

Comparison of Ease of Insertion and Hemodynamic Response to Lma with Propofol and Thiopentone.

Dr. P.Nageswara Rao, Dr. B. Venu Gopalan. Asst. Professor,
Dr. S.Seetharamaiah. Professor.

Abstract

Introduction: Insertion of laryngeal mask airway (LMA) requires sufficient depth of anesthesia for jaw muscles to relax and suppression of airway reflexes for the device to be tolerated within the hypopharynx without undue coughing, gagging, and patient movement. Various induction agents and their combinations have been used to facilitate its insertion with least side effects. The present study is designed to compare the haemodynamics and conditions to facilitate the insertion of the LMA with the two most commonly used agents- thiopentone and propofol, after adequate pre-induction doses of midazolam, fentanyl and intra-venous lignocaine.

Materials: The study was conducted at Government General Hospital, Guntur Medical College, Guntur. A prospective randomized double blind study was conducted on 60 patients of ASA I & 2 between the age group of 18-60 yrs undergoing elective minor surgical procedures under general anaesthesia. Patients were randomly divided into two groups of 30 each.

Results: The insertion conditions for successful placement of LMA were comparable in both the groups. The overall insertion scores were also comparable in both the groups. A significant fall in systolic BP, diastolic BP and mean arterial pressure was noted in Propofol group ($P < 0.001$). A significant decrease in respiratory rate was also observed in group P following induction and up to 3 min following insertion of LMA. There was no significant difference in SpO₂ between the two groups.

Keywords: LMA, Thiopentone, Propofol.

I. Introduction

For decades, endotracheal intubation or bag-and-mask ventilation were the mainstays of airway management. In 1983 this changed with the invention of the laryngeal mask airway (LMA), providing ease of placement and hands-free maintenance, along with a relatively secure airway¹.

Insertion of laryngeal mask airway (LMA) requires sufficient depth of anesthesia for jaw muscles to relax and suppression of airway reflexes for the device to be tolerated within the hypopharynx without undue coughing, gagging, and patient movement. Such conditions are provided by a bolus dose of an intravenous (IV) anesthetic induction agent². Most of the induction agents can be used to facilitate placement of the LMA. The adequate depth of anaesthesia for LMA placement is significantly less than that for tracheal intubation.³

Various induction agents and their combinations have been used to facilitate its insertion with least side effects. The present study is designed to compare the haemodynamics and conditions to facilitate the insertion of the LMA with the two most commonly used agents- thiopentone and propofol, after adequate pre-induction doses of midazolam, fentanyl and intra-venous lignocaine.

Aim:

1. To compare the Haemodynamic responses to LMA insertion with the most commonly used induction agents, A) Propofol and B) Thiopentone .
2. To compare the suitability of conditions for insertion during LMA insertion in these two groups.
3. To assess which induction agent is more suitable and cost effective for insertion of LMA in our hospital condition.

II. Materials And Methods

The study was conducted at Government General Hospital, Guntur Medical College, Guntur.

A prospective randomized double blind study was conducted on 60 patients of ASA I & 2 between the age group of 18-60 yrs undergoing various elective minor surgical procedures under general anaesthesia. Patients were randomly divided into two groups of 30 each.

Group P – Propofol group n=40

Group T – Thiopentone group n=40

Inclusion criteria:

1. ASA grade 1&2
2. Age 18-60 yrs
3. Weight 30-80kg
4. Who give informed valid consent
5. Scheduled to undergo various elective minor surgical procedure under general anaesthesia

Exclusion criteria:

1. Risk of gastric aspiration
2. Smokers
3. Patients undergoing oral surgeries
4. Grossly obese patients
5. Those with respiratory diseases
6. ASA grade 3&4 patients

III. Anaesthetic Technique:

Patients were visited on the previous day of surgery, and the procedure was explained to them. On arrival at the operation theatre, an intravenous line was secured and the patient's baseline vital data were recorded. Both groups received Inj.Fentanyl (1.5 mcg) IV, Inj.Midazolam (0.02mg/kg) IV and Inj. Lignocaine (1.5mg/kg) IV prior to induction.

