# COMPARISON OF DEXMEDETOMIDINE PROPOFOL WITH FENTANYL PROPOFOL FOR LARYNGEAL MASK AIRWAY INSERTION IN GENERAL ANAESTHESIA PATIENTS UNDERGOING ELECTIVE SURGERIES

**By**

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SDUAHER

DISSERTATION SUBMITTED TO
SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, KOLAR, KARNATAKA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

**DOCTOR OF MEDICINE**

IN

ANAESTHESIOLOGY

**Under the guidance of**

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**TAMAKA, KOLAR- 563101**

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**Dr. ABHISHEK. K. M.**

# LIST OF ABBREVIATIONS USED

| Abbreviation | Full Form |
|---|---|
| ASA | American society of Anaesthesiologists |
| CNS | Central nervous system |
| Cms | Centimeters |
| CSF | Cerebro spinal fluid |
| CVS | Cardiovascular system |
| ECG | Electrocardiogram |
| HR | Heart Rate |
| Hrs | Hours |
| I.V | Intravenous |
| Kg | Kilogram |
| $L_{3-4}$ | Lumbar Vertebra |
| Ml | Milliliter |
| Mg | Milligram |
| Min | Minutes |
| mm of Hg | Millimeter of mercury |
| NIBP | Non Invasive Blood Pressure |
| PR | Pulse rate |
| SBP | Systolic blood pressure |
| $SpO_2$ | Percentage of oxygen saturation |
| VAS | Visual analogue scale |

# ABSTRACT


**COMPARISON OF DEXMEDETOMIDINE PROPOFOL WITH FENTANYL PROPOFOL FOR LARYNGEAL MASK AIRWAY INSERTION IN GENERAL ANAESTHESIA PATIENTS UNDERGOING ELECTIVE SURGERIES**

**Aims and Objectives:**

1. To compare efficacy of Dexmedetomidine – Propofol and Fentanyl – Propofol for LMA insertion in terms of ease of intubation using MUZI and COLLEAGUES scoring system.
2. To compare the hemodynamic responses to LMA insertion with Dexmedetomidine – Propofol and Fentanyl – Propofol in terms of heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, saturation and respiratory rate.

**Materials and Methods:**

After obtaining institutional ethical committee approval, a prospective, randomized, double blind study was carried out at R.L.Jalappa Hospital and Research centre, Tamaka, Kolar. 110 ASA I and II patients of either sex undergoing elective surgeries under general anaesthesia were included in the study. Patients were divided into two groups of 55 each. Group A patients were preoxygenated for 3min, dexmedetomidine 1mcg/kg diluted in 10ml normal saline was given over 2min. 30sec later propofol 2mg/kg was given for induction without neuromuscular blocking agents. Whereas, group B patients were preoxygenated for 3 min, fentanyl 1mcg/kg diluted in 10ml normal saline was given over 2 min. 30 sec later propofol 2mg/kg was given for induction without neuromuscular blocking agents.

Parameters observed include HR, SBP, DBP, MAP, $SpO_2$ and RR before insertion of LMA and 30 sec, 1 min, 3 min, 5 min, 10 min and 15 min after insertion of LMA. Response of the patient to LMA insertion like coughing, gagging or any movement were noted. And to assess the tolerance of LMA insertion we followed the scoring system modified by Muzi and colleagues.

**Results:**

Dexmedetomidine group had better LMA insertion conditions like better jaw mobility, lesser incidence of cough and fewer incidence of breath holding spells. In Group A 72.7% had Spontaneous ventilation and 27.3% had breath holding spells. In Group B 76.4% had Spontaneous ventilation, 47.3% had breath holding and 1.8% had expiratory stridor. There was significant difference in breath holding spells between two groups.

Moreover, reduction of hemodynamic parameters like SBP, DBP and MAP was more with fentanyl group than dexmedetomidine group. In our study significant difference in Mean MAP with p value <0.016 between two groups was observed from 5 min and persisted till 15 min intervals. At other intervals there was no significant difference in mean MAP between two groups. But on the other hand, in our study significant difference in Mean Heart rate with p value <0.006 and <0.025 was seen between two groups at 1 min and 3 min respectively. Mean HR was lower in group A than group B. No significant difference was observed between two groups at other intervals. In Group A, LMA was inserted on second attempt in 14.5% individuals and in Group B, LMA was inserted on second attempt in 3.6% individuals. This difference was statistically significant. These observations showed us that dexmedetomidine with propofol provided better hemodynamic stability than fentanyl with propofol for LMA insertion

**Conclusion:**

From our study we conclude that dexmedetomidine caused less respiratory depression and more stable hemodynamic conditions, compared to fentanyl. Thus we feel that dexmedetomidine can be used as an alternative to fentanyl with an advantage for LMA insertions in short surgical procedures.

**Key words: Dexmedetomidine, Propofol, Laryngeal Mask Airway, Hemodynamic responses**

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# INTRODUCTION

Laryngeal mask Airway (LMA), one of the extra glottic airways (EGA), was invented by Dr. Archie Brain in 1981. But, it was available commercially only after 1988 in United Kingdom and 1991 in United States. With the introduction of LMA classic (cLMA) there was wide spread recognition and it had major impact on anaesthesia practice and airway management. There are thousands of articles, book chapters and textbooks that testify to the efficacy of LMA as an extraglottic device. Later on, manufacturers and individuals introduced similar airway device.[1]

LMA secures airway better than face mask and also causes less hemodynamic stress than endotracheal tube insertion. Basically, LMA consists of a silicon mask that is connected to a silicon rubber tube. The mask is bounded by an inflatable elliptical cuff, that forms a tip distal to LMA. There are aperture bars in the dome of the mask, that lift the epiglottis away, so that the lumen is patent. LMA is contraindicated in patients with risk of pulmonary aspiration, if peak inspiratory pressure is >20 cm of $H_2O$. In case of risk of pulmonary aspiration, LMA is not a substitute for endotracheal tube insertion. American Society of Anaesthesiologists (ASA), in their difficult airway algorithm recommends the insertion of LMA when ventilation or intubation is difficult. The distal aperture of LMA is in close proximity to vocal cords, so that a 6.0-mm endotracheal tube can be passed over an intubating stylet or a pediatric fibreoptic bronchoscope to secure a patient's airway.[2]

During intubation of endotracheal tube with direct laryngoscopy, there are haemodynamic changes seen in the patient. Haemodynamic changes are in the form of transient increase in the arterial pressure and heart rate. These changes are due to mechanical stimulation of sympathetic system in the upper airway. Moreover, most episodes of myocardial ischaemia are seen with intubation response are mainly due to tachycardia.

Hence, the use of LMA a supraglottic airway device has advantage of not having intubation response that is associated with endotracheal tube insertion.[4]

But, LMA insertion causes less haemodynamic changes. There is less increase in heart rate and arterial pressure. Thereby, intubation response can be avoided with LMA insertion and there are less chances of myocardial ischaemia.[7] It is probably that stimulation of the trachea by a tracheal tube has a significant role in causing cardiovascular responses to tracheal intubation.[8] Moreover, there are several advantages of LMA over endotracheal tube placement. Apart from being beneficial to patients with cardiovascular disease, there is also less change in intraocular pressure and provides benefit to patients with glaucoma. Also lower incidence of cough at the time of emergence may benefit patients after ENT or open eye surgery, where, excessive straining is harmful. Lower incidence of sore throat and change in voice has benefits for professional voice users as well.[9]

One of the major advantage of using LMA is that it requires lighter plane of anaesthesia when compared to endotracheal tube insertion.[10] Coming to the type of anaesthesia, inahalational anaesthesia is more efficient than intravenous anaesthesia, but, requires more time.[11] Amongst intravenous anaesthesia, propofol was chosen over thiopentone. With propofol, passage of LMA is smoother as it suppresses the upper airway reflexes and it also has a shorter half-life than thiopentone.[10]

But, propofol itself does not possess any analgesic property. Also, the high dose of propofol for LMA insertion itself can cause apnoea. Therefore, adjuvants are used along with propofol to decrease its requirement. There are some studies that report that fentanyl reduces 50% or median effective concentration ($EC_{50}$) of propofol used for various noxious stimuli. But fentanyl combined with propofol also has a depressive effect on haemodynamics.[12]

Dexmedetomidine, on the other hand, is a pharmacologically active dextromer of medetomidine and has a selective alpha-2 receptor agonist activity. It has sedative and analgesic activity without causing post operative respiratory depression.[13] Also, dexmedetomidine is said to be a good anaesthetic adjuvant that decreases the requirement of propofol and maintains stable hemodynamics intraoperatively.

Therefore, we have done a study on comparison of dexmedetomidine-propofol with fentanyl-propofol for laryngeal mask airway insertion, in patients posted for elective surgeries under general anaesthesia.

# AIMS AND OBJECTIVES

**AIMS**:

To compare the combination of Dexmedetomidine – Propofol and Fentanyl – Propofol for conditions of LMA insertion in short elective surgeries under general anaesthesia.

**OBJECTIVES:**

1. To compare efficacy of Dexmedetomidine – Propofol and Fentanyl – Propofol for LMA insertion in terms of ease of intubation using MUZI and COLLEAGUES scoring system.

2. To compare the hemodynamic responses to LMA insertion with Dexmedetomidine – Propofol and Fentanyl – Propofol in terms of heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, saturation and respiratory rate.

# REVIEW OF LITERATURE

## APPLIED ANATOMY OF THE UPPER AIRWAY[62]

### PHARYNX

The pharynx can be divided into 3 parts - the Nasopharynx, Oropharynx and Laryngopharynx. It forms the common tract for both the respiratory and alimentary system. It extends from base of the skull upto the cricoid cartilage and divides into esophagus which forms the alimentary tract and trachea which forms the respiratory tract.

### Nasopharynx

It forms the upper part of the pharynx. It is bounded anteriorly by the nasal cavity and below by the soft palate.

### Oropharynx

It forms the middle part of the pharynx. It is bounded superiorly by the soft palate and inferiorly by the tip of the epiglottis.

### Laryngopharynx

It forms the lower part of the pharynx. It is bounded superiorly by the tip of epiglottis and inferiorly by the lower part of cricoid cartilage.

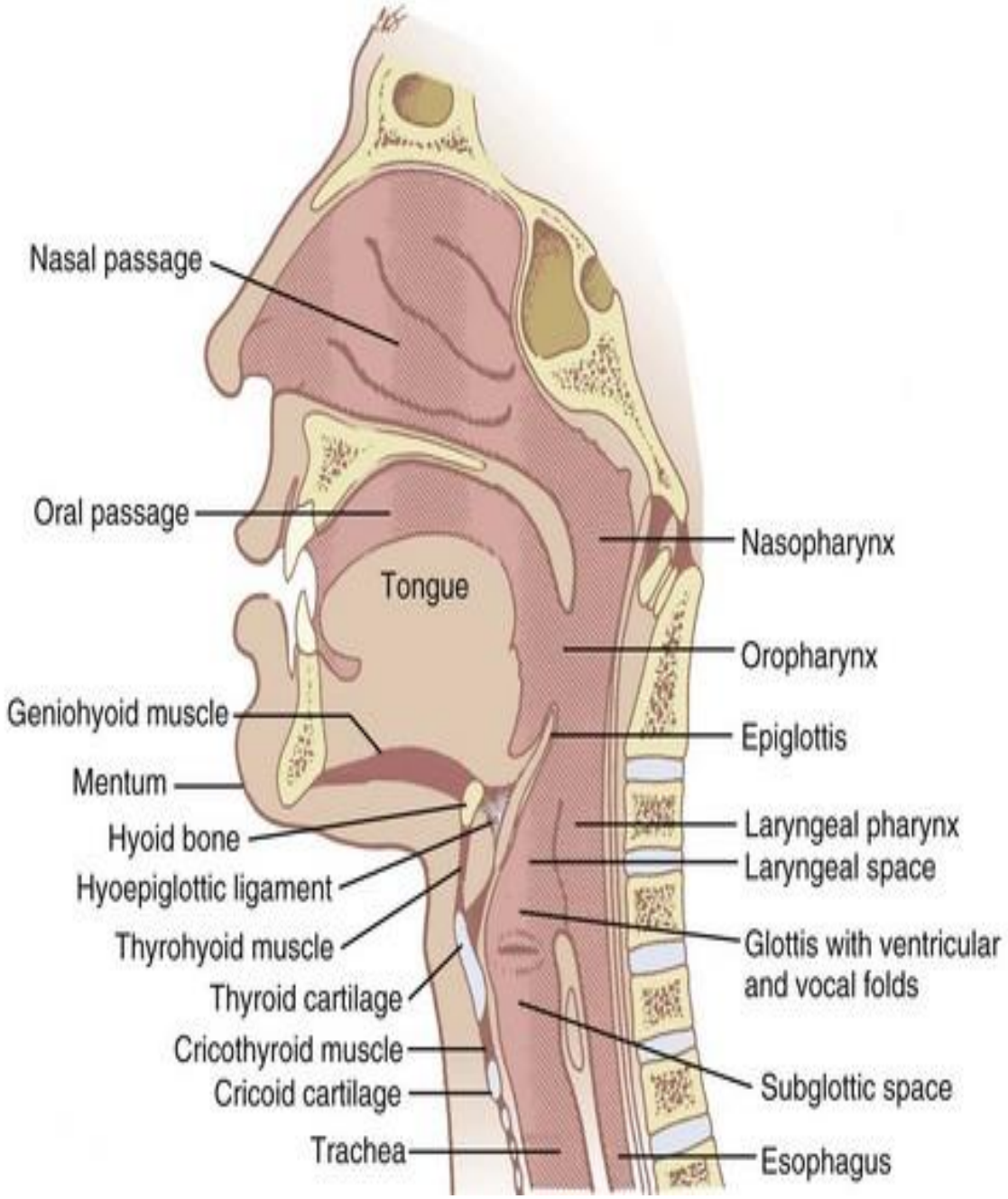


**FIGURE 1: ANATOMY OF UPPER AIRWAY**

## Blood supply and venous drainage

Arterial supply is mainly by the external carotid artery and its branches. Its branches are ascending pharyngeal artery, maxillary artery, facial artery and lingual arteries.

Venous drainage is mainly by the pharyngeal venous plexus that drains into the internal jugular vein.

## TONGUE

It has two parts. Oral part and pharyngeal part. These two parts are separated by Sulcus terminalis.

## Oral part

It is the anterior part of the tongue. It is in contact with gums and teeth.

## Pharyngeal part

It is the posterior part of the tongue. It is connected to the epiglottis by the folds of mucous membranes. These are called glossoepiglottic folds. There are two right and left glossoepiglottic fold and one median glossoepiglottic fold.

## Blood supply and venous drainage

Arterial supply is from the lingual artery which is the branch of the external carotid artery.

Venous supply is from the lingual vein which drains into the internal jugular vein.

# LARYNX

Larynx lies in the midline of the neck. It is bounded superiorly by the root of the tongue and inferiorly by the lower border of cricoids cartilage.

Laryngeal inlet is bounded anteriorly by the upper part of the epiglottis, laterally by aryepiglottic folds and posteriorly by the fold of mucous membrane that is stretched between two arytenoids.

Larynx is made up of skeletal framework that constitutes cartilages, ligaments and membranes.

## The Skeleton of Larynx

It is made up of 3 paired and 3 unpaired cartilages.

| UNPAIRED CARTILAGES | PAIRED CARTILAGES |
|---|---|
| Epiglottis | Arytenoid |
| Thyroid | Corniculate |
| Cricoid | Cuneiform |

TABLE 1: PAIRED AND UNPAIRED CARTILAGES

Epiglottis is an omega shaped cartilage that protects the airway. It is connected to the thyroid cartilage by thyroepiglottic ligament.

Thyroid cartilage is V shaped in cross section. In males it makes an angle of approximately $90^0$ and in females an angle of $120^0$.

Cricoid cartilage is in the form of a ring.

Arytenoids are pyramid shaped that lie on the lamina of the cricoid cartilage.

Corniculate cartilage is in the form of a nodule at the apex of the arytenoids.

Cuneiform cartilage lies within the aryepiglottic fold.

## Ligaments of the larynx

The ligaments of the larynx can be divided into the extrinsic and the intrinsic ligaments.

Extrinsic ligaments are:

1. Hyoepiglottic ligament
2. Thyrohyoid membrane
3. Cricotracheal ligament

Intrinsic ligaments are the capsules of tiny synovial joints between arytenoids and cricoid and between thyroid and cricoid cartilages.

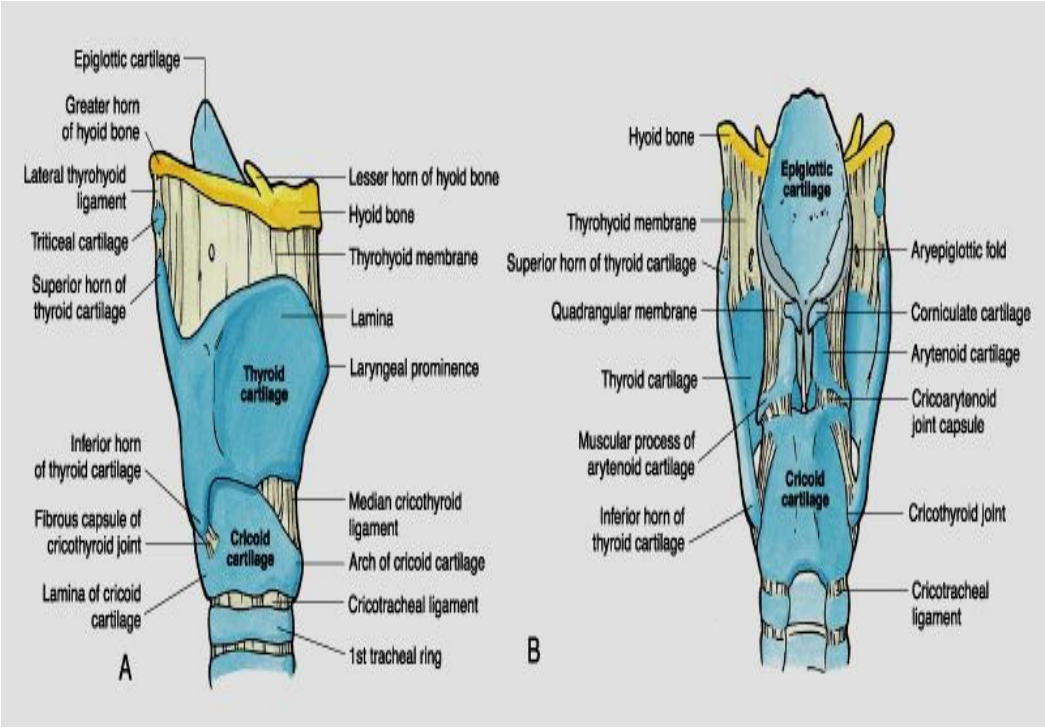


FIGURE 2: CARTILAGES OF LARYNX

## Muscles of the larynx

The muscles can be broadly classified into extrinsic and intrinsic group of muscles.

Extrinsic group of muscles are:

1. Sternohyoid
2. Thyrohyoid
3. Mylohyoid
4. Stylohyoid
5. Geniohyoid

Intrinsic group of muscles are:

1. Posterior cricoarytenoid
2. Lateral cricoarytenoids
3. Interarytenoid
4. Aryepiglottic
5. Thyroarytenoid
6. Cricothyroid
7. Vocalis

## Blood supply and venous drainage of larynx

1. Above vocal cords, arterial supply is by the superior laryngeal artery which is a branch of the superior thyroid artery. Whereas, superior laryngeal veins drain into the superior thyroid vein.

2. Below vocal cords, arterial supply is by the inferior laryngeal artery which is a branch of inferior thyroid artery. Whereas, inferior laryngeal veins drain into the inferior thyroid veins.

## Sensory nerve supply of larynx

Pharynx

1. Nasal part is supplied by maxillary nerve.
2. Oral part is supplied by glossopharyngeal nerve.
3. Laryngeal part is supplied by internal laryngeal branch of vagus nerve.

Epiglottis

1. Anterior surface is supplied by glossopharyngeal nerve.
2. Posterior surface is supplied by vagus nerve.

Larynx

1. Mucous membrane above vocal cords and cricothyroid membrane is supplied by superior laryngeal nerve.
2. Mucous membrane below vocal cords and rest of the membranes are supplied by recurrent laryngeal nerve.

