A COMPARATIVE STUDY ON EASE OF INSERTION OF LARYNGEALMASK AIRWAY; INTRAVENOUS LIGNOCAINE VERSUSTOPICAL LIGNOCAINE

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ABSTRACT:

Title: A comparative study on ease of insertion of laryngeal mask airway; intravenous lignocaine v/s topical lignocaine.

Background and objectives: This study was undertaken to compare:

1. The ease of insertion of LMA when propofol is combined with either IV lignocaine or topical lignocaine spray.
2. The hemodynamic changes during LMA insertion in both the groups.

Methods:

Type of study: Randomized controlled trial

Study population: 100 ASA physical status 1 and 2 patients of age group 20 to 50 years who underwent various elective surgical procedures.

Randomization: Sealed envelope method.

Methodology: In group A, lignocaine was administered intravenously; and in Group B, lignocaine aerosol 10% was sprayed to posterior pharyngeal wall before induction. Classic LMA of appropriate size was inserted. The ease of insertion of LMA was compared between both groups based on the incidence of gagging, coughing and laryngospasm. Hemodynamic parameters- HR, SBP, DBP, MAP, $EtCO_2$ and SPO_2 were recorded.

Result: In group A, grades in ease of LMA insertion was excellent/good/poor in 50%/20%/30% of subjects

respectively. In group B, the grades in ease of insertion of LMA was excellent/good/poor in 60%/30%/10% of subjects respectively. The p value is 0.04. There is a significant difference between both the groups.

The hemodynamic parameters- HR, SBP, DBP, MAP and $EtCO_2$ were significantly higher in IV lignocaine group during the initial 5 minutes from the beginning of Anesthesia

Interpretation and conclusion: Topical anesthesia of airway with 10% lignocaine aerosol before induction, provides excellent ease for inserting LMA.

Key words: LMA; topical lignocaine; intravenous lignocaine; ease of insertion; hemodynamic response

INTRODUCTION:

Airway management is an essential skill in the field of anesthesiology. Laryngeal mask airway (LMA) is one of the most significant advances in airway management. It is a noninvasive ventilatory device. The placement of an LMA is less stimulating and leads to less presser response than direct laryngoscopy[1]. It can be used as a conduit for ventilation, oxygenation, and delivery of anesthetic gases and can be used for either spontaneous ventilation or positive pressure ventilation[2]

There are several stress responses to laryngeal instrumentation[2].

These stress responses can precipitate myocardial ischemia and cerebrovascular accidents.

Successful insertion of LMA requires the airway reflexes to be obtunded as intact airway reflexes may cause gagging, coughing or laryngospasm[3].

Drugs that suppress laryngeal reflexes such as sedative premedication, opioids or benzodiazepines are administered intravenously to facilitate early insertion and superior laryngeal nerve blockade with lignocaine has also been used[4].

.The upper airway has a major role in the defense of the lung. Afferent neural pathways react to invadingnoxious stimuli by reflex cough and/or bronchoconstriction and, in the semi-anaesthetized patient by laryngospasm. Since LMA is a relatively non-invasive airway, it causes only less triggering and interference with lung defenses. LMA does not impede the mucociliary clearance like ETT. 25% of the total airway resistance is contributed by the larynx. Since LMA bypasses the narrowed laryngopharyngeal space, it provides an unobstructed low resistance airway. The work of breathing is also significantly reduced. There isless laryngeal damage while using LMA as it does not involve laryngeal penetration.

Reflex responses to many mechanical and chemical stimuli are mediated by the superior laryngeal nervewhich lead to sympathetic stimulation and rise in blood pressure and tachycardia. LMA rises the heart rate andthe BP only by 0-20% as compared to 20 to 50% by the endotracheal tube. This is due to the avoidance of anterior structures like epiglottis on insertion and the lack of laryngeal instrumentation. The postoperative analgesic requirement is also less compared to ETT due to less central sensitization. It is therefore advantageous in patients with hypertension and acute cerebrovascular disease

Propofol is the most popular induction agent for LMA insertion as this agent obtunds oropharyngeal reflexes, suppresses cough reflex, and decreases the sensitivity of upper airway. For LMA insertion, use of only propofol as the sole induction agent has less success rate. A variety of supplementary drugs like midazolam, lignocaine, fentanyl and succinylcholine are used to facilitate LMA insertion[5].

