IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 2 Ver. 14 February. (2018), PP 65-76
www.iosrjournals.org

A Comparative Study Between Intravenous Propofol And An Equipotent Dose Of Thiopentone For The Insertion Of Laryngeal Mask Airway

Dr Gunjan[1], Dr Subrata Dey[2]
[1, 2] *(Department of Anaesthesiology and Critical Care, Bokaro General Hospital, Bokaro Steel City, India)*
Corresponding Author: Dr Gunjan

Abstract: *Since its advent in 1981 by Dr. Archie Brain at the London hospital, the laryngeal mask airway (LMA) has turned out to be a boon for the anaesthesiologists .It not only forms an integral part of the difficult airway cart, but is also used outside the OT setup by the paramedics for securing airway. With growing emphasis on day care surgery, the LMA is into wider practice in recent times. The basis lies on the fact that the LMA insertion does not obviates the use of a depolarising muscle relaxant; use of induction agents, alone or in combination, is sufficient enough to obtund the upper airway reflexes of the patient for an easy insertion. The present study is designed using two of such induction agents, propofol and thiopentone, and a comparision is drawn as to which of the two induction agents facilitate an easy LMA insertion ensuring hemodynamic stability. Conditions for LMA insertion was graded on a three-point scale using six variables such as ease of insertion, jaw opening, coughing, gagging, etc. Our study concluded that Propofol at the dose of 2.5 mg/kg was superior to Thiopentone at the dose of 5 mg/kg as an induction agent for insertion of the laryngeal mask airway.*

Keywords*: airway, laryngeal, mask, propofol, thiopentone*

Date of Submission: 12-02-2018 Date of acceptance: 01-03-2018

I. Introduction

Insertion of laryngoscope and endotracheal tube is a routine part of delivering general anaesthesia and securing airway. However, these are noxious stimuli which causes a reflex increase in both sympathetic and sympathoadrenal activity that may lead to undesirable hemodynamic perturbations in the patients, especially in the high risk groups[1]. The LMA offers advantages of endotracheal intubation while avoiding the fundamental disadvantage of visualisation of cords and forcing them apart [2]. It has been successfully used to manage difficult airways as a ventilator device by itself or as a conduit for tracheal intubation [3,4] . With increasing emphasis on day care anaesthesia, the LMA is into wider practice, for the fact that a depolarising muscle relaxant is not necessary for its insertion. This helps in avoiding succinylcholine induced muscle pain in cases where early ambulation is recommended. It also decreases the incidence of dysphonia and sore throat. The insertion of LMA requires the upper airway reflexes to be obtunded sufficiently in order to prevent undesired patient responses like coughing, gagging, laryngospasm, etc.[5]. If general anaesthesia is used, insertion requires a depth similar to that necessary for insertion of an oropharyngeal airway, but not as deep as is needed for tracheal intubation. Various induction agents and their combinations have been used to facilitate its insertion with least side effects. However each of these methods have their own limitations and none of them has evolved as a standard method for insertion of the LMA so far. Hence, the present study is designed to compare the conditions to facilitate the insertion of the LMA with the two most commonly used agents – thiopentone and propofol, after adequate pre-induction with midazolam and fentanyl.

II. Aim And Objectives

2. 1 primary purpose

1. To compare the suitability of conditions to facilitate the insertion of laryngeal mask airway, using Propofol (2.5mg/kg) with that of Thiopentone (5mg/kg) iv, both preceded by a pre-induction dose of Midazolam (0.04mg/kg) and Fentanyl (1.5mcg/kg).
2. To compare the hemodynamic changes during insertion of LMA and immediately afterwards in these groups.
3. To compare the undesired responses to LMA insertion in both the groups.

2.2 secondary purpose

1. Review the benefits of adding Midazolam and Fentanyl as pre-induction drugs.
2. To assess the incidence of the side-effects of the drugs.

3. To judge the efficacy of the either drugs for facilitation of LMA insertion, using appropriate mathematical or statistical tools.

III. Sampling

A randomised, prospective, double-blinded study was designed and conducted in the Department of Anaesthesiology, Bokaro General Hospital after due approval by the hospital ethics and scientific committee. Informed consent was taken from all the patients enrolled for the study.

3.1 randomisation*:*

a**) Population group** -The patients belonging to ASA Grade-I, posted for elective surgeries under general anaesthesia in general surgery, orthopaedics and gynaecology/obstetrics, during the study period were designated as 'population group'.

b) Sample group -Since the date of commencement of the study, all patients who underwent elective surgeries were serialized from 1 onwards and was designated as 'sample group'. If any selected patient refused to give consent or failed to fulfil the selection criteria, patient was excluded from the study at this point and the next patient in the 'population group' list was selected.

c) Study group -The sample group of 100 was randomly divided into two groups-'P' and 'T'-of 50 each using computerised randomisation prior to commencement of the study.

3.2 selection criteria*:*

a) Inclusion criteria- Age group 18-50 years, either sex, ASA Grade-I, patient posted for elective surgeries in general surgery, orthopaedics and gynaecology/obstetrics.

b) Exclusion criteria- Patient refusal **,** morbidly obese patients**,** patients with anticipated difficult intubations**,** history of drug allergy or contraindication to any drug used in the study**,** history of upper respiratory tract infection within 21 days prior to surgery**,** surgeries in prone position**,** head and neck surgeries**,** history of chronic smoking, hypertension, bronchial asthma or diabetes mellitus.

3.3 double blinding*:*

The study was designed as a double blind, prospective trial, in which both the study subjects and investigator were blinded to: the group into which the patients were placed prior to completion of the study; the content of the syringe given to the patient prior to induction, whether propofol or thiopentone.

This was achieved in the following manner:

a) All the patients were explained about the procedure and told the same thing regarding the study i.e."a medication will be given prior to induction to achieve better hemodynamic response."

b) The computer generated randomised list of two group was not available to the investigator before completion of the study.

c) An assistant loaded the syringe with thiopentone or propofol, based on the group designation of the patients on the randomisation list.This list was available only to the assistant and was unobserved by the investigator.

d) The assistant having the randomisation list administered the drugs to the patient.

