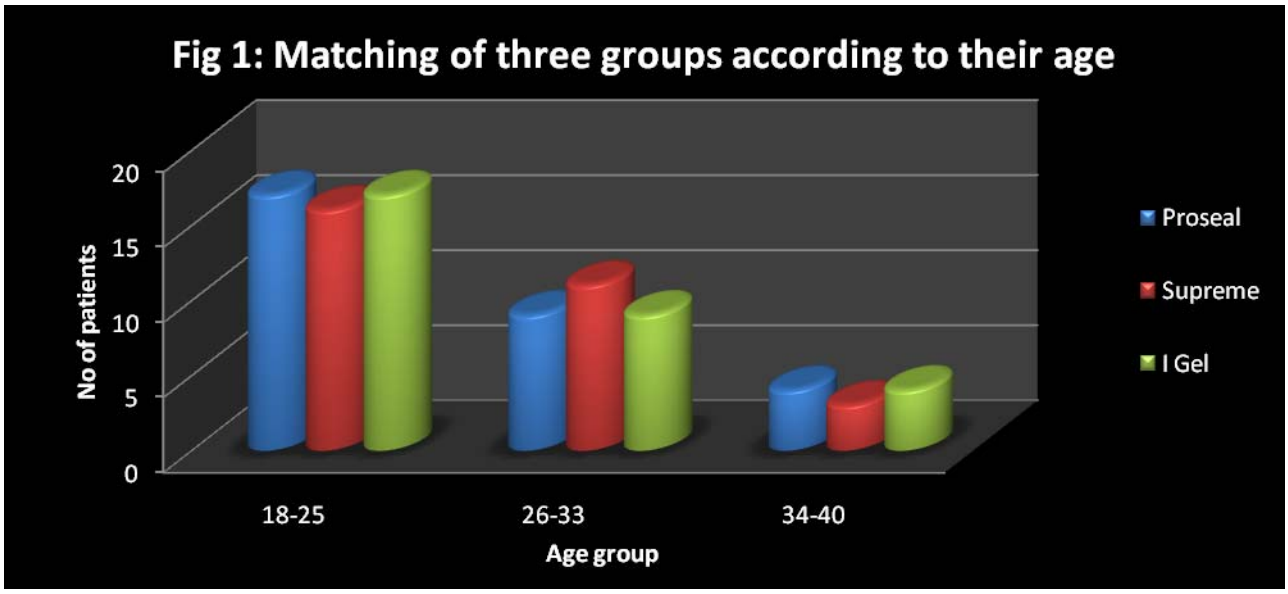
The parameters – oropharyngeal leak pressure, Time taken for insertion, hemodynamic responses, number of attempts, ease of Ryles tube insertion was compared by ANOVA and interpreted the difference by Post Hoc test of Bonferroni. Post operative complications were compared by CHI SQUARE test.P value < 0.05 was considered as significant.

OBSERVATION AND RESULTS

Matching of three groups based on their age

Table 1:

Age	Proseal	Supreme	I gel
18-25	17	16	17
26-33	9	11	9
34-40	4	3	4
Total	30	30	30



The three groups were matched according to their age (table 1, figure 1). There were no statistical differences between three groups. P=0.127 (P > 0.05).

Matching of three groups based on their weights

Table 2:

Weight	Proseal	Supreme	I Gel
40-46	5	5	4
47-54	23	21	22
54-60	2	4	4
Total	30	30	30

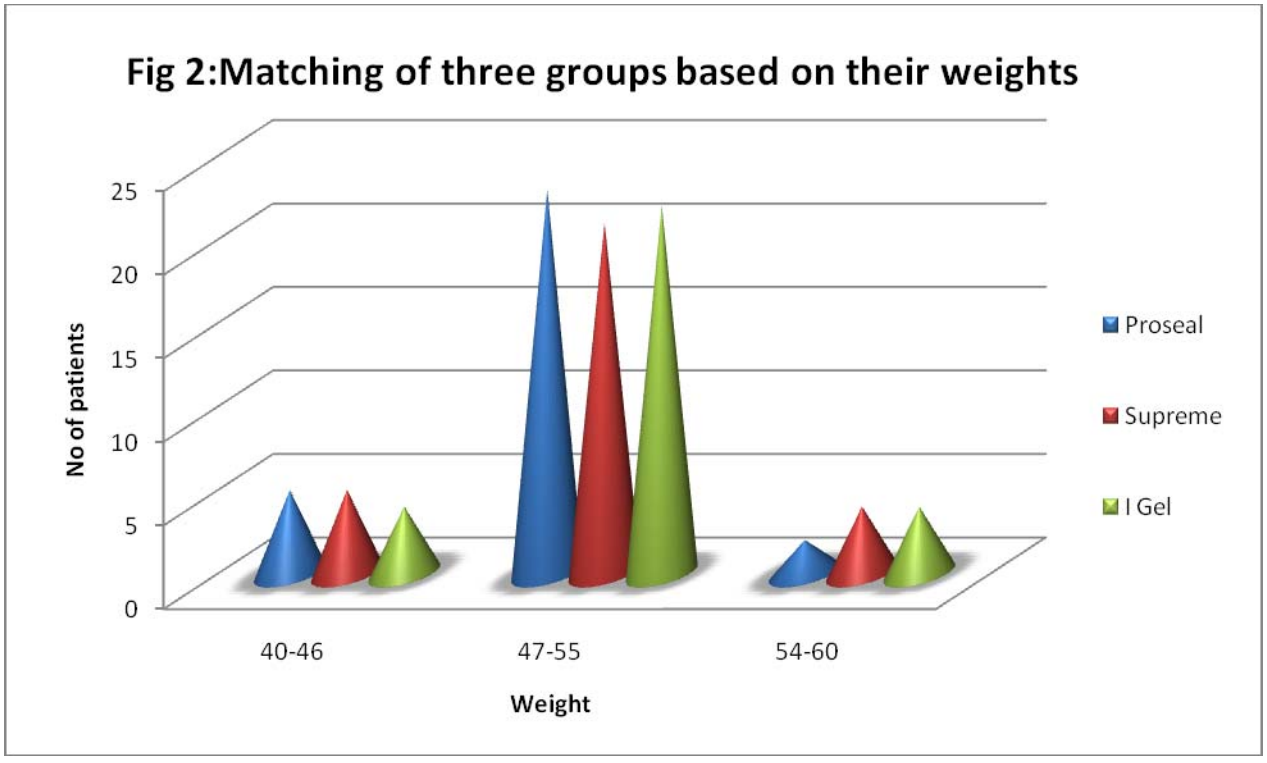
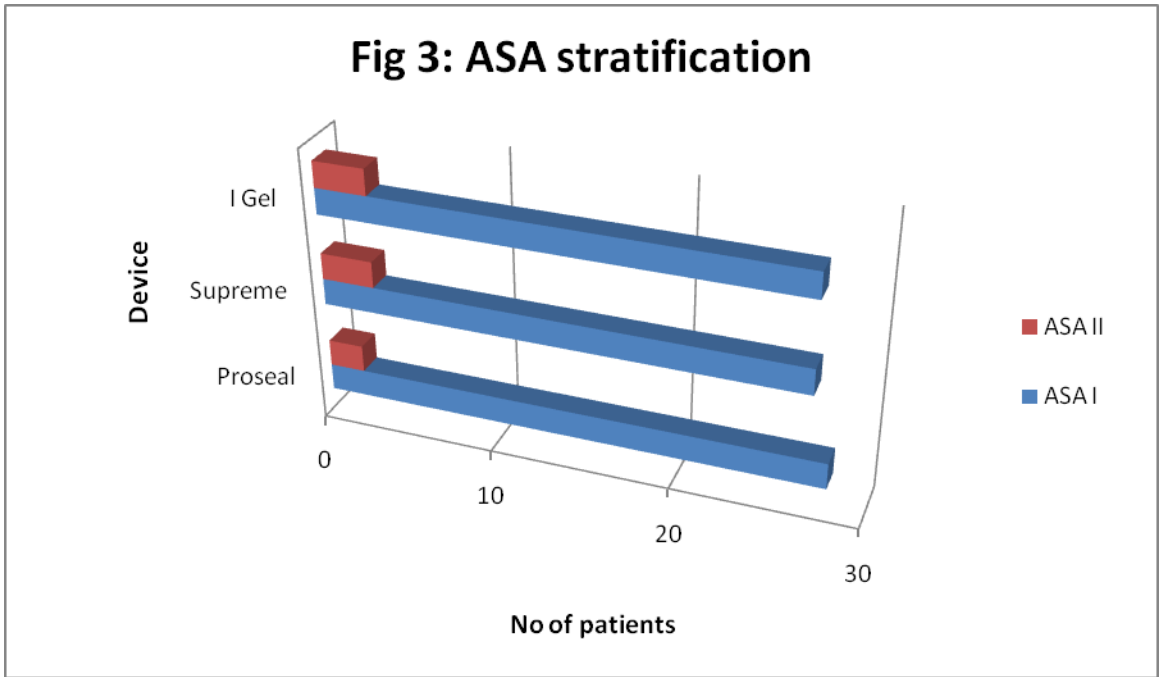