OBJECTIVES OF THE STUDY:

Primary Objective:

To compare the ease of insertion of LMA using intravenous lignocaine v/s topical lignocaine, based on the incidence of gagging, coughing and laryngospasm during LMA insertion.

Secondary objective:

To compare the hemodynamic responses to LMA insertion using IV lignocaine v/s topical lignocaine- heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure.

REVIEW OF LITERATURE:

Engidawork Belete et al, compared the induction of anesthesia for LMA insertion on 84 patients. One group received induction with IV thiopentone combined with 40mg 10% lidocaine spray on the airway and the other group received induction with only IV propofol. Patients were observed for changes in hemodynamic parameters during induction time, apnea time, and LMA insertion condition based on gagging, coughing, jaw relaxation, patient movement, number of attempts to LMA insertion, and laryngeal spasm at 1^{st}, 5^{th} and 10^{th}

min after the insertion of the LMA. The study showed that there was no significant difference in the heart rate and LMA insertion conditions in both the groups but the mean arterial pressure was significantly low in the propofol group for the first 10 minutes[6].

Ahmed S et al, studies LMA insertion conditions on 60 patients of age group 16-45 years of both sexes, American society of anesthesiologists (ASA) grade 1 and 2 undergoing elective surgeries were randomized into 2 groups, 30 in each group. Group 1-patients received IV lignocaine 1.5mg/kg over 30 seconds and group 2- patients receiving lignocaine aerosol 40mg topically (4 sprays of lignocaine, 10% spray, were used 3 minutes prior to injection propofol at interval of 30 seconds each) to the posterior pharyngeal wall. Both groups received injection propofol 2mg/kg IV following administration of lignocaine. LMA was inserted 30 seconds after propofol injection and conditions for LMA insertion (based on incidence of gagging, coughing and laryngospasm) and vital parameters were recorded. The study concluded that topical lignocaine provides better LMA insertion conditions as compared to intravenous lignocaine but hemodynamic stability remains same with topical as well as intravenous lignocaine[5].

Hee Jung Baik et al, compared laryngeal mask airway insertion conditions in 80 adult patients. Anaesthesia induction was done with propofol target controlled infusion at a target plasma concentration of 6mcg/ml. The lidocaine group received 1.5mg/kg of IV lidocaine 50 seconds after starting target-controlled infusion and the control group received an equivalent volume of saline. Laryngeal mask airway insertion conditions (mouth opening, gagging, coughing, movements, laryngospasm, overall ease of insertion, and hiccups) were noted, and haemodynamic responses were recorded for 3 min after laryngeal mask airway insertion. The study showed that there were no significant haemodynamic differences in both the groups but the lidocaine group showed lower incidences of coughing (5 vs. 22.5%), gagging (25 vs. 55%), and laryngospasm (2.5 vs. 17.5%)($P<0.05$)[7].

Changchien et al, compared three groups. Group 2PL received four sprays of topical lignocaine (40 mg) over

the posterior pharyngeal wall followed by propofol 2mg/kg. Group 2P received four sprays of 0.9% normal saline followed by propofol 2 mg/kg and Group 3P received four sprays of 0.9% normal saline followed by propofol 3mg/kg. The frequency of optimal insertion conditions and side effects were recorded. Occurrence of coughing, gagging, laryngospasm, or body movement were also recorded. Study demonstrated that the frequency of optimal LMA insertion conditions achieved by the combination of propofol 2 mg/kg and topical lidocaine 40 mg was comparable to that achieved using propofol 3 mg/kg alone, with greater hemodynamic stability and a lower incidence of apnea[8].

