COMPARISON OF KETAMINE AND LIDOCAINE SPRAY WITH PROPOFOL FOR THE INSERTION OF LARYNGEAL MASK AIRWAY IN CHILDREN

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CERTIFICATE

This is to certify that **Dr.M.S.YUVARAJ**, has prepared this dissertation titled "**COMPARISON OF KETAMINE AND LIDOCAINE SPRAY WITH PROPOFOL FOR THE INSERTION OF LARYNGEAL MASK AIRWAY IN CHILDREN**" under my overall supervision and guidance in Madras Medical College, Chennai in Partial fulfillment of the regulations of The Tamilnadu Dr.M.G.R. Medical University, for the award of M.D. degree in Anaesthesiology.

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CONTENTS

INTRODUCTION

The laryngeal mask airway (LMA) may provide a better airway, with respect to ventilation and oxygenation, than a conventional mask and oropharyngeal airway. In addition, the LMA has been successfully used to manage difficult airways as a ventilatory device by itself and as a conduit for tracheal intubation.

Propofol appears to provide the best conditions for LMA insertion, although propofol frequently causes apnea, pain on injection and hypotension.

To overcome this problem and to examine a better method for Laryngeal mask airway insertion in uncoperative children – a method in which the onset of action is rapid but airway and spontaneous ventilation are well maintained and a mode of drug administration other than Intravenous injection are being evaluated.

Ketamine is well known for its airway maintaining activity as well as for its increase in heart rate and cardiac output, which are favourable characteristics in paediatric anaesthesia.

Because it increases airway reflexes however, ketamine has been

regarded as inappropriate for the preparation of Laryngeal mask airway insertion. To take advantage of airway maintaining activity and to suppress increased airway reflexes, lidocaine spray was added to the preparation of the patients before the injection of ketamine.

The equipotent doses of propofol and ketamine for insertion of an LMA are not known, especially in patients premedicated with midazolam. This study compares the effectiveness of lidocaine spray and Intravenous ketamine with Propofol for insertion of LMA in children.

AIM OF THE STUDY

The aim of the study was to compare ketamine and lidocaine spray with propofol for the insertion of laryngeal mask airway in children, based on the following parameters

- Conditions for LMA insertion
- Responses after LMA insertion

ANATOMY OF PAEDIATRIC AIRWAY

In infants and young children the head is relatively large and the neck shorter than in the adult. These factors, together with the relatively large tongue, predispose to upper airway obstruction, and probably account for the greater use of tracheal intubation in these patients.

The infant glottis is situated opposite to $C_3 – C_4$ intervertebral disk. By the age of 3 years it has descended to the $C_4 – C_5$ interspace, where it remains until puberty, when it descends again to lie opposite the body of C_5.

The epiglottis of the infant is longer and U – shaped posteriorly as opposed to the flat leaf – shape of the adult. Infant larynx occupies a more anterior position compared with that in adults.

The larynx is funnel shaped in children below 8 years of age with the narrowest portion being at the level of the cricoid cartilage. The vocal cords of the neonate are slanted such that the anterior commissure is more caudal than the posterior commissure.

Airflow in the upper airway is turbulent during quiet respiration. Laminar flow begins only at the level of the 4^{th} or 5^{th} bronchial divisions where the

rapid increase in cross – sectional area increases airflow velocity.

They have highly complaint chest wall and horizontally placed ribs, which place them at a mechanical disadvantage and increase their work of breathing.

Diaphragm is the major muscle of respiration in the neonate, but its muscle fibers are such that they are less efficient. This implies that airway obstruction will produce hypoxia more rapidly than in the adult.

The LMA can be used in children, including small infants. It may be particularly helpful with children in whom unusual anatomy makes tracheal intubation difficult.

Studies show fewer hypoxic episodes and improved surgical conditions in children ventilated with the LMA compared to a face mask.

The LMA has been successfully used for neonatal resuscitation in infants as small as 1.2kg and neonates with abnormal airways.

LARYNGEAL MASK AIRWAY

The standard LMA consists of a curved tube (shaft) connected to an elliptical mask at a 30º angle. The mask made of silicone, consists of a cuff, which is inflatable through an inflation tube and a self – sealing pilot balloon. There are two vertical bars at the junction of the tube and the mask, which are designed to prevent the epiglottis from falling into the aperture of the tube.

A black line runs longitudinally along the posterior aspect of the tube to orient it after placement. A standard 15mm connection is present at the machine end.

Initially the LMA was introduced in 4 sizes. The design of the mask is based on the shape of the hypopharynx and not the larynx, hence the higher and more anterior position of the larynx in children does not affect the design of the mask, and the smaller sizes are scaled down models of the adult size.

Available Laryngeal Mask Airways

Size	Cm	Inflation volume	Patient size
1	8	Upto 4ml	Neonates / infants upto 5 kg
1.5	10	Upto 7ml	Infants between 5 – 10 kg
2	11.0	Upto 10ml	Children between 10 – 20 kg
2.5	12.5	10-14ml	Children between 20 – 30 kg
3	16	15- 20ml	Children and small adults over 30 kg
4	16	20-30ml	Normal adults
5	18	30-40ml	Large adults

Various types :

1. Standard LMA

2. Flexible LMA (reinforced LMA)
3. Short tube LMA
4. LMA Unique (Disposable LMA)
5. Intubating LMA (LMA fastrach)
6. LMA Pro – Seal

Preparation :

The cuff is fully deflated by pressing the hollow side down onto a clean flat surface, with two fingers pressing the tip flat. The deflated cuff should be free from wrinkle and its rim should face away from the mask apature. This imparts rigidity to the cuff. A lubricant is applied to the posterior surface of the cuff.