The intra-operative study parameters were observed and recorded by the investigator, who was unaware of the drug given to the patient

IV. Methodology

One day prior to the scheduled surgery, a detailed pre-anaesthetic examination of the patient was conducted. Fasting for 8 hours overnight was observed. On reaching the operation theatre, their baseline hemodynamic parameters were recorded. Premedication was done using Inj. Midazolam (0.04mg/kg), Inj. Fentanyl (1.5mcg/kg) along with Inj. Glycopyrrolate (0.2mg/kg).

The patients were pre-oxygenated with 100% oxygen for 3 minutes, after which the induction agent (thiopentone- 5mg/kg in Group T and propofol-2.5mg/kg in Group P) was injected at a constant rate over 30 seconds. After further 30 seconds, adequacy of anaesthesia was assessed (loss of response to verbal commands and loss of eyelash reflex). If it was found to be adequate, LMA insertion was attempted using the standard technique. If the depth of anaesthesia was inadequate, propofol or thiopentone was repeated in a dose of 0.25mg/kg or 0.5mg/kg respectively. If conditions for insertion of LMA were still not satisfactory, 1 mg/kg of succinylcholine was given, and patient was ventilated with 100% oxygen using facemask, and LMA was then inserted. The cuff was inflated with the recommended volume of air. Anaesthesia was maintained with N_2O:O_2 (66:33%) and Isoflurane with appropriate fresh gas flow. Fluid of choice was Ringer's lactate or normal saline. At the end of the surgical procedure all the patients were reversed and the removal of the LMA was carried out according to the standard procedure. After assessing, the patient was shifted to the ward. Post operative follow up for 12 hours was done, side-effects if any were treated and recorded.

V. Recording Of Data

The parameters recorded at baseline, 2 minutes after giving midazolam (pre-LMA), and 1 minute, 2 minute and 3 minute after insertion of LMA were pulse rate,systolic blood pressure, diastolic blood pressure, mean arterial pressure and time taken for successful LMA insertion from time of injection of midazolam was noted.

Conditions for LMA insertion was graded on a three-point scale using six variables:

Jaw opening:	3. Full	(>/= 3 fingers)
	2. Partial	(=2 fingers)
	1. Nil	(<2 fingers)
Ease of insertion:	3. Easy	(1 attempt)
	2. Difficult	(2-3 attempt)
	1. Impossible	(> 3 attempt)
Coughing:	3. Nil	(no coughing)
	2. +	(cough settles in<30 secs.)
	1. ++	(cough settles in >30 secs.)
Gagging:	3. Nil	(no gagging)
	2. +	(gag settles in<30 secs)
	1. ++	(gag settles in >30 secs)
Laryngospasm	3.Nil	
	2. Partial	(self-limiting)
	1. Total	(needs medication)
Patients Movements:	3. Nil	(no movement)
	2. Moderate	(facial/head movement)
	1. Vigorous	(limb movement)

Overall undesired response were graded as:

Mild	–	If settles within 30secs without intervention.
Moderate	–	If incremental dose of test drug is required.
Severe	–	If patient requires succinylcholine for insertion.

VI. Statistical Analysis

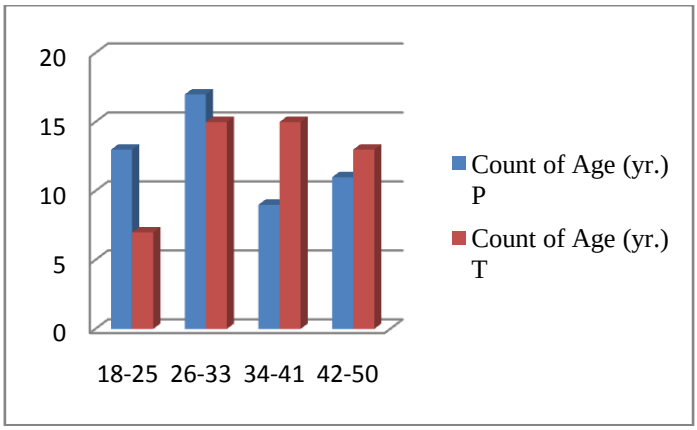
The analysis was performed using SPSS software for windows, version 19.The data were represented as mean $\pm$ SD and percentage. Student's unpaired t-test was used for finding the significance of different mean of two independent samples and Chi-Square test for determining the association between continuous variables (conditions for LMA insertion).Irrespective of methods used, differences between various parameters among different group or sub-groups were considered significant if the p-value was <0.05.

VII. 7. RESULTS (Expressed In Terms Of Tables And Graphs)

7.1. Demographic incidence

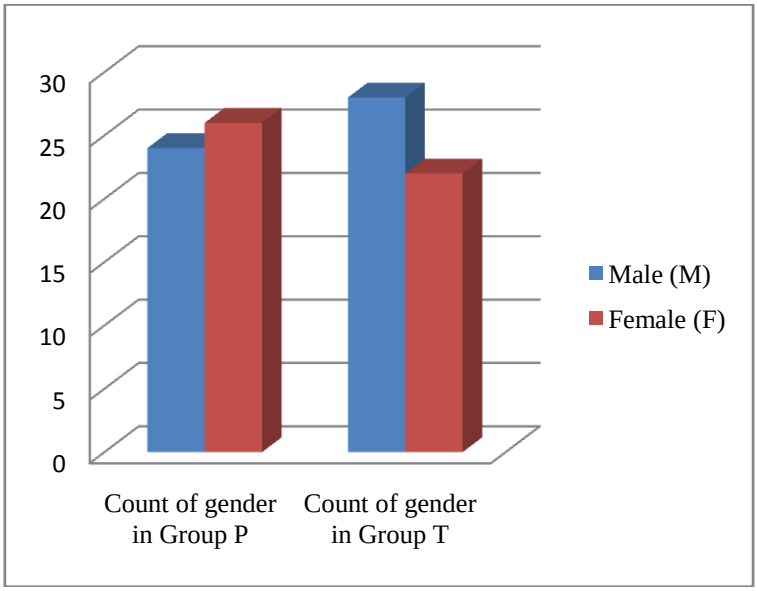
7.1.1. Age distribution

AGE (YR.)	COUNT OF AGE (YR.) P	PERCEN-TAGE OF AGE (YR.) P	COUNT OF AGE (YR.) T	PERCEN-TAGE OF AGE (YR.) T
18-25	13	26%	7	14%
26-33	17	34%	15	30%
34-41	9	18%	15	30%
42-50	11	22%	13	26%
Sum total	50	100%	50	100%