Jae-Hyon Bahk in 2002, compared propofol vs ketamine and lignocaine spray for induction in 90 children aged 3 to 12years. After injection of the designated drug; self-respiration, laryngospasm, coughing, gagging, swallowing, biting or tongue movements, secretions, and head or limb movements after LMA insertion were graded as satisfactory, acceptable or unsatisfactory. Ketamine group achieved overall satisfactory or acceptable results but none in the propofol group achieved satisfactory results. Thus, the study concluded that premedication with lidocaine spray with ketamine is a better induction technique compared to propofol alone[9].

Geetha Bhandari et al, compared IV lignocaine 1.5mg/kg vs topical lignocaine 10% spray 4 sprays (10 mg/spray, 40mg) on the posterior pharyngeal wall, 30 seconds and 3 minutes respectively prior to induction with Inj. thiopentone 5mg/kg. The LMA insertion conditions (based on incidence of gagging and coughing) and hemodynamic parameters were observed. The LMA insertion conditions were significantly better in the topical group with fewer incidences of gagging and coughing. The number of attempts to pass the LMA and the hemodynamic parameters were similar in both the groups. The study concluded that the topical lignocaine provided better LMA insertion conditions than IV lignocaine[1].

T.M. Cook, compared conditions for insertion of a laryngeal mask airway in 90 adult patients. Patients received either lignocaine 0.5 mg/kg intravenously or 1.5 mg/kg intravenously or 40mg of topical lignocainespray to

the posterior pharyngeal wall. Each patient received fentanyl 1 mcg/kg and thiopentone **5** mg/kg over 30 seconds. Conditions for laryngeal mask airway insertion were recorded - the presence or absence of laryngospasm and coughing, graded any degree of gagging that occurred and measured the length of time that the patient was apneic. The group that received topical lignocaine had a lower incidence of laryngospasm, required fewer attempts for successful insertion of the laryngeal mask and, coughed or gagged less frequently than either group receiving lignocaine intravenously. There were no significant differences in hemodynamic response and apnea between the three groups. The study concluded that topical lignocaine spray prior to thiopentone provides conditions for insertion of a laryngeal mask that are superior to those provided by lignocaine and thiopentone administered intravenously[10].

C.R.Seavell, compared conditions for insertion of a laryngeal mask airway following either propofol 2.5mg/kgor thiopentone 5mg/kg with 40mg of lignocaine spray. There were no significant differences between the two groups with regard to the incidence of gagging, coughing and laryngospasm, but the apnea time was significantly less in the thiopentone group. The decrease in systolic and diastolic blood pressure, following induction and the insertion of a laryngeal mask was greater in the propofol group. The study demonstrated that thiopentone preceded by topical lignocaine spray provides conditions for insertion of a laryngeal mask equal to those of propofol, with more hemodynamic stability and a shorter period of apnea[11]

M.D Stoneham et al, studied the effects of pretreatment with IV lignocaine 1.5mg/kg vs Normal salin on the insertion of the laryngeal mask airway. Induction of anesthesia was achieved with propofol given. The study showed that coughing, airway obstruction and the incidence of failure of insertion requiring deepening of anesthesia were significantly reduced by pretreatment with lignocaine[4].

METHODOLOGY:

Place of study: St John's Medical College and Hospital,

Bangalore

Study period: 2 years

Adult patients aged 20-50 years belonging to either sex with ASA Grade 1 or 2, undergoing surgeries in whom LMA was the airway of choice were included in the study. Pregnant women, Obese patients (BMI more the 30) and patients with risk of aspiration were excluded.

Patients were randomly allocated into one of the 2 groups by sealed envelope technique.

Methodology:

Type of study: Randomized controlled trial.

Sample size estimation: Required sample size was calculated with mean ± SD. Assuming 75% patients in Group A and 98% patients in Group B will fall into the excellent to good LMA insertion condition with 80% power and 5% level of significance, the number of subjects required in each group was 50, which made a total sample size of 100 (based on the study conducted by Ahmed S et al -Comparative evaluation of topical and intravenous lignocaine for insertion of laryngeal mask airway with propofol).