Placement:

Standard Technique :

The LMA can be placed with or without muscle relaxants. The patient is placed in the sniffing position (neck flexed and head extended). The head is held in slight extension by having the nonintubating hand stabilize the occiput. The jaw is allowed to fall open or is held open by an assistant. The device is held between the thumb and index finger as close as possible to the

junction of the tube and the mask. The distal tip of the deflated cuff is pressed against the hard palate and the LMA is advanced, using the index finger to guide the tube over the back of the tongue. The tube is advanced until a characteristic resistance is felt as the upper oesophageal sphincter is engaged. The hand is taken out. Without holding the tube, the cuff is inflated with the appropriate amount of air to achieve a proper seal.

The longitudinal blackline on the shaft of the tube should lie in the midline against the upper lip. When correctly positioned, the tip of the LMA cuff lies at the base of the hypopharynx against the upper oesophageal sphincter, the sides lie in the piriform fossae, and the upper border of the mask lies at the base of the tongue pushing it forward.

Modified techniques :

1. Lateral approach

2. Partially inflated cuff

3. By using a laryngoscope

Removal :

The LMA is tolerated well even in light planes of anaesthesia and can be left in place during emergence. The LMA should not be removed in light planes of anaesthesia.

The overall role of the LMA in clinical anaesthesia appears to lie between that of the facemask and that of the endotracheal tube, because it provides more airway security than the former but not the reliable airway protection and maintenance of the latter.

PHARMACOLOGY OF KETAMINE

AND LIDOCAINE SPRAY

Physical properties :

Ketamine is a 2-0-chlorophenyl–2-methylaminocyclo hexanone hydrochloride. It is a white crystalline substance with a characteristic smell. Readily soluble in water.

pH 3.5 – 4.1 in 10% solution. Supplied as 1,5 and 10% solutions.

PHARMACOKINETICS :

Absorption and Distribution :

Ketamine is administered by either the intravenous or intramuscular route. Peak plasma levels are usually achieved within 10 – 15 minutes after intramuscular injection.

Ketamine is more lipid – soluble and less protein bound than thiopental; it is equally ionized at physiological pH.

These characteristics, along with a ketamine induced increase in cerebral

blood flow and cardiac output, lead to rapid uptake and subsequent redistribution (Distribution half life is 10 – 15mts). Once again, awakening is due to redistribution to peripheral compartments.

Biotransformation :

Ketamine is biotransformed in the liver to several metabolites, some of which (eg. norketamine) retain anaesthetic activity. Induction of hepatic enzymes may partially explain the development of tolerance in patients who receive multiple doses of ketamine. Extensive hepatic uptake (extraction ratio of 0.9) explains ketamine's relatively short elimination half – life (2 hours). End products of biotransformation are excreted renally.

PHARMACODYNAMICS:

Effect on Cardiovascular System:

Ketamine increases arterial blood pressure, heartrate, and Cardiac output. These indirect cardiovascular effects are due to central stimulation of the sympathetic nervous system and inhibition of the reuptake of nor-epinephrine. Accompanying these changes are increase in pulmonary artery pressure and myocardial work. For these reasons, ketamine should be avoided in patients with coronary artery disease, hypertension, Congestive Heart

Failure and aneurysms. These indirect effects are often beneficial to patients with acute hypovolemic shock.

Respiratory System:

Ventilatory drive is minimally affected by the customary induction doses of ketamine, although rapid intravenous bolus administration or pretreatment with opioids occasionally produce apnea. It is a potent bronchodilator, making it a good induction agent for asthmatic patients. Upper airway reflexes remain intact. The increased salivation associated with ketamine can be attenuated by premedicaton with an anticholinergic agent.

Central Nervous System:

Ketamine increases cerebral O_2 consumption, CBF and Intra Cranial Pressure. These effects preclude its use in patients with space – occupying intracranial lesions. ***Undesirable psychotomimetic side effects during emergence and recovery are less common in children and in patients premedicated with benzodiazepines. Of the nonvolatile agents, ketamine may be the closest to being a 'complete' anaesthetic since it induces analgesia, amnesia and unconsiousness.***

Adverse reactions :

1. Hypertension, tachycardia, rashes

2. Vivid unpleasant dreams occur, and occasionally true hallucinations. The incidence of these emergence phenomenon increases with age, being about 5% under 5 years of age and 50% in adulthood.

Clinical uses and doses :

Adults → 1 – 2 mg/kg, IV and supplementary doses of 0.5 mg/kg.

Intramuscular 10mg/kg.

IV infusion rate 40µg/kg/min.

Onset – 1min (IV) 10 min (IM).

Uses

1. As the sole agent for minor operations.

2. As an induction agent before general anaesthesia.

3. For induction of anaesthesia in small children

4. When maintenance of BP is important, eg: in states of shock and in some poor – risk patients and in the elderly.

Xylocaine spray

It is a clear liquid with an odour of ethanol, menthol and banana. The active ingredient is dissolved in a mixture of water, ethanol and polyethylene glycol.

Action : Causes a reversible blockade of impulse propagation along nerve fibres by preventing the inward movement of sodium ions through the nerve membrane.