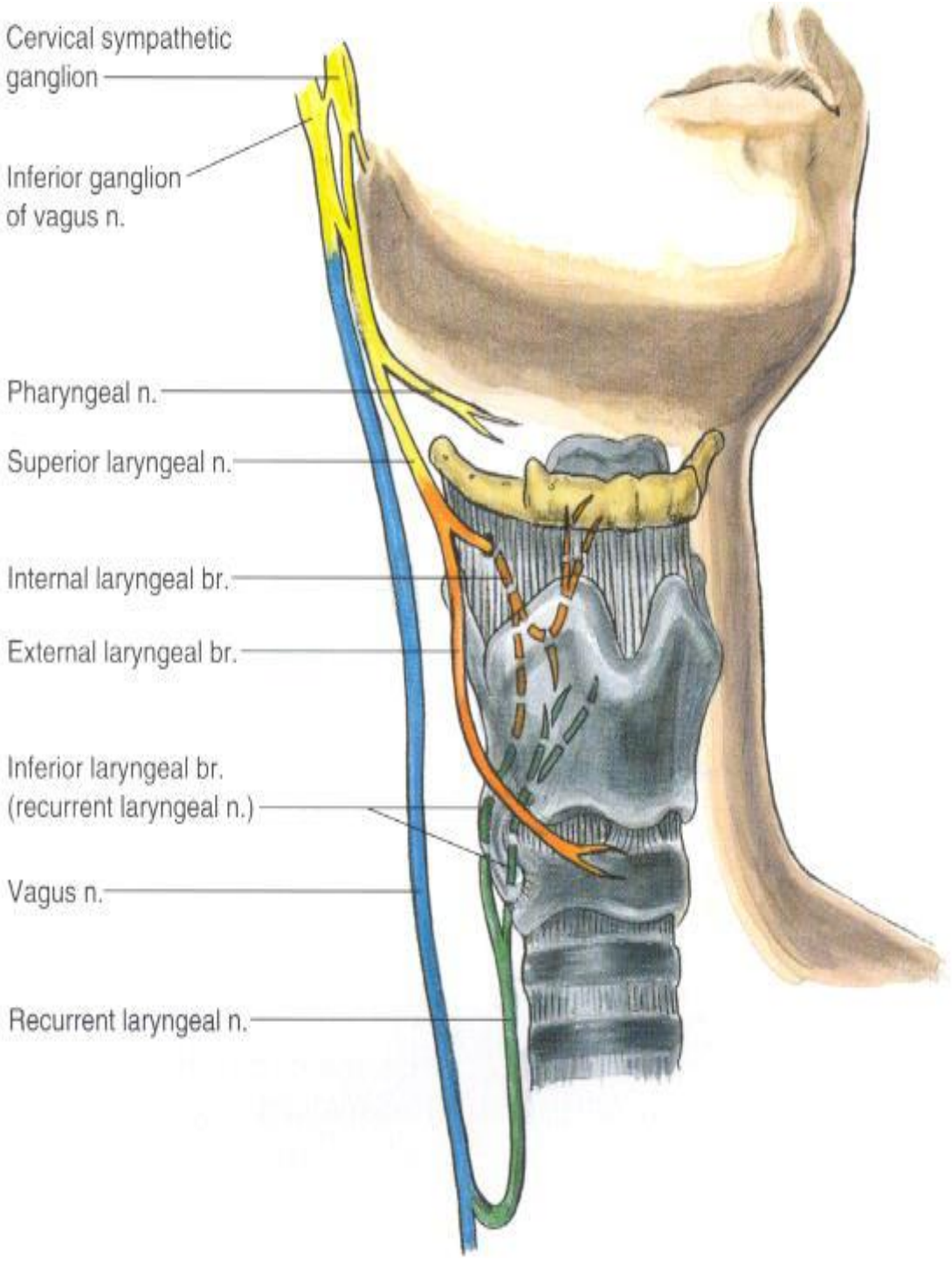


FIGURE 3: NERVE SUPPLY OF LARYNX

# PHYSIOLOGICAL RESPONSE TO INTUBATION AND LARYNGEAL MASK AIRWAY INSERTION

The main response to airway device is due to stimulation of supraglottic region, placing of tube within the vocal cords and inflation of the cuff of tube. It is basically a sympathoadrenal response.[63]

The prime response is seen in the form of tachycardia and hypertension. This is due to activation of the sympathetic system. It is mainly due to stimulation of epipharynx, laryngopharynx and tracheobroncial tree. The process of normal intubation requires introduction of scope into the valeculla that is supplied by the glossopharyngeal nerve. All these responses can be avoided by the use of laryngeal mask airway wherein there is no question of intubation response.[64]

## LARYNGEAL MASK AIRWAY (LMA):

Laryngeal Mask Airway, this supraglottic airway device was developed by Archie Brain in 1981. But it was commercially made available only in 1988 in United Kingdom and 1991 in United States.[14]

# 1. HISTORY OF INVENTION OF LMA[14]

### BIOGRAPHY

Archie Ian Jeremy Brain was born in Kobe, Japan on 2nd July 1942 to Sir Henry Norman Brain who worked as British Consul in Kobe. Archie Brain had a reputation as an athlete and a poet, who found physics to be interesting. He built his own guitar in 1956. He finished his preclinical studies and graduated in 1970. Then, in 1971, he began his anaesthetic career at the Royal East Sussex Hospital.

FIGURE 4: Archie Ian Jeremy Brain

## INVENTION OF FIRST LARYNGEAL MASK AIRWAY[15]

While working in East end of London Hospital in Anaesthesia department, in 1981, he studied anatomy and physiology of upper airway in great depth. During that period, airway management was done in two ways. Firstly, was to secure nasal or oral tracheal tube. Secondly, was to use face mask, along with oral or nasopharyngeal airways. The mask had to be held always in the second scenario.

He then thought of respiratory tree to be like a tube terminating at the glottis. Now, he required a device that could connect these two tubes and make the circuit complete. He considered the place behind the glottis to be in the shape of a boat. The tip of the boat was the space behind hypopharynx, the sides of the boat were compared to the pyrifom fossa and the base of the boat to the space above the cervical vertebrae.

Hence he used the Goldman Dental Mask, to make the first supraglottic airway device. The goldman mask had a detatchable vulcanised rubber cuff that formed an ellipse. He used the cuff and attatched it to the 10mm plastic tube after cutting the tube elliptically. The cut portion of the tube was placed at the open end of the cuff. This sat in the hypopharynx forming a seal and the anaesthetic agents and gases could now be administered in this device.

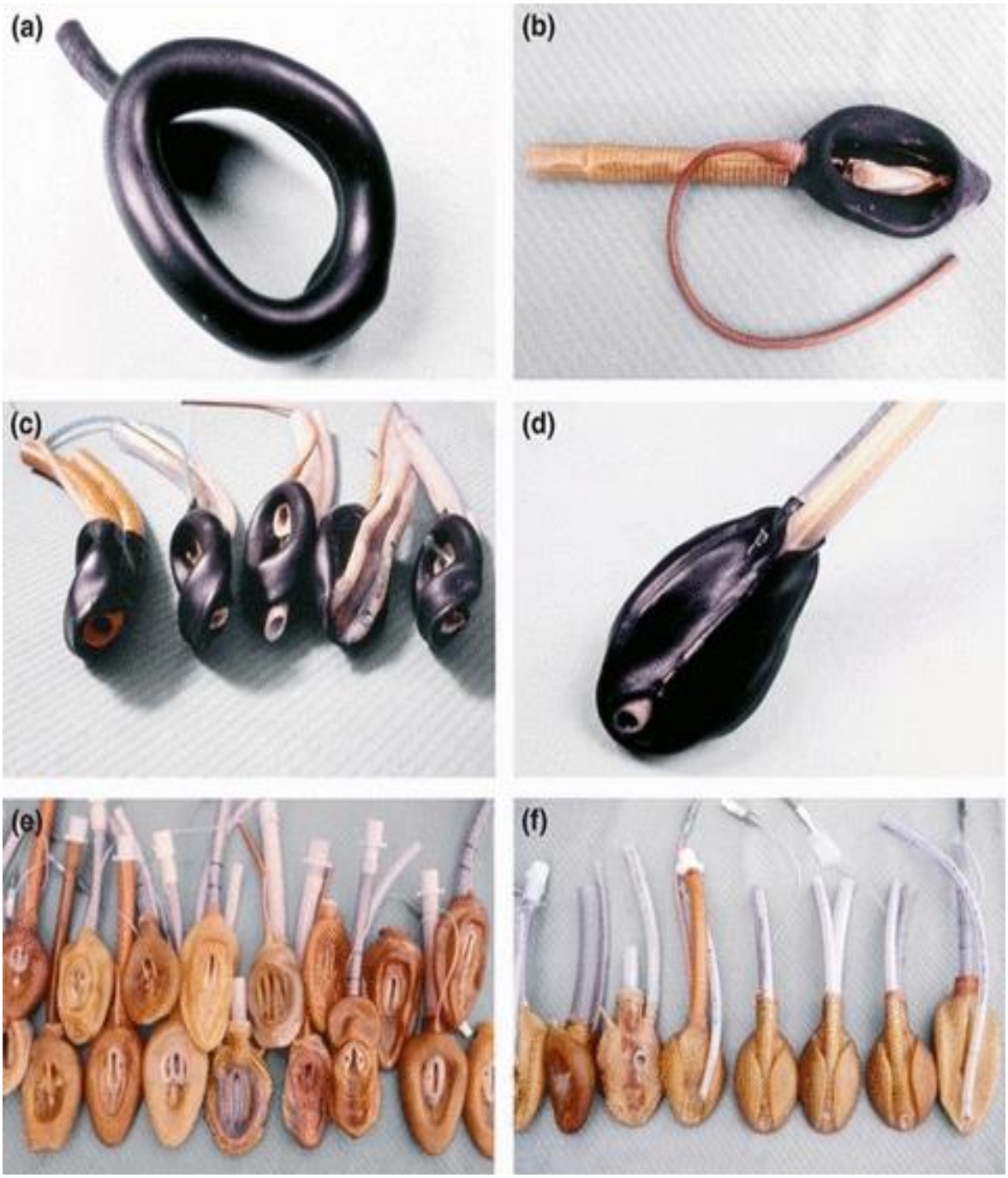


FIGURE 5: The Goldman mask cuff (a), attached to a 10mm plastic tube (b-d), was the basis of large number of LMA prototypes (e-f)

## 2. LMA PROTOTYPES

### DUNLOP PROTOTYPE

Originally the Laryngeal Mask Airway was a cuff obtained from Goldman Mask attached to the polyvinylchloride tracheal tube. Later on, with the help of Dunlop Company, he devised the laryngeal mask airway using silicon cuff. Its advantage was that it provided a smooth surface and could be deflated into paper thin surface.

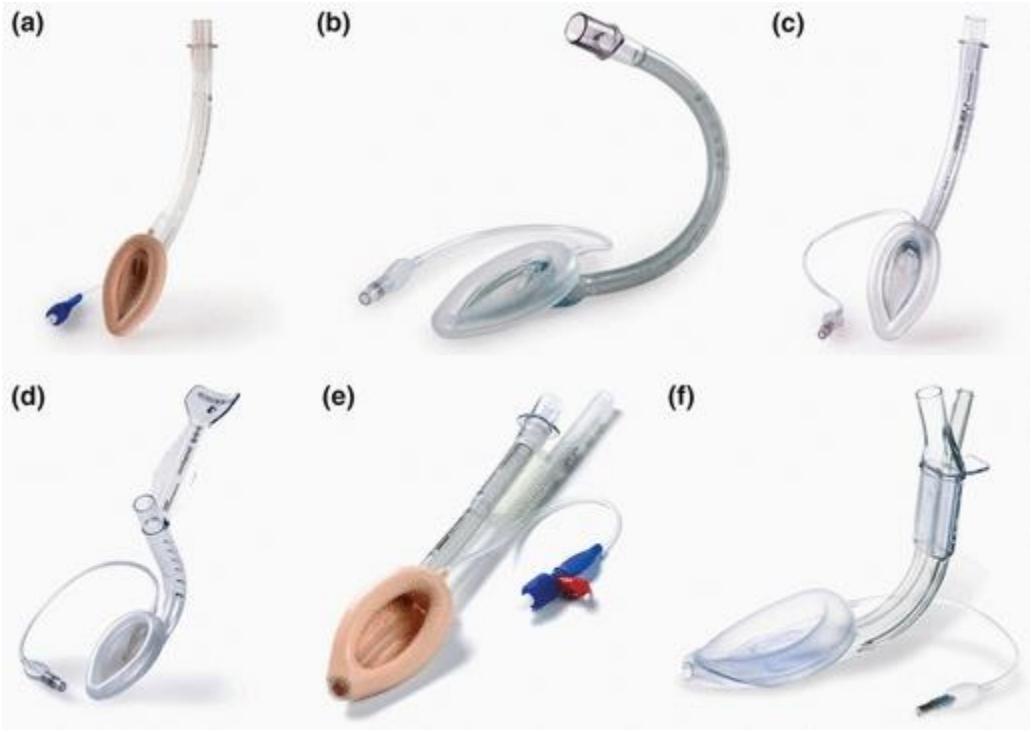


FIGURE 6: LMA PROTOTYPES (a) LMA Classic (b) LMA Flexible (c) LMA Unique (d) Intubating Laryngeal Mask Airway (e) LMA ProSeal (f) LMA Supreme

a) LMA CLASSIC

- Available in eight sizes
- It can be reused upto 40 times
- Blockade of airway by epiglottis prevented by aperture bars
- Surface is soft due to silicon cuff

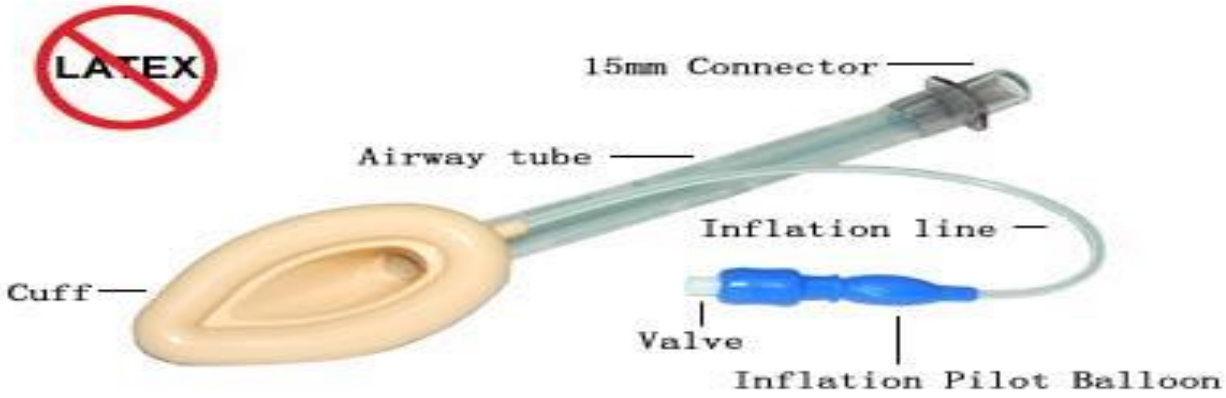


FIGURE 7: PARTS OF LMA CLASSIC

b) LMA FLEXIBLE

- Provides better surgical field with minimal displacement of cuff
- Has lower incidence of irritation of airway
- Prevents kinking or displacement of laryngeal mask airway.

c) LMA UNIQUE

- Available in seven different sizes
- Single use sterile device
- To prevent fall of epiglottis and blockade of airflow, aperture bars are provided
- Provided with a soft and flexible cuff

d) INTUBATING LMA

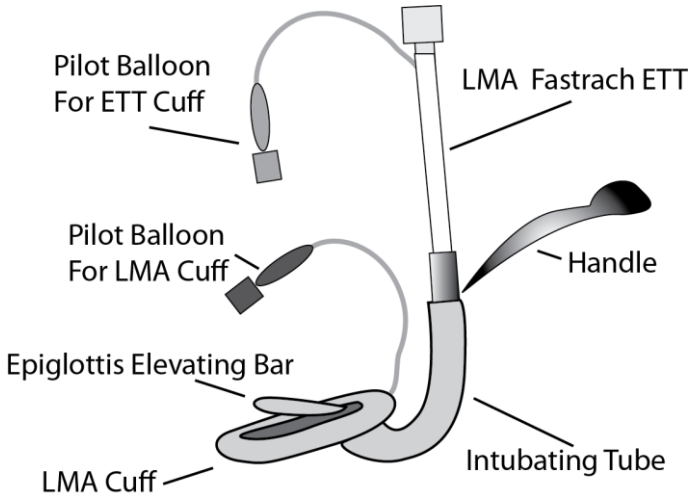


FIGURE 8: PARTS OF INTUBATING LMA

- This LMA can be used for unanticipated or anticipated difficult intubation
- Can also be used for cardiopulmonary resuscitation
- Rigid handle in this LMA facilitates one hand insertion

e) LMA PROSEAL

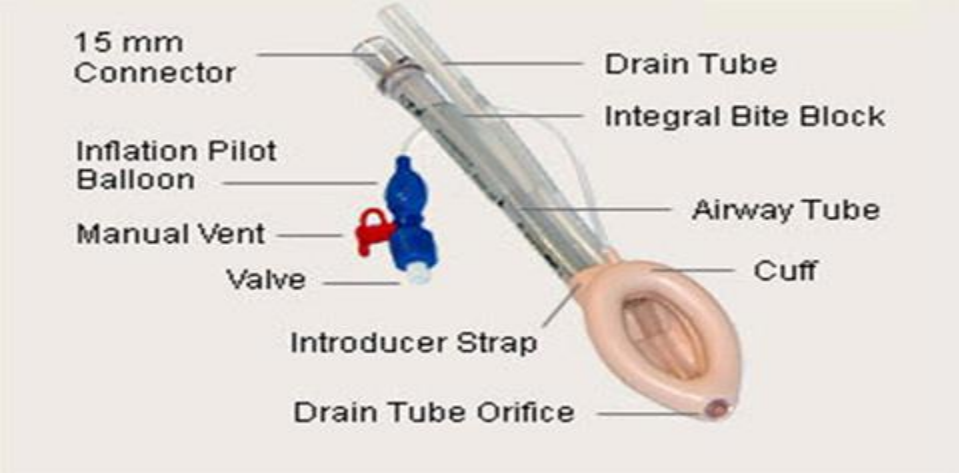


FIGURE 9: PARTS OF PROSEAL LMA

- Provides seal of more than 32cm$H_2O$
- Prevents aspiration of the contents as the suction tube is provided
- Smoother surface facilitates smooth induction and recovery

f) LMA SUPREME

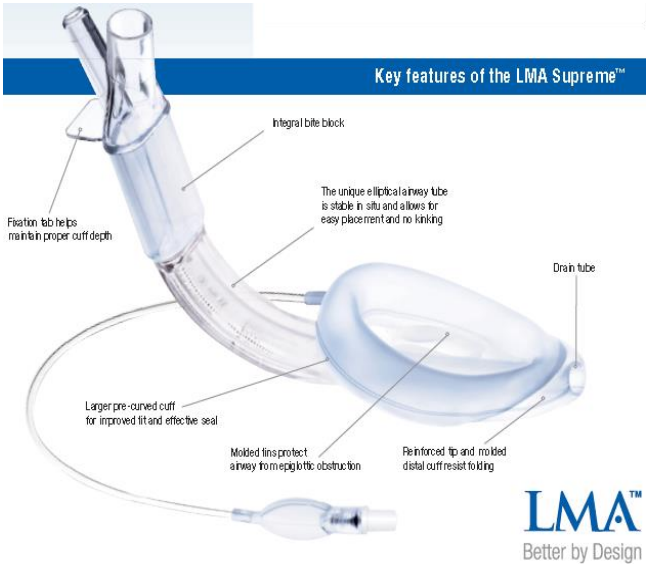


FIGURE 10: PARTS OF LMA SUPREME

- Provides 2 seals
- Oesophageal and oropharyngeal seal
- Prevents aspiration of gastric contents

## 3. LMA SIZES FOR DIFFERENT AGE GROUPS

| Patient age/Size | LMA | Largest ET (ID) | Largest FOB (OD) |
|---|---|---|---|
| Neonate (< 5 kg) | 1 | 3.0 | 2.8 |
| Infant (< 10 kg) | 1.5 | 3.5 | 2.8 |
| Child (10−20 kg) | 2 | 4.5 | 3.6 |
| Child (20−30 kg) | 2.5 | 5.5 | 3.6 |
| Small adult (≥ 30 kg) | 3 | 6.0 cuffed | 5.0 |
| Adult | 4 | 6.5 cuffed | 5.0 |

FIGURE 11: Laryngeal Mask Airway(LMA) sizes for different age groups, in association with largest endotracheal tube(Largest ET) with ID(Internal diameter) and largest fibreoptic bronchoscope(Largest FOB) with OD(Outer diameter).[16]

## 4. CLASSIC TECHNIQUE OF LMA INSERTION

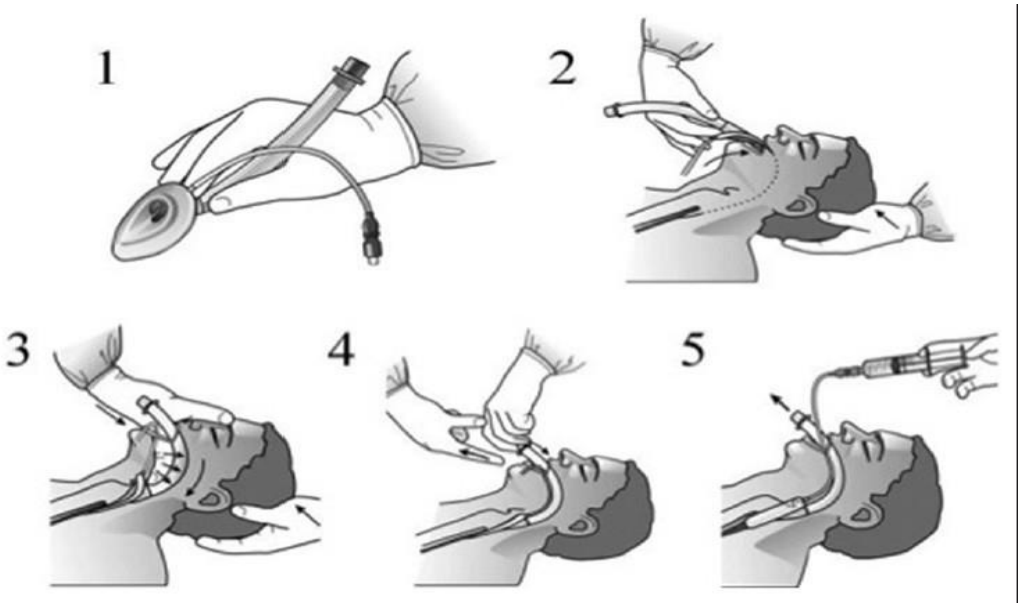


FIGURE 12: CLASSIC TECHNIQUE OF LMA INSERTION IN STEPS.[17]

There are many techniques proposed for LMA insertion. But the most preferred method of all the methods is CLASSIC technique. Here the LMA is inserted in a

technique that mimics deglutition. The tip of the LMA is inserted into the oral cavity as the person holds it in a pen holding fashion. With the help of index finger, the tip of the LMA is inserted into the oral cavity bracing the hard palate. Thereby the tip of the LMA is placed behind the cricoid cartilage and the proximal part of the LMA touches the tongue base. While inserting the LMA, it is completely deflated, thus creating a spoon like shape. Also, it is not inflated to more than 60cm$H_2O$. When inflated excessively and moreover with the use of nitrous oxide, it causes pressure related injuries.