The CTRI registration number for the study is **CTRI/2020/07/026636**. After obtaining clearance from the **institutional ethical committee (IEC study reference no: 322/2019)** on **8/11/2019**, 100 patients belonging to ASA grade 1 or 2 of age group 20-50 years who were posted for elective surgeries for whom LMA was the airway of choice were included in the study after getting an informed written consent from the patient. The patients were kept nil per oral -6 hours for solids and 2 hours for clear liquids, prior to surgery. In the operating room, standard anesthesia monitors ECG, NIBP, SPO2 and $EtCO_2$ were connected. Intravenous access was secured. All patients were premedicated with glycopyrrolate 10 mcg/kg, ondansetron 0.1mg/kg and midazolam 0.02mg/kg administered intravenously. Induction was done with injection fentanyl 2mcg/kg IV and injection propofol 2 mg/kg IV.

In group A after preoxygenation with 100% oxygen for 3 minutes and premedication, IV fentanyl 2 mcg/kg was administered. Lignocaine 1.5mg/kg was administered intravenously 90 seconds prior to LMA insertion. Induction was done with IV propofol 2 mg/kg. Classic LMA of appropriate size (size 3 or 4) was inserted using standard technique by an anesthesiologist with 2 years of experience and cuff was inflated according to standard guidelines.

In Group B after pre-oxygenation with 100% oxygen for 3 minutes and premedication, IV fentanyl 2 mcg/kg was administered. Lignocaine aerosol was sprayed to posterior pharyngeal wall, and its either side

(total 4 sprays, 10% spray, 10mg/spray, at an interval of 30 seconds). First spray was administered 3 minutes prior to induction with 2mg/kg of propofol IV and the subsequent 3 sprays at an interval of 30

seconds. Classic LMA of appropriate size (size 3 or 4) was inserted using standard technique by an anesthesiologist with 2 years of experience and cuff was inflated according to standard guidelines.

Conditions for LMA insertion and vital parameters were recorded.

The primary objective was to compare the ease of insertion of LMA among the two groups. The secondary objective was to compare the hemodynamic responses following LMA insertion in both the groups.

Table 3: Comparing ease of insertion of LMA

Conditions of LMA insertion	Gagging	Laryngospasm	Coughing
Excellent	Grade 0/1	None	None
Good	Grade 2	None	None
Poor	Grade 2	None	Present
Unacceptable	Grade 3	Present	Present

Grades of gagging:

Grade 0- No Gagging

Grade 1- Gagging settled within 30 seconds.

Grade 2-A further dose of induction agent was required

Grade3 -Suxamethonium was required.

Laryngospasm was defined as the presence of stridor or other evidence of upper airway obstruction that subsides with deepening of anesthesia.

Vital parameters:

ECG, SBP, DBP, MAP, SPO2 and $EtCO_2$ were recorded at 1minute interval for the first 5 minutes followed

by 5 minutes interval for next 25 minutes and 15 minutes interval for next 30 minutes.

Patient's lungs were manually ventilated and received volatile agents and air/oxygen for maintenance of anesthesia.

At the end of the surgery all inhalational agents were discontinued and LMA was removed when the patient was fully awake, obeying commands and was breathing adequately.

STATISTICAL ANALYSIS

SAMPLE SIZE ESTIMATION:

Assuming 75% patients in Group A and 98% patients in Group B will fall into the excellent to good grade of ease of LMA insertion with 80% power and 5% level of significance, the number of subjects required in each group was 50, which made a total sample size of 100 (based on the study conducted by Ahmed S et al - Comparative evaluation of topical and intravenous lignocaine for insertion of laryngeal mask airway with propofol[5]).

Statistical Analysis[12]:

Data was entered into Microsoft excel data sheet and was analysed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. **Chi-square test** was used as test of significance for qualitative data.