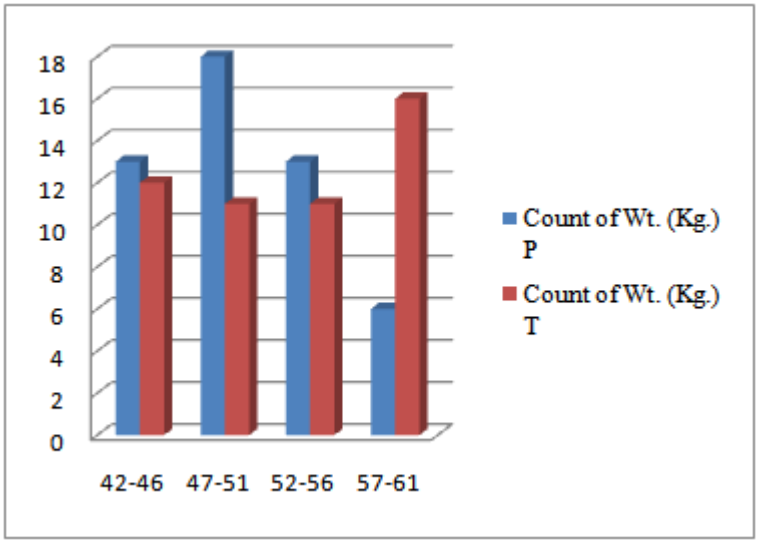
7.1.2.Gender

GENDER	COUNT OF GENDER IN GROUP P	PERCENT- AGE OF GENDER IN GROUP P	COUNT OF GENDE-R IN GROUP T	PERCEN-TAGE OF GENDER IN GROUP T
Male (M)	24	48%	28	56%
Female (F)	26	52%	22	44%
Sum total	50		50	



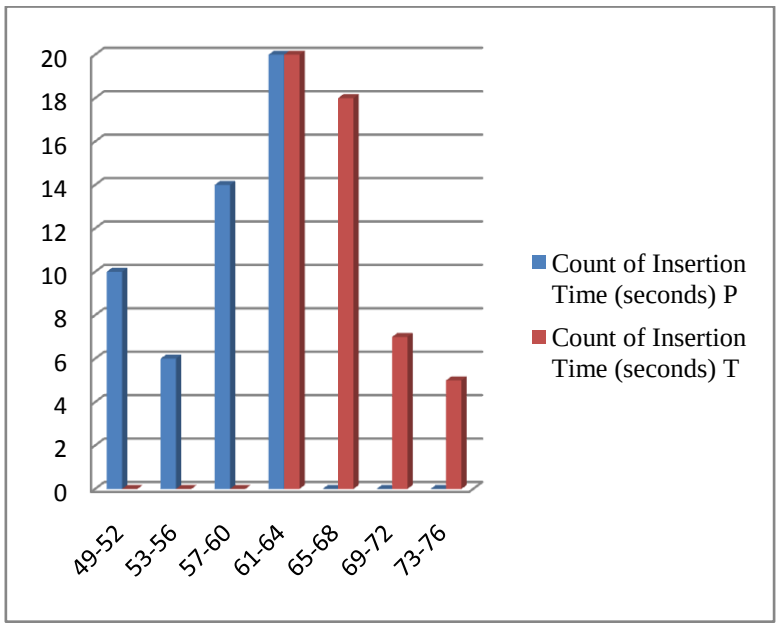
7.1.3.Weight

WT. (KG.)	COUNT OF WT. (KG.) P	PERCENTA-GE OF WT. (KG.) P	COUNT OF WT. (KG.) T	PERCE-NTAGE OF WT. (KG.) T
42-46	13	26%	12	24%
47-51	18	36%	11	22%
52-56	13	26%	11	22%
57-61	6	12%	16	32%
Sum total	50		50	



7.2. Insertion time of lma

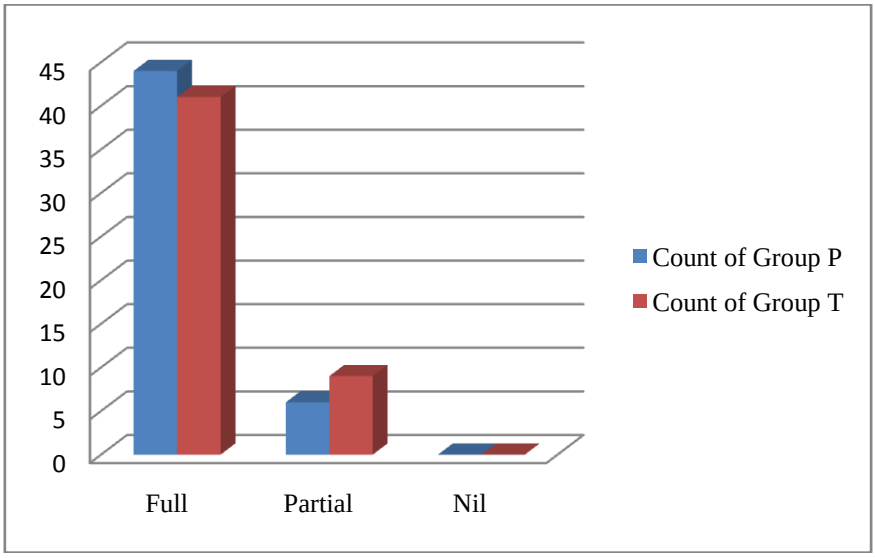
INSERTION TIME (SECONDS)	COUNT OF INSERTION TIME (SECONDS) P	PERCEN-TAGE OF INSERTI-ON TIME (SECONDS) P	COUNT OF INSERTIO-N TIME (SECONDS) T	PERCE-NTAGE OF INSERT-ION TIME (SECON-DS) T
49-52	10	20%	0	0%
53-56	6	12%	0	0%
57-60	14	28%	0	0%
61-64	20	40%	20	40%
65-68	0	0%	18	36%
69-72	0	0%	7	14%
73-76	0	0%	5	10%
Sum total	50		50	