## 5. INDICATIONS OF LMA INSERTION

a) Short outpatient procedures in adult and paediatric patients.
b) In case of difficult intubation and difficult bag mask ventilation.
c) American Heart Association (AHA) recommends use of LMA in Basic Life Support, for people who are less expertise in endotracheal tube insertion.
d) In many minor procedures like fibroadenoma excision in surgery, dilatation and curettage in obstetrics, upper limb procedures in orthopaedics and minor urological procedures like stent removal.

The use and role of LMA insertion in the field of anaesthesiology has been fast expanding.[18]

## 6. CONTRAINDICATIONS OF LMA INSERTION

a) ABSOLUTE CONTRAINDICATIONS

- Inability to open mouth
- Complete upper airway obstruction

b) RELATIVE CONTRAINDICATIONS

- Risk of aspiration
- Requiring pressure more than 20cm$H_2O$
- Abnormal upper airway anatomy

# PHARMACOLOGY OF DEXMEDETOMIDINE

Dexmedetomidine hydrochloride is the dextro isomer (S-enantiomer) of medetomidine with the chemical formula (+)-4-(S)-[1-(2,3-dimethylphenyl)ethyl]-1H-imidazole monohydrochloride. It belongs to the Imidazole group. Its empirical formula and molecular weight are $C_{13}H_{16}N_2$ HCl and 236.7 Da.

Amongst all the $\alpha_2$ adrenoceptor agonists, it is the highly selective $\alpha_2$ agonist and it is said to have eight times more powerful $\alpha_2$ receptor sensitivity than Clonidine. Thus it is also considered as the complete $\alpha_2$ receptor agonist. It was approved by FDA in 1999 for use in humans for analgesia and sedation.[19]

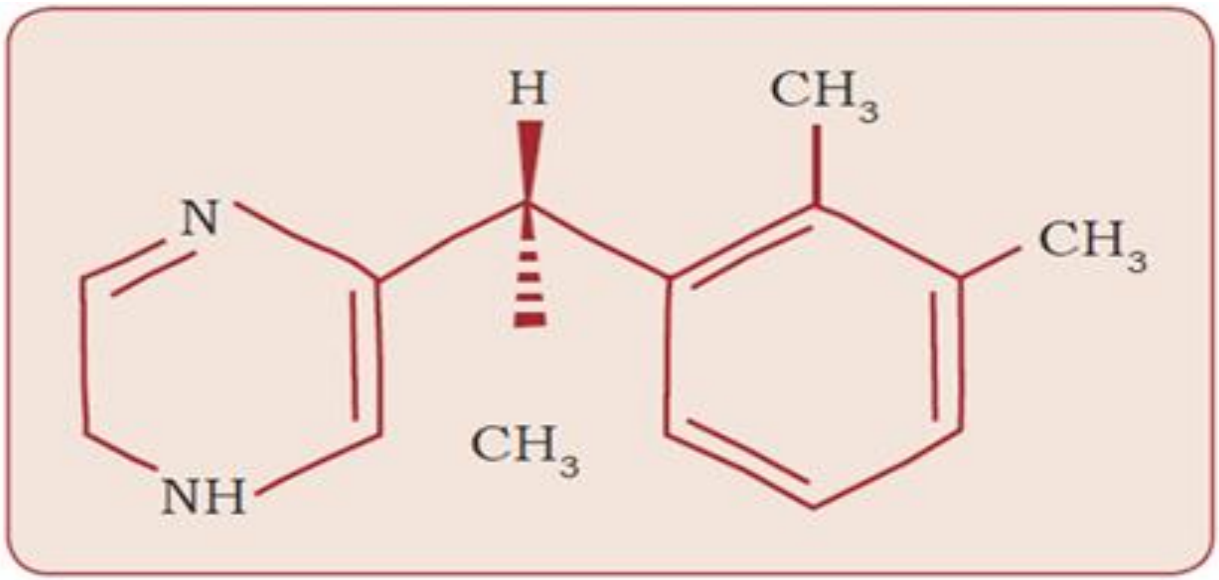


FIGURE 13: CHEMICAL STRUCTURE OF DEXMEDETOMIDINE.[20]

## MECHANISM OF ACTION

As explained earlier, Dexmedetomidine is a highly selective $\alpha_2$ receptor agonist. It has action on both post synaptic and pre synaptic $\alpha_2$ receptors. Its action on pre synaptic $\alpha_2$ receptors cause decrease in nor-epinephrine release, causing inhibition of transmission of pain signals. On the other hand, its action on the post synaptic $\alpha_2$ receptors causes inhibition of sympathetic activity, thereby, decreasing blood pressure and heart rate. All these effects in combination cause anxiolysis, analgesia and sedation. Thus Dexmedetomidine has an advantage of causing multiple effects with use of single drug. Nociceptive signals are not only inhibited by $\alpha_2$ receptors present in supraspinal and spinal region in central nervous system, but also by the peripheral $\alpha_2$ receptors.[21]

Action of drug on any of these receptors reduces nociceptive transmission, thereby causing analgesia. Also the action on $G_1$-protein-gated potassium channels causes hyperpolarization of membranes. This mechanism is said to be significant for $\alpha_2$-receptor inhibitory activity.[22]

Another mechanism of $\alpha_2$ receptors is their inhibitory effect of neurotransmitter release by its indirect action on calcium channel receptors. Calcium channels are N-type voltage-gated channels that are not dependent on cAMP and phosphorylation of proteins. It is said to be mediated by $G_0$ proteins. Action of drug on $\alpha_2$ receptor causes inhibition of calcium entry into the cells, thereby causing inhibition of neurotransmitter release.

These two above mentioned mechanisms show different ways of causing analgesia. In the first mechanism, hyperpolarization of membranes prevents stimulation of nerve fibres. Whereas in the second mechanism there is inhibition of neurotransmitter release.

The highest concentration of $\alpha_2$ receptors is said to be present in locus coeruleus. It is also said to be the predominant noradrenergic nucleus in brain that has hypnotic and sedative effects. Also, the descending medullospinal noradrenergic pathway that modulates nociceptive neurotransmission originates from locus coeruleus. These observations infer that the major antinociceptive and sedative effects of dexmedetomidine are due to its action on $\alpha_2$ receptors present in locus coeruleus. Moreover, there is a study, wherein they have found that the sedative and analgesic properties of dexmedetomidine are due its action on $\alpha_2$A-adrenoceptor subtype.[23]

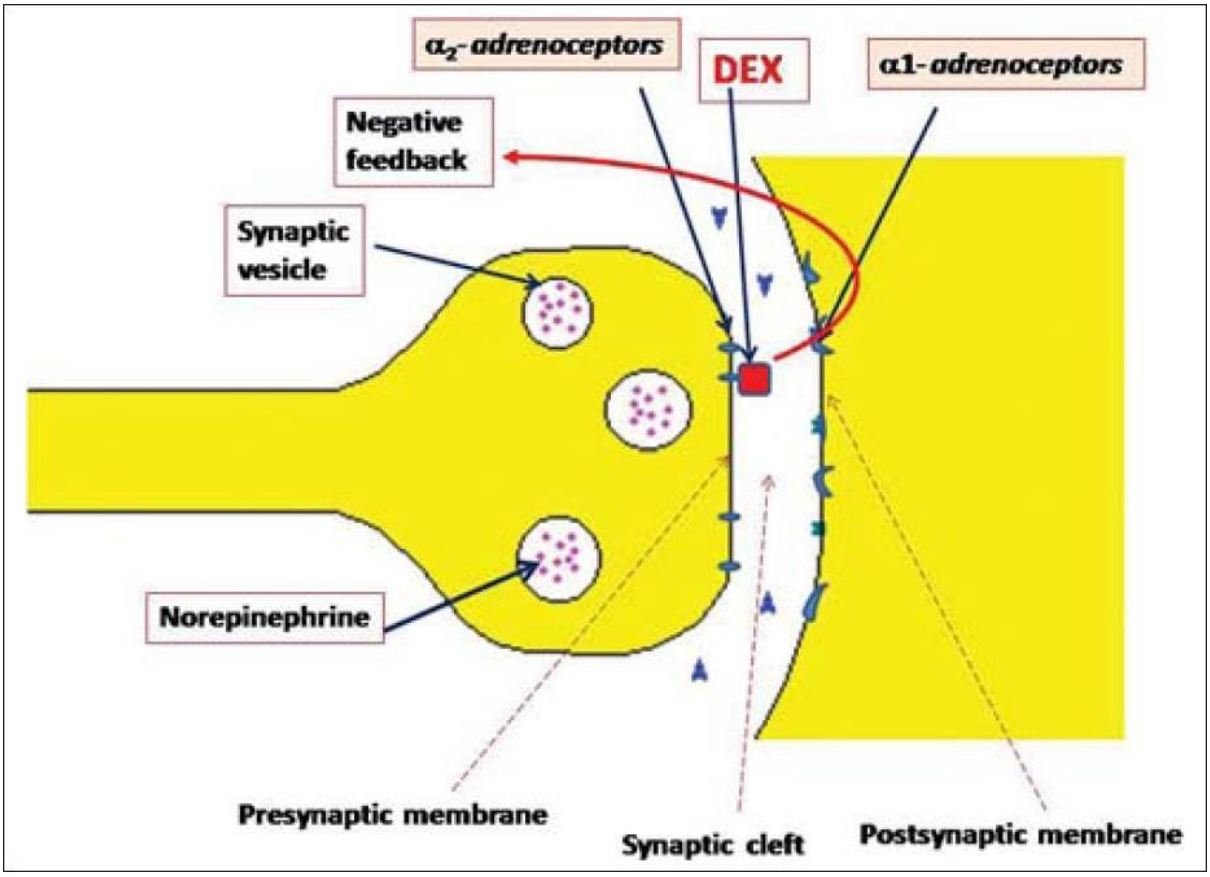


FIGURE 14: MECHANISM OF ACTION OF DEXMEDETOMIDINE.[24]

# PHARMACOKINETICS OF DEXMEDETOMIDINE

Constant amount of drug is eliminated per hour, not the constant fraction of drug. Hence, dexmedetomidine follows zero order kinetics and not first order kinetics. Onset of action is 15 minutes after intravenous administration. Peak concentration of drug is achieved within 1 hour. Dexmedetomidine is also administered by oral, intramuscular and transdermal routes.

Protein binding to dexmedetomidine is approximately 94% and remains constant independent of concentration of drug. It is bound to serum albumin and α1-glycoprotein. In patients with hepatic dysfunction, reduction in dose of dexmedetomidine is advised as the protein bound fraction is decreased. It has a rapid distribution phase. Its volume of distribution is 118L and its distribution half-life (t½ α) is 6 min at a dose in the range of 0.2-0.7μg/kg/hr. Its elimination half life (t½ β) is between 2.0-2.5 hours and its clearance is 39L/hr.

But the total plasma clearance of dexmedetomidine is age dependent and similar rates of infusion can be used in children and adults. However in patients aged >65 years, higher incidences of bradycardia and hypotension are reported, thus requiring lower doses. Whereas in children <2 years, there is increased volume of distribution, requiring more amount of drug.

Dexmedetomidine undergoes biotransformation in liver by cytochrome P450 enzyme. Also it is metabolised in liver by glucuronide conjugation. The metabolites are excreted 94% in urine and 4% by feces.[25]

# PHARMACODYNAMICS OF DEXMEDETOMIDINE

## CENTRAL NERVOUS SYSTEM

Dexmedetomidine provides sedation, anxiolysis, hypnosis, amnesia and analgesic effects. Dexmedetomidine converges normal sleep pathway and exerts its sedative effect in endogenous non rapid eye movement sleep. The pattern of cerebral blood flow is also like that of normal sleep.

The amnestic effects of dexmedetomidine are not significant like that of benzodiazepines. The plasma level of >1.9ng/ml is required for amnestic effects.

The analgesic effects of dexmedetomidine are due to its action on $\alpha_2$A receptors, inhibition of Aɖ and C nerve fibres and by the release of encephalins.[25]

## CARDIOVASCULAR SYSTEM

There is no direct effect of dexmedetomidine on heart.[26] Dexmedetomidine is said to have biphasic cardiovascular response.[27]

Initially, there is transient increase in blood pressure with reflex decrease in heart rate, following administration of dexmedetomidine in a bolus of 1µ/kg, especially in younger patients.[28] This mechanism has been explained to be due to stimulation of $\alpha_2$B receptor of vascular smooth muscle and can be decreased by reducing the rate of infusion over 10 min. But, though the rate of infusion is decreased, there was 7% increase in the mean arterial pressure and 16-18% reflex decrease in the heart rate.[29]This initial response lasting for 5-10 minutes is followed by decrease in both, blood pressure and heart rate below the baseline. These two effects are due to inhibition of central sympathetic outflow that

overcomes the direct stimulating effect.[30] Another mechanism postulated is the decrease in norepinephrine release due to stimulation of the presynaptic $\alpha_2$-adrenoceptor.[31]

Baroreceptor reflex is well preserved in patients who receive dexmedetomidine. But, cardiovascular depression manifesting as bradycardia and hypotension is seen with patients on dexmedetomidine. However, these effects are temporary and can be treated with atropine or ephedrine.[32]

## RESPIRATORY SYSTEM

There is improvement in dynamic compliance and oxygenation. Dexmedetomidine has also shown to decrease dead space ventilation.[33] In case of histamine-induced bronchocontriction, dexmedetomidine is said to have bronchodialator effect when administered intravenously.[34] There are very limited studies that describe the effect of dexmedetomidine on pulmonary vasculature and perfusion. Though dexmedetomidine increases systemic blood pressure, its effect on pulmonary blood pressure has not been studied extensively. However, on administration of dexmedetomidine it decreases the pulmonary blood pressure with patients of pulmonary vasoconstriction.[35]

## ENDOCRINE SYSTEM

Dexmedetomidine does not alter serum cortisol and ACTH levels in patients on dexmedetomidine infusion.[36] Imidazole compounds inhibit cytochrome P450 enzyme. But dexmedetomidine does not inhibit cytochrome P450 enzyme, including those taking part in steroidogenesis.[37] Dexmedetomidine causes hyperglycemia. The postulated mechanism is

that it acts on $\alpha_2$ receptors in pancreas and decreases insulin production.[38] Also, it causes stimulation of growth harmone. It also decreases inflammatory response and the level of IL-6 is decreased.[39]

## RENAL SYTEM

The $\alpha_2$B receptor action on locus coeruleus of dexmedetomidine causes decrease in norepenephrine release. This in turn causes vasodilatation and increase in renal blood flow.[40]

## INDICATIONS OF DEXMEDETOMIDINE

Dexmedetomidine is supplied in 2 ml/ 1 ml ampoule, 100µg/ml. It is compatible with D5W, NS, Mannitol 20%. It is usually diluted in 0.9% sodium chloride.

**PREMEDICATION[41]** – Dexmedetomidine possesses anxiolytic, sedative, analgesic, antisialogogue and sympatholytic properties. It is given in the dose of 1mcg/kg over 10 minutes.

**ICU SEDATION[41]** – Loading dose of 1mcg/kg IV over 10 minutes, followed by maintenance of 0.2-1.4 mcg/kg/hr IV.

**FOR ATTENUATION OF INTUBATION RESPONSE[41]** – Loading dose of 0.25-1mcg/kg IV over 10 minutes.

**FOR MAINTENANCE OF ANAESTHEISA[41]** – Maintenance dose of 0.2-0.7 mcg/kg/hr IV to be adjusted based on hemodynamic parameters.

**FOR ATTENUATION OF EXTUBATION RESPONSE**[41] – Loading dose of 0.5-1.0 mcg/kg IV over 10 minutes.

**FOR SUBARACHNOID BLOCK**[41] – 3-5 mcg added to local anaesthetic.

**FOR EPIDURAL ANAESTHESIA**[41] – 1-2 mcg/kg added to local anaesthetic.

**FOR CAUDAL ANAESTHESIA**[41] – 1-2 mcg/kg added to local anaesthetic.

**IVRA**[41] – 0.5 mcg/kg added to local anaesthetic solution.

**FIBREOPTIC INTUBATION**[42] - Loading dose of 1mcg/kg IV over 10 minutes, followed by maintenance of 0.7mcg/kg/hr IV.

**PROCEDURAL SEDATION**[42] - Loading dose of 1mcg/kg IV over 10 minutes, followed by maintenance of 0.6mcg/kg/hr IV.

## CONTRAINDICATIONS OF DEXMETOMIDINE

1. Infusion over 24 hours.
2. In obstetrics, as the safety has not been studied.
3. In patients with pre-existent bradycardia, heart blocks and related bradyarrhythmias.
4. In Hypovolemic or hypotensive patients.
5. Allergy or known hypersensitivity to dexmedetomidine.

## SIDE EFFECTS OF DEXMEDETOMIDINE

The adverse effects of dexmedetomidine include bradycardia, hypotension, nausea, atrial fibrillation and hypoxia.[43]

# PHARMACOLOGY OF FENTANYL

It is a narcotic (opioid) agonist, which is a phenylpiperidine derivative. This analgesic resembles meperidine structurally and was discovered by Jassen in 1960.

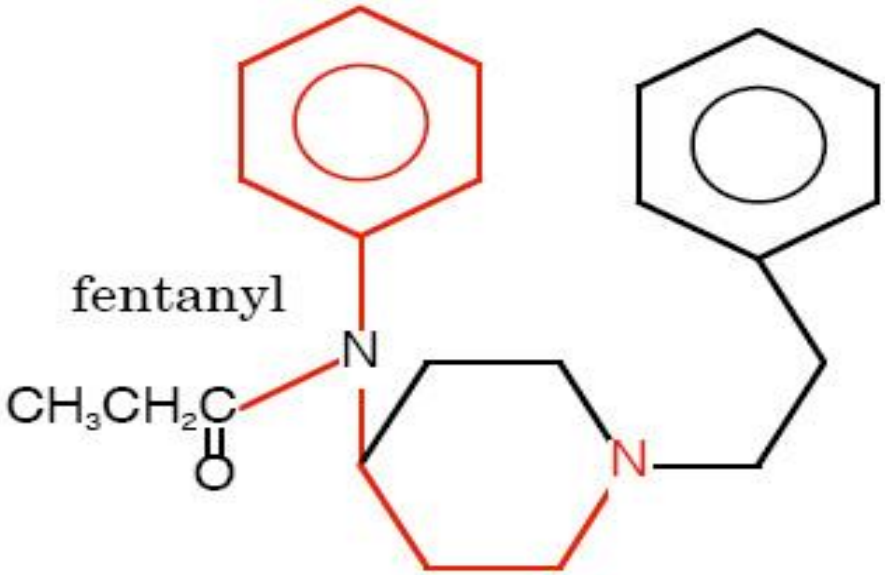


FIGURE 15: CHEMICAL STRUCTURE OF FENTANYL

N-(1-(2-phenethyl)-4-piperidinyl-N-phenyl-propanamide

Molecular formula: $C_{22}H_{28}N_2O$

Molecular weight: 336.471 g/mol

## MECHANISM OF ACTION

Fentanyl being an opioid agonist, acts on opioid receptors. Opioid receptors can be broadly classified into mu, kappa and sigma receptors. Of these receptors mu receptor plays a major role for analgesia and respiratory depression. Mu receptor can be again divided into mu1 and mu2 receptors. Mu1 receptor is responsible for analgesia. Mu2 receptor mediates bradycardia, respiratory depression and physical dependence.

Opioid acts on G protein coupled receptors. Once this receptor is activated, it causes increase in conductance of potassium and decrease in conductance of calcium. This leads to membrane hyperpolarisation and inhibits neuronal activity.