Pharamacokinetics :

Lignocaine is absorbed following topical administration to mucous membrane. In general, the rate of absorption of local anesthetic agents following topical application is most rapid after intratracheal and bronchial administration.

Normally 64% of lidocaine is bound to plasma proteins, mainly alpha-1 acid glycoprotein but also to albumin. Lignocaine crosses the blood brain barrier by passive diffusion.

Elimination pathyway is by liver metabolism, 90% excreted in the form

of various metabolites and less than 10% is excreted unchanged in the urine. The elimination half – life of lignocaine following an intravenous bolus injection is typically 1.5 - 2 hours. Half life may be prolonged two fold or more in patients with liver dysfunction.

Adverse effects become apparent with increasing venous plasma levels above 6.0µg free base / ml.

Indications : gynaecological procedures

Introduction of instruments, tubes and catheters into respiratory and GI tracts

Dental practice

Dosage and administration :

Duration : 10 – 15 minutes

Anaesthesia occurs with 1 – 5 minutes

(10% solution) each actuations of the metered dose delivers 10 mg lignocaine base.

In children less than 12 years of age the dose should not exceed 3 mg/kg (6 metered dose in an infant weighing 20 kg). In children less than 3 years of age less concentrated lignocaine solutions are recommended.

Contraindication – Hypersensitivity to amide local anesthetics.

Adverse effects –

1. Local reactions – irritation, hoarseness may occur
2. Allergic reactions (< 0.1%)
3. Acute systemic toxicity

PHARMACOLOGY OF PROPOFOL

Physical properties : Propofol is 2,6, diisopropylphenol. It is insoluble in water and was initially prepared with cremophor EL. Since there was complement mediated adverse reaction to cremophor EL, it is presently formulated in a 1% oil in water emulsion containing 10% soyabean oil, 1.2% egg phosphatide and 2.25% glycerol. It has a pKa of 10.76. Its molecular weight 178.3. pH – 7. It is currently available as a 1% solution in 20ml. (10mg/ml) ampoules and 50 and 100 ml bottles containing 1% or 2% solution.

Pharmacokinetics

It is best described by a three compartment model. After a single bolus dose two distribution phases are seen. The first phase has a half life of

1.8 – 8.3 minutes. This is followed by a phase of slow distribution with a half life of 30 – 60 minutes. It is during the second phase that significant metabolism occurs.

Distribution

The central compartment can be loaded by administering a single dose and starting a continuous infusion at the same time. There is a difference in concentration achieved at the effector site in the brain as compared to blood. The difference is due to a delay in the transfer of the drug from blood to the effector site. It has high plasma protein binding capacity especially with albumin and haemoglobin.

Metabolism :

It has large volume of distribution. Redistribution occurs into muscle, fat and poorly perfused tissues. It undergoes extensive hepatic metabolism to conjugates which are eliminated in the urine. The terminal half life ranges from 300 – 700minutes.

Pharmacodynamics

Effect on Central Nervous System:

Propofol is primarily a hypnotic. Anesthesia is induced within 20 – 40 seconds after IV administration. There is a delay in disappearance of eyelash reflex. Loss of verbal contact is a better end point. EEG frequency decreases and amplitude increases. It reduces the duration of seizures induced by ECT in humans.

Effect on Cardiovascular system:

In healthy patients arterial pressure decreases to a greater degree after induction of anaesthesia with propofol than with thiopentone. The reduction results primarily from vasodilation although there is a slight negative inotropic effect.

The degree of hypotension is substantially reduced by decreasing the rate of administration of the drug.

The pressor response to tracheal intubation is attenuated to a greater degree by propofol than thiopentone. It has been suggested that propofol resets rather than inhibits the baroreceptor reflex.

Both myocardial blood flow and myocardial oxygen consumption are significantly reduced. Hence myocardial O_2 supply demand ratio is preserved.

Effect on Respiratory System :

After induction apnea occurs more commonly and for a longer duration than with Thiopentone. During infusion of propofol, tidal volume is reduced and respiratory rate is increased than in the conscious state.

It has no effect on bronchial smooth muscle and laryngospasm is particularly uncommon.

Laryngeal reflexes are suppressed to a greater extent and propofol is regarded as the agent of choice when laryngeal mask airway is to be used.

Effect on skeletal muscle:

Tone is reduced but movements may occur in response to surgical stimulation.

Effect on GIT: No effect on GI motility in animals.

Effect on Hepatorenal system :

Hepatic blood flow is decreased by reduction in arterial pressure and cardiac output. Liver function tests are not altered. There is a transient

decrease in renal function.

Effect on endocrine system

Plasma concentrations of cortisol are decreased after administration of propofol.

Adverse effect :

1. Cardiovascular depression

Unless given very slowly, depression following a bolus dose of propofol is greater than that associated with a bolus dose of barbiturate and is likely to cause profound hypotension in hypovolemic or previously hypertensive patients.

2. Respiratory depression :

Apnea is more common and of longer duration than with thiopentone.

3. Excitatory phenomenon

These are more frequent than with thiopentone.

4. Pain on injection

This occurs in upto 40% of patient. The incidence is reduced when a small dose of lignocaine is injected shortly before propofol.

5.Allergic reaction

Skin rashes occur occasionally and anaphylactic reactions have also been reported.

Uses and doses of propofol

Adults

Induction 1 – 2.5mg/kg IV

Maintenance 50-150mcg/kg/min IV

Sedation 25 – 75 mcg/kg/min IV.