Table no 1 and figure 1 shows thethree groups were matched according to their weight. There were no statistical differences between three groups. P=0.722 (P > 0.05).

ASA stratification:

Table 3:

ASA	Proseal	Supreme	I Gel
I	28	27	27
II	2	3	3

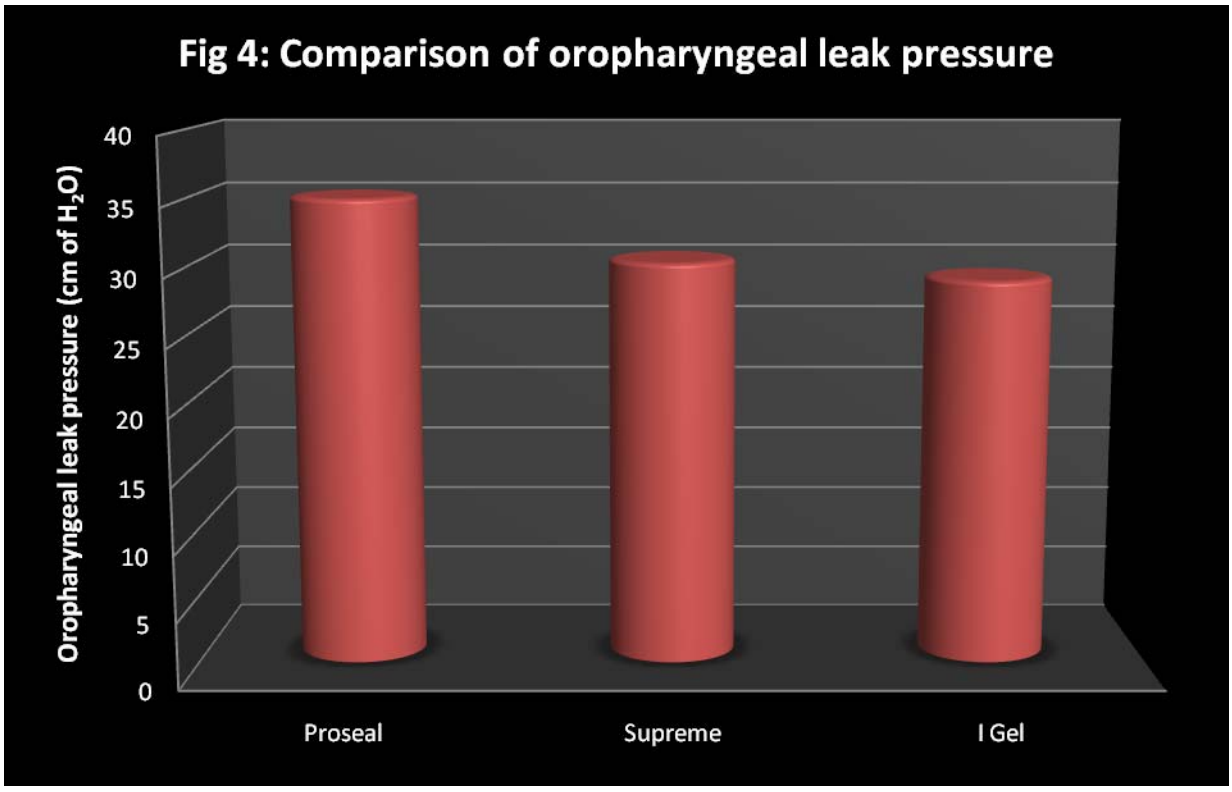


The above table 3 and figure 3 shows that the ASA stratification in all the three groups was comparable and found to be statistically not significant.