All patients were pre oxygenated for 3 minutes. In group T or thiopentone group, anaesthesia was induced with thiopentone 5mg/kg IV. In group P after preoxygenation, anaesthesia was induced with propofol 2.5mg/kg IV. Loss of eyelash reflex was considered as the end point of induction in both groups. An appropriate size of LMA was introduced using standard technique by an experienced anaesthesiologist blinded to the dose and type of induction agent. He stayed outside the anaesthetic room during the initial induction period and was called after the loss of eyelash reflex for the insertion of the LMA. If the depth of anaesthesia was inadequate, propofol or thiopentone was repeated in a dose of 0.5mg/kg or 1mg/kg respectively. The cuff was inflated with the recommended volume of air. Proper placement was assured by observing bag movements, and auscultating chest for bilateral equal air entry. Following LMA insertion, anaesthesia was maintained with nitrous oxide in oxygen along with halothane with the patient breathing spontaneously.

The anaesthesiologist who performed the LMA insertion also graded the LMA insertion conditions accordingly to

- Mouth opening - 3= Full, 2= Partial, 1= Nil,
- Coughing - 3= Nil, 2= Mild, 1= Severe
- Gagging - 3= Nil, 2= Mild, 1= Severe
- Laryngospasm - 3= Nil, 2= Mild, 1= Severe
- Limb movements - 3= Nil, 2= Mild, 1= Severe
- Ease of insertion - 3= Easy, 2= Difficult, 1= Failure.

The six variables, three point scores were then summed to give an overall insertion condition score.

Total score Insertion condition

18 Excellent

16-17 Satisfactory

<16 Poor

The hemodynamic parameters, namely

- Pulse rate
- Non-invasive blood pressures (systolic and diastolic),
- Respiratory rate
- SpO₂ were monitored at
 - Baseline,
 - 30 sec after induction,
 - 1, 2, 3,5 minutes after insertion of LMA.

All the observations and particulars of the patient were recorded in a proforma, a copy of which is enclosed.

IV. Statistical Analysis:

Comparison of Ease of Insertion and Hemodynamic Response to Lma with Propofol and Thiopentone.

Data was analysed using students‘t’ test for parametric data and Chi square test and Fisher’s exact test for non parametric data. A value of p <0.05 was considered statistically significant.

V. Observation And Results:-

Distribution of patients according to age

The mean age in group P was 33.36 ± 10.52 years and in group T was 33.76 ± 10.67 years. Age incidences between two groups were comparable (P>0.05).

Distribution of patients according to sex :-

The sex distribution in the two groups were comparable (P>0.05), group P had 15 male patients which constituted (50%) and 15 female patients making up for (50%), whereas group T had 16 male patients (53.3%) and 14 female patients (46.6%).

Distribution of patients according to Mouth Opening:-

MOUTH OPENING	GROUP P (N = 30)	GROUP T (N = 30)
FULL	27 (90 %)	28 (93.3%)
PARTIAL	3 (10 %)	2 (6.6 %)
NIL	0	0

The above table is showing Distribution of patients according to Mouth Opening.

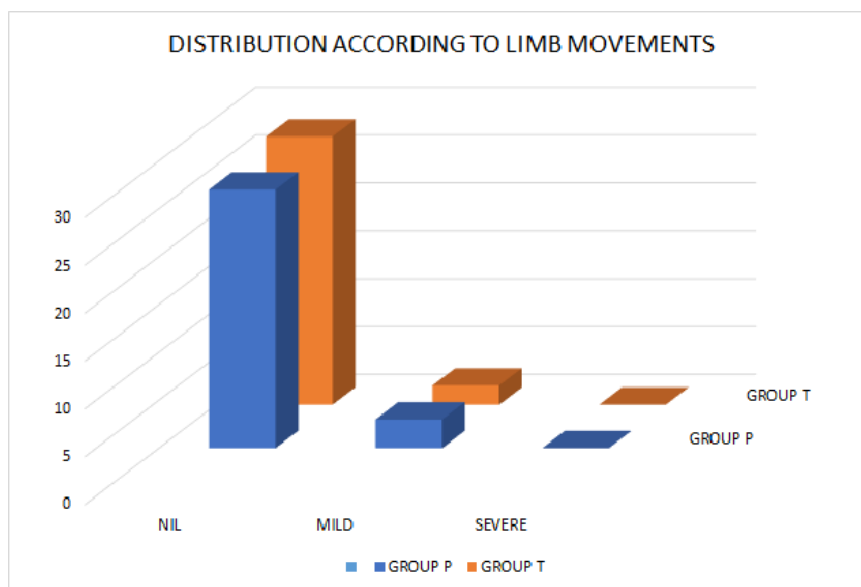
Mouth opening was graded as Full in 27(90 %) in group P and 28 (93.3%) in group T patients while 3(10%) patients in group P and 2(6.6%) patients in group T showed partial grade of mouth opening. None of the patient showed Nil grade of mouth opening. The incidence was comparable in both the groups (p>0.05).