7.3. Conditions for lma insertion

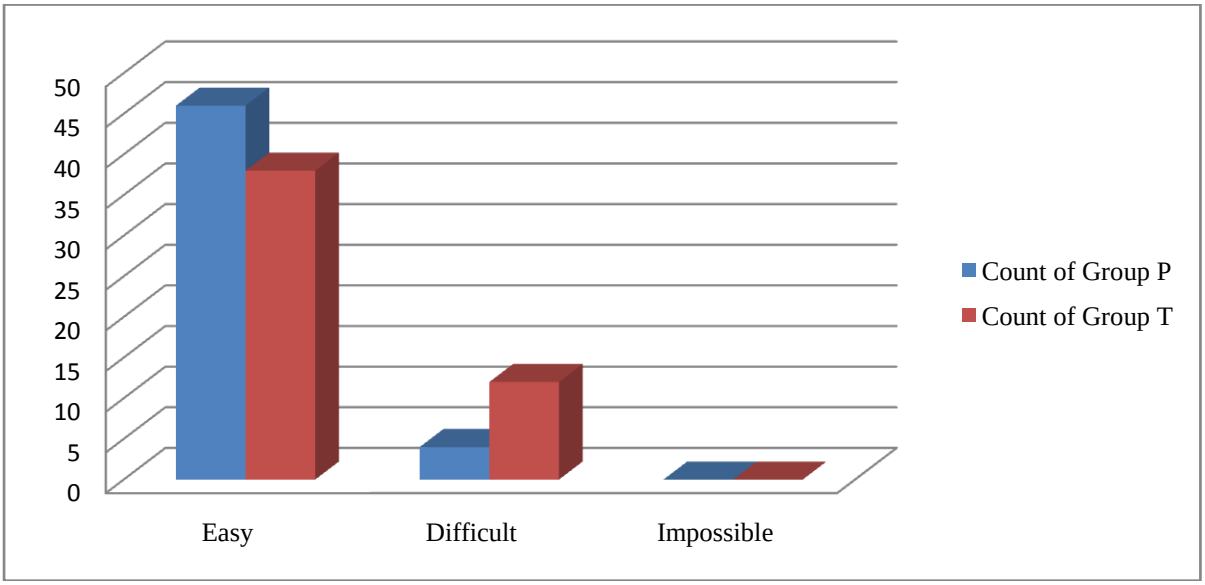
7.3.1. Jaw opening

GRADE	CONDITIONS FOR INSERTION (JAW OPENING)	COUNT OF GROUP P	PERCENT-AGE OF GROUP P	COUNT OF GROUP T	PERCENT-AGE OF GROUP T
3	Full	44	88%	41	82%
2	Partial	6	12%	9	18%
1	Nil	0	0%	0	0%
	Sum total	50		50	



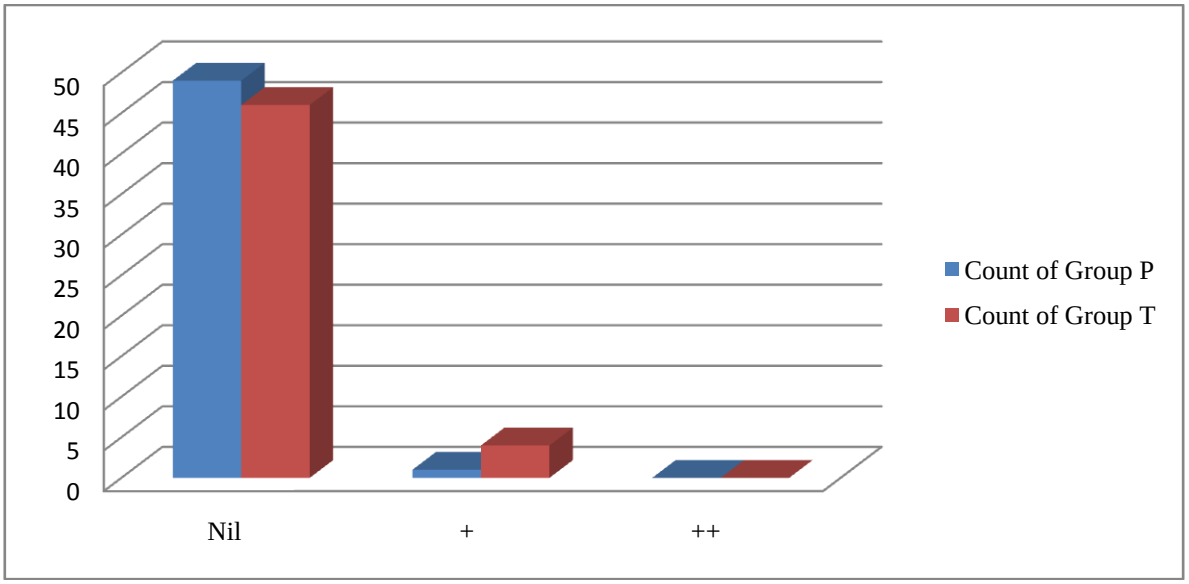
7.3.2. Ease of insertion

GRADE	CONDITIONS FOR INSERTION (EASE OF INSERTION)	COUNT OF GROUP P	PERCENTAGE OF GROUP P	COUNT OF GROUP T	PERCENTAGE OF GROUP T
3	Easy	46	92%	38	76%
2	Difficult	4	8%	12	24%
1	Impossible	0	0%	0	0%
	Sum total	50		50	