Comparison of Oropharyngeal Leak Pressure:

Table 4:

	Proseal	**Supreme**	**I Gel**
Oropharyngeal leak pressure (cms of H_2O)	35.06	30.33	29.0



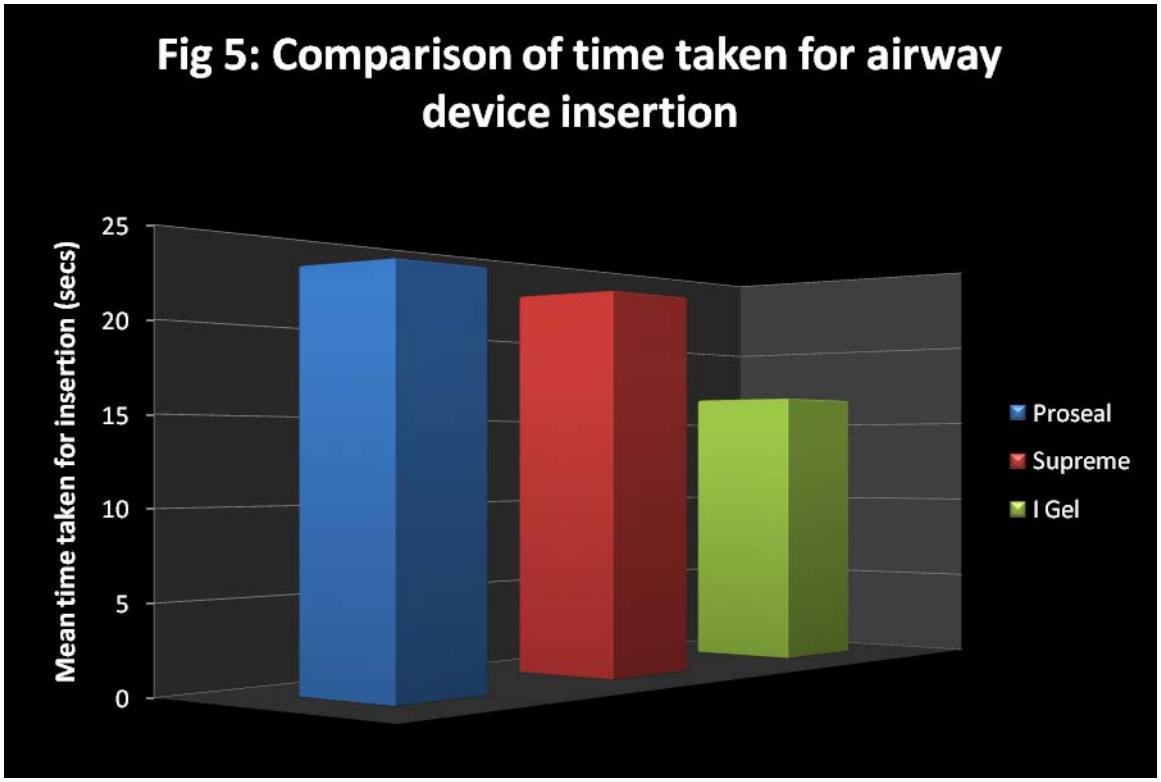
From the above table 4 and figure 4 it was inferred that the oropharyngeal leak pressure was significantly higher for Proseal LMA and was found to besignificant statistically. (P=0.002).

Mean Oropharyngeal Leak pressure of Proseal LMA, LMA Supreme , I Gel were 35, 30, 29 cm H_2O respectively. From the observation it is clear that airway leak pressure was much higher for the Proseal LMA group than the other two groups. These results were analyzed statistically it was found to be statistically significant. (P>0.05).

Comparison of time taken for Airway Device Insertion:

Table 5

	Proseal	Supreme	I Gel
Mean time taken for insertion (secs)	22.9	22.3	16.5



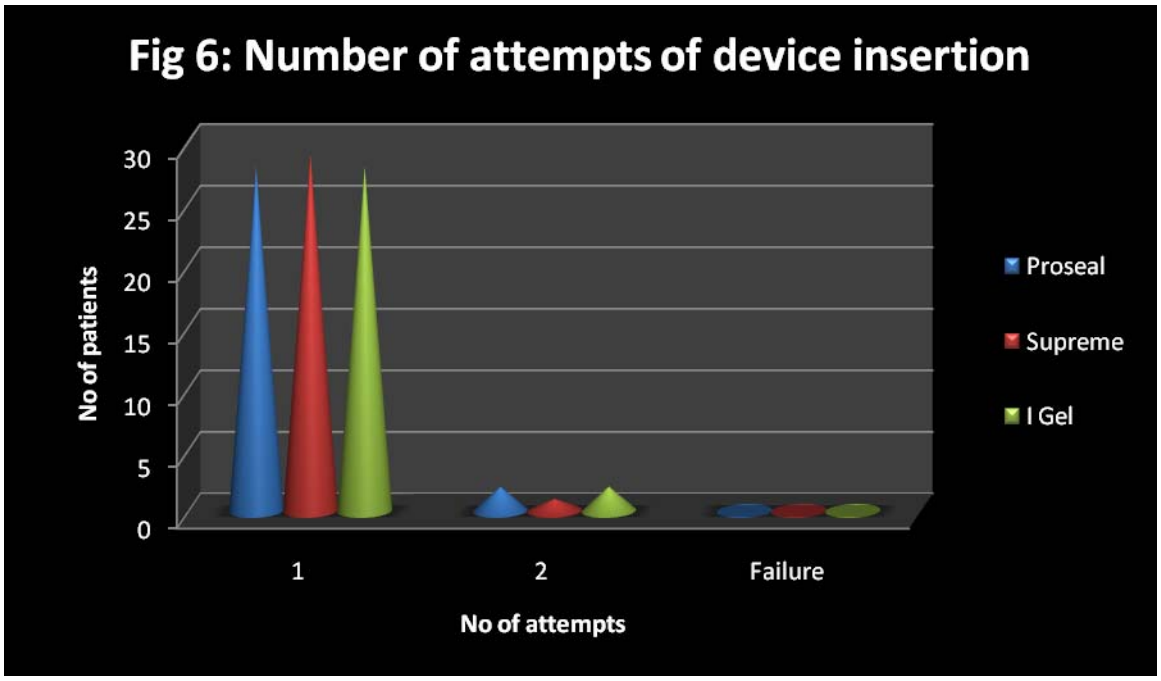
From the above observation in table 5 and figure5 it was inferred that the time taken for insertion of I Gel was significantly lower than other two devices and was found to be significant statistically. (P=0.001).

The mean time taken for inserting and establishing a definite airway in these three groups were **Proseal LMA** - 22.9 secs, **LMA supreme** - 22.3 secs, **I gel** - 16.5 secs. From these observations it is found that the time taken for establishing the airway was much lower for the I gel group of patients. These results were analyzed statistically and found to be significant.