Distribution of patients according to occurrence of Coughing

In group P none of the patients had coughing of any grade. In group T Nil response was observed in 28(93.33%) patients and mild grade of coughing in 1(2.5%) patient. The response was found to be statistically insignificant (p>0.05)

Distribution of patients according to occurrence of Limb movement

27(90%) patients in group P and 28(93.3%) patients in group T showed Nil response with respect to limb movements. Mild limb movements were present in 3(10%) and 2(6.6%) patients of group P and group T respectively. None of the patients had severe limb movements in both the groups. The incidence was statistically insignificant (p>0.05).



Distribution of patients according to Ease of insertion

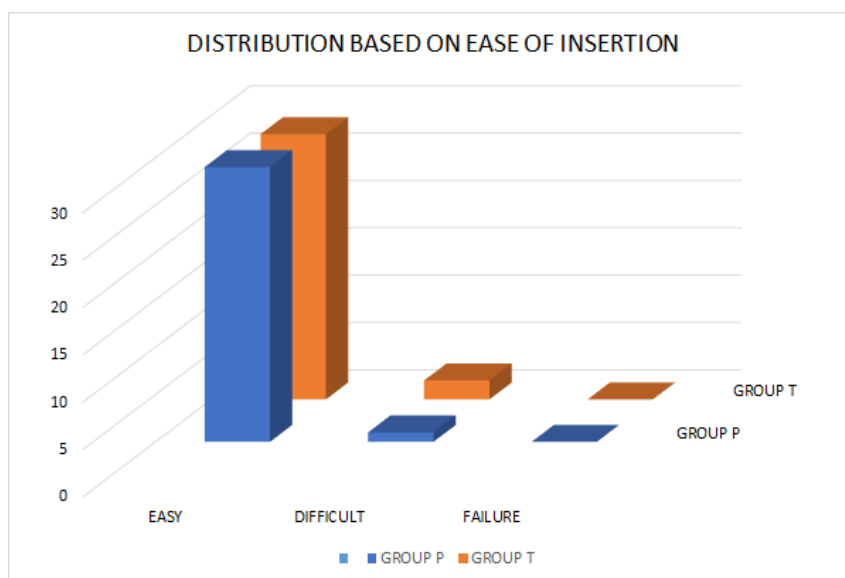
COUGHING	GROUP P (N= 30)	GROUP T (N = 30)
EASY	29 (96.66 %)	28 (93.3 %)
DIFFICULT	1 (3.33 %)	2 (6.6 %)
FAILURE	0	0

The above table shows the distribution of patients according to ease of insertion of LMA. 29(96.66%) patients in group P and 28(93.3%) patients in group T had easy insertion of LMA. Difficulty in insertion was observed in 1(3.3%) patient in group P and 2(6.6%) patients in group T. None of the patient came in to the failure category in both the groups. The ease of insertion when compared amongst the groups shows statistically insignificant difference (P>0.05).