Children

Induction 2.5 – 3.5mg/kg/ IV administered over 20 – 30 seconds.

Maintenance 125 – 300 mcg/kg/min (7.5 - 18mg/kg/hr)

The ED95 induction dose is increased in children because the volume of the central compartment is 50% larger and clearance rate is 25% higher when compared to adults.

Contraindications for Propofol :

1. Airway obstruction
2. Hypersensitivity

Mechanism of action of Propofol :

Pharmacologic data suggests that atleast some of the CNS actions of propofol are mediated by the GABA receptor. Propofol also augments GABA induced neuronal inhibition of cerebral cortex.

Propofol binding to the GABA receptor is at a site distinct from those for barbiturates, benzodiazepines, or steroids.

The anesthetic effects are probably mediated by mechanisms other than those on the GABA receptors.

REVIEW OF LITERATURE

1. **Chiu CL, Wang CY, Chan YK et al (2005)**. In their study, they evaluated the effectiveness on hemodynamics and insertion conditions for laryngeal mask airway using ketamine – propofol, Fentanyl – Propofol and Profol-saline. They concluded that the addition of ketamine 0.5mg/kg. improves hemodynamics when compared to fentanyl 1µg/kg, with less prolonged apnea, and is associated with better LMA insertion.
2. **Jae – Hyon Bahk et al., (2002).** They studied the effectiveness of lidocaine spray, ketamine anaesthesia and LMA insertion and concluded that is could be used as airway management that could maintain spontaneous breathing in children. No propofol dose was completely satisfactory. Most cases involved apnoea or airway obstruction. Ketamine and lidocaine spray were appropriate for LMA insertion, which may be a safe method for management of difficult airway in children.
3. **Seavell CR, Cook TM et al (1996).** They assessed conditions for insertion of a laryngeal mask airway in patients who received either Thiopentone 5mg/kg preceeded by 40 mg of topical lignocaine to the posterior pharyngeal wall or propofol 2.5 mg/kg alone. They conclude

that thiopentone preceeded by topical lignocaine spray provided conditions for insertion of a LMA equal to those of propofol, with more hemodynamic stability and a shorter period of apnea. Gagging, coughing and laryngospasm following LMA insertion were graded and hemodynamic data and apnoea times were recorded.

4. **Cook TM Seavell CR et al., (1996).** They compared the use of topical and intravenous lignocaine to aid the insertion of the LMA with thiopentone. The group receiving topical lignocaine had a lower incidence of laryngospasm, required fewer attempts for successful insertion of the laryngeal mask and coughed or gagged less frequently than the group receiving lignocaine intervenously. Overall, the conditions for laryngeal mask airway insertion were better in the topical group.
5. **Efrat R Kadani A et al., (1994)**. The authors report their experience with LMA on 120 consecutively treated children who underwent elective inguinal herniorrhapy or orchidopexy. Anaesthesia was induced and maintained with halothane, nitrous oxide and oxygen. The LMA was easily inserted in 115 patients (95.8%) on the first attempt. Anaesthesia was maintained by halothane.
6. **Keidan I, Motoyama EK et al (2000).** They studied work of breathing in 24 healthy children, during elective urogenital surgery under 1 MAC

halothane – N_2O anaesthesia with a caudal block while breathing spontaneously.

7. **Reignier J, Ben Ameur M et al, (1995).** They compared spontaneous ventilation via the LMA with that via the endotracheal tube in children anaesthetized with halothane. They measured tidal volume, respiratory rate, minute ventilation and end tidal CO_2. They conclude that in 6 – 24 month old children anesthetized with halothane, paradoxic inspiratory movement is less when breathing an LMA than through an endotracheal tube.
8. **Lopez ML et al (1999).** They compared patient outcome for propofol vs sevoflurane with the LMA using either spontaneous breathing or pressure controlled ventilation. They concluded that the techniques using propofol and sevoflurane are equally suitable for induction and maintenance of anaesthesia with the LMA in children undergoing minor surgery below the umbilicus. Emergence is more rapid, but postoperative agitation more common with sevoflurance.
9. **Mamaya B et al., (2002).** The efficacy and safety of the smallest size of the cuffed oropharyngeal airway (COPA) for school age, spontaneously breathing children was investigated and compared with the laryngeal mask airway (LMA). The COPA is a good extratracheal airway that provides new possibilities for airway management in school age children

with an adequate and well sealed airway, during spontaneous breathing or during short – term assisted manual ventilation.

10. **Joshi GP et al., (1998).** They compared anaesthetic requirements, recovery times and postoperative side effects when a laryngeal mask airway was used as an alternative to the tracheal tube during ambulatory anaesthesia. Use of the laryngeal mask airway can obviate the need for insertion of a tracheal tube for many ambulatory surgery procedures, and thereby decrease the incidence of post operative sore throats.
11. **Nagais et al., (2000).** They modified the technique for laryngeal mask airway insertion in children. It involves inserting a two - thirds inflated LMA with its lumen facing laterally towards left and then rotating it 90 degrees clockwise as it passes downwards into position behind the larynx. Then the cuff is inflated fully. A satisfactory airway was achieved in all of the children who participated in the survey. There were no significant differences in vital signs between pre and post – insertion.
12. **In 1985 McCulloch and coworkers** studied the incidence of pain on injection of Propofol. The incidence of pain was 37.5% on injection into the dorsal hand veins. The incidence of pain was only partially reduced when using intravenous lidocaine.
13. **In 1922 Jan Manschot et al** studied the age related difference in propofol requirements for induction in healthy children aged 3 – 15

years, using 1.5mg/kg to 3.5mg/kg. There was significant decrease in MAP and this occurred in all dose and age groups.