Comparison of number of attempts of device insertion:

Table 6:

No of attempts	Proseal	Supreme	I Gel
1	28	29	28
2	2	1	2
Failure	0	0	0



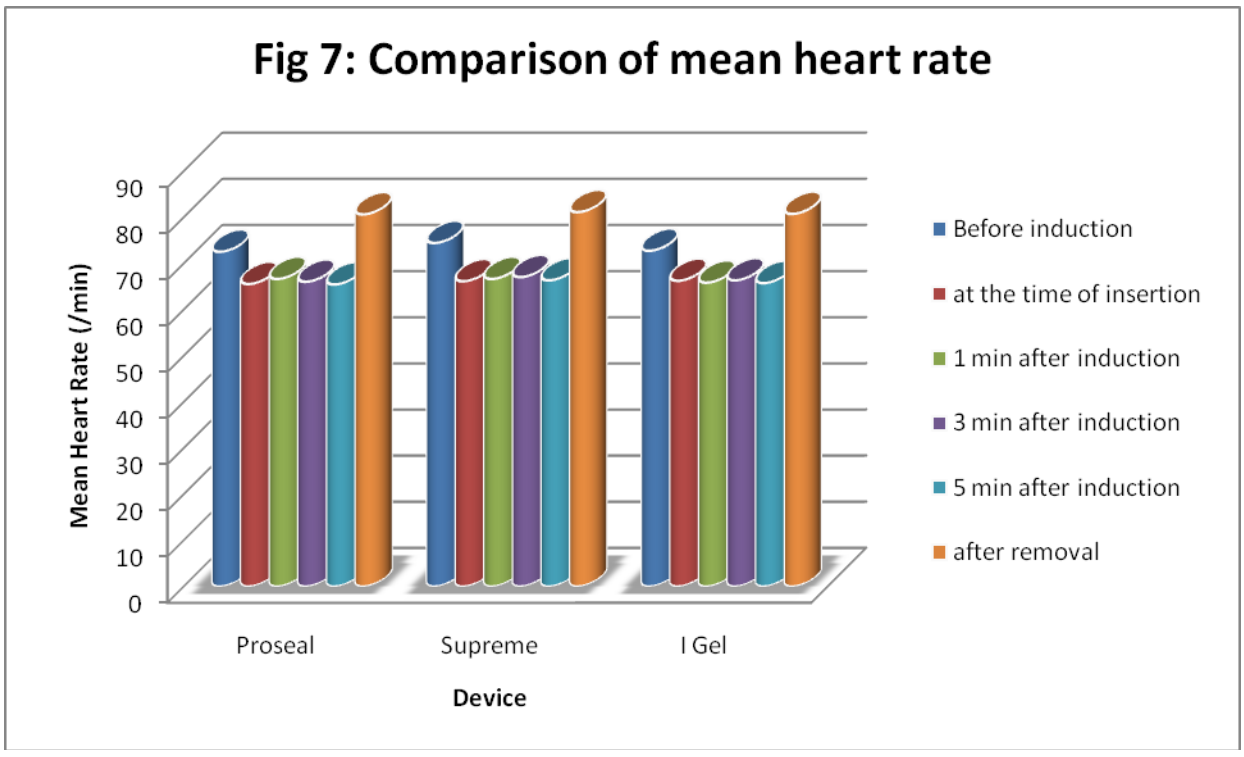
From the above data in table 6 and figure 6 the comparison of number attempts for device insertion between three groups shows no significant difference. (P>0.05).

Insertion success rate for the airway device in each group of the patients were **Proseal LMA** - 93.3% of patients in first attempt & 6.6% of patients in second attempt, **LMA supreme** - 96.6% of patients in first attempt & 3.3% of patients in second attempt, **I gel** - 93.3% of patients in first attempt & 6.6% of patients in second attempt. These results were found to be statistically not significant.

Comparison of Mean Heart Rate:

Table 7:

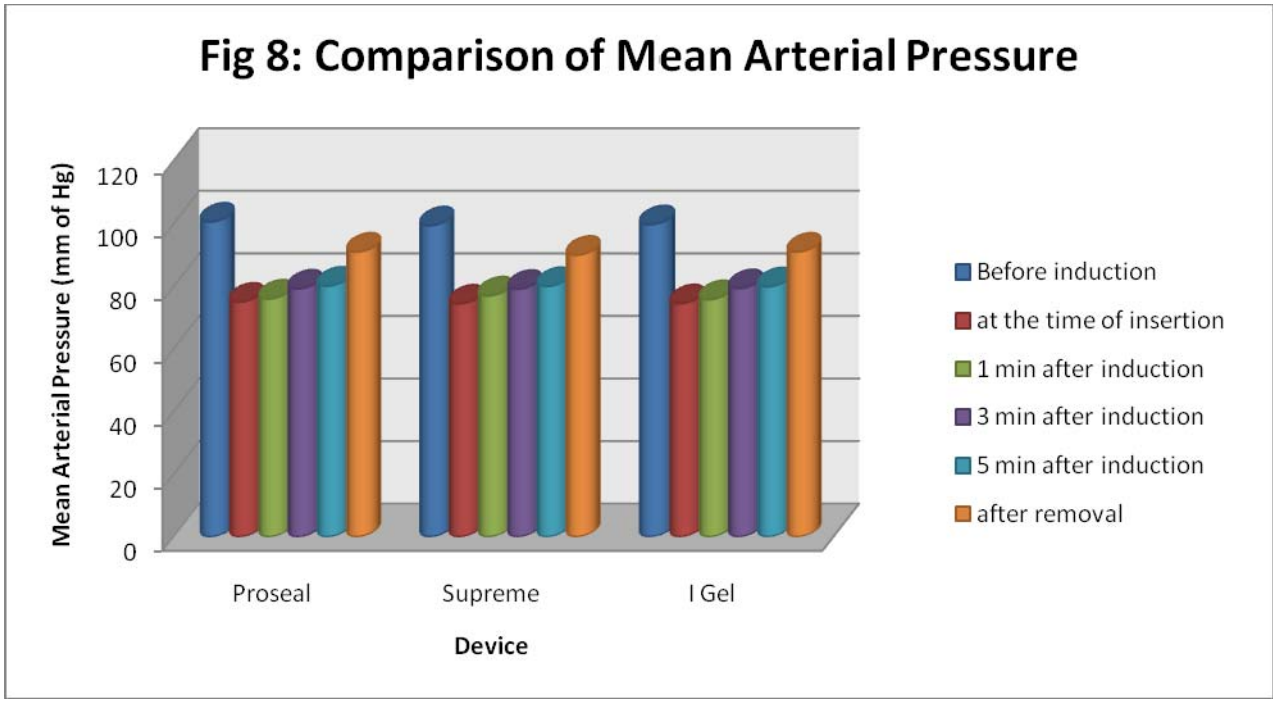
	Before induction (/ min)	at the time of insertion (/ min)	1 min after induction (/ min)	3 min after induction (/ min)	5 min after induction (/ min)	after removal (/ min)
Proseal	72.5	65.5	66.6	66	65.4	80.6
Supreme	74.4	66.1	66.6	67	66.3	81.1
I Gel	72.7	66.2	65.8	66.3	65.7	80.7