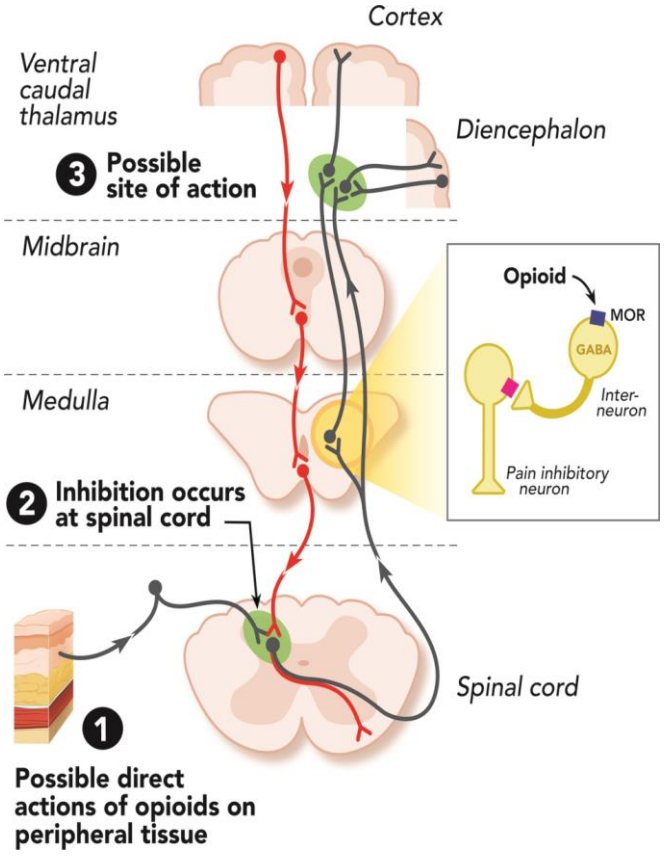


FIGURE 16: GREY PATHWAY SHOWS PAIN CONDUCTANCE FROM PERIPHERY TO CNS. THE RED PATHWAY SHOWS PAIN MODULATING ZONES IN MIDBRAIN AND MEDULLA.[44]

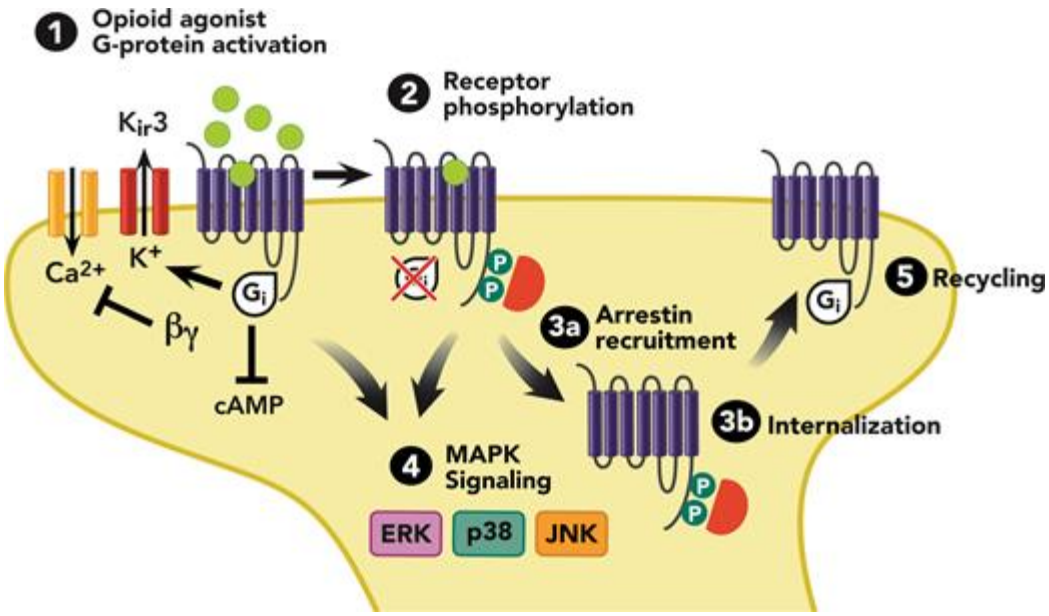


FIGURE 17: SHOWS SIGNAL TRANSDUCTION OF OPIOID RECEPTORS.[44]

βγ = G protein β-γ subunit; cAMP = cyclic adenosine monophosphate; ERK = extracellular signal-regulated kinase; JNK = c-jun N-terminal kinase; MAPK = mitogen-activated protein kinases; P = phosphorylation.

## PHARMACOKINETICS OF FENTANYL

Fentanyl follows three compartment models. Its elimination half life is 219 minutes, distribution time is 1.7 minutes and redistribution time is of 13 minutes. Its volume of distribution is 4L/kg.

For analgesia, the onset of action, when given intravenously is 1.5 minutes and peak effect is seen in 3.6-4.5 minutes. The duration of action is 30-60 minutes after intravenous administration of 100 mcg of fentanyl. The onset of action extends by 7-8 minutes when administered intramuscularly and the duration of action by1-2 hours.

The unionized fraction of the drug is 8.5% at the pH of 7.4. Almost 84% is protein bound. There is slower distribution from skeletal muscle and fat into the blood. Its distribution and redistribution times are 1.2-1.9 minutes and 9.0-19 minutes respectively. Its elimination half life is 3.1-6.6 hours. Fentanyl on intravenous administration shows high first pass metabolism of 75% and it undergoes transformation in liver. 10% of the metabolites are excreted unchanged in urine and 9% of the metabolites are found in feces.[45]

## PHARMACODYNAMICS OF FENTANYL

## ANALGESIA

When compared to morphine, it is 50-100 times more potent. Reduction in pain by 50% is seen with plasma fentanyl concentration of 1.3 ng/ml. Hence it is a good analgesic. It mainly acts on the μ receptors and $\mu_1$ receptor is responsible for analgesia.[46]

## CARDIOVASCULAR SYSTEM

It causes decrease in myocardial oxygen demand due to peripheral vasodilatation leading to decrease in preload and afterload. There is slight decrease in cardiac output, heart rate and mean arterial pressure. Thereby, the effect of fentanyl on the hemodynamics is minimal and it causes cardiac depression.[47]

## RESPIRATORY SYSTEM

Fentanyl abolishes upper airway reflexes in a dose dependent manner. At 50mcg, then at 50mcg more and then at 100mcg, dose dependent decrease in cough and laryngospasm is seen. In fact apnoea and laryngospasm were caused after subsequent doses.[48]

Also, fentanyl causes respiratory depression. The respiratory depression is evidenced by increase in the end tidal carbon dioxide levels, decrease in the carbon dioxide dose response curve and there is increase in minute ventilation when the end tidal carbon dioxide builds upto 50 mmHg.[49] In fact this respiratory depression is increased when fentanyl is used with other sedatives like midazolam. Hence, it is advisable to use pulse oximeter and oxygen supplementation for patients in these situations.[50]

## ENDOCRINE SYSTEM

On administration of high dose of fentanyl in a dose of 1 0mcg/kg, it caused decrease in plasma epinephrine, cortisol, growth hormone, glucose and free fatty acids. Whereas, when fentanyl was administered in a dose of less than 5 mcg/kg, it did not decrease the hormones.[51]

## FENTANYL INDUCED COUGH (FIC)

The incidence ranges from 18-65%.[52] There are various mechanisms postulated for FIC. These are the stimulation of vagal C-fibers in the airway, derangement of irritant receptors present in the tracheobronchial tree, release of histamine from mast cells in the lung, sudden adduction of vocal cords and release of neuropeptides from prejunctional μ opioid receptors.[53]

## INDICATIONS FOR FENTANYL

1. As an analgesic in the dose of 1-2 mcg/kg IV.
2. As an adjuvant to general anaesthesia in a dose of 2-10 mcg/kg to blunt the haemodynamic responses.
3. As a sole anaesthetic agent in the dose of 50-150 mcg/kg.
4. As an adjuvant in spinal anaesthesia. A dose of 25 mcg of fentanyl is added to bupivacaine.
5. As a adjuvant in labour analgesia in epidural anaesthesia in a dose of 2 mcg/ml.[54]

## SIDE EFFECTS

1. Respiratory depression
2. Apnoea
3. Myoclonic movements
4. Muscle rigidity
5. Nausea and vomiting
6. Bradycardia

## CONTRAINDICATIONS FOR FENTANYL

1. Allergic or hypersensitivity reaction to opioids
2. Patient with history of bronchial asthama and COPD
3. Patients with head injury and increased intracranial pressure
4. Patients who have been taking MAO inhibitors.[54]

# PHARMACOLOGY OF PROPOFOL

It is a sedative and hypnotic intravenous anaesthetic agent. It is given by the chemical formula – 2,6-di-isopropylphenol.[55] It contains 10% soya bean oil, 1.2% Egg Lecithin, 2.25% Glycerol and preservative disodium edentate 0.005%.[56]

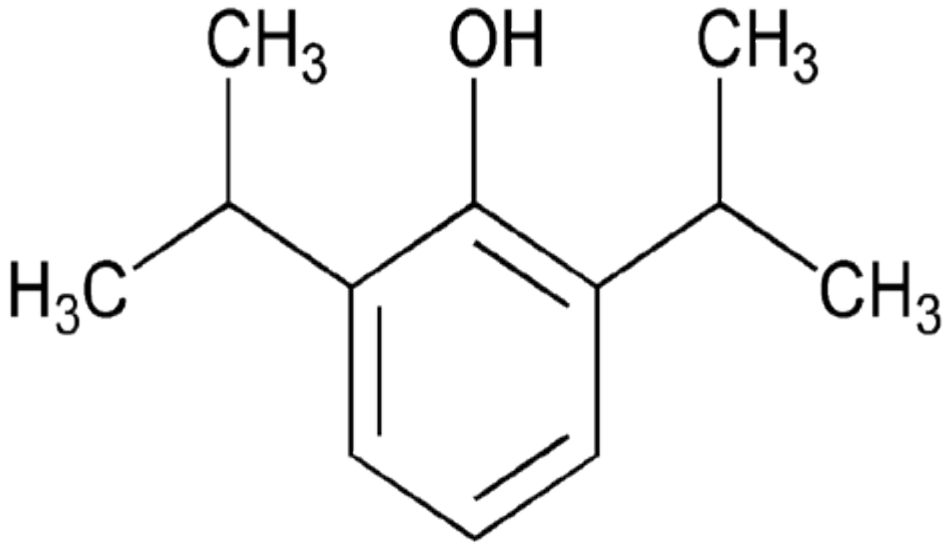


FIGURE 18: CHEMICAL STRUCTURE OF PROPOFOL

## COMMERCIAL PREPARATIONS OF PROPOFOL

- The emulsion is an excellent medium for bacterial growth. EDTA or Sodium Benzoate is added to impede bacterial growth. Propofol causes pain on injection.

1. PROPOFOL LIPURO – preparation of propofol containing both long & medium chain triglycerides in 1:1 ratio. Reduces pain on injection

2. FOSPROPOFOL- A water soluble methylphopshorylated prodrug of propofol that has no pain on injection, but has slower onset of action.

## MECHANISM OF ACTION OF PROPOFOL

Propofol basically acts on the $GABA_A$ receptors. The mechanism of action being, it prevents dissociation of GABA from the receptors. This increases the duration of action of GABA-activated opening of chloride channel resulting in hyper polarization of cell membrane.[57]

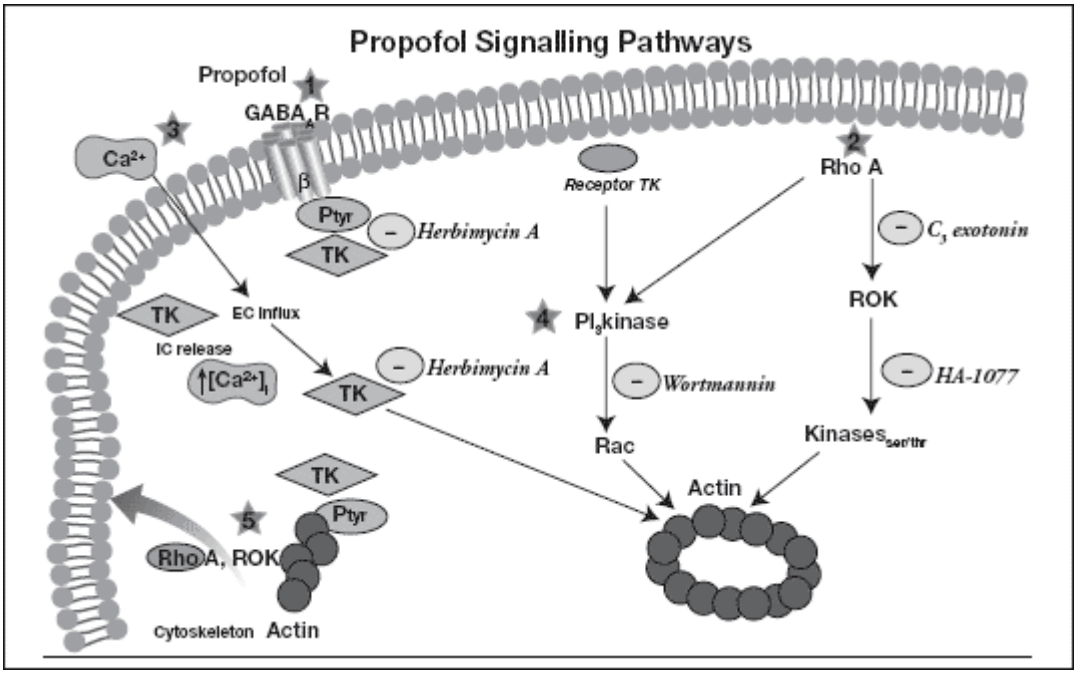


FIGURE 19: MECHANISM OF ACTION OF PROPOFOL.TK= tyrosine kinase, ROK= rho kinase, PI3kinase= phophatidylinositide 3'-kinase, ser/thr = serine/threonine phosphorylation, [Ca2+]i = intracellular calcium ion concentration, EC= extracellular, IC= intracellular, HA-1077= 1-5(-isoquinolinesulfonyl)homopiperazine, - = inhibition.

## PHARMACOKINETICS OF PROPOFOL

Using the three compartment model, it has pKa value of – 11. Its **v**olume of distribution is 4.6 L/Kg. Its clearance is 25 ml/Kg/min. It is got almost protein binding of 98%. It is not water soluble and has got a pH in the range of 7.0 – 8.5.

- **Onset of action** – One arm brain circulation time ( 15 -20 seconds)
- **Duration of action** – 3 to 5 min when given intravenously.
- **Half life** : α half life – 3-5 minutes

  β half life – 20-50 minutes

  γ half life – 200-500 minutes
- **Context sensitive half time** : Appoximately 10 minutes when infused for less than 3 hours & less than 40 minutes when infused for upto 8 hours.
- **Elimination** : Propofol is metabolized by conjugation to glucuronide & sulfate by liver. Propofol also undergoes extra hepatic metabolism in kidney and lungs (30%).[58]

## PHARMACODYNAMICS OF PROPOFOL

## CENTRAL NERVOUS SYSTEM

Propofol reduces cerebral metabolic rate by 48-58%. It also decreases cerebral blood flow by 58-78%. Moreover, propofol has an anticonvulsant action.

## CARDIOVASCULAR SYSTEM

Propofol is a potent cardiovascular depressant. It acts both centrally and peripherally. Centrally, it has got direct myocardial depressant action and peripherally, it decreases peripheral vascular resistance. These two mechanisms lead to cardiovascular depression. Propofol inhibits sympathetic vasoconstrictor nerve activity and causes vascular smooth muscle relaxation. Even the baroreceptor reflex is altered by propofol. Thus for a given decrease in blood pressure, there is small increase in heart rate. Hence propofol should be used cautiously in patients with poor cardiopulmonary reserve.[59]

## RESPIRATORY SYSTEM

Propofol shows respiratory depression that is dose dependent. After the induction dose, around 25-35% of the patients have apnoea. Propofol basically reduces tidal volume and increases respiratory rate. The ventilator response to hypercapnoea and hypoxia is blunted with propofol. It even produces bronchodilation in patients with COPD. However, propofol does not inhibit hypoxic pulmonary vasoconstriction.[60]

## PROPOFOL PAIN ON INJECTION

Propofol causes pain on intravenous injection. Two mechanisms have been postulated for this pain. One is that the propofol being a phenol group causes pain on injection. The other cause for pain has been attributed to be due to preservative used in propofol. Sang Young So et al, demonstrated that when preservative free lignocaine in a dose of 40 mg was added to propofol, it alleviated pain on injection and it did not alter the intubating haemodyamic conditions of the patient.[61]

## INDICATIONS FOR USE OF PROPOFOL

1. INDUCTION OF ANAESTHESIA, in a dose of 2 – 2.5 mg/Kg in adults and 2.5 – 3 mg/Kg in children.
2. MAINTENANCE OF ANAESTHESIA, at a dose of 50-150 μg/Kg/min.
3. CONSCIOUS SEDATION, at the dose of 50-75 μg/Kg/min.
4. Sole anaesthetic for short procedures, as in cardioversion.
5. Very useful in day care anaesthesia and surgery.
6. Useful in patients susceptible to malignant hyperthermia.
7. Can be used as an Anticonvulsant.
8. ***Total intravenous anaesthesia (TIVA)***: A plasma concentration of 2.5 to 8 μg/ml is required. This can be achieved as follows – 1 mg/Kg bolus, followed by 10 mg/kg/hr for 10 min, 8 mg/kg/hr for next 10 minutes and 6 mg/kg/hr thereafter. This is expected to give a plasma conc. of propofol of 3 μg/ml.

9. Sedation of critically ill patient in ICU: 1-3 mg/kg/hr.
10. Can also be used as antipruritic & antiemetic.
11. Safe in patients susceptible to porphyrias.

## ADVERSE EFFECTS OF PROPOFOL

1. It causes hypotension
2. It causes pain on injection
3. With propofol there are chances of apnoea and shallow breathing
4. It decreases the heart rate
5. It may cause allergic reaction
6. It may cause PROPOFOL INFUSION SYNDROME
    - Occurs due to prolonged infusion in small children and infants
    - Usually when used in excess of 4 mg/kg/hr for > 48 hours
    - Propofol interferes with mitochondrial mechanisms
    - Features : METABOLIC ACIDOSIS , hyperkalemia , RHABDOMYOLYSIS, renal failure, hepatomegaly, cardiac failure ( RBBB & asystole ) hyperlipidemia
    - Management : Cardiorespiratory support
      Hemodialysis

# REVIEW OF LITERATURE

## HISTORY OF REVIEW OF LITERATURE

Sir Henry Norman Brain worked as British Consul in Kobe. It was in 2nd July 1942, that Archie Ian Jeremy Brain was born. Archie Brain had interest in poetry and dramatics. But he had no interest in mathematics. However he always had an interest in physics. Seeing his interest in poetry and dramatics, he was sent to field of arts. But nothing could prevent him from inventing and he built his own guitar in 1956. He finished his preclinical studies and graduated in 1970. Then, in 1971, he began his anaesthetic career at the Royal East Sussex Hospital.[14]

When we reviewed the literature, we came across following studies which we feel are relevant to our study and would like to discuss with our results.

**Wee P et al (1991)[65]** studied the occurrence of cough before induction, and after the patients are administered with intravenous fentanyl of 1.5 mcg/kg. They randomly allocated first 100 patients into 50 each. Group 1 received 1.5 mcg/kg of fentanyl. Group 2 received equivalent volume of normal saline. It was reported that 28% of the patients who received fentanyl reported cough. Then they randomly allocated next 150 patients into three groups of 50 each. Group 3 received 0.01 mg/kg atropine 1 minute before fentanyl. Group 4 received 0.2 mg/kg morphine intramuscularly 1 hour before fentanyl and group 5 received 7.5 mg midazolam orally 1 hour before fentanyl. 30% of patients in group 3, 4% of patients in group 4 and 40% of patients in group 5 reported coughing. It was clear that the patients receiving fentanyl and morphine combination had greater incidence of cough. The probable two mechanisms are by either stimulation of J receptors or the stimulation of irritant receptors. Thus, as coughing at the time of induction is significant, this study is of clinical importance.

Also, in another study, **Mc Crory et al (1995)**[66] compared the relation between the ease of LMA insertion and the mallampati classification. They viewed the LMA position in 100 patients using fibreoptic bronchoscopy. In 72 patients, there was easy insertion of LMA, there was proper seating of LMA when viewed in fibreoptic bronchoscope and they belonged to mallampati class I or II. Whereas, in other 28 patients, there was difficulty in LMA insertion, there was improper seating of LMA when viewed in fibreoptic bronchoscope and they belonged to mallampati class II or III. Thereby, they concluded that mallampati classification is not only the tool to assess the ease of intubation but also the LMA insertion.

Interestingly, **Lawrence and colleagues (1997)**[67] assesed the perioperative hemodynamic stability and anaesthetic requirements in patients administered with single dose of 2 mcg/kg intravenous dexmedetomidine as a preinduction dose. They randomly allocated 50 patients posted for minor surgical procedures into two groups of 25 each. Group A received dexmedetomidine and group B received normal saline. The required amount of dexmedetomidine was taken in 20 ml syringe and rest was filled with normal saline. This solution was given over 5 minutes. For 15 minutes the patients were monitored for sedation using ramsay sedation score. Following this the patients were administered with fentanyl 2 mcg/kg and they were preoxygenated for 3 minutes. Then thiopentone was given in the dose of 3mg/kg intravenously followed by vecuronium in the dose of 0.1 mg/kg. Patients were intubated with endotracheal tube and ventilated with 67% of nitrous oxide. Isoflurane was adjusted by 0.25% until the blood pressure did not exceed 20% of the preoperative value. It was seen that the requirement of intraoperative anaesthetics, intubation response, extubation response, requirement of post operative analgesics and post operative antiemetics was reduced in patients receiving dexmedetomidine.

Moreover, **Hsu YW et al (2004)[68]** investigated the respiratory effect of dexmedetomidine and remifentanyil. They assessed the respiratory response of the 6 healthy volunteers using a step wise target-controlled infusion of dexmedetomidine, remifentanil and a pseudo natural sleep session. When compared with the baseline values, patients receiving remifentanil infusions had decreased respiratory rate, decreased minute ventilation, apnoea episodes and respiratory acidosis. Whereas the patients receiving dexmedetomidine, had respiratory pattern that mimics the natural sleep. Thereby, the patients receiving dexmedetomidine, did not have respiratory depression, decreased apnoea/hypopnoea index and had natural sleep pattern.

On the other hand, **Wong CM et al (2007)[69]** chose 21 male and 54 female healthy female patients to study the optimal dose and duration of fentanyl required along with propofol for insertion of LMA. Here they administered fentanyl in the dose of placebo, 0.5, 1.0, 1.5 and 2.0 mcg/kg. Propofol was given in the dose of 2 mg/kg. After 90 seconds of induction LMA was inserted. Around 95% of the patients required fentanyl above the clinical dose and 65% of the patients required fentanyl in the dose of 1 mcg/kg. And 90 seconds was optimum duration after induction and LMA insertion.

In another study, **Ismail S et al (2007)[70]** compared the effect of different age groups on hemodynamic response to LMA insertion. They divided 90 patients into 3 groups of 30 each. Group Y (young) 18-25 years, Group M (middle) 40-45 years and group E (elderly) 65-80 years. To all the three groups they administered midazolam 7.5 mg orally one hour before induction preoperatively. Then they were induced with propofol in the dose of 2 mg/kg and LMA was inserted. Hemodynamic parameters in the form of heart rate and blood pressure was measured immediately after propofol injection and at 1, 2, 3, 4 and 5 minutes after LMA insertion. No significant hemodynamic changes were seen in all three groups after LMA insertion. However maximum response was seen at 1 minute which returned to baseline

at 3 minutes an all groups, except in middle aged group where it returned to baseline at 4 minutes. Thereby middle aged group had the greatest arterial pressure and heart rate changes, but when compared to the baseline, the change was very minimal.