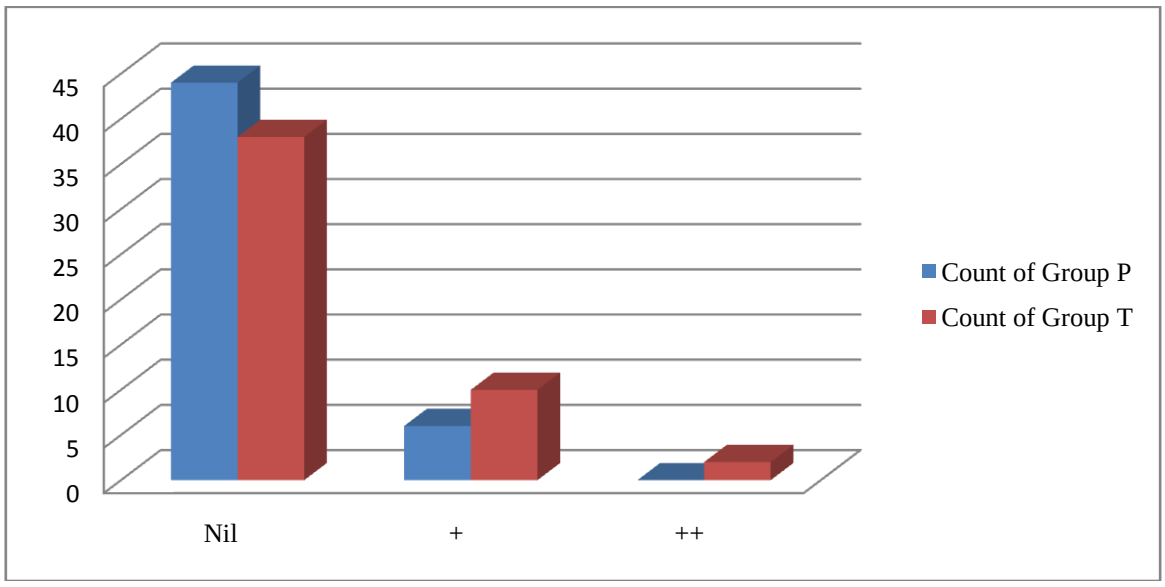
7.3.3. Coughing

GRADE	CONDITIONS FOR INSERTION (COUGHING)	COUNT OF GROUP P	PERCENTAGE OF GROUP P	COUNT OF GROUP T	PERCENTAGE OF GROUP T
3	Nil	49	98%	46	92%
2	+	1	2%	4	8%
1	++	0	0%	0	0%
	Sum total	50		50	



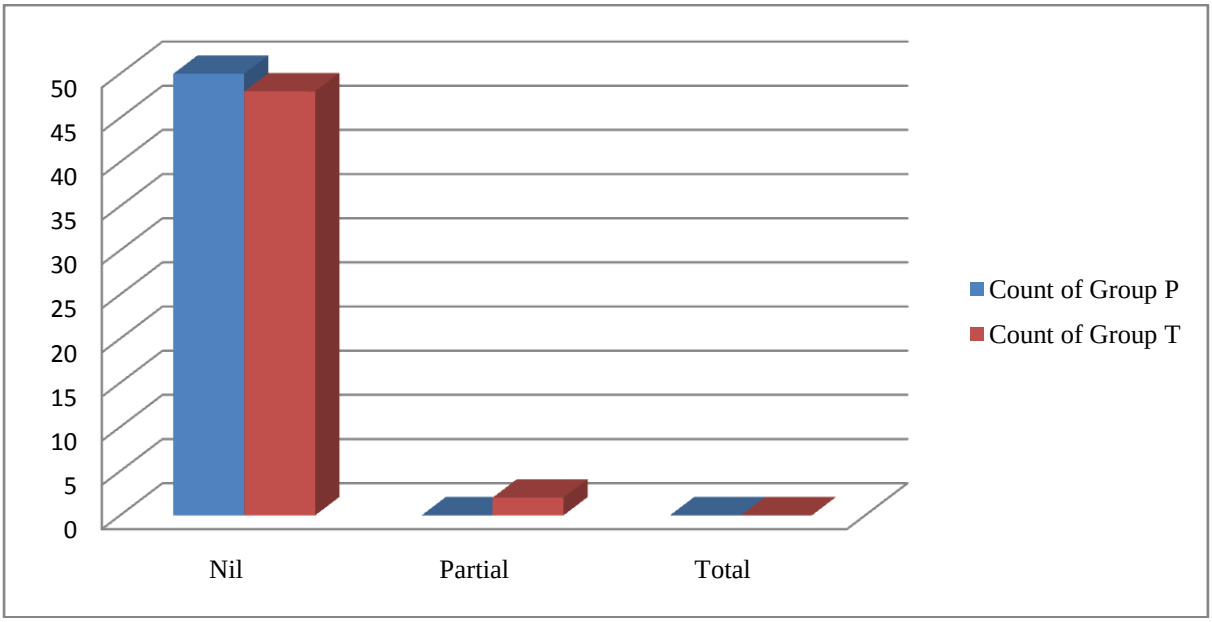
7.3.4.Gagging

GRADE	CONDITIONS FOR INSERTION (GAGGING)	COUNT OF GROUP P	PERCENTAGE OF GROUP P	COUNT OF GROUP T	PERCENTAGE OF GROUP T
3	Nil	44	88%	38	76%
2	+	6	12%	10	20%
1	++	0	0%	2	4%
	Sum total	50		50	