14. **In 1994, Hanallah et al** conducted a study on one hundred children (3 – 12 years) scheduled for day care surgery and compared propofol anaesthesia with thiopentone and halothane. The study evaluated the hemodynamic changes during induction of anaesthesia and the speed and quality of recovery from anaesthesia.

The results were

i. 3mg/kg of bolus propofol produced rapid and smooth induction of anesthesia in children.

ii. 4% of patients who received propofol had pain on injection

Samar Kandi AH et al., (1995). A prospective study to assess airway protection by the LMA in paediatric patients, using methylene blue and the fibroptic bronchoscope to view the inside of the mask, to detect any leakage of the dye. All patients were allowed to breath spontaneously over an Ayre's T piece. No serious complications occurred in any patients.

Gursoy et al., (1996). The safety of positive pressure ventilation when using the size 2 LMA in children were studied. The LMA cuff was inflated in incremental steps to achieve a cuff leak pressure of 15cm H_2O.

Abdominal circumference was measured before and after PPV in study patients, as well as in a control group managed with tracheal intubation. The size 2 LMA provides an effective airway for PPV. Mild gastric distension often occurs. They conclude that with certain precautions described in the text, the size 2 LMA provides a relatively safe airway for PPV in children.

15. **Frantantonio R et al (2000).** To assess the incidence of postoperative respiratory complications in patients recently suffering from inflammation of the upper respiratory tract in whom a LMA or uncuffed orotracheal tube have been used. The frequency of adverse respiratory events increases significantly in URI patients with both LMA and the tracheal tube. In recent URI, it would seem appropriate to avoid tracheal intubation, if possible, preferring the LMA.

Ofer R et al., (1997). In case of craniofacial and mandibulofacial malformations, which are mostly treated during childhood, difficult intubation conductions must generally be expected. In such cases, the LMA an alternative instrument for use in endotracheal intubation is a new aid for ventilation. It is not only a ventilation aid, but also a valuable too in difficult intubation conditions.

MATERIAL AND METHODS

The study was conducted in 50 paediatric patients of either sex, between the age group of 3 – 12 years. They belonged to ASA I and II and were posted for elective surgery.

Those who have neuromuscular disease, psychiatric disorders, seizure disorders, respiratory tract infection, or a history of allergy or asthma were excluded. Patients were randomized into two groups to receive propofol or ketamine with lidocaine spray.

Informed written consent was obtained from all parents.

Study group (Group K) – Ketamine 3mg/kg with Xylocaine spray

Control group (Group P) – Propofol 3mg/kg.

Premedication :

Intravenous line with Balanced salt solution was established in all patients.

Patients were premedicated with

Inj. MIDAZOLAM 0.05mg/kg IV

Inj. GLYCOPYROLATE 0.005 mg/kg IV

5 minutes before induction

Monitoring :

Precordial stethoscope

Pulse oximetry

Electrocardiogram

NIBP monitor

Induction :

Ketamine group

One minute before induction lidocaine spray (10%) was applied to the oropharynx.

Body weight between 10 – 20 kg: spray twice,

20 – 30kg: spray 3 times

> 30 kg : spray 4 times.

Ketamine 3mg/kg was injected over one minute. Immediately after loss of lid reflex, a face mask was gently put onto the face with 4L/min of oxygen. If apnea occurred, controlled ventilation was instituted. The LMA was inserted. If spontaneous ventilation was lost, LMA position and airway patency were checked by gentle manual ventilation. If spontaneous ventilation was active, LMA position and airway patency were clinically checked by regular, rhythmic reservoir bag movement.

Propofol group :

The calculated dose (3mg/kg) of propofol was injected over 15 seconds. Immediately after injection, 3ml of saline was used to flush the drug from the IV line.

After 1min, LMA was inserted. If spontaneous ventilation was lost, LMA position and airway patency were checked by gentle manual ventilation. If there was airway obstruction before insertion, mask ventilation with 4L/min

of oxygen was administered. The respiratory rate was monitored. If apnea (cessation of breathing for > 20s) occurred controlled ventilation was instituted.

The conditions for LMA insertion and patient responses in both the groups were tabulated, as follows

1. **Self respiration**

    a. Satisfactory (Active)

    b. Acceptable (weaker than active)

    c. Unsatisfactory (apnea)

2. **Airway obstruction**

    a. None

    b. Partial, relived by mandibular lift, or if apnea, smooth mask ventilation, with minimal jaw thrust.

    c. More severe than acceptable criteria.

3. **Jaw relaxation**

   a. Satisfactory (ideal).

   b. Acceptable (Not ideal but permits easy opening of mouth).

   c. Unacceptable (None).

Responses after LMA insertion

1. **Laryngospasm**.

   a.None

   b.Mild (spontaneous relief)

   c.Moderate (relieved by Positive Pressure)

   d.Severe (relieved by Scoline)

2. **Coughing, gagging, swallowing, tongue movement.**

   a.Absent

b.Minimal (Some movement but did not affect positioning of LMA).

c.Moderate (holding required no need for inhalational anaesthetic)

d.Severe (additional dose of drug needed)

3. Head and Limb movements

a.Absent

b.Mild (no restraint necessary)

c.Moderate (some restraint necessary discontinued immediately).

d.Severe (additional dose needed).