Thus, **Uzumcugil F et al (2008)**[71] studied the effects of dexmedetomidine administered with propofol and fentanyl administered with propofol for laryngeal mask airway insertion in 52 patients. Group F received fentanyl in the dose of 1 mcg/kg with 1.5 mg/kg of propofol. Group D received dexmedetomidine in the dose of 1 mcg/kg with 1.5 mg/kg of propofol. They did not use any neruromuscular blocking agents. After 90 seconds of induction, first attempt of LMA insertion was attempted. 50% nitrous oxide and sevoflurane in oxygen was used for maintenance of anaesthesia. They observed jaw mobility, cough and other events like spontaneous ventilation, breath holding, expiratory stridor and lacrimation. The episodes of apnoea, reduction in systolic and mean blood pressure was more in fentanyl group than the dexmedetomidine group. They came to a conclusion that dexmedetomidine when used with propofol provided better hemodynamic conditions then fentanyl.

Similarly, **Ali AR et al (2010)**[72] evaluated the dexmedetomidine and fentanyl when combined with propofol in 50 children aged 3-8 years posted for extracorporeal shock wave lithotripsy. They received a loading dose of 0.7 mcg/kg over 10 minutes, followed by the maintenance of infusion at the rate of 0.3 mcg/kg/hr of either dexmedetomidine in propofol or fentanyl in propofol. The target infusions were set to maintain the hemodynamics within 20% of the baseline values. They concluded that propofol-dexmedetomidine group was accompanied with less propofol consumption, prolonged analgesia, and lower incidence of apnoea and less post procedural complications.

Also, **Hanci V et al (2010)[73]** compared the efficacy of dexmedetomidine with fentanyl when used for endotracheal intubation in combination with propofol and lignocaine. 60 patients were randomized into two groups of 30 each. Group D received dexmedetomidine in the dose of 1 mcg/kg. Group F received fentanyl in the dose of 2 mcg/kg. Both the groups were administered with propofol 3 mg/kg and lignocaine 1.5 mg/kg respectively. Intubating conditions like ease of bag mask ventilation, jaw mobility, vocal cord positioning and patients response to intubation were noted. Hemodynamic parameters like heart rate, systolic blood pressure and diastolic pressure were also noted. Group D had good conditions for intubation, there was no significant fall in blood pressure in this group and there was not significant decrease in heart rate. Thus they opined that dexmedetomidine-lignocaine-propofol combination provided better conditions for intubation.

Moreover, **Suparto et al (2010)[74]** studied the efficacy of fentanyl and dexmedetomidine in attenuating the intubation response. It was a randomized double blind study, where they divided 56 patients posted for general anaesthesia into two groups. They either received fentanyl 1 mcg/kg or dexmedetomidine 1 mcg/kg intravenously prior to induction. Patients were then induced with propofol, atracurium and oxygen with sevoflurane. Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure were noted. In dexmedetomidine group, the mean increase in the SBP and DBP were 25% and 29% respectively. Whereas in the fentanyl group, both SBP and DBP increased to 40%. They postulated that dexmedetomidine provided better intubating conditions.

The evidence of **Qifeng ae al (2010)[75]** suggests the different priming doses of propofol required to attenuate the fentanyl induced cough. Here 120 patients were randomly allocated into 4 groups of 30 each. Group I received 0.15 ml/kg of intralipid, group II received 1 mg/kg of propofol, group III received 1.5 mg/kg of propofol and group IV

received 2 mg/kg of propofol. 1 minute later, all the four groups received 2.5 mcg/kg of fentanyl in a bolus of less than 2 seconds duration. After 90 seconds of induction with propofol, patients were given succinyl choline in the dose of 2 mg/kg and patients were intubated with endotracheal tube. Group II, III and IV had lower incidence of cough. This study showed that priming with propofol of 1.5 mg/kg or more reduced the incidence of fentanyl induced cough.

**Asha et al (2011)[76]** studied the efficacy of ketamine and opioids as adjuncts to propofol in 90 patients for LMA insertion. Group PK received ketamine 0.5 mg/kg, group PF received fentanyl 1 mcg/kg and group PB received butorphanol 20 mcg/kg. All groups received propofol in the dose of 2.5 mg/kg before induction. Jaw relaxation was assessed according to young's criteria. They inferred that the patients receiving butorphanol had better conditions for LMA insertion.

**Sukhminder B et al (2012)[77]** evaluated the efficacy of dexmedetomidine in reducing the requirement of opioids and anaesthetics intraoperatively. They divided 100 patients into 2 groups of 50 each. Group D received dexmedetomidine 1 mcg/kg and fentanyl 1 mcg/kg. Group F received fentanyl 2 mcg/kg. Then they administered thiopentone until loss of eyelash reflex was seen. They intubated patients after giving vecuronium in the dose of 0.1 mg/kg. They maintained anaesthesia with oxygen and nitrous oxide in the ratio 33:66, isoflurane was adjusted till the blood pressure was around 20% of the preoperative value. They investigated that the dexmedetomidine group had better intubation and extubation conditions. The requirement of opioids and anaesthetics was also reduced in this group.

Finally, in a recent study, **Liang HE et al (2012)[78]** investigated the potency of dexmedetomidine in reducing the incidence of fentanyl induced cough. They randomly

allocated 300 patients into 3 groups of 100 each. Group I received 10 ml isotonic saline, group II received dexmedetomidine 0.5 mcg/kg and group III received dexmedetomidine 1 mcg/kg in isotonic saline. All three groups subsequently received fentanyl in the dose of 4.0 mcg/kg. The incidence of cough were 61%, 40% and 18% in groups I, II and III respectively. They inferred that dexmedetomidine in the dose of 0.5 mcg/kg or 1 mcg/kg was effective in reducing fentanyl induced cough.

# MATERIALS AND METHODS

For our study entitled, comparison of dexmedetomidine propofol with fentanyl propofol for laryngeal mask airway insertion in general anaesthesia patients undergoing elective surgeries, 110 patients admitted for elective surgeries posted under general anaesthesia at R.L.Jalappa Hospital and Research centre, Tamaka, Kolar during the duration of February 2015 to August 2016.

## Inclusion criteria:

All elective patients belonging to age group 18-60 years with adequate mouth opening and ASA grade I, II undergoing operative procedure undergoing general anaesthesia.

## Exclusion criteria:

- Patients refusal
- Full stomach patients
- Patients undergoing emergency surgeries
- Smokers
- Patients undergoing oral surgeries

### Sampling Procedure:

A prospective randomized double blind study was planned. After obtaining approval from the ethical committee and taking informed consent, the patients who meet the inclusion criteria were taken for the study. They were randomly allocated into two groups.

- Group A patients were preoxygenated for 3min, dexmedetomidine 1mcg/kg diluted in

10ml normal saline was given over 2min. 30sec later propofol 2mg/kg was given for induction without neuromuscular blocking agents.

- Group B patients were preoxygenated for 3 min, fentanyl 1mcg/kg diluted in 10ml normal saline was given over 2 min. 30 sec later propofol 2mg/kg was given for induction without neuromuscular blocking agents.
- Anaesthesia was maintained with 50% nitrous oxide and isoflurane with oxygen.
- To decrease pain due to propofol injection, 20 mg of lignocaine was added to 100 mg of propofol.
- It is a double blind study and the anaesthesiologist was not aware of the inducing agent and the adjuvant used. He was called to insert the LMA after giving the inducing agent and adjuvant.

## PARAMETERS OBSERVED

- Heart rate, non-invasive blood pressure, oxygen saturation and respiratory rate before insertion of LMA and 30 sec, 1 min, 3 min, 5 min, 10 min and 15 min after insertion of LMA.
- Response of the patient to LMA insertion like coughing, gagging or any movement was noted.
- To assess the tolerance of LMA insertion we followed the scoring system modified by Muzi and colleagues.

- **SCORING SYSTEM TO ASSESS JAW MOBILITY**

1. Fully relaxed

2. Mild resistance

3. Tight, but opens

4. Closed

- **SCORING SYSTEM TO GRADE COUGHING OR MOVEMENT**

1. None

2. One or two coughs

3. Two or more coughs

4. Bucking or movement

**OTHERS**

- Spontaneous ventilation
- Breath holding
- Expiratory stridor
- Lacrimation

IN EACH CATEGORY SCORES LESS THAN TWO (<2) WAS CONSIDERED OPTIMUM FOR LMA INSERTION

**Statistical analysis**

SPSS (version18.0) to analyze data (version 18.0), and Sigma-Stat 12.0 is used to decide sample size. Statistical analyses were performed using the Chi-square test and Fisher's exact test for categorical data and one-way ANOVA for continuous data. A P value of < 0.05 was considered significant.

Statistical evaluation of data or parameters were done as follows

Sample Size

$$n = \frac{2P\bar{Q}(Z\alpha + Z_{1-\beta})^2}{(P1-P2)^2}$$

where,

P1=22.5%, P2=2.5%, P =12.5, $\bar{Q}$ =87.5

Zα=95% confidence interval=1.96

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

Thus, the sample size required is total of 110 and 55 per group.

# RESULTS

STUDY DESIGN: A prospective, randomized double blind study with 110 patients, randomized into two groups, 55 in Group D (Dexmedetomidine) and 55 in Group F (Fentanyl) were taken to study the hemodynamic responses and conditions for laryngeal mask airway insertion.

**Table 2: Age distribution of subjects**

| | GROUP | | | | P value |
|---|---|---|---|---|---|
| | Group A | | Group B | | |
| | Mean | SD | Mean | SD | |
| AGE | 35.2 | 11.7 | 38.7 | 15.1 | 0.180 |

The Mean age subject in the study was 35.2 ± 11.7 years and in group B was 38.7 ± 15.1 years. There was no significant difference in mean age between two groups.

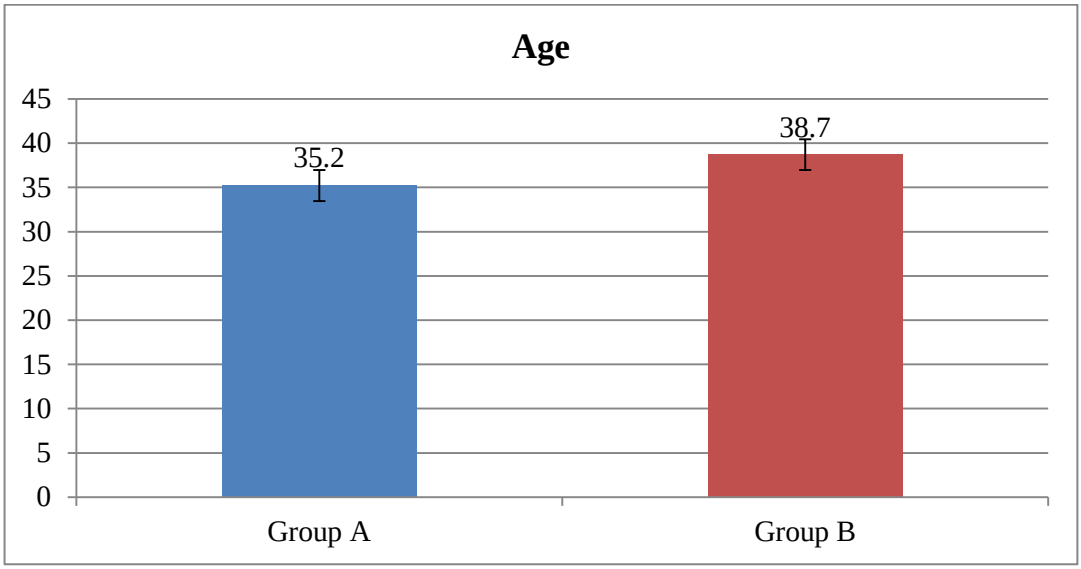


Figure 20: Bar diagram showing age distribution of subjects

**Table 3: Gender distribution of subjects**

| | | GROUP | | | | p value |
|---|---|---|---|---|---|---|
| | | Group A | | Group B | | |
| | | Count | % | Count | % | |
| Gender | Female | 45 | 81.8% | 39 | 70.9% | 0.178 |
| | Male | 10 | 18.2% | 16 | 29.1% | |

In the study majority of subjects in both group A and group B were females. 81.8% in Group A and 70.9% in Group B. There was no significant difference in gender between two groups.

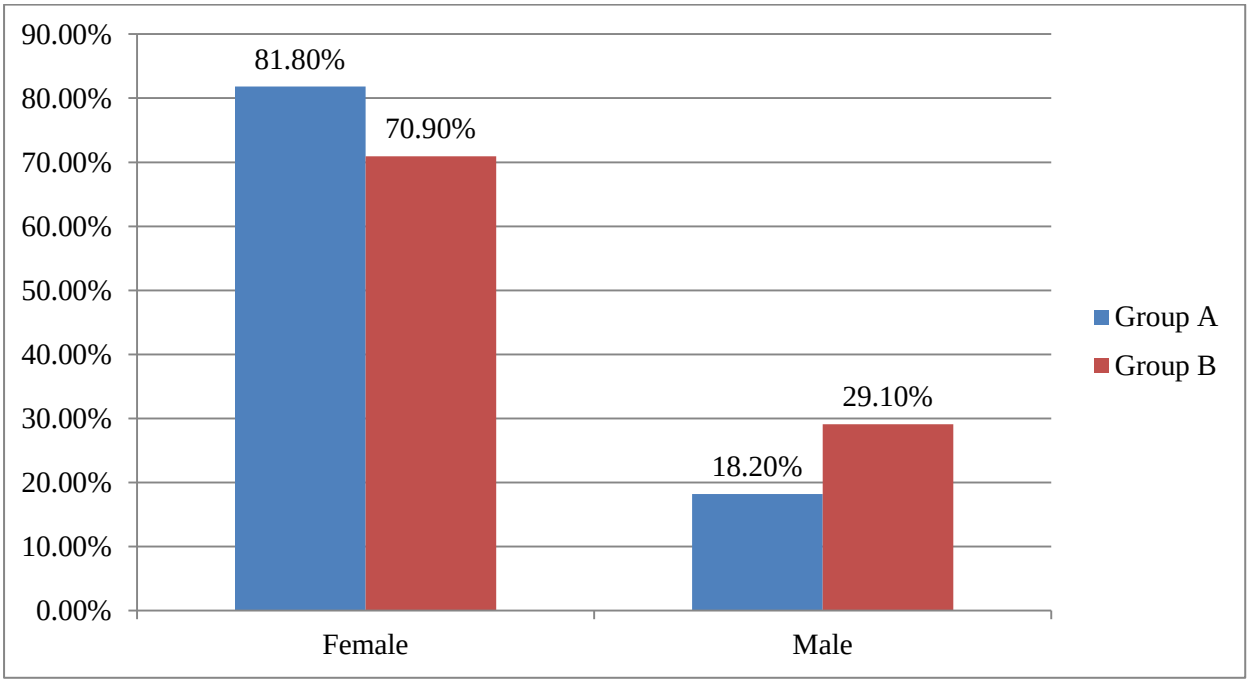


**Figure 21: Bar diagram showing Gender distribution of subjects**

**Table 4: Weight distribution of subjects**

| | GROUP | | | | P value |
|---|---|---|---|---|---|
| | Group A | | Group B | | |
| | Mean | SD | Mean | SD | |
| Body Weight (Kg) | 57.2 | 5.1 | 59.3 | 8.4 | 0.117 |

Mean weight of subjects in Group A was 57.2 ± 5.1 kgs and in Group B was 59.3 ± 8.4 kgs.

There was no significant difference in mean weight between two groups.

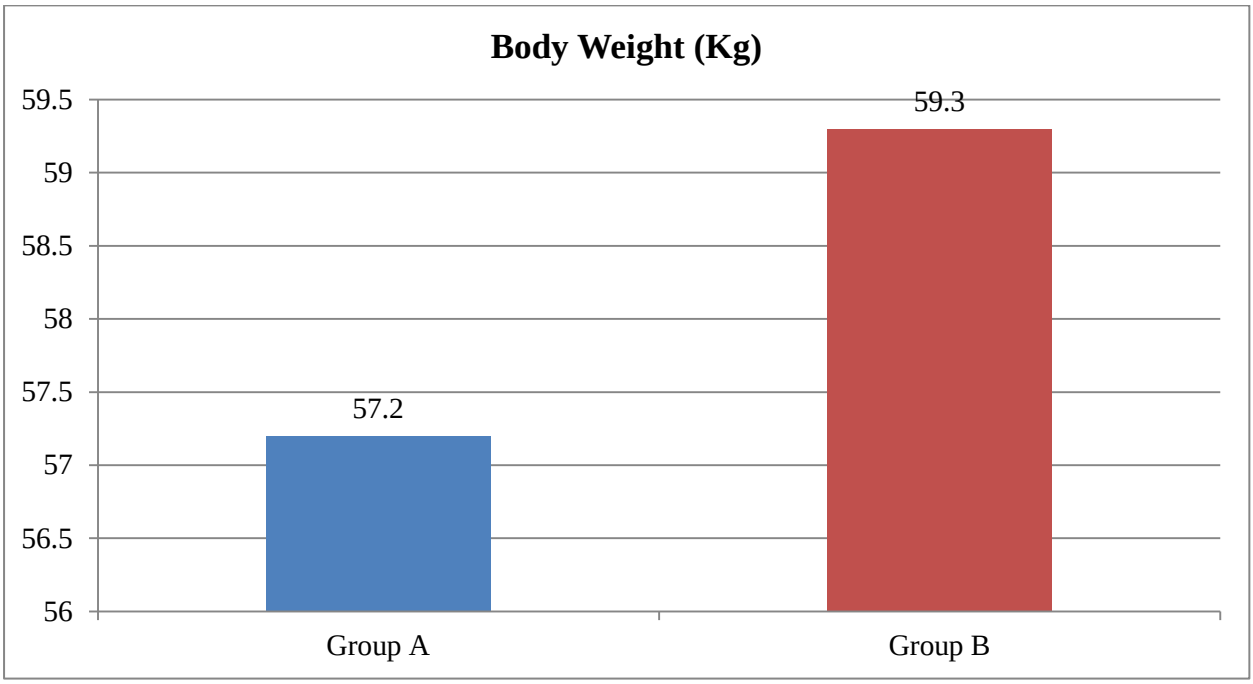


**Figure 22: Bar diagram showing Weight distribution of subjects**

**Table 5: Heart rate comparison between two groups**

| | GROUP | | | | P value |
|---|---|---|---|---|---|
| | Group A | | Group B | | |
| | Mean | SD | Mean | SD | |
| PRE LMA | 77.0 | 10.3 | 80.8 | 10.0 | 0.051 |
| 30 SEC | 73.0 | 9.8 | 75.0 | 9.4 | 0.280 |
| 1 MIN | 67.8 | 7.2 | 72.3 | 9.2 | 0.006* |
| 3 MIN | 66.4 | 6.6 | 69.8 | 9.0 | 0.025* |
| 5 MIN | 68.7 | 9.7 | 68.6 | 8.8 | 0.975 |
| 10 MIN | 68.5 | 9.7 | 67.9 | 9.0 | 0.745 |
| 15 MIN | 68.5 | 9.6 | 67.6 | 9.1 | 0.626 |

In the study there was significant difference in Mean Heart rate between two groups at 1 min and 3 min. Mean HR was lower in group A than group B. No significant difference was observed between two groups at other intervals.

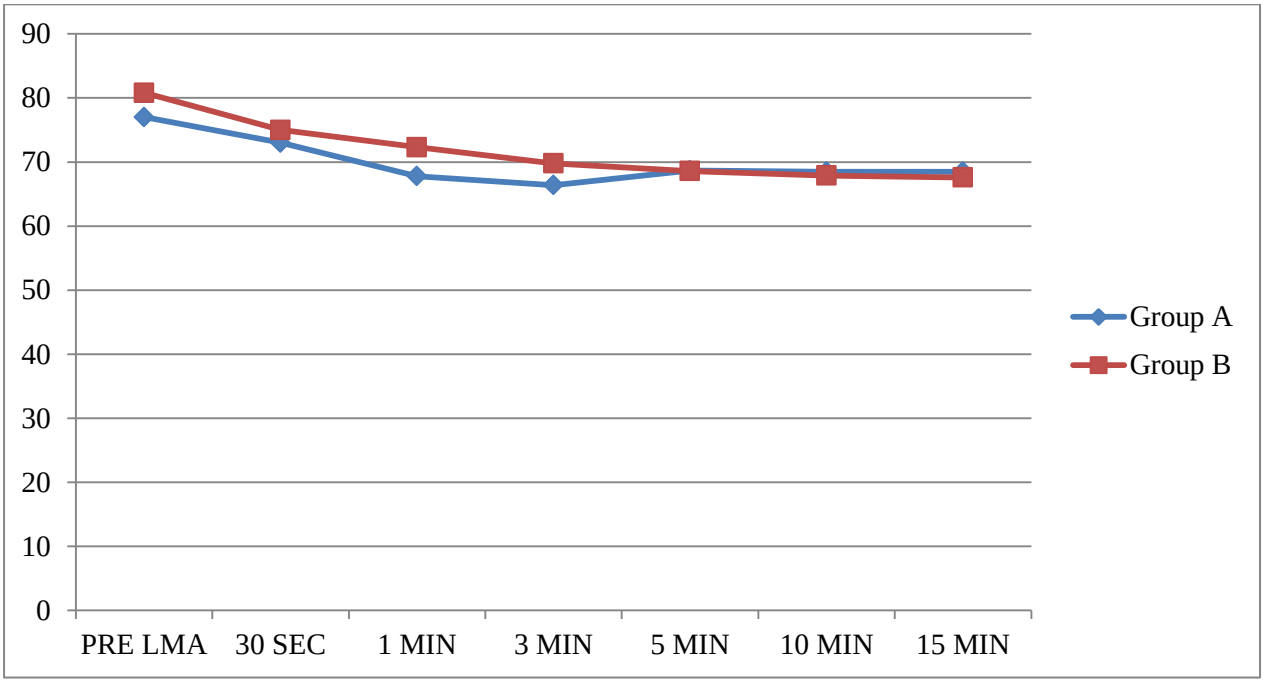


**Figure 23: Line diagram showing Heart rate comparison between two groups**

**Table 6: SBP comparison between two groups**

| | GROUP | | | | P value |
|---|---|---|---|---|---|
| | Group A | | Group B | | |
| | Mean | SD | Mean | SD | |
| PRE LMA | 122.7 | 9.5 | 125.3 | 9.0 | 0.146 |
| 30 SEC | 118.0 | 9.2 | 117.1 | 9.4 | 0.623 |
| 1 MIN | 115.2 | 9.1 | 113.3 | 8.5 | 0.273 |
| 3 MIN | 112.5 | 9.2 | 109.7 | 8.2 | 0.099 |
| 5 MIN | 111.1 | 9.4 | 106.4 | 7.0 | 0.004* |
| 10 MIN | 110.6 | 9.5 | 104.3 | 6.7 | <0.001* |
| 15 MIN | 110.4 | 9.4 | 103.8 | 6.7 | <0.001* |

In the study there was significant difference in Mean SBP between two groups was observed from 5 min and persisted till 15 min intervals.