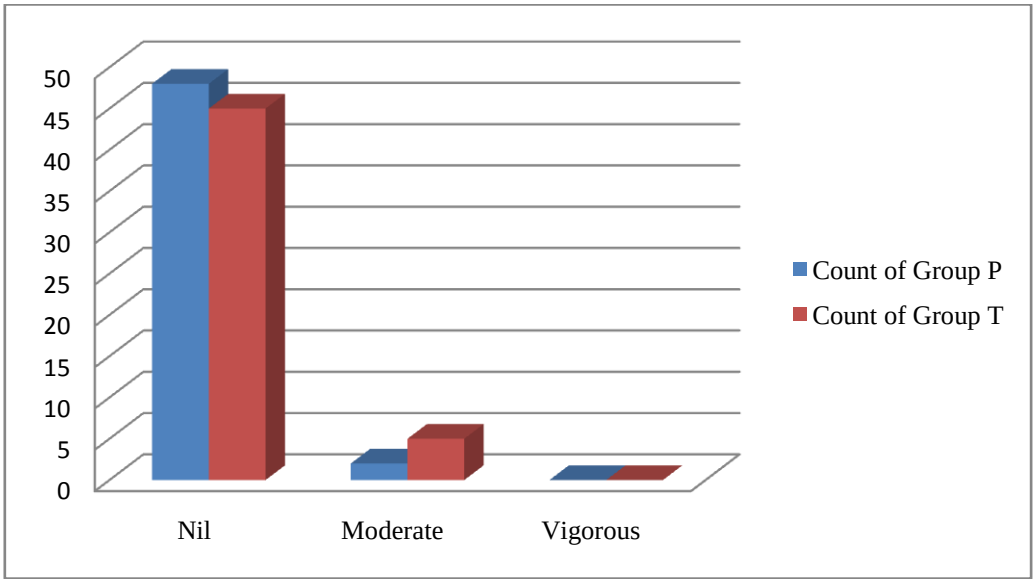
7.3.5. Laryngospasm and airway obstruction

GRADE	CONDITIONS FOR INSERTION (LARYNGOSPASM AND AO)	COUNT OF GROUP P	PERCENTAGE OF GROUP P	COUNT OF GROUP T	PERCENTAGE OF GROUP T
3	Nil	50	1	48	0.96
2	Partial	0	0	2	0.04
1	Total	0	0	0	0
	Sum total	50		50	



7.3.6. Patient movement

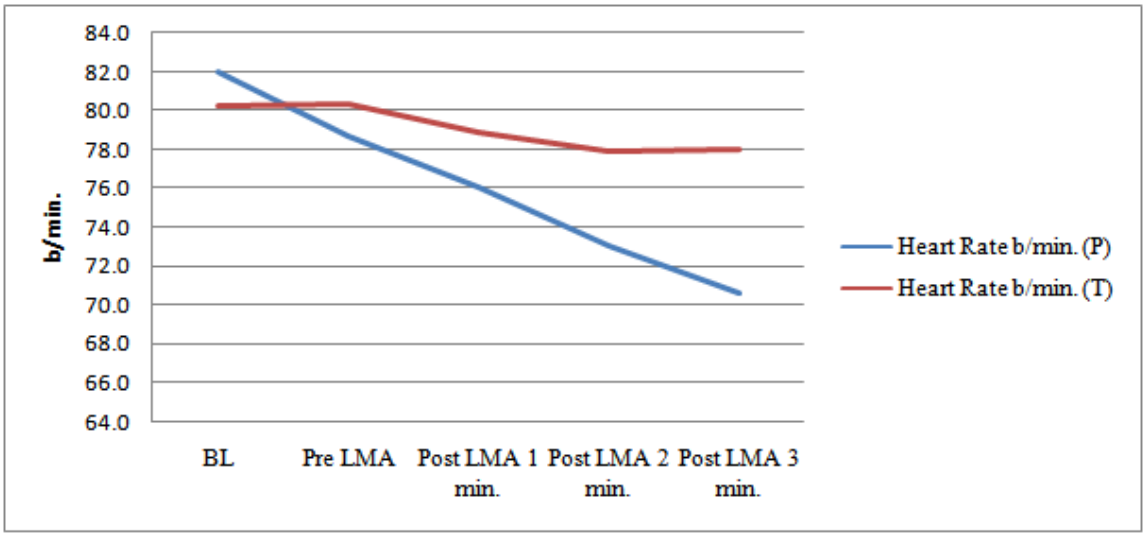
GRADE	CONDITIONS FOR INSERTION (PM)	COUNT OF GROUP P	PERCENTAGE OF GROUP P	COUNT OF GROUP T	PERCENTAGE OF GROUP T
3	Nil	48	96%	45	90%
2	Moderate	2	4%	5	10%
1	Vigorous	0	0%	0	0%
	Sum total	50		50	



7.4. Hemodynamic responses

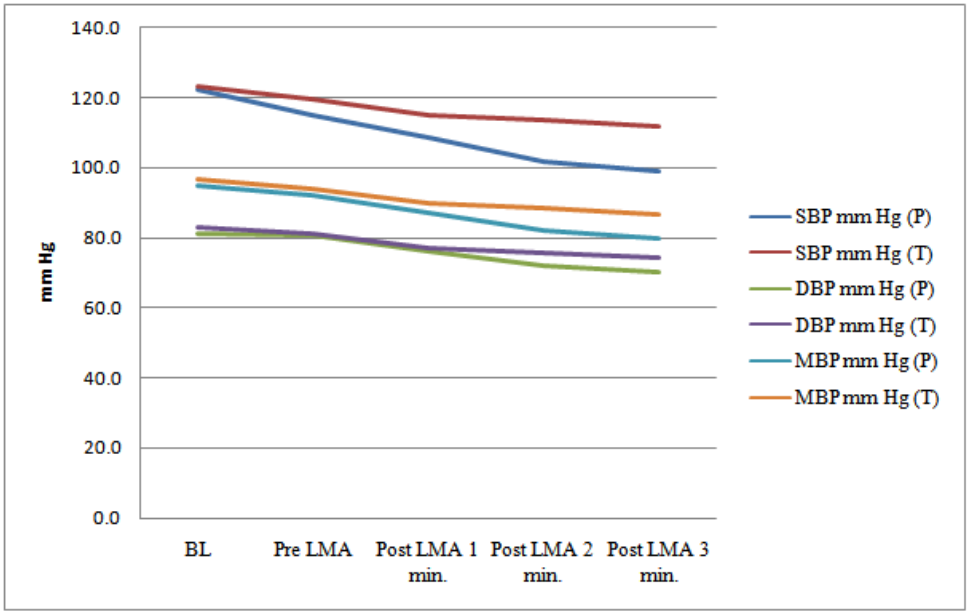
7.4.1. Heart Rate

HEART RATE	BL	PRE LMA	POST LMA 1 MIN.	POST LMA 2 MIN.	POST LMA 3 MIN.
Heart Rate b/min. (P)	82.0	78.7	76.0	73.0	70.6
Heart Rate b/min. (T)	80.2	80.3	78.9	77.9	78.0