The results were tabulated and statistically analysed.

Chi-square test was used to arrive at the p value. The significance of all the tests was compared with available studies and results were arrived at.

OBSERVATION AND RESULTS

This study was conducted on 50 patients who were divided into 2 groups

Group K: Ketamine 3mg/kg IV with lidocaine spray

Group P: Propofol 3mg /kg

The age, body weight and sex distribution of all 50 patients are shown in table – A. There were no wide variations in the age or body weight of the study groups. The surgical procedures were mainly of general surgeries below umbilicus.

TABLE A

Demographical data (Mean ± SD)

Parameter	Group K	Group P
Age (Years)	7.5 ± 4.5	8.0 ± 4
Weight (kg)	19 ± 11	21 ± 11
Sex (M : F)	13 : 12	12 : 13

Comparison of conditions for LMA insertion

Three conditions such as self respiration, airway obstruction and jaw relaxation were assessed in both groups and the results were tabulated as shown in table B,C,D.

TABLE B

Self respiration

Self respiration	Group K (n = 25)	Group P (n = 25)
Satisfactory (active)	22 (88%)	16 (64%)
Acceptable (Weaker than active)	3 (12%)	8 (32%)
Unsatisfactory (apnea)	-	1 (4%)

($P < 0.05$) statistically significant ($X^2 = 3.95$)

In group K patients respiration was active in 88% as compared to group P (64%). 36% of group P patients had weaker than active respiration or apnea (cessation of breathing >20 sec) before LMA insertion. In them respiration was assisted with mask ventilation. But only 12% of group K patients had weaker than active respiration. There was statistical significant difference between the two groups.

TABLE C

Airway obstruction	**Group K (n = 25)**	**Group P (n = 25)**
Satisfactory (none)	24 (96%)	12 (48%)
Acceptable (partial, relieved by mandibular lift or if apnea, mask ventilation with minimal jaw thrust)	1 (4%)	13 (52%)
Unsatisfactory (more severe)	-	-

$P < 0.001$ statistically significant ($X^2 = 14.29$)

Airway obstruction was more in group P patients (52%). In group K patients only 4% had airway obstruction. In both the groups obstruction was relieved by mandibular lift and mask ventilation with minimal jaw thrust.

TABLE D

Jaw Relaxation

Jaw relaxation	**Group K (n =25)**	**Group P (n = 25)**
Satisfactory (Ideal)	14 (56%)	19 (76%)
Acceptable (not ideal but permits easy opening)	10 (40%)	4 (16%)
Unsatisfactory (none)	1 (4%)	2 (8%)

P > 0.05 not significant ($X^2 = 2.23$)

In both the groups, jaw relaxation was minimal for LMA insertion in considerable number of patients. Difficulty in mouth opening is more in (44%) group K patients than in group P (24%). But the results are not statistically significant.

Comparison of response after LMA insertion.

TABLE E

LARYNGOSPASM

Laryngospasm	**Group K (n = 25)**	**Group P (n = 25)**
None	24 (96%)	25 (100%)
Mild (Spontaneous relief)	1 (4%)	-
Moderate (relieved by applying positive pressure)	-	-
Severe (relieved by scoline)	-	-

In both the groups there was no incidence of life threatening laryngospasm. In our study, only one patient had mild laryngospasm after LMA insertion, which was spontaneously relieved.

TABLE F
COUGHING, GAGGING, SWALLOWING, TONGUE MOVEMENTS

Coughing, Gagging, Swallowing, Tongue Movements	**Group K (n – 25)**	**Group P (n = 25)**
Absent	15 (60%)	13 (52%)
Minimal (some movement but didn't affect positioning of LMA)	6 (24%)	8 (32%)
Moderate (holding required)	4 (16%)	2 (8%)
Severe (additional dose of drug needed)	-	2 (8%)

P > 0.05 statistically not significant.

In both the groups coughing, gagging, swallowing and tongue movements occurred in considerable number of patients. There was no statistically significant difference in results between the two groups.

TABLE G

HEAD AND LIMB MOVEMENTS

Head and Limb Movements	Group K (n – 25)	Group P (n = 25)
Absent	22 (88%)	16 (64%)
Mild (no restraint necessary)	-	-
Moderate (some restraint necessary discontinued immediately)	3 (12%)	9 (36%)
Severe (additional dose needed)	-	-

P > 0.05 Statistically significant

Head and limb movements are more in group P patients (36%) than in Group K (12%). These results show a statistically significant difference.

DISCUSSION

Laryngeal mask airway introduced by Brain in 1983 as an alternative to tracheal intubation in patients when conventional endotracheal intubation is either difficult or impossible.

Ketamine is well – known for its airway maintaining activity as well as for its increases in heart rate and cardiac output. To take advantage of airway maintaining activity and to suppress increased airway reflexes, lidocaine spray was added to the preparation of the patients before the injection of ketamine

Conditions for laryngeal mask airway insertion.

Self respiration:

Jae – Hyon Bahk et al, showed the effectiveness of ketamine for LMA insertion. Ketamine maintains spontaneous respiration effectively than propofol in children.

In our study, there was less incidence of apnea in ketamine group than in propofol group.