Distribution of patients according to Overall insertion scores

COUGHING	GROUP P (N= 30)	GROUP T (N = 30)
EXCELLENT	26 (86.66 %)	24 (80 %)
SATISFACTORY	4 (13.33%)	6 (20 %)
POOR	0	0

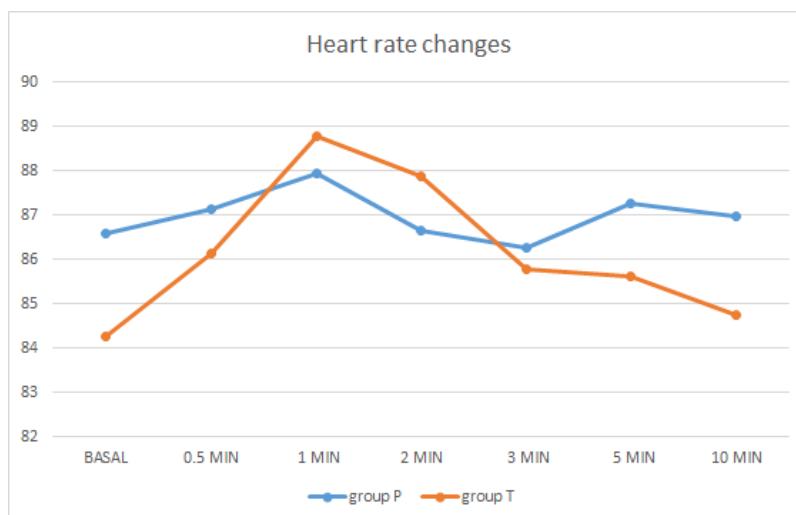
The above table shows overall summation of scores of six variables. Excellent insertion score was observed in 35(87.5%) and 34(85%) patients in group A and group B respectively. Insertion score was satisfactory in 5(12.5%) patients of group A and 6(15%) patients of group B. None of the patients had poor insertion score in both the groups. The groups were statistically insignificant when compared (p>0.05).



Changes in Mean Pulse rate in beats per min

	PULSE RATE		P VALUE
	GROUP P	GROUP T	
BASELINE	86.6 ± 5.23	84.26 ± 4.62	0.072 (NS)
30 SEC AFTER INDUCTION	87.13 ± 2.86	86.13 ± 4.63	0.31 (NS)
1 MIN AFTER INSERTION OF LMA	87.93 ± 2.59	88.8 ± 4.71	0.38 (NS)
2 MIN	86.66 ± 2.18	87.86 ± 4.89	0.22 (NS)
3 MIN	86.26 ± 1.55	85.76 ± 5.37	0.62 (NS)
5 MIN	87.26 ± 1.70	85.65 ± 4.88	0.08 (NS)

The table is showing the changes in mean pulse rate in beats per minute. The mean basal pulse rate in group P was 86.6 ± 5.23 and in group B was 84.26 ± 4.62 which were comparable (P>0.05). There were no statistically significant differences in mean pulse rate between the two groups throughout the study.



Changes in Mean Systolic BP

	SYSTOLIC BP		P VALUE
	GROUP P	GROUP T	
BASELINE	119.13 ± 9.47	121.2 ± 6.27	0.32 (NS)
30 SEC AFTER INDUCTION	101.46 ± 8.75	114.53 ± 5.96	< 0.0001 (S)
1 MIN AFTER INSERTION OF LMA	98.40 ± 8.27	128.13 ± 6.19	< 0.0001 (S)
2 MIN	96.6 ± 8.45	127.07 ± 6.20	< 0.0001 (S)
3 MIN	96.8 ± 7.47	127.47 ± 5.30	< 0.0001 (S)
5 MIN	99.86 ± 6.64	127.87 ± 4.56	< 0.0001 (S)

Changes in Mean Diastolic BP

	DIASTOLIC BP		P VALUE
	GROUP P	GROUP T	
BASELINE	74.86 ± 6.31	77.66 ± 4.55	0.0537 (NS)
30 SEC AFTER INDUCTION	62.53 ± 5.58	73.13 ± 4.83	< 0.0001 (S)
1 MIN AFTER INSERTION OF LMA	61 ± 5.40	82.93 ± 4.29	< 0.0001 (S)
2 MIN	59.6 ± 4.68	81.8 ± 4.11	< 0.0001 (S)
3 MIN	59.8 ± 3.83	80.8 ± 3.84	< 0.0001 (S)
5 MIN	61.4 ± 3.32	79.46 ± 2.77	< 0.0001 (S)

Changes in Mean Systolic/ Diastolic BP:

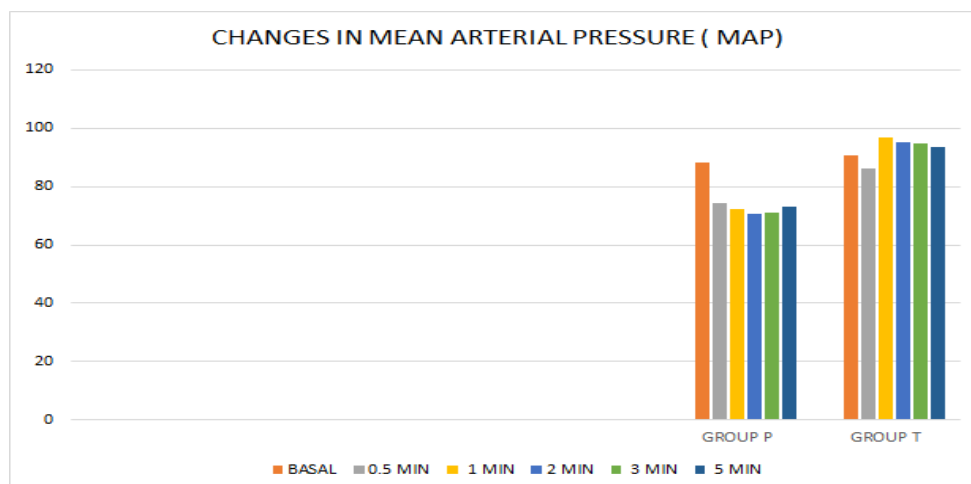
The Mean systolic/diastolic blood pressure was 119.13 ± 9.47 / 74.86 ± 6.31 mm of Hg and 121 ± 6.27 / 77.66 ± 4.55 mm of Hg in group A and group B respectively which were comparable. Post induction there was a significant decrease in blood pressure (P<0.001) in group P compared to group T. The blood pressure in group P was significantly lower compared to group T after the induction and till the end of the study.

Changes in Mean MAP

	MEAN ARTERIAL PRESSURE (MAP)		P VALUE
	GROUP P	GROUP T	
BASELINE	88.13 ± 6.89	90.83 ± 4.29	0.072 (NS)
30 SEC AFTER INDUCTION	74.23 ± 6.15	86.06 ± 4.21	< 0.0001 (S)
1 MIN AFTER INSERTION OF LMA	72.26 ± 5.88	96.8 ± 3.93	< 0.0001 (S)
2 MIN	70.70 ± 5.35	95.33 ± 3.93	< 0.0001 (S)
3 MIN	70.93 ± 4.25	94.76 ± 3.65	< 0.0001 (S)
5 MIN	72.96 ± 3.61	93.66 ± 2.59	< 0.0001 (S)

Changes in Mean MAP (Mean Arterial Pressure)

The Mean arterial pressure was 88.13 ± 6.89 mm of Hg and 90.83 ± 4.29 mm of Hg in group P and group T respectively which were comparable. Post induction there was a significant decrease in MAP (P<0.001) in group P compared to group T. The mean arterial pressure (MAP) in group P was significantly lower compared to group T after the induction and till the end of the study.



Changes in Mean Respiratory rate in breaths/ min

	MEAN RESP.RATE / MIN		P VALUE
	GROUP P	GROUP T	
BASELINE	16.66 ± 1.32	16.26 ± 1.79	0.33 (NS)
30 SEC AFTER INDUCTION	10.33 ± 1.41	11.70 ± 4.49	0.294 (NS)
1 MIN AFTER INSERTION OF LMA	10.60 ± 1.42	14.40 ± 1.77	< 0.0001 (S)
2 MIN	13.73 ± 1.22	15.20 ± 2.64	< 0.0001 (S)
3 MIN	15.13 ± 0.89	16.73 ± 1.59	< 0.0001 (S)
5 MIN	17.73 ± 1.46	18.00 ± 1.96	0.553 (NS)

This table is showing changes in mean respiratory rate in both the groups. The mean basal respiratory rate in group P was 16.66 ± 1.32 and in group T was 16.26 ± 1.79 which were comparable (P>0.05). In group P the decrease in respiratory rate after induction and 1,2,3 min after insertion of LMA was statistically significant (P<0.001) compared to group T. After that there was no statistically significant difference in respiratory rate between two groups.