At other intervals there was no significant difference in mean SBP between two groups.

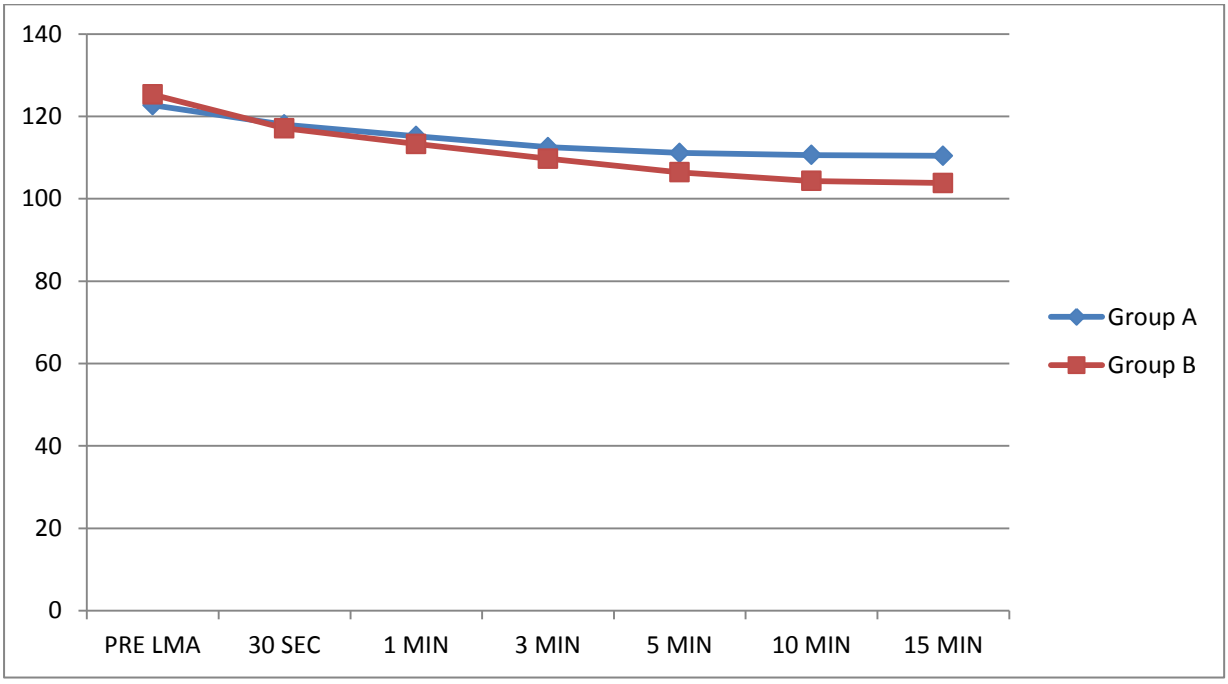


**Figure 24: Line diagram showing SBP comparison between two groups**

**Table 7: DBP comparison between two groups**

| | GROUP | | | | P value |
|---|---|---|---|---|---|
| | Group A | | Group B | | |
| | Mean | SD | Mean | SD | |
| PRE LMA | 68.4 | 6.3 | 70.6 | 7.3 | 0.091 |
| 30 SEC | 64.7 | 6.0 | 64.3 | 5.6 | 0.718 |
| 1 MIN | 62.9 | 5.9 | 62.1 | 5.4 | 0.482 |
| 3 MIN | 61.2 | 5.8 | 59.9 | 5.2 | 0.200 |
| 5 MIN | 60.4 | 5.8 | 58.0 | 5.1 | 0.024* |
| 10 MIN | 60.0 | 5.7 | 57.1 | 5.0 | 0.005* |
| 15 MIN | 60.0 | 5.7 | 56.9 | 5.1 | 0.003* |

In the study there was significant difference in Mean DBP between two groups was observed from 5 min and persisted till 15 min intervals.

At other intervals there was no significant difference in mean DBP between two groups.

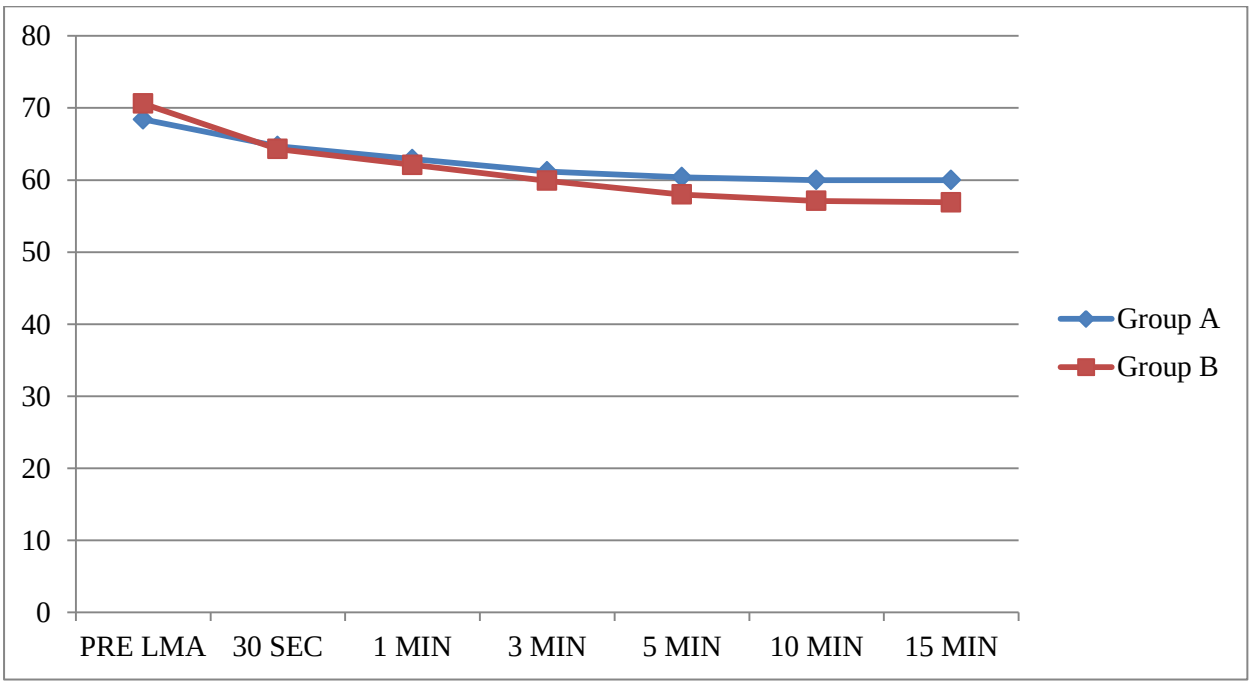


**Figure 25: Line diagram showing DBP comparison between two groups**

**Table 8: MAP comparison between two groups**

| | GROUP | | | | P value |
|---|---|---|---|---|---|
| | Group A | | Group B | | |
| | Mean | SD | Mean | SD | |
| PRE LMA | 86.3 | 6.9 | 88.6 | 7.3 | 0.085 |
| 30 SEC | 82.4 | 6.6 | 81.8 | 6.2 | 0.645 |
| 1 MIN | 80.0 | 6.5 | 79.1 | 5.8 | 0.404 |
| 3 MIN | 78.0 | 6.4 | 75.7 | 7.4 | 0.080 |
| 5 MIN | 77.1 | 6.5 | 74.2 | 5.5 | 0.016* |
| 10 MIN | 76.6 | 6.5 | 72.9 | 5.2 | 0.001* |
| 15 MIN | 76.5 | 6.4 | 72.8 | 5.4 | 0.001* |

In the study there was significant difference in Mean MAP between two groups was observed from 5 min and persisted till 15 min intervals.

At other intervals there was no significant difference in mean MAP between two groups.

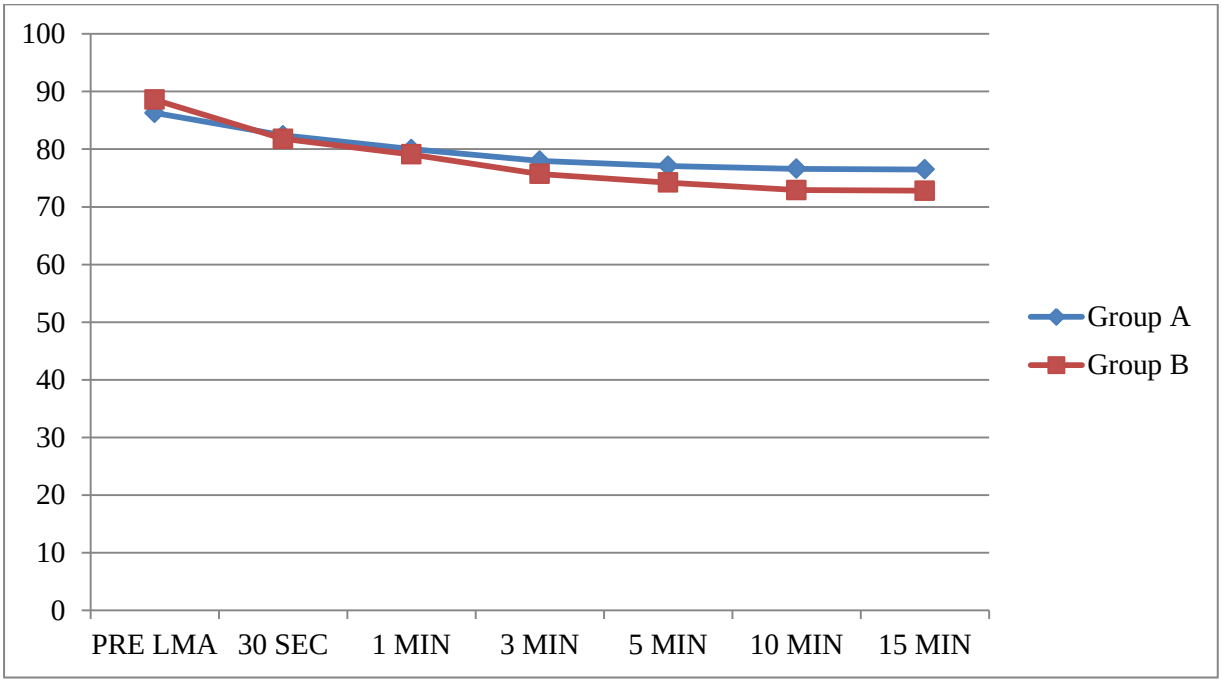


**Figure 26: Line diagram showing MAP comparison between two groups**

**Table 9: SPo2 comparison between two groups**

| | GROUP | | | | P value |
|---|---|---|---|---|---|
| | Group A | | Group B | | |
| | Mean | SD | Mean | SD | |
| PRE LMA | 99.3 | 1.0 | 99.4 | 0.9 | 0.544 |
| 30 SEC | 99.8 | 0.5 | 99.7 | 0.7 | 0.170 |
| 1 MIN | 99.9 | 0.4 | 99.8 | 0.6 | 0.203 |
| 3 MIN | 99.9 | 0.4 | 99.8 | 0.6 | 0.457 |
| 5 MIN | 99.8 | 0.4 | 99.8 | 0.5 | 1.000 |
| 10 MIN | 99.8 | 0.4 | 99.8 | 0.5 | 1.000 |
| 15 MIN | 99.8 | 0.4 | 99.8 | 0.5 | 0.839 |

In the study there was no significant difference in Mean SPo2 between two groups at all the intervals.

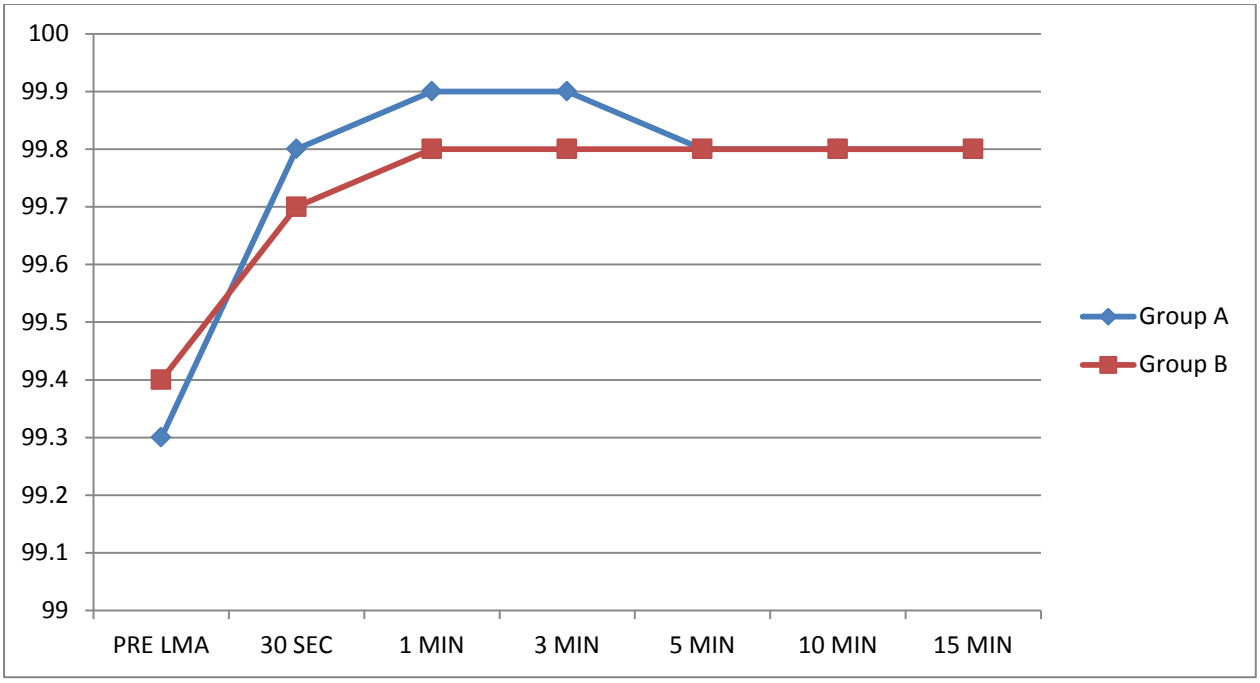


**Figure 27: Line diagram showing SPo2 comparison between two groups**

**Table 10: RR comparison between two groups**

| | GROUP | | | | P value |
|---|---|---|---|---|---|
| | Group A | | Group B | | |
| | Mean | SD | Mean | SD | |
| PRE LMA | 19.6 | 2.1 | 18.9 | 1.6 | 0.655 |
| 30 SEC | 18.2 | 1.8 | 17.7 | 1.7 | 0.105 |
| 1 MIN | 17.6 | 1.6 | 17.2 | 1.6 | 0.183 |
| 3 MIN | 17.2 | 1.7 | 16.7 | 1.7 | 0.074 |
| 5 MIN | 16.9 | 1.8 | 16.4 | 1.8 | 0.136 |
| 10 MIN | 16.9 | 1.8 | 16.4 | 1.7 | 0.109 |
| 15 MIN | 16.9 | 1.8 | 16.4 | 1.7 | 0.107 |

In the study there was no significant difference in Mean Respiratory rate between two groups at all the intervals.

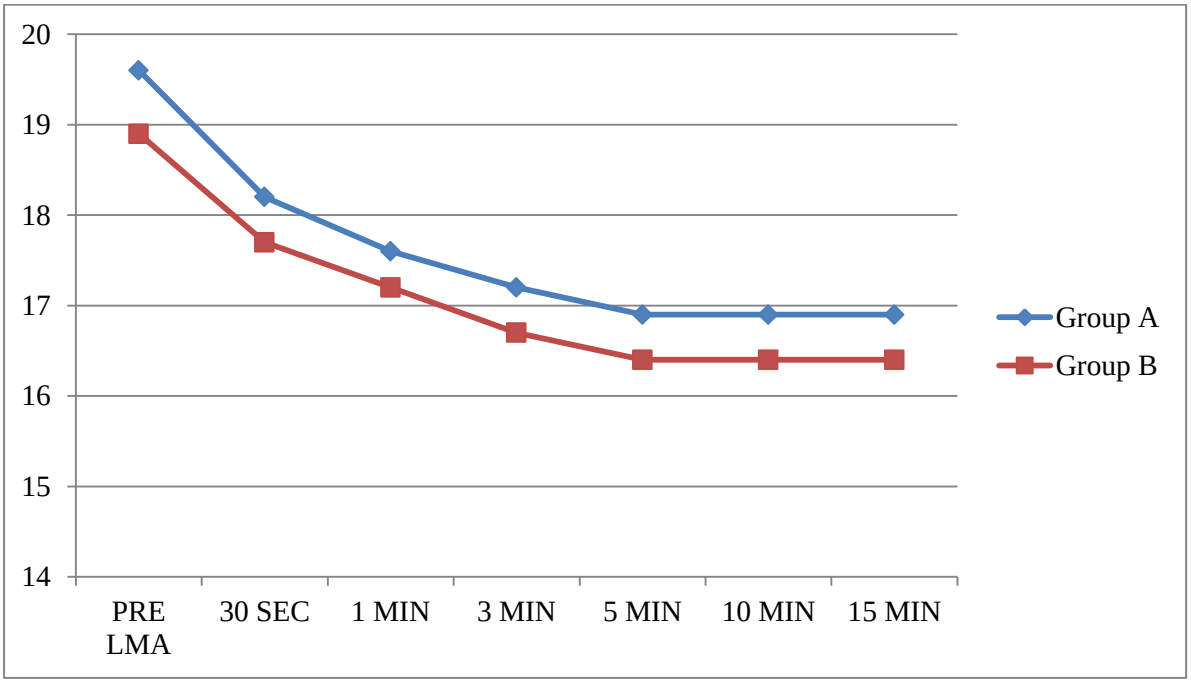


**Figure 28: Line diagram showing RR Comparison between two groups**

**Table 11: Jaw Mobility comparison between two groups**

| | | GROUP | | | | P value |
|---|---|---|---|---|---|---|
| | | Group A | | Group B | | |
| | | Count | % | Count | % | |
| Fully Relaxed | 0 | 16 | 29.1% | 21 | 38.2% | 0.313 |
| | 1 | 39 | 70.9% | 34 | 61.8% | |
| Mild Resistance | 0 | 41 | 74.5% | 35 | 63.6% | 0.216 |
| | 1 | 14 | 25.5% | 20 | 36.4% | |
| Tight But Opens | 0 | 53 | 96.4% | 54 | 98.2% | 0.558 |
| | 1 | 2 | 3.6% | 1 | 1.8% | |
| Closed | 0 | 55 | 100.0% | 55 | 100.0% | - |

In Group A 70.9% had fully relaxed jaw, 25.5% had mild resistance and in 3.6% jaw was tight and opens.

In Group B 61.8% had fully relaxed jaw, 36.4% had mild resistance and in 1.8% jaw was tight and opens.

There was no significant difference in jaw mobility between two groups.

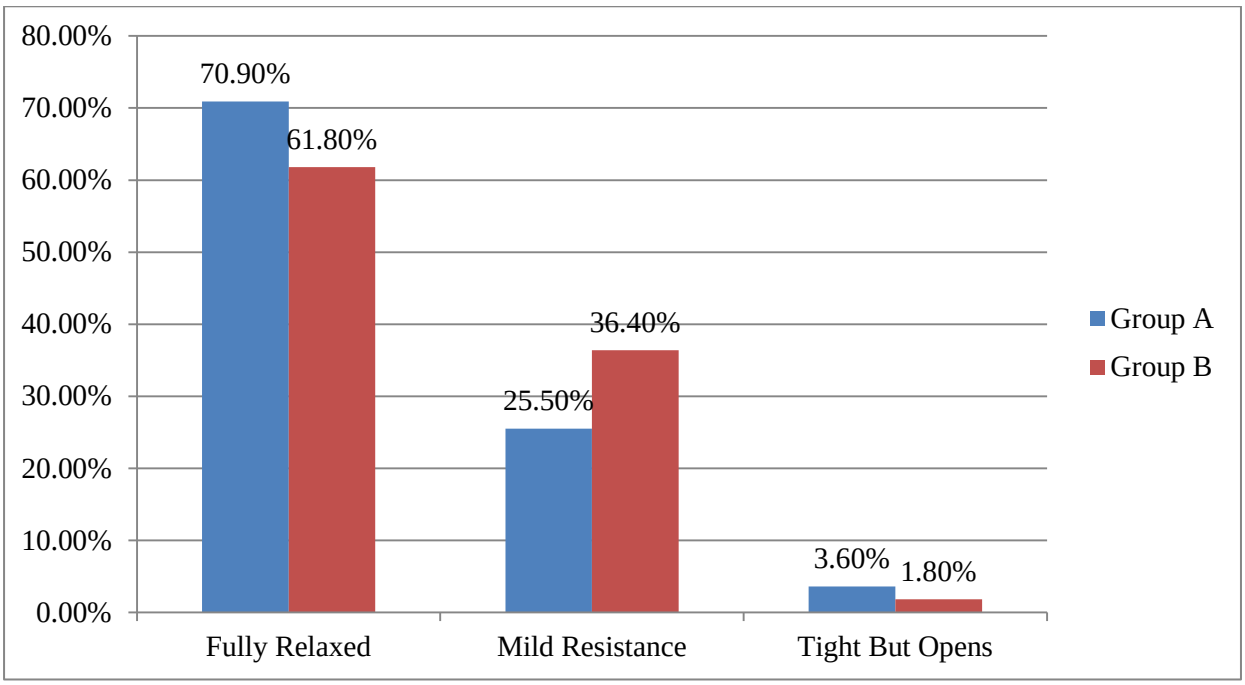


**Figure 29: Bar diagram showing Jaw Mobility comparison between two groups**

**Table 12: Cough comparison between two groups**

| | | GROUP | | | | P value |
|---|---|---|---|---|---|---|
| | | Group A | | Group B | | |
| | | Count | % | Count | % | |
| None | 0 | 28 | 50.9% | 24 | 43.6% | 0.445 |
| | 1 | 27 | 49.1% | 31 | 56.4% | |
| One Or Two Coughs | 0 | 27 | 49.1% | 32 | 58.2% | 0.339 |
| | 1 | 28 | 50.9% | 23 | 41.8% | |
| Two Or More Coughs | 0 | 55 | 100.0% | 54 | 98.2% | 0.315 |
| | 1 | 0 | 0.0% | 1 | 1.8% | |
| Bucking Or Movement | 0 | 55 | 100.0% | 55 | 100.0% | - |

In Group A 49.1% had no cough, 50.9% had one or two coughs and in 0% had two or more coughs.