Airway obstruction :

Bhak et al, showed that airway obstruction was experienced after every

dose of propofol in paediatric patients.

In our study, children who received propofol had significant airway obstruction than in children who received ketamine.

Jaw relaxation :

In both the groups jaw relaxation was minimal for LMA insertion in considerable number of patients.

Responses after laryngeal mask airway insertion.

Laryngospasm :

Cook TM Seavel et al, compared topical and intravenous lignocaine to aid insertion of LMA with thiopentone. The group who had topical lignocaine had a lower incidence of laryngospasm.

In out study, no patients had severe laryngospasm.

Coughing, gagging, swallowing, tongue movements

Jae – Hyon Bahk et al, compared responses after LMA insertion in patients who received ketamine and propofol. They showed that both the groups had similar results.

In our study, both the groups of patients had coughing, gagging,

swallowing and tongue movements after LMA insertion.

Head and limb movements:

In our study, there was significant difference between the two groups in limb movements. More number of propofol group patients had limb movements than ketamine group.

SUMMARY

In our study, there was better conditions for laryngeal mask airway insertion regarding self respiration. It was better in the ketamine with lignocaine group as compared to the propofol group during LMA insertion.

There was decreased incidence of airway obstruction in ketamine group as compared to the Propofol group.

There was no significant difference between the two groups as far as jaw relaxation was concerned.

Response to LMA insertion (laryngospasm, coughing, gagging) was also not significant between the two groups.

Haemodynamically, ketamine produced an increase in the heart rate when compared to propofol.

CONCLUSION

From the study, there was better conditions for laryngeal mask airway insertion regarding self respiration. It was better in the ketamine with lignocaine group as compared to the propofol group during LMA insertion.

There was decreased incidence of airway obstruction in ketamine group as compared to the Propofol group.

There was no significant difference between the two groups as far as jaw relaxation was concerned.

Response to LMA insertion (laryngospasm, coughing, gagging) was also not significant between the two groups.

we concluded that ketamine with lidocaine spray in the dose of 3mg/kg can be used for LMA insertion in children.

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PROFORMA

Comparison of Ketamine and Lidocaine spray with propofol for the insertion of LMA in children

Name :

Age : Sex :

Diagnosis : Surgery :

Body weight:

ASA status :

CVS : RS :

Premedication:(5 minutes before induction)

Inj. Midazolam 0.05 mg/kg IV-
Inj. Glycopyrrolate 0.05 mg/kg IV-

Monitors:

Precordial stethoscope-

ECG

Pulse oximetry

BP monitoring

Group K	**Group P**
Propofol 3.0 mg/kg (15 sec).	Ketamine 3.0 mg/kg (1 min.) Liodcaine spray (10%)

Conditions for Insertion of LMA

1. Self respiration

	Group K	Group P
a. Satisfactory (active)		
b. Acceptable (weaker than active)		
c. Unsatisfactory (apnea)		

2. Airway obstruction

	Group K	Group P
a. Satisfactory (none)		
b. Acceptable (partial, relieved by mandibular lift or if apnea, mask ventilation with minimal jaw thrust)		
c. Unsatisfactory (more severe)		

3. Jaw relaxation

	Group K	Group P
a. Satisfactory (ideal)		
b. Acceptable (not ideal but permits easy opening)		
c. Unsatisfactory (none)		

Responses after LMA Insertion

4. Laryngospasm

	Group K	Group P
a. None		
b. Mild (spontaneous relief)		
c. Moderate (relieved by applying PP)		
d. Severe (relieved by Scoline)		

5. Unsatisfactory responses (coughing, gagging, swallowing, tongue movement)

	Group K	Group P
a. Absent		
b. Minimal (some movement but did not affect positioning of LMA)		
c. Moderate (holding required, no need for inhalation anaesthetic)		
d. Severe (additional dose of drug needed)		

6. Head and limb movements

	Group K	Group P
a. absent		
b. mild (no restraint was necessary)		
c. moderate (some restraint necessary discontinue immediately)		
d. severe (additional dose needed)		