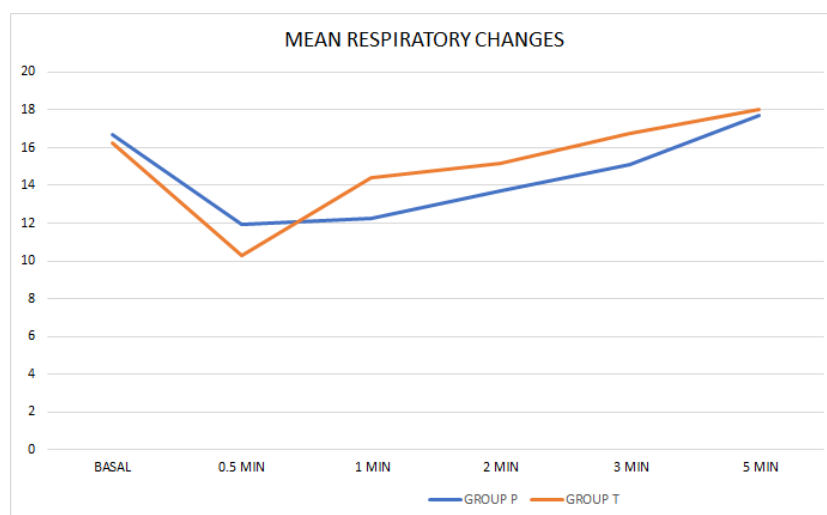
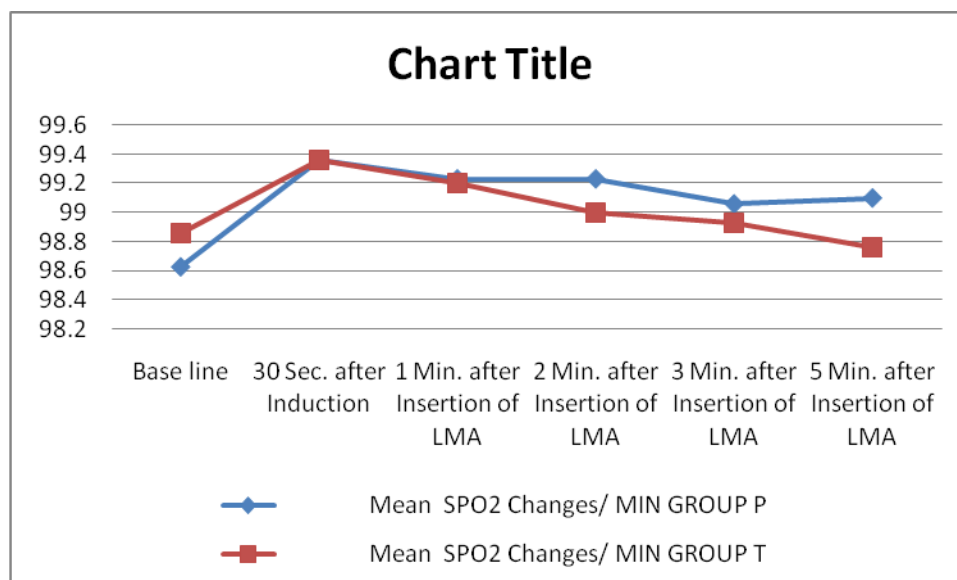


Table – 16 : Changes in Mean SpO2

SPO2 Changes	Mean SPO2 Changes/ MIN		P VALUE
	GROUP P	GROUP T	
Base line	98.63 ± 0.96	98.86 ± 1.04	0.37 (NS)
30 Sec. after Induction	99.36 ± 0.49	99.36 ± 0.55	0.99 (NS)
1 Min. after Insertion of LMA	99.23 ± 0.67	99.20 ± 0.66	0.84 (NS)
2 Min. after Insertion of LMA	99.23 ± 0.50	99.00 ± 0.87	0.20 (NS)
3 Min. after Insertion of LMA	99.06 ± 0.58	98.93 ± 0.78	0.45 (NS)
5 Min. after Insertion of LMA	99.10 ± 0.60	98.76 ± 0.81	0.07 (NS)



This table is showing the changes in mean SpO2 in both the groups. The mean basal SpO2 in group P was 98.63 ± 0.96 and in group T was 98.86 ± 1.04 which were comparable. No significant difference in mean SpO2 between the two groups during the study.