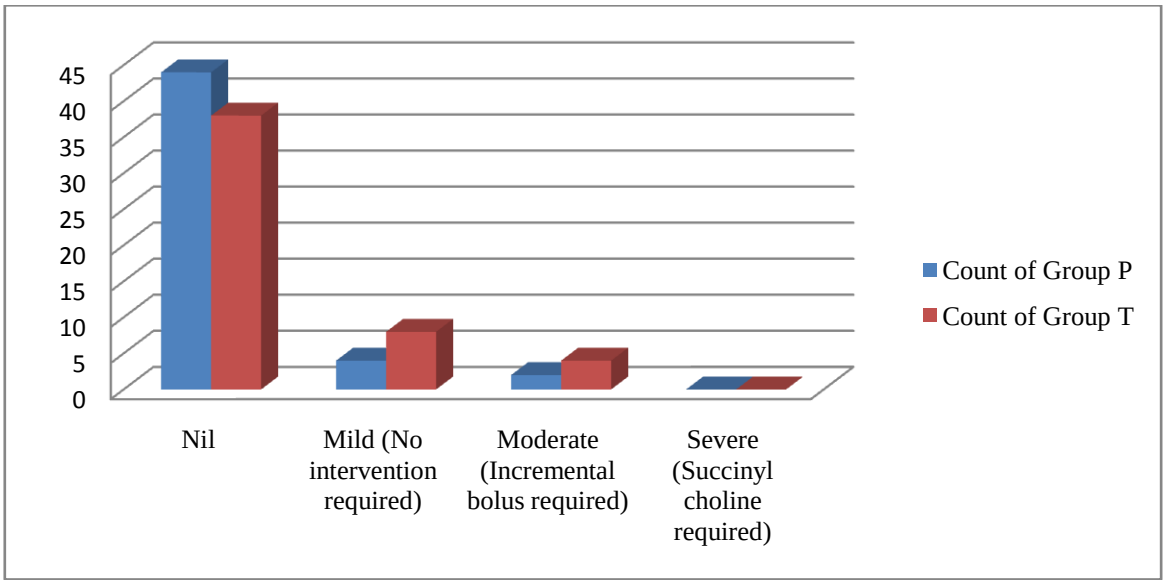
7.4.2. Blood Pressure

BLOOD PRESSURE (BP) in mmHg	BL	PRE LMA	POST LMA 1 MIN.	POST LMA 2 MIN.	POST LMA 3 MIN.
SBP mm Hg (P)	122.3	115.1	108.5	101.8	98.9
SBP mm Hg (T)	123.3	119.3	115.0	113.4	111.6
DBP mm Hg (P)	81.4	80.9	76.3	72.2	70.4
DBP mm Hg (T)	83.1	81.3	77.0	75.7	74.1
MBP mm Hg (P)	95.0	92.3	87.0	82.1	79.9
MBP mm Hg (T)	96.5	94.0	89.6	88.3	86.6



7.5. Undesired responses of lma insertion

UNDESIRED RESPONSES	COUNT OF GROUP P	PERCENTAGE OF GROUP P	COUNT OF GROUP T	PERCENTAGE OF GROUP T
Nil	44	88%	38	76%
Mild (No intervention required)	4	8%	8	16%
Moderate (Incremental bolus required)	2	4%	4	8%
Severe (Succinyl choline required)	0	0%	0	0%
Sum total	50		50	



All the patients were observed intraoperatively and post-operatively for 6 hours for side-effects like bradycardia, hypotension, arrhythmia, desaturation, nausea, vomiting, respiratory depression or sedation. No incidences of side effects were observed.

VIII. Discussion

Insertion of the LMA requires adequate mouth opening and that the pharyngeal and laryngeal reflexes be obtunded to a sufficient degree, to avoid coughing or gagging which would make correct positioning difficult or even impossible. Thiopentone, which is routinely used for induction of anaesthesia has been used for insertion of LMA. Similarly propofol, a relatively newer induction agent has also been employed for LMA insertion. But each of these has its disadvantages when used alone. For example, thiopentone when administered without premedication may produce undesirable responses like coughing and gagging. Propofol when given as a sole agent, requires to be given high doses which is likely to cause respiratory depression and hemodynamic instability. Hence in this study, an attempt has been made to compare and assess the suitability of conditions for the insertion of the LMA using either propofol (2.5 mg/kg) iv or thiopentone (5 mg/kg) iv as induction agents, after preinduction doses of midazolam (0.04 mg/kg) and fentanyl (1.5 mcg/kg).

8.1. Haemodynamic changes:

The baseline heart rates were comparable between the two groups. After insertion of LMA, there was a fall in the heart rates in both the groups at 1 min, 2 mins & 3 mins, but the fall was more pronounced in group P when compared to group T. The statistical analysis using student's unpaired 't' test showed that difference was extremely significant ($p<0.0001$). Similarly, the arterial blood pressures (syslotic, diastolic and mean) were comparable at baseline values and before insertion of the LMA. Statistically there was no significant difference between the two groups. But after insertion of the LMA at 1 min, 2mins & 3 mins, there was a fall in the arterial blood pressures which was more in group P compared to group T. These results were considered statistically extremely significant ($p<0.0001$).

Vandana Talwar, et al in their study compared the haemodynamic changes during LMA insertion and immediately thereafter in patients induced with propofol or thiopentone. It was observed that there was a fall in

heart rates and arterial blood pressures in both groups after insertion, with propofol recording a greater fall compared to thiopentone.

***8.2. Conditions for insertion of lma*:**

In this study, jaw opening was found to be full in 44 patients in group P as against 41 patients in group T, partial in 6 patients in group P and 9 patients in group T. None of the patients in either group had nil mouth opening. One of the patients in the propofol group and four in the thiopentone group had coughing. 6 patients in group P experienced gagging which was mild, as against 10 patients in group T. None of the patients in group P experienced laryngospasm or airway obstruction, whereas 2 patients in group T had partial airway obstruction. Laryngospasm was not observed in any patient in group T also.2 patients in group P exhibited moderate movements during insertion of the LMA when compared to only 5 patients in thiopentone group. Chi square test revealed no significant difference between the two groups.