Comparison of Mean Arterial Pressure:

Table 8:

	Before induction (mm of Hg)	at the time of insertion (mm of Hg)	1 min after induction (mm of Hg)	3 min after induction (mm of Hg)	5 min after induction (mm of Hg)	after removal (mm of Hg)
Proseal	100.6	75.0	76	79.2	80.1	91
Supreme	99.4	74.4	77	79.1	80	90
I Gel	99.7	74.5	75.8	79.3	79.9	91



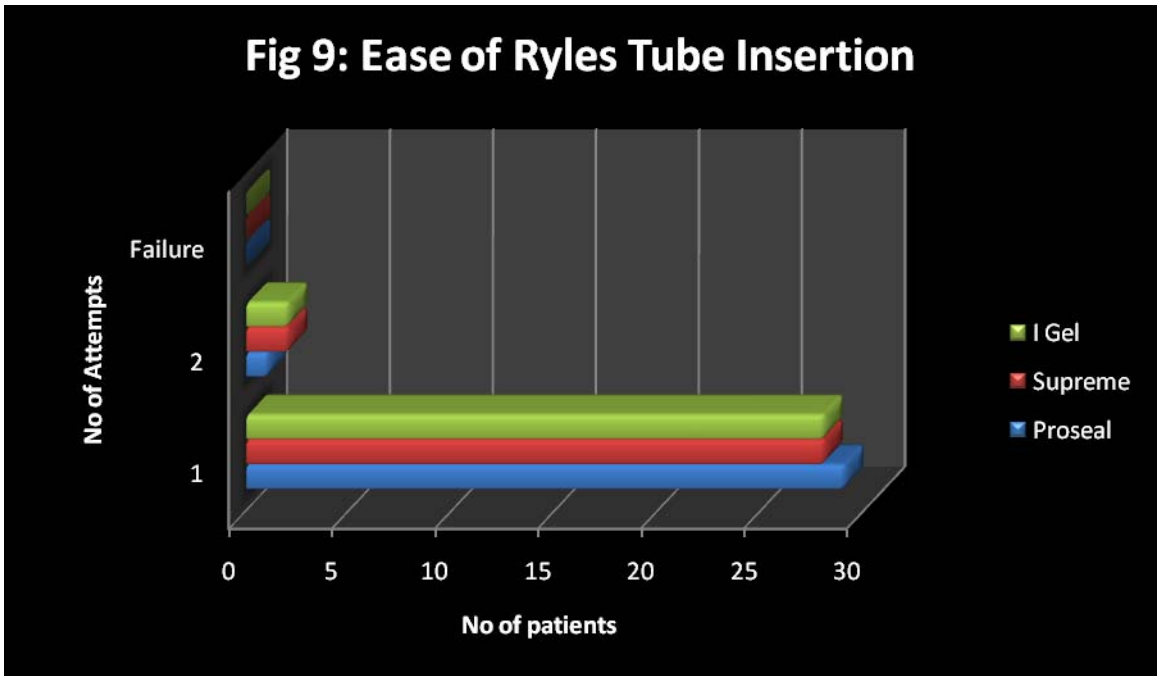
From the above table 7, 8, and figure 7, 8, thecomparative analysis between the groups, it was inferred that there no significance difference in the hemodynamic parameters. (P>0.05).

The hemodynamic parameters (Mean Heart Rate & Mean Arterial Pressure) before induction, at the time of insertion, 1 min after insertion, 3 min after insertion, 5 min after insertion & after removal of the device were **Proseal LMA** - 72/min &100 mm of Hg, 65/min & 75mm of Hg, 66/min & 76mm of Hg, 66/min & 79 mm of Hg, 65/min & 80 mm of hg, 80/min & 91 mm of Hg, **LMA supreme** - 74/min & 99 mm of Hg, 66/min & 74 mm of Hg, 66/min & 77 mm of Hg, 67/min & 79 mm of Hg, 66/min & 80 mm of Hg, 81/min & 90 mm of Hg, **Igel**- 72/min & 99 mm of Hg, 66 & 74 mm of Hg, 65/min & 75 mm of Hg, 66/min & 79mm of Hg, 65/min & 79 mm of Hg, 80/min & 91mm of Hg respectively.The hemodynamic variables between these three groups showed no significant fluctuation. These results between groups were analyzed statistically and it was found to be statistically insignificant. (P>0.05).

Comparison of Ease of Ryle's tube insertion:

Table 9:

No of attempts	Proseal	Supreme	I Gel
1	29	28	28
2	1	2	2
Failure	0	0	0



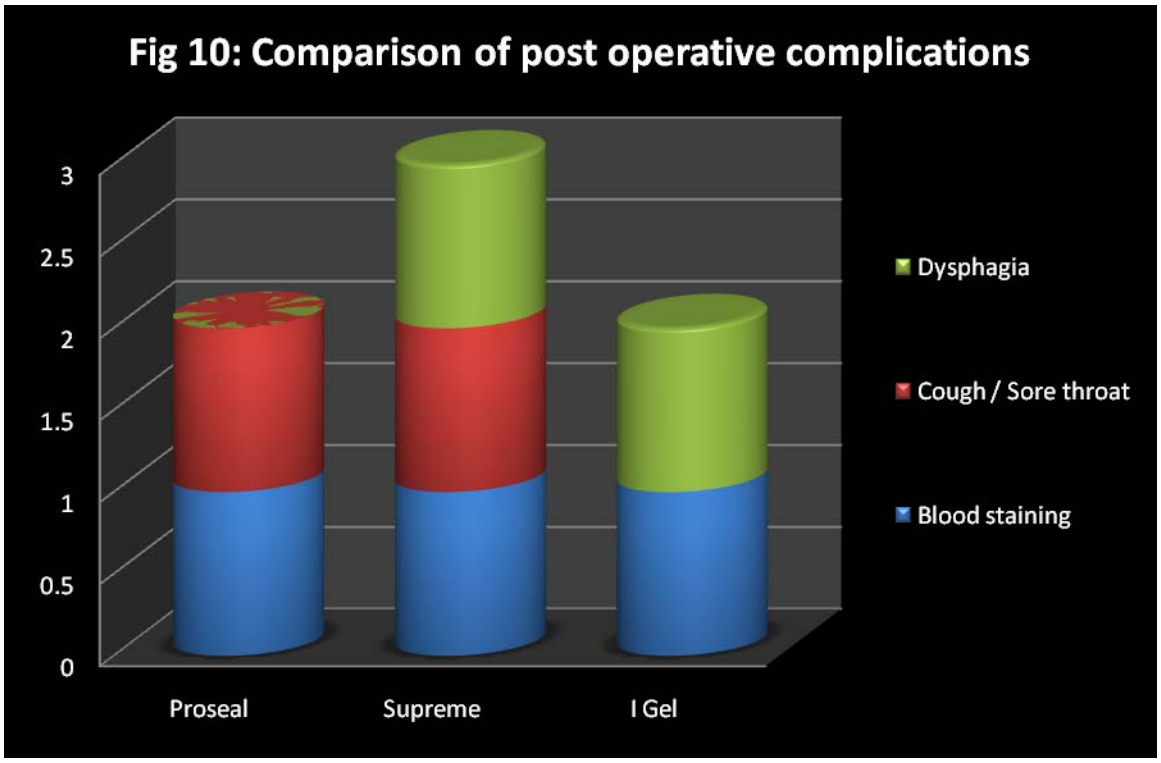
From the above table 9 and figure 9 it was inferred that there no significant difference in the ease of Ryles Tube Insertion between three groups. (P>0.05).