VI. Discussion

The laryngeal mask airway represents major advancement in airway management. Although endotracheal intubation has a long history of the most widely accepted techniques in anaesthetic practice, it is not without complications, most of which arise from the need to visualize and penetrate the laryngeal opening.⁴ Increasing emphasis on day care anaesthesia has led to a greater use of the laryngeal mask airway in place of the facemask and in some cases to tracheal intubation during anaesthesia.⁵

The present study was conducted in the department of anaesthesiology at GGH/GMC, Guntur. It was a prospective randomized double blind study. 60 patients of ASA1&2 undergoing various elective minor surgical procedures under general anaesthesia were included in the study. Patients were randomly divided into two groups of 30 each.

- Group P – Propofol group
- Group T – Thiopentone group

The patients were belonging to the age group of 18 - 60 years, most of them (21) were from the age group of 21-30 years, while 17 in the age range of 31-40 years and 16 in 41-50 years range were observed. The mean age in group P was 33.36 ± 10.52 years and in group T was 33.76 ± 10.67 years. Age incidences between two groups were comparable.

The present study included 29 female patients (15 in group P and 14 in group T) and 31 male patients (15 in group P and 16 in group T). The sex distribution between the groups was comparable.

Weight of each patient was noted. According to table no 3, most of the patients were in weight range of 61-70kg i.e 10 in group P and 11 in group T. Mean weight was (54.20 ± 9.38) in group P and (54.73 ± 9.58) in group T, which was comparable.

All the patients in both the groups were pre-medicated with inj.Fentanyl (1.5 mcg/kg) IV, Inj.Midazolam (0.02mg/kg) IV and Inj. Lignocaine (1.5mg/kg) IV prior to induction.

Group P patients received propofol 2.5mg/kg IV for induction. Group T received

Thiopentone 5mg/ kg IV for induction. LMA insertion was attempted using standard technique.

The insertion conditions were scored for six variables as mouth opening, coughing, gagging, laryngospasm, limb movements and ease of insertion in a three point scoring system. Then overall summation of the insertion scores was done.

The changes in pulse rate, systolic and diastolic blood pressure, mean arterial pressure, respiratory rate and SpO2 were recorded at baseline, 30 sec after induction, and 1, 2, 3, 5 min after the insertion of LMA.

With respect to the first variable in insertion conditions for LMA i.e mouth opening, we observed full mouth opening in 27(90 %) patients in group P and 28(93.3%) patients in group T. 3(10%) patients in group P and 2(6.6%) patients in group T showed partial grade of mouth opening. None of the patient showed Nil grade of mouth opening.

Vandana Talwar, Rajesh Pattanayak, Sujesh Bansal⁶ conducted a study to compare the efficiency of the two most commonly used induction agents, thiopentone and propofol, in facilitating insertion of the LMA in 50 ASA 1 patients. They assessed conditions for LMA insertion using six variables on a three point scale.

They observed mouth opening in a three point scale which was comparable in both the groups. Out of 25 patients in propofol group, 22 patients showed full mouth opening and 3 patients showed partial mouth opening. In thiopentone group 20 patients showed full mouth opening and 5 patients showed partial mouth opening. None of the patients showed nil grade of mouth opening. Our study correlates with this study.

Coughing and gagging are potent upper airway reflexes, triggered by irritation of the larynx or epiglottis and preventing foreign material entering the trachea and lungs. In our present study, the incidence of coughing was comparable in both the groups ($P=0(0\%)$ vs $T=2(6.66\%)$). In a study conducted by **C.R. Seavell, T.M.Cook, C.M.Co⁷**, coughing was present in one patient in thiopentone group compared to none in propofol group. The incidence was comparable between the two groups.

In our study, 2 (6.66%) patients in each group showed mild grade of gagging which was comparable between the two groups. In **Vandana Talwar, Rajesh Pattanayak, Sujesh Bansal⁶** study 1(4%) patient in propofol group and 2(8%) patients in thiopentone group showed mild grade of gagging which was statistically insignificant. In **S Keerthi Kumar⁸** study 2(1%) patients in group A and 1(0.5%) patient group B developed gagging which was comparable. **C.R.Seavell, T.M. Cook, C.M. Cox⁷** also showed statistically insignificant difference in the incidence of gagging between the two groups. Our results correlate with these studies.