MASTER CHART

Ketamine Group

	NAME	AGE (YRS) & SEX	WT (kg)	SURGERY	CONDITIONS ON INSERTION			RESPONSES AFTER INSERTION			PRE INDUCT HEAR RATE/
					SR	AO	JR	L	CGT	HL	
	GIRIJA	6.5/F	12kg	Dislocation hip/ open Reduction	S	S	S	N	Ab	Ab	96
	SARAVANAN	12/M	32kg	Hypospadias/ Urethroplasty	S	S	S	N	Ab	Ab	82
	GANESH	7/M	14kg	Penile hypospedias Urethroplasty	A	S	S	N	MI	Ab	86
	HARIHARAN	9/M	22kg	Illizarovav fixation tibia	S	S	S	N	Ab	Ab	82
	JAYABHARATHAN	8/M	19kg	Urethroplasty	S	S	A	N	MI	MO	92
	MANIKANDAN	3/M	8kg	Analstenosis /Anoplasty	S	S	S	N	Ab	Ab	110
	KUMAR	5/M	13kg	Herniotomy	S	S	A	N	Ab	Ab	100
	RAMYA	10/M	21kg	Cystoscopy	S	A	S	N	MI	Ab	92
	RAKESH	11/M	26kg	Hypospadias/ Urethroplasty	S	S	S	N	Ab	Ab	96
	SENTHILKUMAR	8/M	20kg	Herniotomy Rt	S	S	U	N	MI	Ab	92
	LAVANYA	9/F	18kg	ORIF® tibia	S	S	S	N	Ab	Ab	96
	SUGANTHI	4/F	9kg	CTEV / illizarov	S	S	S	N	MO	MO	102
	RAMESH	4/M	10kg	Herniotomy	S	S	A	M	Ab	Ab	106
	KUMARI	6/F	14kg	B/L Herniotomy	S	S	S	N	MO	Ab	96
	THILAK	7/M	16kg	Coronalhypospadias/ urethroplasty	S	S	S	N	Ab	Ab	102
	BALAMANI	12/F	28kg	Skin graft	A	S	S	N	Ab	Ab	96
	VINODHA	8/F	20kg	Herniotomy Rt	S	S	S	N	MI	Ab	92
	FILOMINA	9/F	21kg	Cystoscopy	S	S	A	N	Ab	Ab	102
	PANDIAN	6/M	12kg	Encysted hydiocale/ Ligation	S	S	S	N	Ab	Ab	98
	VIKRAM	7/M	16kg	Herniotomy Rt	S	S	S	N	MO	Ab	90
	NISHA	5/F	15kg	Anoplasty	S	S	S	N	Ab	Ab	96
	VALLI	8/F	20kg	Cystoscopy	S	S	U	N	MI	MO	96
	KOLINCHI	10/F	22kg	Circumcesion/Herniotomy	A	S	S	N	Ab	Ab	102
	ALAGESAN	6/M	16kg	Illizarov Rt. Leg	S	S	S	N	Ab	Ab	92
	NIROSHA	4/F	13kg	Herniotomy	S	S	S	N	MI	Ab	106

SR – Self Respiration L – Laryngospasm S – Satisfactory Ab - Absent

AO – Airway Obstruction CGT – Coughing,Gagging A – Acceptable N - None

JR – Jaw Relaxation HL – Head and Limb Movement U – Unacceptable Mi – Minimal

Mo - Moderate

MASTER CHART

PROPOFOL GROUP

S. NO	NAME	AGE (YRS) & SEX	WT (kg)	SURGERY	CONDITIONS ON INSERTION			RESPONSES AFTER INSERTION			IN HE
					SR	AO	JR	L	CGT	HL	
1.	DILIRAJ	4/M	11kg	Rt Herniotomy	S	S	S	S	Ab	Ab	96
2	ITHIKAS	4/M	12kg	Hypospadias/urethroplasty	A	S	S	S	MI	Ab	90
3	ARUNKUMAR	5/M	15kg	Illizarov® tibia	S	S	S	S	Ab	MO	92
4	ANUSUYA	8/F	19kg	R Herniotomy	S	A	A	S	Ab	Ab	100
5	MEENA	5/F	12kg	Skin graft Rt. Thigh	A	A	A	S	MI	MO	106
6	JAYABALAN	6/M	13kg	Herniotomy	A	S	A	S	Ab	MO	92
7	SABARIGIRI	4/M	10kg	Hypospadias fistula/Repair	S	A	S	S	Ab	Ab	126
8	RAJADURAI	10/F	20kg	Penile Hypospadias fistula/Repair	U	S	S	S	MO	Ab	88
9	DAVID	6/M	17kg	Undescended testis / orchidopexy	S	S	S	S	Ab	MO	102
10	KISHORE	4/M	12kg	Herniotomy	A	S	S	S	MI	Ab	106
11	RAJALAKSHMI	12/F	24kg	Cystoscopy	S	A	A	S	SE	Ab	88
12	LAVANYA	11/F	28kg	CTEV/Illizarov	S	A	S	S	Ab	MO	82
13	MALA	9/F	22kg	Club foot/Repair	S	S	S	S	Ab	Ab	86
14	KISHORE	7/M	20kg	Herniotomy	S	A	S	S	MI	Ab	92
15	VIKRAM	6/M	12kg	Herniotomy Rt	S	A	S	S	SE	Ab	100
16	BEEPA	5/F	13kg	Dislocation hip/open reduction	S	S	S	S	Ab	Ab	98
17	VINDHYA	4/F	11kg	Herniotomy Rt	A	S	S	S	MI	MO	92
18	PRADARSHINI	12/F	22kg	Anoplasty	S	A	U	S	MI	Ab	88
19	MUGANTHAN	9/M	18kg	Circumcision /Herniotomy	S	A	S	S	MO	MO	96
20	GAYATHRI	11/F	17kg	Cystoscopy	A	S	S	S	Ab	Ab	88
21	SHANTHI	10/F	16kg	Pv sac ligation	A	A	S	S	MI	MO	90
22	DINESH	8/M	18kg	Herniotomy Lt	S	S	U	S	Ab	Ab	92
23	PRAKASH	9/M	24kg	Hypospadias fistula/Repair	S	A	S	S	Ab	MO	96
24	KARTHIK	10/F	22kg	Skin graft Rt. Leg	A	A	S	S	Ab	Ab	82
25	RAMYA	11/F	22kg	Slipped femoral epiphysis/ Repair	S	A	S	S	MI	Ab	96

SR – Self Respiration
Ab - Absent

L – Laryngospasm

S – Satisfactory

AO – Airway Obstruction
N - None

CGT – Coughing,Gagging

A – Acceptable

JR – Jaw Relaxation
Mi – Minimal

HL – Head and Limb Movement

U – Unacceptable

Mo - Moderate