Insertion success rate for Ryle's tube in each group of patients were, **Proseal LMA** - 96.6% of patients in first attempt & 3.3% of patients in second attempt, **LMA Supreme** - 93.3% of patients in first attempt & 6.6% of patients in second attempt, **I gel** - 93.3% of patients in first attempt & 6.6% of patients in second attempt. These results were found to be statistically not significant.

Comparison of Post Operative Complications:

Table 10:

	Proseal	Supreme	I Gel
Blood staining	1	1	1
Cough / Sore throat	1	1	0
Dysphagia	0	1	1



From the above table10 and figure 10 it was inferred that the post operative complications in all the three groups are statistically insignificant. (P>0.05)

DISCUSSION

The use of supraglottic airway devices has been in an increasing trend these days. SAD's has been used as a conduit for endotracheal tube. Endotracheal tube produces a stress response that will be deleterious for patients with cardiac disease and hypertensive disorders. In such patientssupraglottic airway devices produces an alternate airway technique. Also the plane of anaesthesia needed for inserting endotracheal tube is much deeper and almost always muscle relaxant is required. But for insertion of supraglottic device deep plane is not required as it is required for intubation.

A quite number of studies have been done by using muscle relaxant for SAD insertion. Gasteiger et al, eschertzhuber et al, saraswat et al have used muscle relaxant for SAD insertion. They have compared two supraglottic devices and their performances.

Francksen et al in their study compared LMA unique and I Gel in anaesthetized non-paralyzed patients.

Regarding the time of insertion, our results correlated the results of Eschertzhuber et al pointing that the time took for insertion of insertion of Laryngeal mask airway supreme andProseal Laryngeal mask airway have no significant difference. In our study the time taken for insertion of Proseal LMA is 22.9 secs and for LMA supreme is 22.3 secs. The insertion time for I Gel is 16.5 secs. We found a significant difference for I gel insertion.

Oropharyngeal seal pressure was measured during the maintenance period of anaesthesia. It is measured with incremental tidal volumes and the airway pressure at which the leak is constant. The oropharyngeal seal pressure measured for LMA supreme and I Gel were 30 and 29 cm H_2O which didn't show any statistical significance. But the oropharyngeal seal pressure for Proseal LMA is 35.06 cm h20. This shows a significant difference statistically. This is of clinical significance in daily practice especially during laparoscopic surgeries. High effective seal pressure prevents gastric inflation and aspiration.

LMA Proseal offered a better seal and it is 5 cm h2o higher than LMA supreme and I gel. Proseal LMA is more effective supraglottic airway device than I gel and LMA supreme since it with stands higher tidal volumes with minimal leak. It may be due to the material (silicone) which it is made of. The LMA supreme is made of PVC which withstands less pressure. Also I-gel which is made of non inflatable cuff withstands less pressure than Proseal .This is especially important in patients with increased airway resistance, in pts with COPD, patients who are morbidly obese, for surgeries done under laparoscopy or in the head down position where high airway pressures are required for positive pressure ventilation. These results were similar to studies conducted by Theiler et al &Brimacombe et al.

Supraglottic airway device with gastric channel facilitates suction and drainage of stomach contents. This will reduces the risk of aspiration and regurgitation especially in positive pressure ventilation.Gibbisonand his colleagues described in two cases that I-gel has prevented aspiration.Ryles tube insertion in all the three groups were compared and it was found to be statistically insignificant. In most of the patients Ryle s tube was inserted in single attempt. Only in two of the patients gastric tube insertion was done in second attempt .Therefore a 12 F gastric tube can be easily passed without any difficulty in these 3 & 4 sized airway devices.

Post anaesthesia airway complications has gained very much attention these days especially when patient satisfication is of high importance . The post operative adverse events were noted during the use of supra glottis airway device were sorethroat& coughing,dysphagia,dysphonia, vomiting &trauma. We have evaluated the presence of dysphagia, blood staining of the airway, coughing in all the three groups. The incidence of postoperative e morbidity in all the three devices in our study was very low. These results were comparable with the previous studies.

Limitations of our study should be noted. We didn't use fibreopticbroncoscope to confirm the position of the airway device.

CONCLUSION

We conclude that

1) LMA proseal provides a betteroropharyngeal seal for controlled ventilation especially in patients where higher airway pressure are necessary for achieving a effective tidal volume .

2) The lesser time required for insertion of I gel may be due to the presence of non inflatable cuff.

3) Hemodynamic stability and postoperative morbidity were similar with all the three devices .

4) The insertion attempts for all the three devices was found to be similar and there was no failure in our study.

5) Gastric tube insertion was found to be easier with all the three devices and in none of the patients there was failure.

Therefore I gel and LMA supreme can be an alternative to proseal LMA especially in patients with normal pulmonary function.