In assessing the conditions for LMA insertion, the fourth variable was laryngospasm. In our study none of the patients developed laryngospasm in both the groups. **Patrick Scanlon, Micheal Carey, Micheal Power⁹** reported higher incidence of laryngospasm in thiopentone group (30%) compared to propofol group (9%) which was statistically significant. In **C.R. Seavell, T.M.Cook, C.M.Cox⁷** study, 2 patients had laryngospasm in thiopentone group compared to none in propofol group which was statistically insignificant. **S Keerthi Kuma⁸** also showed statistically insignificant difference in the incidence of laryngospasm between the two groups indicating topical lignocaine suppresses the airway reflexes.

In our study 27(90%) patients in group P and 28(93.3%) patients in group T showed nil response with respect to limb movements. Mild limb movements were present in 3(10%) and 2(6.6%) patients of group P and group T respectively. None of the patients had severe limb movements in both the groups. The incidence was statistically insignificant. In **S Keerthi Kumar⁸** study 3(1.5%) patients in propofol group and 4(2%) patients in thiopentone group moved head and limbs during LMA insertion which was comparable between the groups. Our results correlate with this study.

The six variables, three point scores were summed to give an overall insertion condition score. Score 18 was considered excellent, 16-17 was satisfactory and <16 was considered poor. In our study, (Table no 10) excellent insertion score was observed in 26(86.66%) and 24(80%) patients in group P and group T respectively. Insertion score was satisfactory in 4(13.33%) patients of group P and 6(20%) patients of group T. None of the patients had poor insertion score in both the groups. In **S Keerthi Kumar⁸** study overall successful insertion of LMA was observed in 99% of patients in propofol group and 99.5% in thiopentone group which was comparable.

In our study, pre-treating the patients with Inj.Fentanyl (1.5 mcg/kg) IV, Inj.Midazolam (0.02mg/kg) IV and Inj. Lignocaine (1.5mg/kg) IV three min before the induction of anaesthesia, provided comparable insertion conditions in both thiopentone and propofol group. This may be attributed to the fact that intra-venous lignocaine suppresses airway reflexes.

In our study the basal mean pulse rate was 86.6 ± 5.23 beats per min and 84.26 ± 4.62 in group P and group T respectively. Changes in mean pulse rate were comparable between the two groups till the end of the study.

Blood pressure, both systolic and diastolic was measured at various intervals similar to pulse rate. The Mean basal systolic/diastolic blood pressure was $119.13\pm 9.47 / 74.86\pm 6.31$ mm of Hg and $121.2\pm 6.27 / 77.66\pm 4.55$ mm of Hg in group P and group T respectively which were comparable. After the induction the Mean basal systolic/diastolic blood pressure was $101.46\pm 8.75 / 62.53\pm 5.58$ mm of Hg and $114.53\pm 5.96 / 73.13\pm 4.83$ mm of Hg in group P and group T respectively. We observed that there was decrease in blood pressure after the induction in both the groups, but decrease was more in propofol group compared to thiopentone group which was statistically significant. This significant difference in blood pressure was present till the end of our study.

In our present study we observed the effects of both the induction agents on respiratory rate. The mean basal respiratory rate in group P was 16.66 ± 1.32 and in group T was 16.26 ± 1.79 which were comparable ($P>0.05$). In group P the decrease in respiratory rate after induction and 1, 2, 3 min after insertion of LMA was statistically significant compared to group T. After that there was no statistically significant difference in respiratory rate between two groups indicating propofol causes greater initial ventilatory depression.

Our study shows that conditions for insertion of LMA were comparable between Propofol and Thiopentone group. The finding of less respiratory depression with thiopentone is well documented. The thiopentone group also had a significantly smaller reduction in systolic and diastolic pressure. We also observed better cost effectiveness in thiopentone group compared to propofol group.

VII. Conclusion

In conclusion, we have shown that if premedicated with Inj.Fentanyl (1.5 mcg/kg) IV, Inj.Midazolam (0.02mg/kg) IV and Inj. Lignocaine (1.5mg/kg) IV, 3 min before induction of anaesthesia with propofol or thiopentone, the conditions for insertion of an LMA are equal, except thiopentone provides better hemodynamic stability and significantly less respiratory depression with more cost effectiveness.

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