In Group B 56.4% had no cough, 41.8% one or two coughs and 1.8% had two or more coughs.

There was no significant difference in cough between two groups.

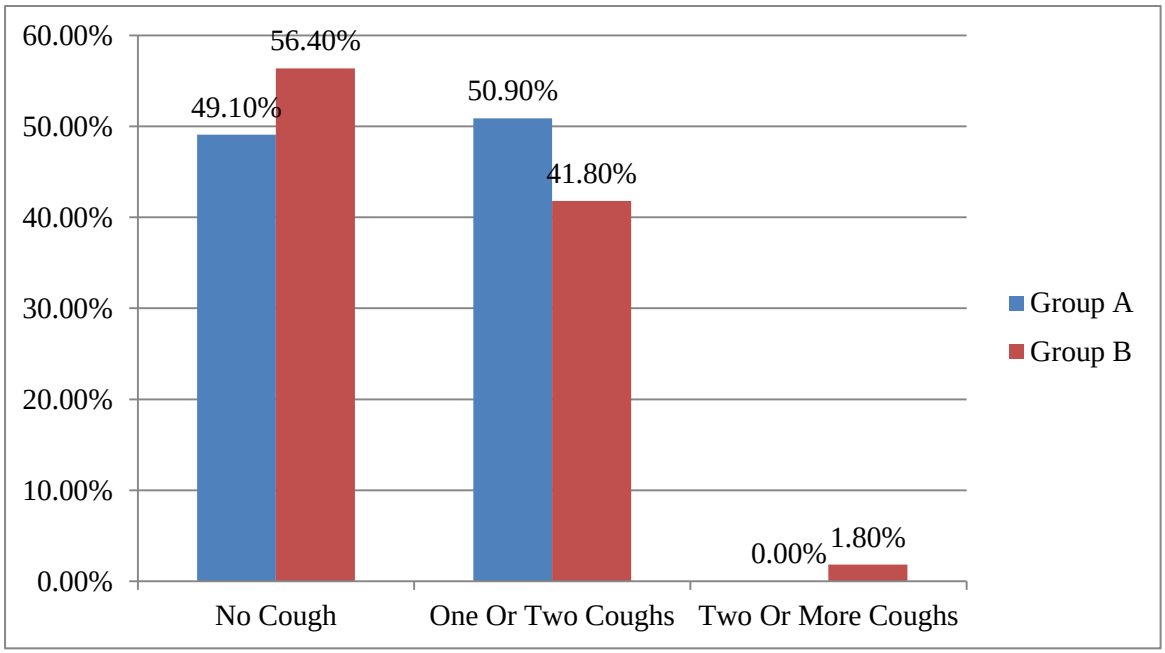


**Figure 30: Bar diagram showing Cough comparison between two groups**

**Table 13: Other findings among subjects between two groups**

| | | GROUP | | | | P value |
|---|---|---|---|---|---|---|
| | | Group A | | Group B | | |
| | | Count | % | Count | % | |
| Spontaneous Ventilation | 0 | 15 | 27.3% | 13 | 23.6% | 0.662 |
| | 1 | 40 | 72.7% | 42 | 76.4% | |
| Breath Holding | 0 | 40 | 72.7% | 29 | 52.7% | 0.03* |
| | 1 | 15 | 27.3% | 26 | 47.3% | |
| Expiratory Stridor | 0 | 55 | 100.0% | 54 | 98.2% | 0.315 |
| | 1 | 0 | 0.0% | 1 | 1.8% | |
| Lacrimation | 0 | 55 | 100.0% | 55 | 100.0% | - |

In Group A 72.7% had Spontaneous ventilation, 27.3% had breath holding spells.

In Group B 76.4% had Spontaneous ventilation, 47.3% had breath holding and 1.8% had expiratory Stridor. There was significant difference in breath holding spells between two groups.

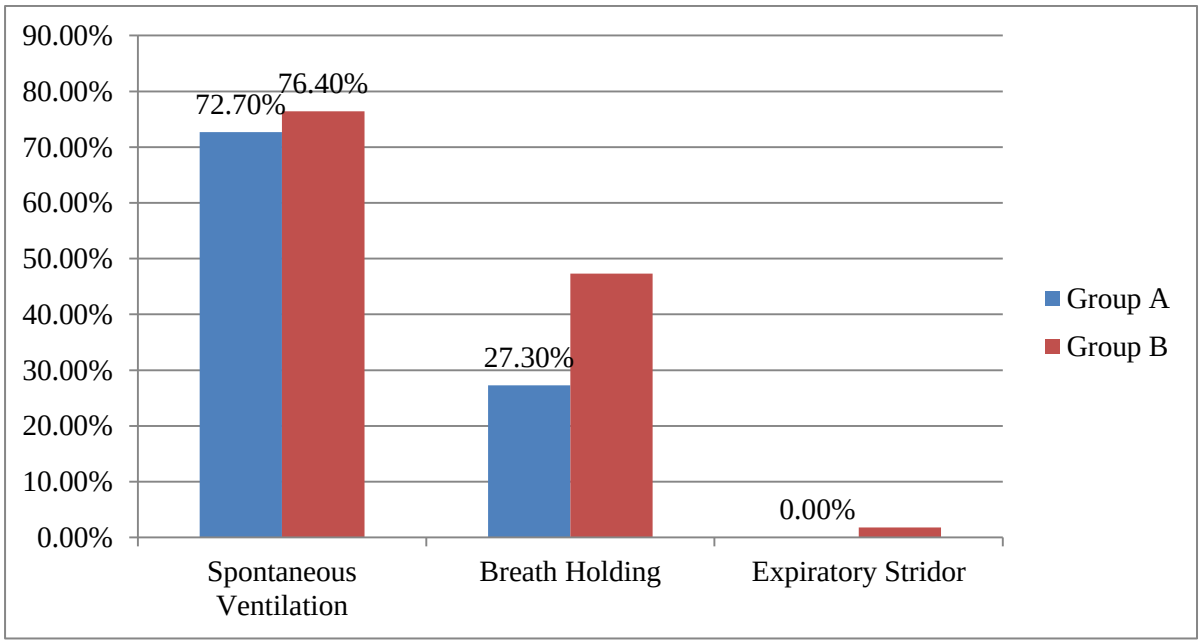


**Figure 31: Bar diagram showing other findings among subjects between two groups**

**Table 14: No of second attempts for LMA insertion among subjects between two groups**

| | | GROUP | | | | p value |
|---|---|---|---|---|---|---|
| | | Group A | | Group B | | |
| | | Count | % | Count | % | |
| No of Second Attempts | Yes | 8 | 14.5% | 2 | 3.6% | 0.046* |
| | No | 47 | 84.5% | 53 | 96.4% | |

In Group A, 14.5% of them were inserted on second attempt and 3.6% in Group B were inserted on second attempt. This difference was statistically significant.

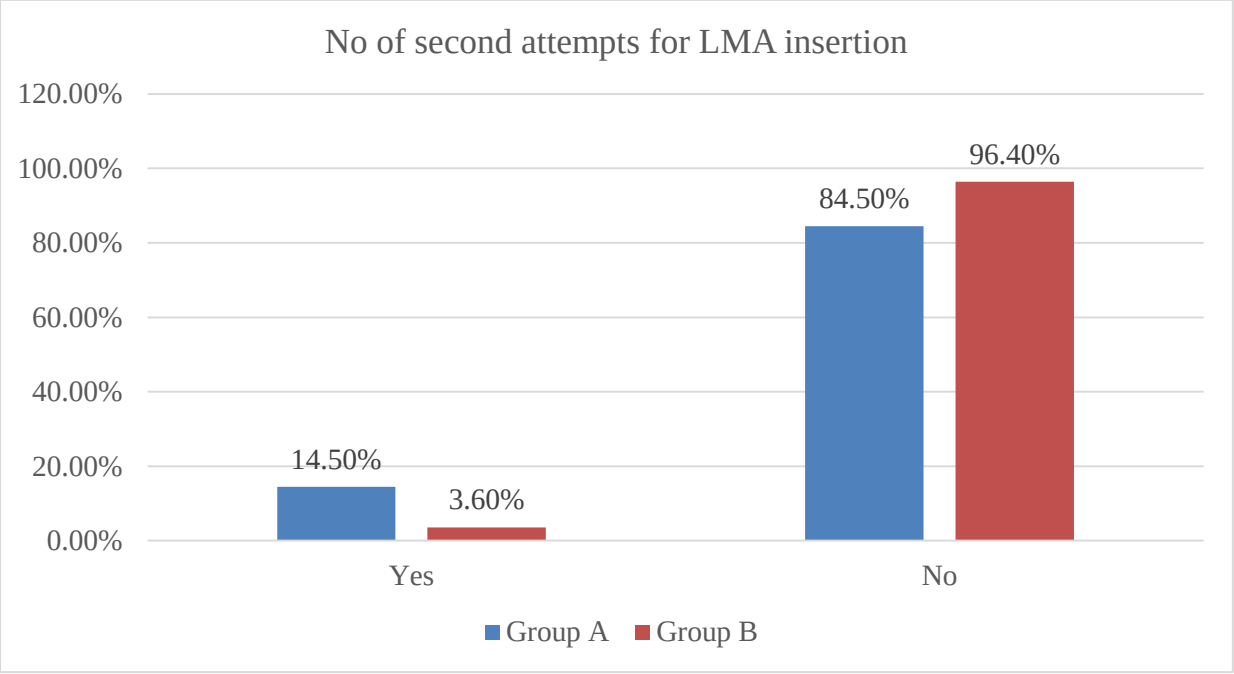


**Figure 32: Bar diagram showing No of second attempts for LMA insertion among subjects between two groups**

# DISCUSSION

Laryngeal mask airway insertion, like insertion of any other airway device, requires certain prerequisites. If these prerequisites are fulfilled, there will be smooth insertion and correct positioning of LMA. The factors that affect the insertion and positioning of LMA are jaw relaxation, mouth opening, episodes of coughing or movement during insertion and the depth of anaesthesia. If all these parameters are satisfactory, then there will be minimal hemodynamic stress response, which is required for LMA insertion.

Amongst intravenous anaesthesia, propofol was chosen over thiopentone. With propofol, passage of LMA is smoother as it suppresses the upper airway reflexes and also it has got shorter half-life than thiopentone.[10]

But, propofol itself does not possess any analgesic property. Also, the high dose of propofol for LMA insertion itself can cause apnoea. Therefore, adjuvants are used along with propofol to decrease its requirement. There are some studies that report that fentanyl reduces the 50% or median effective concentration ($EC_{50}$) of propofol used for various noxious stimuli. But, fentanyl combined with propofol also has a depressive effect on haemodynamics.[12]

Dexmedetomidine, on the other hand, is a pharmacologically active dextromer of medetomidine and has a selective alpha-2 receptor agonist activity. It has sedative and analgesic activity without causing post operative respiratory depression.[13] Also, dexmedetomidine is said to be a good anaesthetic adjuvant that decreases the requirement of propofol and maintains stable hemodynamics intraoperatively.

Thereby, we chose propofol as an intravenous anaesthetic agent and we compared two adjuvants fentanyl and dexmedetomidine. Thus, we evaluated hemodynamic response

and conditions for LMA insertion amongst these two adjuvants when used with propofol for LMA insertion.

This was a prospective, randomized, double blind study carried out at R.L.Jalappa Hospital and Research centre, Tamaka, Kolar. 110 ASA I and II patients of either sex undergoing elective surgeries under general anaesthesia were included in the study. Patients were divided into two groups of 55 each. Group A patients were preoxygenated for 3min, dexmedetomidine 1mcg/kg diluted in 10ml normal saline was given over 2min. 30sec later propofol 2mg/kg was given for induction without neuromuscular blocking agents. Whereas, group B patients were preoxygenated for 3 min, fentanyl 1mcg/kg diluted in 10ml normal saline was given over 2 min. 30 sec later propofol 2mg/kg was given for induction without neuromuscular blocking agents. In the study group, the drug dosage was fixed based on previous studies.

Parameters observed include HR, SBP, DBP, MAP, $SpO_2$ and RR before insertion of LMA and 30 sec, 1 min, 3 min, 5 min, 10 min and 15 min after insertion of LMA. Response of the patient to LMA insertion like coughing, gagging or any movement was noted. And to assess the tolerance of LMA insertion we followed the scoring system modified by Muzi and colleagues.

In our study, both the groups were comparable with respect to age, sex, weight and ASA physical status grading. **Ismail S et al (2007)[70]** compared the effect of different age groups on hemodynamic response to LMA insertion. They divided 90 patients into 3 groups of 30 each. Group Y (young) 18-25 years, Group M (middle) 40-45 years and group E (elderly) 65-80 years. To all the three groups they administered midazolam 7.5 mg orally one hour before induction, preoperatively. Then they were induced with propofol in the dose of 2 mg/kg and LMA was inserted. Hemodynamic parameters in the form of heart rate and blood

pressure were measured immediately after propofol injection and at 1, 2, 3, 4 and 5 minutes after LMA insertion. Here middle aged group had the greatest arterial pressure and heart rate changes, but when compared to the baseline, the change was very minimal. But our study did not show any age related hemodynamic changes on LMA insertion.

In our study, propofol was chosen as an intravenous anaesthetic agent. But, the dose of propofol that was needed to be administered was decided from the previous study done by Blake et al.[79] They had used four doses of propofol for LMA insertion. 1.0 mg/kg, 1.5 mg/kg, 2 mg/kg and 2.5 mg/kg IV propofol for LMA insertion. They evaluated that a dose of 1.5 mg/kg IV propofol was not optimum for LMA insertion. Hence we considered using 2 mg/kg IV propofol for LMA insertion. But as explained earlier, if propofol was used alone without adjuvants, we would have required more amount of propofol and that would have caused cardio-respiratory depression. Thereby we used adjuvants like dexmedetomidine and fentanyl with propofol.

In a study, **Lawrence and colleagues (1997)[67]** assessed the perioperative hemodynamic stability and anaesthetic requirements in patients administered with single dose of 2 mcg/kg intravenous dexmedetomidine as a preinduction dose. It was seen that the requirement of intraoperative anaesthetics, intubation response, extubation response, requirement of post operative analgesics and post operative antiemetics was reduced in patients receiving dexmedetomidine. Moreover, **Hsu YW et al (2004)[68]** investigated the respiratory effect of dexmedetomidine and remifentanyil. They assessed the respiratory response of the 6 healthy volunteers using a step wise target-controlled infusion of dexmedetomidine, remifentanil and a pseudo natural sleep session. The patients receiving dexmedetomidine, had respiratory pattern that mimics the natural sleep. Also, the patients receiving dexmedetomidine, did not have respiratory depression, decreased apnoea/hypopnoea index and had natural sleep pattern. As this was not a study on intubation

response and we needed to do LMA insertion we chose dexmedetomidine in the dose of only 1 mcg/kg as an adjuvant along with fentanyl.

On the other hand, **Wong CM et al (2007)[69]** chose 21 male and 54 female healthy female patients to study the optimal dose and duration of fentanyl required along with propofol for insertion of LMA. Here they administered fentanyl in the dose of placebo, 0.5, 1.0, 1.5 and 2.0 mcg/kg. Propofol was given in the dose of 2 mg/kg. After 90 seconds of induction, LMA was inserted. Around 95% of the patients required fentanyl above the clinical dose and 65% of the patients required fentanyl in the dose of 1 mcg/kg. And 90 seconds was optimum duration after induction for LMA insertion. Therefore, in our study we used fentanyl in the dose of 1 mcg/kg.

Also, **Uzumcugil F et al (2008)[71]** studied the effects of dexmedetomidine administered with propofol and fentanyl administered with propofol for laryngeal mask airway insertion in 52 patients. Group F received fentanyl in the dose of 1 mcg/kg with 1.5 mg/kg of propofol. Group D received dexmedetomidine in the dose of 1 mcg/kg with 1.5 mg/kg of propofol. They did not use any neruromuscular blocking agents. After 90 seconds of induction, first attempt of LMA insertion was attempted. 50% nitrous oxide and sevoflurane in oxygen was used for maintenance of anaesthesia. They observed jaw mobility, cough and other events like spontaneous ventilation, breath holding, expiratory stridor and lacrimation. The episodes of apnoea, reduction in systolic and mean blood pressure was more in fentanyl group than the dexmedetomidine group. When compared to this study, even in our study, dexmedetomidine group had better LMA insertion conditions like better jaw mobility, lesser incidence of cough and fewer incidence of breath holding spells. In Group A 72.7% had Spontaneous ventilation, 27.3% had breath holding spells. In Group B 76.4% had Spontaneous ventilation, 47.3% had breath holding and 1.8% had expiratory stridor. There was significant difference in breath holding spells between two groups.

Moreover, reduction of hemodynamic parameters like SBP, DBP and MAP was more with fentanyl group than dexmedetomidine group. In this study significant difference in Mean SBP with p value <0.001 between two groups, was observed from 5 min and persisted till 15 min intervals. At other intervals there was no significant difference in mean SBP between two groups. Also, in this study significant difference in Mean DBP with p value <0.025 between two groups was observed from 5 min and persisted till 15 min intervals. At other intervals there was no significant difference in mean DBP between two groups. In our study significant difference in Mean MAP with p value <0.016 between two groups was observed from 5 min and persisted till 15 min intervals. At other intervals there was no significant difference in mean MAP between two groups. But on the other hand, in our study significant difference in Mean Heart rate with p value <0.006 and <0.025 was seen between two groups at 1 min and 3 min respectively. Mean HR was lower in group A than group B. No significant difference was observed between two groups at other intervals. In Group A, LMA was inserted on second attempt in 14.5% individuals and in Group B, LMA was inserted on second attempt in 3.6% individuals. This difference was statistically significant. These observations showed us that dexmedetomidine with propofol provided better hemodynamic stability than fentanyl with propofol for LMA insertion.

Hence we feel that dexmedetomidine can be used with an advantage for LMA insertion in short surgical procedures.

# CONCLUSION

From our study we conclude that dexmedetomidine caused less respiratory depression and more stable hemodynamic conditions, compared to fentanyl. Thus we feel that dexmedetomidine can be used as an alternative to fentanyl with an advantage, for LMA insertions in short surgical procedures.

# SUMMARY

This was a prospective, randomized, double blind study carried out at R.L.Jalappa Hospital and Research centre, Tamaka, Kolar. 110 ASA I and II patients of either sex undergoing elective surgeries under general anaesthesia were included in the study. Patients were divided into two groups of 55 each. Group A patients were preoxygenated for 3min, dexmedetomidine 1mcg/kg diluted in 10ml normal saline was given over 2min. 30sec later propofol 2mg/kg was given for induction without neuromuscular blocking agents. Whereas, group B patients were preoxygenated for 3 min, fentanyl 1mcg/kg diluted in 10ml normal saline was given over 2 min. 30 sec later propofol 2mg/kg was given for induction without neuromuscular blocking agents.

Parameters observed include HR, SBP, DBP, MAP, $SpO_2$ and RR before insertion of LMA and 30 sec, 1 min, 3 min, 5 min, 10 min and 15 min after insertion of LMA. Response of the patient to LMA insertion like coughing, gagging or any movement were noted. And to assess the tolerance of LMA insertion we followed the scoring system modified by Muzi and colleagues.

Dexmedetomidine group had better LMA insertion conditions like better jaw mobility, lesser incidence of cough and fewer incidence of breath holding spells. In Group A 72.7% had Spontaneous ventilation and27.3% had breath holding spells. In Group B 76.4% had Spontaneous ventilation, 47.3% had breath holding and 1.8% had expiratory stridor. There was significant difference in breath holding spells between two groups.

Moreover, reduction of hemodynamic parameters like SBP, DBP and MAP was more with fentanyl group than dexmedetomidine group. In our study significant difference in Mean MAP with p value <0.016 between two groups was observed from 5 min and persisted till 15 min intervals. At other intervals there was no significant difference in mean MAP between two groups. But on the other hand, in our study significant difference in Mean Heart rate with p value <0.006 and <0.025 was seen between two groups at 1 min and 3 min respectively. Mean HR was lower in group A than group B. No significant difference was observed between two groups at other intervals. In Group A, LMA was inserted on second attempt in 14.5% individuals and in Group B, LMA was inserted on second attempt in 3.6% individuals. This difference was statistically significant. These observations showed us that dexmedetomidine with propofol provided better hemodynamic stability than fentanyl with propofol for LMA insertion.