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PROFORMA

Name : Age: Sex: Ip.NO: Weight:

ASA: Device:

Diagnosis: Siagnosis:

Premedication:

Induction:

Maintenance:

Reversal:

Parameters compared:

1) Insertion time
2) Insertion attempts 1(easy) 2(difficult) 3(failed)
3) Hemodynamic responses HR MAP

Before induction

At the time of insertion

1 min after insertion

3 min after insertion

5 min after insertion

After removal

4) Ease of gastric tube insertion 1(easy) 2(difficult) 3(failed)
5) Oropharyngeal seal pressure
6) Complications

Blood staining

Coughing

Dysphagia

Proseal LMA

S. No	Name	Age	Sex	Wt	ASA	Orophary geal leak pressure	Time Taken For Insertion	No. of Attempts	Hemodynamic Responses												Ease Of NG Tube Insertion	Post Operative Complications		
									Pulse Rate						Mean Arterial Pressure									
									Before Induction	At the Time of Insertion	1min	3min	5min	After Removal	Before Induction	At the Time of Insertion	1min	3min	5min	After Removal		Blood Staining	Coughing	Dysphagia
1	sangeetha	35	F	43	I	34	23	1	75	62	65	64	65	80	100	75	76	79	80	90	First	N	N	N
2	banu	23	F	40	I	36	21	1	72	64	69	65	64	85	97	72	76	79	82	85	First	N	N	N
3	Amaravathi	38	F	56	II	35	24	1	73	63	67	68	68	76	99	76	77	78	81	96	First	N	N	N
4	Balasaraswathi	19	F	54	I	36	23	1	75	64	68	62	65	77	103	75	79	73	78	94	First	N	N	N
5	Brindha	23	F	43	I	37	23	1	72	65	64	66	63	84	110	72	78	74	76	92	First	N	Y	N
6	muthulakshmi	34	F	42	I	33	21	1	71	63	68	65	67	86	98	78	78	82	79	85	First	N	N	N
7	meena	21	F	56	I	36	25	1	74	62	64	65	67	75	96	74	73	80	81	95	First	N	N	N
8	Vijayalakshmi	23	F	54	I	27	24	1	73	66	74	68	68	83	105	73	74	79	80	94	First	N	N	N
9	Veeralakshmi	39	F	56	I	39	23	1	73	67	65	63	67	80	108	73	75	81	80	98	First	N	N	N
10	Divya	27	F	45	I	35	23	1	72	64	64	68	65	74	99	76	77	76	74	91	First	N	N	N
11	Dharani	25	F	58	I	37	22	1	72	68	65	69	64	80	105	77	76	84	80	92	First	N	N	N
12	dhanalakshmi	24	F	54	I	36	24	1	72	65	68	65	67	82	95	72	75	77	82	86	First	N	N	N
13	Malathi	26	F	58	I	34	22	1	72	63	68	67	68	83	100	72	76	80	81	96	First	N	N	N
14	Vishnupriya	28	F	56	I	33	23	1	71	67	67	64	65	78	102	78	74	79	78	91	First	N	N	N
15	Muthulakshmi	24	F	58	I	37	24	1	73	67	64	65	67	77	98	73	77	77	76	93	First	N	N	N
16	marry	22	F	57	I	34	23	1	74	68	65	67	68	79	106	74	78	81	79	87	First	N	N	N
17	Mahalakshmi	25	F	55	I	36	21	1	75	67	68	70	67	88	110	75	79	79	81	93	First	N	N	N
18	Maheshwari	23	F	54	I	34	23	1	71	65	69	65	66	80	90	77	78	82	80	94	First	N	N	N
19	Roja	26	F	55	I	36	24	2	72	64	68	66	67	78	99	76	73	79	80	84	First	N	N	N
20	Rajeshwari	21	F	49	I	35	21	1	71	67	69	70	68	84	98	75	74	78	74	96	First	N	N	N
21	Sindhya	26	F	60	I	34	25	1	73	68	65	63	64	80	103	76	75	80	80	87	First	N	N	N
22	Suryapriya	25	F	58	I	37	22	1	74	65	67	65	65	78	98	74	77	82	82	93	First	Y	N	N
23	geetha	32	F	60	I	34	22	1	71	67	64	64	62	80	105	77	76	83	81	89	First	N	N	N
24	Kirthika	23	F	56	I	35	21	1	72	68	65	65	64	79	108	72	75	79	78	90	First	N	N	N
25	Karthicka	23	F	52	I	36	24	1	71	67	67	70	63	80	96	79	76	76	86	94	First	N	N	N
26	Madhangi	20	F	59	I	33	22	1	74	66	62	68	64	71	99	74	74	81	79	92	First	N	N	N
27	vasugi	26	F	60	II	37	24	2	72	67	65	67	65	79	94	75	77	81	81	90	First	N	N	N
28	Maheshwari	31	F	58	I	36	25	1	73	68	66	69	63	86	98	77	72	80	80	83	Second	N	N	N
29	priya	25	F	56	I	33	21	1	71	64	69	65	62	88	100	79	79	79	87	95	First	N	N	N
30	Sheela	28	F	58	I	37	24	1	73	65	69	62	66	89	98	76	77	79	89	84	First	N	N	N

Laryngeal Mask Airway Supreme

S. No	Name	Age	Sex	Wt	ASA	Oropharygeal leak pressure	Time Taken For Insertion	No. of Attempts	Hemodynamic Responses												Ease Of NG Tube Insertion	Post Operative Complications		
									Pulse Rate						Mean Arterial Pressure									
									Before Induction	At the Time of Insertion	1min	3min	5min	After Removal	Before Induction	At the Time of Insertion	1min	3min	5min	After Removal		Blood Staining	Coughing	Dysphagia
1	Madathi	18	F	43	I	29	23	1	70	67	65	66	65	80	100	75	76	79	81	92	First	N	N	N
2	Varshini	25	F	49	I	30	22	1	69	68	69	65	70	79	101	72	80	79	82	85	First	N	N	N
3	Sundarilakshmi	34	F	57	I	32	21	1	71	67	67	64	72	76	99	76	79	78	81	96	First	N	N	N
4	Jayakumari	35	F	60	I	31	22	1	75	60	68	69	71	77	103	75	76	75	79	89	First	N	N	N
5	Sangeetha	26	F	59	I	31	22	1	70	66	64	66	65	77	105	72	77	74	76	92	First	N	N	N
6	Mahesh	22	F	57	I	32	23	1	72	64	68	70	66	89	98	75	77	82	79	85	First	N	N	N
7	meena	21	F	53	II	29	22	1	71	60	64	69	69	90	96	72	77	80	81	95	First	N	N	N
8	Vijaylakshmi	27	F	57	I	30	22	1	70	60	74	67	67	83	97	76	78	74	80	94	First	N	N	N
9	Veeralakshmi	28	F	59	II	30	23	1	71	60	65	68	67	80	99	75	70	81	76	80	First	N	N	N
10	Gowri	24	F	60	I	32	21	1	61	64	64	69	68	74	99	72	73	80	74	91	First	N	N	N
11	Kalaivani	23	F	58	I	28	23	1	60	69	65	69	67	80	105	78	74	84	80	92	First	N	N	N
12	Kumari	22	F	57	I	31	24	1	89	68	68	68	65	92	95	74	71	77	82	86	First	N	N	N
13	Mathumitha	30	F	54	I	32	21	1	90	70	68	69	64	89	100	73	72	80	81	96	First	N	N	N
14	peratchi	18	F	45	I	30	25	1	80	69	67	69	67	70	102	73	73	79	78	91	First	N	N	N
15	mariammal	21	F	54	I	32	22	1	81	68	64	69	68	72	100	76	70	77	76	93	First	N	N	Y
16	kaniammal	27	F	56	I	31	22	1	79	70	65	65	65	80	106	77	72	81	79	97	First	N	N	N
17	Rajkumari	36	F	59	I	29	21	1	75	69	68	69	67	88	98	72	80	81	78	93	Second	N	N	N
18	Rajeshwari	24	F	60	I	32	22	1	75	69	67	65	68	80	90	72	80	82	80	94	First	N	N	N
19	latha	21	F	56	I	31	22	1	74	68	68	65	67	78	99	78	80	79	80	84	First	N	N	N
20	Varalakshmi	27	F	60	I	30	24	1	71	69	69	71	66	81	98	73	78	78	74	96	First	N	N	N
21	Vidhya	28	F	59	I	29	25	1	80	60	61	66	67	79	102	74	81	77	81	87	First	N	N	N
22	Vinotha	24	F	59	I	28	23	1	76	69	62	68	68	78	98	76	79	82	82	97	First	N	N	N
23	Mangayarkarasi	21	F	45	I	29	21	1	76	65	60	65	64	80	105	77	78	83	81	89	First	N	N	N
24	Muthukumari	27	F	60	I	32	24	1	76	69	63	66	65	79	98	72	80	79	78	90	First	N	N	N
25	devi	21	F	58	I	30	21	2	71	66	65	66	62	80	96	75	79	78	86	94	First	Y	N	N
26	Arivu	27	F	47	I	31	23	1	74	65	71	65	64	71	99	78	80	81	80	92	First	N	N	N
27	Venkateshwari	28	F	53	I	30	21	1	77	65	69	65	63	90	99	72	80	81	81	89	First	N	N	N
28	pappa	28	F	60	I	30	21	1	69	66	66	61	64	86	98	77	81	74	80	83	Second	N	N	N
29	meena	19	F	45	II	28	21	1	68	68	65	69	65	88	100	71	82	79	87	95	First	N	N	N
30	lakshmi	18	F	45	I	31	23	1	90	65	78	68	63	89	98	74	79	79	89	84	First	N	Y	N