Overall ease of insertion of the laryngeal mark airway was considered easy in 46 patients in the propofol group compared to 38 patients in the thiopentone group. It was difficult in 4 patients in group P and 12 patients in group T. However, it was not impossible in any patient. Chi square test revealed that the ease of insertion was significantly greater in group P when compared to group T ($p<0.0001$).

Vandana T, et al, in 2004 compared conditions for LMA insertion using thiopentone and propofol. They observed that jaw opening was full in 88% of patients in propofol group as against 80% in thiopentone group. 12% in propofol group had partial jaw opening compared to 20% in thiopentone group. Overall ease of insertion was considered easy in 96% patients in propofol group when compared to 76% in thiopentone group. It was difficult in 4% in propofol and 24% in thiopentone group. This was considered statistically significant [6].

8.3. Time taken for insertion of lma:

In group P, time taken for insertion of LMA was a 57.7 +4.58secs (mean + SD), when compared to 66.18 +4.22secs (mean+SD) in group T. The statistical analysis using student's unpaired 't' test showed that the difference was statistically extremely significant ($p<0.0001$).

Talwar T, et al. compared the time taken for LMA insertion in a similar fashion between two groups, one which received propofol and the other thiopentone. Time taken in the propofol group was 54.3 +3.47secs (mean + SD), as compared to 63.78 +4.12secs (mean + SD). Statistical analysis indicated the difference in the time taken to be significant (p value = 0.03) [6].

***8.4. Overall undesired responses*:**

In our study, there were no undesired responses in 44 patients in group P compared to 38 patients in group T. 4 patients in group P as against 8 patient in group T had mild undesired responses which settled without any intervention. 2 patients in group P required additional bolus of propofol whereas 4 patients in group T required incremental dose. None of the patients in either groups required succinylcholine for insertion of the LMA.

Sujesh Bansal, et al, in their study observed the undesired responses during LMA insertion in patients induced with either propofol or thiopentone. They found that 19 patients in propofol group had no undesired responses, as against 17 patients in thiopentone group. 4 patients had mild undesirable responses as against 1 patient in thiopentone group. 2 patients in propofol group required additional boluses of propofol when compared to 5 patients in thiopentone group. 2 patients in thiopentone group required succinylcholine for insertion of LMA but no patient in propofol group needed it [7].

The results of our study are in concordance with the above mentioned studies.

IX. Summary And Conclusion

Pre-operative fasting guidelines and pre-medications were standardised. Induction and maintenance of anaesthesia was standardised to all patients. Usual protocols were followed during reversal and recovery. Patients were comparable to age, weight, sex distribution and type of surgery.

The parameters recorded were:

1. Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure at baseline, pre LMA insertion, post LMA at 1 min, 2 min and 3 min.
2. Conditions for insertion of LMA using a graded three point scale with six variables.
3. Time taken for the LMA insertion.
4. Undesired responses.

9.1. Hemodynamic changes

It was observed that there was a fall in all the hemodynamic parameters in both the groups. But it was more pronounced in the propofol group. Though this was statistically significant, it was not clinically significant.

9.2. Conditions for insertion

Ease of insertion was significantly greater in the propofol group when compared to thiopentone group. The difference was statistically significant. There were no major differences with the other parameters.

9.3. Time taken for insertion

The mean time taken for insertion was compared and found to be 57.7 secs in the propofol group and 66.18 secs in the thiopentone group. This was statistically extremely significant ($P < 0.0001$).

9.4. Undesired responses

Though the incidence of undesired responses was found to be more in the thiopentone group, when compared to the propofol group, the difference was not statistically significant ($P < 0.05$).

In conclusion, our study has shown that Propofol at the dose of 2.5 mg/kg is superior to Thiopentone at the dose of 5 mg/kg as an induction agent for insertion of the laryngeal mask airway with respect to patient's response like gagging, coughing, limb and head movement and laryngospasm. Better ease of insertion, lesser time taken for insertion and better recovery profiles were observed with propofol. Hemodynamically, the fall in the concerned parameters were more with propofol as compared to thiopentone, however they were not clinically significant.

References

[1]. Pollart BJ, Norton ML. Principle of airway management- Wylie and Churchill-Davodson's, A Practice of Anaesthesia. 7th Edition ,2003;443-464.

[2]. Drage MP, Nunez J, Vaughan RS, et al. Jaw thrusting as a clinical test to assess the adequate depth of anaesthesia for insertion of the laryngeal mask. Anaesthesia 1996; 51: 1167 -1170.

[3]. Bahk JH, Kim CS. A method for removing the laryngeal mask airway after using it as an intubation guide. Anaesthesiology, 1997;86:1218.

[4]. Bahk JH, Kim JK, Kim CS. Use of the laryngeal mask airway to preoxygenate in a pediatric patient with Treacher–Collins Syndrome. Pediatric Anesthesia, 1998;8:274-275.

[5]. Van Zundert, Brimacombe, Ferson ,Bacon. Archie Brain :celebrating 30 years of development in laryngeal mask airway. Anaesthesia vol 67 issue 12;1375-85.

[6]. Vandana Talwar, Rajesh Pattanayak, Sujesh Bansal. Comparison of propofol versus hiopentone for facilitation of laryngeal mask insertion. J Anaesth Clin Pharmacol 2004; 20(1): 33-38.

[7]. Sujesh Bansal, M.Pawar. Hemodynamic responses to laryngoscopy and intubation in patients with PIH : effect of intravenous esmolol with or without lidocaine. International Journal of Obstetric anaesthesia. Jan 2002,Vol 11, Issue 1,Pg 4-8.

Dr Gunjan "A Comparative Study Between Intravenous Propofol And An Equipotent Dose Of Thiopentone For The Insertion Of Laryngeal Mask Airway". "IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), Volume 17, Issue 2 (2018), PP 65-76.