# BIBLIOGRAPHY


1. Hernandez M, Klock P, Ovassapian A. Evolution of the extraglottic airway: A review of its history, applications and practical tips for success. Anaesth analog 2012;114:64-68.

2. Jones J. Laryngeal mask airway: an alternative for the difficult airway. AANA J 1995;63:444-9.

3. Barak M, Ziser A, Greenberg A, Lischinsky S, Rosenberg B. Haemodynamic and catecholamine response to tracheal intubation: direct laryngoscopy compared with fibreoptic intubation. J Clin Anesth 2003;15:132-136.

4. Laxton C, Milner Q, Murphy P. Haemodynamic changes after tracheal intubation in cigarette smokers compared with non-smokers. Br J Anaesth 1999;82:442-43.

5. Casati A, Cappelleri G, Fanelli G, Magistris L, Beccaria P, Albertin A, Torri G. The pressor response after laryngeal mask or cuffed oropharyngeal airway insertion. Acta Anaesthesiol Scand 1999;43:1053-56.

6. Lamb k, James M, Janicke P. LMA for intra-ocular surgery. Effects on intra-ocular pressure and stress responses. Br J Anaesth 1992;69:143-47.

7.Bennett R, Grace D, Griffin C. Cardiovascular changes with the laryngeal mask airway in cardiac anaesthesia. Br J Anaesth 2004;92:885-87.

8. Montazari K, Naghibi K, Hashemi S. Comparison of hemodyanamic changes after insertion of laryngeal mask airway, facemask and endotracheal intubation. Acta Medica Iranica 2004;42:34-36.

9.Brimacombe J. The advantages of LMA over tracheal tube or facemask: a meta analysis. Can J Anaesth 1995;42:1017-23.

10. Wilkins C, Cramp P, Staples J, Stevens W. Comparison of the anaesthetic requirement for tolerance of laryngeal mask airway and endotracheal tube. Anaesth analg 1992;75:794-97.

11. Molloy E, Buggy D, Scanlon P. Propofol or sevoflurane for laryngeal mask airway insertion. Can J Anesth 1999;46:322-26.

12.Kodaka M, Okamoto Y, Handa F, Kawasaki J, Miyao H. Relation between fentanyl dose and predicted EC50 of propofol for laryngeal mask insertion. Br J Anaesth 2004;92:238-41.

13. Turgut N, Turkmen A, Ali A, Altan A. Remifentanil-propofol vs dexmedetomidine-propofol anesthesia for supratentorial craniotomy. Middle East J Anaesthesiol 2009;20:63-70.

14. Zundert V, Brimacombe J, Ferson Z, Bacon D, Wilkinson J. Archie Bain: Celebrating 30 years of development in laryngeal mask airways. Anaesthesia 2012;67:1375-85.

15. Abdul M, Fauzia A. Laryngeal Mask Airway Insertion Anaesthesia and Insertion Techniques. J Pak Med Assoc 2007;57:607-11.

16. Kim JE, Chang CH, Nam YT. Intubation through a Laryngeal Mask Airway by Fiberoptic Bronchoscope in an Infant with a Mass at the Base of the Tongue - A case report. Korean J Anesthesiol 2008;54:43-46.

17. Ramaiah R, Das D, Bhananker SM, Joffe AM. Extraglottic airway devices: A review. Int J Crit Illn Inj Sci 2014;4:77-87.

18. Chmielewski C, Clickett S. The use of the Laryngeal Mask Airway with mechanical positive pressure ventilation. AANA Journal 2004;72:347-48.

19. Maze M, Tranquili W. Alpha2-adrenoceptor agonists: Defining the role in clinical anaesthesia. Anaesthesiology 1991;74:581-605.

20. Botero AG, Rodriguez L, Perez FAS, Saavedra AV. Use of Dexmedetomidine in Total Intravenous Anaesthesia (TIVA). Rev Colomb anestesiol 2011;39:514-26.

21. Nakamura M, Ferreira SH. Peripheral analgesic action of clonidine: mediation by release of endogenous enkephalin-like substances. Eur J Pharmacol 1988;146:223-228.

22. Birnbaumer L, Abramowitz J, Brown AM. Receptor-effector couping by G proteins. Biochim Biophys Acta 1990;1031:163-224.

23. Hunter JC, Fontana DJ, Hedley LR, Jasper JR. Assessment of the role of alpha 2 adrenoceptor subtypes in the antinociceptive, sedative and hypothermic action of dexmedetomidine in transgenic mice. Br J Pharmacol 1997;122:1339-1344.

24. Paranjpe JS. Dexmedetomidine: Expanding role in anesthesia. Med J DY Patil Univ 2013;6:5-13.

25. Alfonso J, Reis F. Dexmedetomidine: Current role in Anesthesiology and Intensive Care. Rev Bras Anestesiol 2012;62:118-133.

26.Housmans PR. Effects of dexmedetomidine on contractility, relaxation and intracellular calcium transients of isolated ventricular myocardium. Anesthesiology 1990;73:919-922.

27. Dyck JB, Maze M, Haack C, Vuorilehto L, Shafer SL. The pharmacokinetics and hemodynamic effects of intravenous and intramuscular dexmedetomidine hydrochloride in adult human volunteers. Anesthesiology 1993;78:813-820.

28. Bloor BC, Ward DS, Belleville JP, Maze M. Effects of intravenous dexmedetomidine in humans. Anesthesiology 1992;77:1134-1142.

29. Hall JE, Uhrich TD, Barney JA, Arain SR, Ebert TJ. Sedative, amnestic and analgesic properties of small dose dexmedetomidine infusions. Anesth Analg 2000;90:699-705.

30. Xu H, Aibiki M, Seki K, Ogura S, Ogli K. Effects of dexmedetomidine, an alpha-2 adrenoceptor agonist, on renal sympathetic nerve activity, blood pressure, heart rate and central venous pressure in urethane-anesthetized rabbits. J Auton Nerv Syst 1998;71:48-54.

31. Aantaa R, Kanto J, Scheinin M, Kallio A, Scheinin H. Dexmedetomidine, an alpha-2 adrenoceptor agonist, reduces anesthetic requirements for patients undergoing minor gynecologic surgery. Anaesthesiology 1990;73:230-235.

32. Nath SS, Singh S, Pawar ST. Dexmedetomidine overdosage: An unusual presentation. Indian J Anaesth 2013;57:289-291.

33. Hyun LS, Namo K, Yeong LC, Gi BM, Jun OY. Effects of dexmedetomidine on oxygenation and lung mechanics in patients with moderate COPD undergoing lung cancer surgery: A randomized double blind trial. Eur J Anaesthesiol 2016;33:275-282.

34. Groeben H, Mitzner W, Brown RH. Effects of the $\alpha_2$-adrenoceptor agonist dexmedetomidine on bronchoconstriction in dogs. Anesthesiology 2004;100:359–363.

35. But AK, Ozgul U, Erdil F, et al. The effects of preoperative dexmedetomidine infusion on hemodynamics in patients with pulmonary hypertension undergoing mitral valve replacement surgery. Acta Anaesthesiol Scand 2006; 50:1207–1212.

36. Venn RM, Bryant A, Hall GM, Grounds RM. Effect of dexmedetomidine on adrenocortical function, and the cardiovascular, endocrine and inflammatory response in post operative patients needing sedation in the Intensive Care Unit. Br J Anaesth 2001;86:650-656.

37. Testa B, Jenner P. Inhibitors of cytochrome P-450s and their mechanism of action. Drug Metab Rev 1981;12:1–118.

38. Angel I, Bidet S, Langer SZ. Pharmacological characterization of the hyperglycemia induced by alpha-2 adrenoceptor agonists. J Pharmacol Exp Ther 1988;246:1098–103.

39. Kennedy BC, Hall GM. Neuroendocrine and inflammatory aspects of surgery: do they affect outcome? Acta Anaesthiol Belg 1999;50:205–9.

40. Balkanay OO, Goksedef D, Omeroglu SN, Ipek G. The dose-related effects of Dexmedetomidine on renal functions and serum neutrophil gelatinase-associated lipocalin values after coronary artery bypass grafting: a randomized, triple-blind, placebo-controlled study. Interact CardioVasc Thorac Surg 2015;20:209-214.

41. Sudheesh K, Harsoor SS. Dexmedetomidine in anaesthesia practice: A wonder drug?. Indian J Anaesth 2011;55:323-24.

42. Grewa LA. Dexmedetomidine: New avenues. J Anaesthesiol Clin Pharmacol 2011;27:297-302.

43. Ebort TJ, Hall JE, Barney JA, Uhrich TD, Colinco MD. The effects of increasing plasma concentrations of dexmedetomidine in humans. Anesthesiology 2000;93:382-394.

44. Hasani RA, Bruchas MR. Molecular mechanism of opioid receptor – dependent signalling and behaviour. Anesthesiology 2011;115:1363-1381.

45. Mather LE. Clinical pharmacokinetics of fentanyl and its newer derivatives. Clin Pharmacokinet 1983;8:422-46.

46. Flacke JW, Bloor BC, Kripke BJ. Comparison of morphine, meperidine, fentanyl and sufentanil in balanced anaesthesia: a double-blinded study. Anesth Analg 1985;64:897.

47. McClain DA, Hug CC. Intravenous fentanyl kinetics. Clin Pharmacol Ther 1980;28:106.

48. Tagito Y, Isono S, Nishino T. Upper airway reflexes during a combination of propofol and fentanyl anesthesia. Anaesthesiology 1998;88:1459.

49. Bailey PL, Streisand JB, East KA. Differences in magnitude and duration of opioids – induced respiratory depression and analgesia with fentanyl and sufentanil. Anaesth Analg 1990;70:8.

50. Bailey PL, Pace NL, Ashburn MA. Frequent hypoxemia and apnoea after sedation with Midazolam and Fentanyl. Anaesthesiology 1990;73:826.

51. Giesecke K, Hamberger B, Jarnberg PO. High and low dose fentanyl anaesthesia: Harmonal and metabolic responses during cholecystectomy. Br J Anaesth 1988;61:575.

52. Lin CS, Sun WZ, Chan WH, Lin CJ, Yeh HM, Mok MS. Intravenous lidocaine and ephedrine, but not propofol, suppress fentanyl- induced cough. Can J Anaesth 2004;51:654-59.

53. Yu H, Yang XY, Zhang X, Li Q, Zhu T, Wang Y. The effect of dilution and prolonged injection time on fentanyl induced coughing. Anesthesia 2007;62:919-922.

54. Fleischman RJ, Frazer DG, Daya M, Jui J, Newgard CD. Effectiveness and safety of fentanyl compared with morphine for Out-of-Hospital Analgesia. Prehosp Emerg Care 2010;14:167-175.

55. Bryson HM, Fulton BR, Faulds D. Propofol: An update of its use in anaesthesia and conscious sedation. Drugs 1995;50:513-559.

56. Fulton B, Sorkin EM. Propofol: An overview of its pharmacology and a review of its clinical efficacy in intensive care sedation. Drugs 1995;50:636-657.

57. Alkire MT, Haier RJ. Correlating in vivo anesthetic effects with ex vivo receptor density data supports a GABAergic mechanism of action of propofol, but not for isoflurane. Br J Anaesth 2001;86:618-626.

58. Hughes MA, Glass PSA, Jacobs JR. Context sensitive half time in multicompartment pharmacokinetic models for intravenous anesthetic drugs. Anaesthesiology 1992;76:334-341.

59. Rouby JJ, Andreev A, Leger P. Peripheral vascular effects of thiopental and propofol in humans with artificial hearts. Anestheisology 1991;75:32-42.

60. Bouillon T, Bruhn J, Radu-Radulescu L. Mixed-effects modelling of the intrinsic ventilatory depressant potency of propofol in the non steady state. Anesthesiology 2004;100:240-250.

61. Sang YS, Yoon-Hee K, Young-Kwon K, Sang P, Hae JP, Woosuk J. Effect of lidocaine (40 mg) mixed to prevent injection pain of propofol on the intubating conditions and onset time of rocuronium. Korean J Anesthesiol 2013;64:29-33.

62. Snell RS. Snell's clinical anatomy for anaesthesiologists 5th ed. Philadelphia:Lippincott Williams;2008;64-97.

63. Shribman AJ, Smith G, Achole J. Cardiovascular and catecholamine responses to laryngoscopy with or without tracheal intubation. Br J Anaesth 1987;59:295-99.

64. Prys-Roberts C, Greene LT, Meloche R, Foex P. Studies on anaesthesia in relation to hypertension: haemodynamic consequences of induction and endotracheal intubation. Br J Anaesth 1971;43:531.

65. Wee P, Winston J, Tat LL, William AT. Tussive effect of a fentanyl bolus. Can J Anaesth 1991;38:330-34.

66. McCrory CR, Moriarty DC. Laryngeal mask airway positioning is related to MPC grading in adults. Anesth Analg 1995;81:1001-004.

67. Lawrence CJ, Delange S. Effect of a single pre-operative dexmedetomidine dose on isoflurane requirements and peri-operative hemodynamic stability. Anaesthesia 1997;52:736-44.

68. Hsu YW, Cortinez LI, Robertson KM. Dexmedetomidine pharmacodynamics: Crossover comparison of the respiratory effects of dexmedetomidine and remifentanil in healthy volunteers. Anesthesiology 2004;101:1066-1076.

69. Wong CM, Critchley LA, Lee A, Khaw KS, Kee WD. Fentanyl dose-response curves when inserting the LMA Classic laryngeal mask airway. Anaesthesia 2007;62:654-660.

70. Ismail S, Khan FA. Laryngeal mask insertion- effect of age on hemodynamic responses. M E J Anesth 2007;19:611-625.

71. Uzumcugil F, Canbay O, Celebi N, Karagoz H, Ozen S. Comparison of dexmedetomidine-propofol vs fentanyl-propofol for laryngeal mask airway insertion. Eur J Anesth 2008;25:675-680.

72. Ali AR, Ghoneimy MN. Dexmedetomidine versus fentanyl as adjuvant to propofol: comparative study in children undergoing extracorporeal shock wave lithotripsy. Eur J Anaesthesiol 2010;27:1058-64.

73. Hanci V, Erdogan G, Okyay RK, Yurtlu BS, Ayoglu H, Baydilek Y, Turan I. Effects of fentanyl-lidocaine-propofol and dexmedetomidine-lidocaine-propofol on tracheal intubation without use of muscle relaxants. Kaohsiung J Med Sci 2010;26:244-250.

74. Suparto, Olivia CF, Clarissa A, Layusa A. A randomized controlled trial on the effectiveness of dexmedetomidine versus fentanyl in attenuating the sympathetic response to direct laryngoscopy and endotracheal intubation. Maj Kedokt Indon 2010;60:35-37.

75. Tang Q, Qian Y, Zhang Q, Yang J, Wang Z. Effects of different priming doses of propofol on fentanyl-induced cough during anaesthesia induction: A preliminary randomized controlled study. Ups J Med Sci 2010;115:121-124.

76. Gupta A, Kaur S, Attri JP, Saini N. Comparative evaluation of Ketamine-Propofol, Fentanyl-Propofol and Butorphanol-Propofol on hemodynamics and laryngeal mask airway insertion conditions. J Anaesthesiol Clin Pharmacol 2011;27:74-78.

77. Bajwa S, Jasbir K, Singh A, Parmar SS, Singh G, Kulshreshta A, Gupta S, Sharma V, Panda A. Attenuation of pressor response and dose sparing of opioids and anaesthetics with pre-operative dexmedetomidine. Indian J Anaesth 2012;56:123-128.

78. Liang HE, Jun-Mei XU, Ru-Ping D. Dexmedetomidine reduces the incidence of fentanyl-induced cough: A double-blind, randomized and placebo-controlled study. Ups J Med Sci 2012;117:18-21.

79. Blake DW, Dawson P, Donnan G, Blorsten A. Propofol induction for laryngeal mask airway insertion:dose requirement and cardiorespiratory effects. Anaesth intensive care 1992;20:479-83.

# ANNEXURES

# PROFORMA

**COMPARISON OF DEXMEDETOMIDINE PROPOFOL WITH FENTANYL PROPOFOL FOR LARYNGEAL MASK AIRWAY INSERTION IN GENERAL ANAESTHESIA PATIENTS UNDERGOING ELECTIVE SURGERIES**

**Investigators**: Dr. ABHISHEK. K.M. **Guide**: Prof Dr DINESH. K

NAME: AGE: SEX: WT:

HOSPITAL NO:

DEPT: ASA GRADE:

DIAGNOSIS:

SURGERY:

A prospective randomized double blind study is planned. After obtaining approval from the ethical committee and taking informed consent, the patients who meet the inclusion criteria are taken for the study. They will be randomly allocated into two groups.

- Group A will be preoxygenated for 3min, dexmedetomidine 1mcg/kg diluted in 10ml normal saline will be given over 2min. 30sec later propofol 2mg/kg will be given for induction without neuromuscular blocking agents.
- Group B will be preoxygenated for 3 min, fentanyl 1mcg/kg diluted in 10ml normal

saline will be given over 2 min. 30 sec later propofol 2mg/kg will be given for induction without neuromuscular blocking agents.

- OBSERVATION: It is a double blind study and the anaesthesiologist will not be aware of the inducing agent and the adjuvant used. He will be called to insert the LMA after giving the inducing agent and adjuvant.

PARAMETERS OBSERVED

- Heart rate, non-invasive blood pressure, oxygen saturation and respiratory rate before insertion of LMA, and 30 sec, 1 min, 3 min, 5 min, 10 min and 15 min after insertion of LMA.
- Response of the patient to LMA insertion like coughing, gagging or any movement will be noted.
- To assess the tolerance of LMA insertion we will follow the scoring system modified by Muzi and colleagues.
- **SCORING SYSTEM TO ASSESS JAW MOBILITY**

  1. Fully relaxed

  2. Mild resistance

  3. Tight, but opens

  4. Closed

- **SCORING SYSTEM TO GRADE COUGHING OR MOVEMENT**

  1. None

  2. One or two coughs

3. Two or more coughs

4. Bucking or movement

**OTHERS**

- Spontaneous ventilation
- Breath holding
- Expiratory stridor
- Lacrimation

IN EACH CATEGORY SCORES LESS THAN TWO (<2) IS CONSIDERED OPTIMUM FOR LMA INSERTION.

| | PRE LMA INSERTION | POST LMA 30 SEC | POST LMA 1 MIN | POST LMA 3 MIN | POST LMA 5 MIN | POST LMA 10 MIN | POST LMA 15 MIN |
|---|---|---|---|---|---|---|---|
| HEART RATE | | | | | | | |
| SYSTOLIC BLOOD PRESSURE | | | | | | | |
| DIASTOLIC BLOOD PRESSURE | | | | | | | |
| MEAN ARTERIAL BLOOD PRESSURE | | | | | | | |
| OXYGEN SATURATION | | | | | | | |
| RESPIRATORY RATE | | | | | | | |

# INFORMATION SHEET AND CONSENT FORM

**TITLE OF THE STUDY: COMPARISON OF DEXMEDETOMIDINE PROPOFOL WITH FENTANYL PROPOFOL FOR LARYNGEAL MASK AIRWAY INSERTION IN GENERAL ANAESTHESIA PATIENTS UNDERGOING ELECTIVE SURGERIES.**

Name of the principal investigator: Dr. ABHISHEK. K.M & Dr. DINESH. K.

I have been explained in a language understandable to me regarding the procedure, that is, increase in haemodynamic responses during Laryngeal Mask Airway insertion in general anaesthesia and the treatment protocol for it.

Patients will be randomly divided into 2 groups of 55 each. Randomization will be done by computer generated table.

- Group A will be preoxygenated for 3min, dexmedetomidine 1mcg/kg diluted in 10ml normal saline will be given over 2min. 30sec later propofol 2mg/kg will be given for induction without neuromuscular blocking agents.
- Group B will be preoxygenated for 3 min, fentanyl 1mcg/kg diluted in 10ml normal saline will be given over 2 min. 30 sec later propofol 2mg/kg will be given for induction without neuromuscular blocking agents.

The associated side effects of study drugs such as hypotension and bradycardia have been enlisted to me and the way it is treated,

Bradycardia:less than 60bpm-Inj atropine 0.6mg/kg(IV)

Hypotension:less than 30% of baseline Systolic blood pressure-Inj mephenteramine 6mg(IV).

No special investigations required.

Whom to contact for questions: Dr. ABHISHEK. K.M & Dr. DINESH. K.

PHONE NO: 9448402498

**CERTIFICATION OF CONSENT:**

I have read the information and I have had the opportunity to ask questions regarding various aspects of the study and my questions have been answered to my satisfaction.

I am aware that I am entitled to refrain/withdraw from the study at any point.

I, the undersigned agree to participate in this study and authorize the collection and disclosure of my personal information as outlined in this consent form.

Subject's/guardian's name and signature/thumb impression:

Date:

Name and signature of witness:

Date:

Name and signature of principle investigator:

Date:

A copy of this informed consent form has been provided to the participant.

# KEY TO MASTER CHART

Ip No : Inpatient No

HR : Heart Rate

DBP : Diastolic Blood Pressure

SBP : Systolic Blood Pressure

M : Male

F : Female

ASA : American Society of Anaesthesiologist grade

MAP : Mean Arterial Pressure

BB : Both Bones

SSG : Split Skin Grafting

PCNL : Percutaneous Nephrolithotomy

ORIF : Open Reduction Internal Fixation

# : Fracture

Lap : Laparoscopic

B/L : Bilateral

FESS : Functional Endoscopic Sinus Surgery

DNS : Deviated Nasal Septum

OSA : Obstructive Sleep Apnoea

CSOM : Chronic Suppurative Otitis Media

CRM : Cortical Radical Mastoidectomy

# INTRODUCTION

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