Igel

S. No	Name	Age	Sex	Wt	ASA	Oropharygeal leak pressure	Time Taken For Insertion	No. of Attempts	Hemodynamic Responses												Ease Of NG Tube Insertion	Post Operative Complications		
									Pulse Rate						Mean Arterial Pressure									
									Before Induction	At the Time of Insertion	1min	3min	5min	After Removal	Before Induction	At the Time of Insertion	1min	3min	5min	After Removal		Blood Staining	Coughing	Dysphagia
1	Raji	23	F	54	I	30	16	1	75	60	60	64	70	80	100	75	76	80	80	90	First	N	N	N
2	Ramalakshmi	25	F	58	I	29	17	1	72	64	64	67	64	85	97	72	76	79	82	90	First	N	N	N
3	Mahalakshmi	28	F	56	I	28	15	1	73	63	63	68	68	76	99	76	77	78	81	96	First	N	N	N
4	Seethalakshmi	27	F	58	I	29	18	1	79	69	69	62	65	79	103	75	78	82	79	94	First	N	N	N
5	Sandhyalakshmi	35	F	57	I	29	16	1	72	65	65	61	63	84	110	79	78	74	76	91	First	N	N	N
6	priya	36	F	55	I	30	16	1	71	63	63	64	67	86	90	69	78	82	79	85	First	N	N	N
7	Kirubha	20	F	54	I	31	17	1	74	64	64	65	68	75	98	73	73	72	81	95	First	N	N	N
8	Kamal	21	F	55	II	30	15	1	73	66	66	68	68	76	101	70	76	79	81	89	First	Y	N	N
9	Murugalakshmi	24	F	49	I	30	15	1	73	67	67	65	67	80	103	73	75	81	80	98	First	N	N	N
10	Anandi	26	F	43	I	28	16	1	70	64	64	64	65	74	110	76	77	75	74	91	First	N	N	N
11	Parimalam	27	F	58	I	31	18	1	72	70	70	70	64	80	98	77	76	84	81	88	First	N	N	N
12	Ganga	28	F	60	I	29	17	1	72	65	65	65	67	82	89	72	80	77	82	86	First	N	N	N
13	Ravikumari	36	F	56	I	30	17	1	69	63	63	63	68	80	110	76	76	80	81	96	First	N	N	Y
14	Devipriya	23	F	52	I	32	16	1	71	67	67	65	69	78	100	78	74	75	78	89	First	N	N	N
15	Kanagalakshmi	25	F	59	I	27	15	2	73	64	64	64	67	77	102	73	73	77	78	93	First	N	N	N
16	shanthi	27	F	60	II	28	16	1	74	68	68	68	68	79	99	74	78	81	79	90	First	N	N	N
17	Rani lakshmi	28	F	58	I	27	15	1	75	67	67	67	67	88	94	75	79	79	81	93	Second	N	N	N
18	Rajalakshmi	24	F	56	II	29	19	1	76	65	65	65	66	79	89	77	74	82	79	94	First	N	N	N
19	Jayamala	23	F	58	I	30	18	1	72	67	67	69	67	78	105	76	73	85	80	84	First	N	N	N
20	Jaya	35	F	56	I	30	17	2	71	67	67	67	68	84	100	75	74	78	74	90	First	N	N	N
21	Sendhurammal	19	F	59	I	28	16	1	73	68	68	68	64	90	101	76	75	80	80	87	First	N	N	N
22	Balasaraswathi	20	F	60	I	28	17	1	69	70	66	70	65	78	100	69	72	82	80	93	First	N	N	N
23	Madathi	25	F	56	I	29	15	1	80	67	65	67	62	80	98	77	76	83	81	91	First	N	N	N
24	Parvathi	18	F	42	I	28	16	1	72	68	65	68	64	79	90	72	75	79	78	92	First	N	N	N
25	Parimala	32	F	43	I	28	18	1	71	70	67	70	63	81	97	70	74	76	81	94	First	N	N	N
26	Chandra	29	F	59	I	27	17	1	74	66	67	66	65	71	103	74	74	81	79	92	First	N	N	N
27	seetha	24	F	45	I	28	19	1	69	67	65	67	65	79	110	75	77	80	81	90	First	N	N	N
28	lakshmi	20	F	49	I	29	15	1	73	68	66	68	63	86	98	76	72	80	80	94	Second	N	N	N
29	divya	21	F	54	I	27	19	1	71	64	69	64	60	89	89	79	79	79	81	95	First	N	N	N
30	dhanam	23	F	47	I	31	15	1	73	70	70	70	66	89	110	75	79	80	89	90	First	N	N	N