Continuous data was represented as mean and standard deviation. **Independent t test** was used as test of significance to identify the mean difference between two quantitative variables.

p value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS[13]:

Table 1 demographic data:

	Group	N	Mean	SD	P value	
	Group A	50	32.94	9.853	0.486	

Age (years)	Group B	50	34.28	9.311		

		Group A		Group B		
		Count	%	Count	%	
Gender	Female	26	52.0%	25	50.0%	p = 0.841
	Male	24	48.0%	25	50.0%	

	Group						p value
	Group A		Group B		Total		
	Mean	SD	Mean	SD	Mean	SD	
Height (cms)	164.78	8.47	165.16	7.08	164.97	7.77	0.808
Weight (Kg)	66.88	10.52	66.40	9.73	66.64	10.09	0.813
BMI (Kg/m^2)	24.55	2.66	24.22	2.10	24.39	2.39	0.490

	Group	N	Mean	SD	P value
Duration of surgery (minutes)	Group A	50	61.74	9.300	0.626
	Group B	50	62.60	8.283	

Demographic parameters and duration of surgery were comparable in both the groups.

Heart Rate Variation:

There was an increase in heart during LMA insertion and immediately post LMA insertion, that is, in the third and the fourth minute in both the groups. There was a significant difference in heart rate between the groups at the fourth minute. At the other intervals the difference in the heart rate is not significant.

Table 2: Heart rate distribution comparison between two groups

HR (beats/mt)	Group				P value
	Group A		Group B		
	Mean	SD	Mean	SD	
0 Min	68.98	6.49	71.60	5.41	.031
1 Min	71.66	6.98	71.04	5.60	.625
2 Min	70.10	7.62	69.68	6.64	.770
3 Min	94.20	6.33	92.12	5.61	.085
4 Min	91.26	6.83	86.86	6.28	.001
5 Min	77.68	12.02	80.36	7.68	.187
10 Min	74.56	11.70	74.90	7.64	.864
15 Min	71.18	10.25	71.38	5.87	.905
20 Min	68.84	10.12	68.78	5.30	.970
25 Min	68.14	10.05	68.32	5.38	.911
30 Min	67.44	8.35	68.32	4.18	.507
45 Min	67.36	7.38	68.18	4.68	.509
60 Min	67.41	8.23	67.61	3.86	.899

Systolic Blood Pressure Variation:

There was a significant difference in systolic blood pressure at the 4, 15, 20 and 25 minutes. There was no significant difference in the systolic blood pressure between the two groups during other intervals.

Table 3: SBP distribution comparison between two groups

SBP (mmHg)	Group		P value
	Group A	Group B	

	Mean	SD	Mean	SD	
0 Min	120.92	9.17	122.82	10.03	.325

1 Min	112.06	9.82	110.26	9.58	.356
2 Min	103.36	6.82	103.96	8.15	.691
3 Min	103.36	10.36	102.22	5.81	.499
4 Min	109.12	17.12	102.12	11.46	.018*
5 Min	103.68	14.76	101.76	11.14	.465
10 Min	95.76	15.97	100.48	7.33	.060
15 Min	94.80	6.06	98.54	5.84	.002*
20 Min	93.96	6.52	98.10	7.97	.005*
25 Min	95.18	6.94	98.66	8.65	.029*
30 Min	95.90	6.96	97.72	8.52	.245
45 Min	96.08	7.52	97.10	7.75	.506
60 Min	96.23	6.99	98.23	8.32	.304

Diastolic Blood Pressure Variation:

There was significant difference in the diastolic blood pressure between the two groups at 3, 4 and 5 minutes.

There was no significant difference in the DBP distribution between the two groups at other time intervals.

Table 4: DBP distribution comparison between two groups

DBP (mmHg)	Group				P value
	Group A		Group B		
	Mean	SD	Mean	SD	
0 Min	70.66	4.83	70.64	4.83	0.984
1 Min	65.34	6.74	63.10	6.05	0.084
2 Min	60.68	4.61	59.02	5.43	0.102
3 Min	60.50	6.45	57.14	5.59	0.006*

4 Min	63.04	9.83	56.44	7.55	<0.001*
5 Min	60.04	8.06	56.68	7.61	0.035*

10 Min	55.98	6.71	54.92	9.36	0.517
15 Min	53.74	4.27	54.08	4.76	0.708
20 Min	54.22	4.12	54.62	6.41	0.711
25 Min	55.16	4.66	54.74	5.81	0.691
30 Min	55.92	4.64	54.66	5.70	0.228
45 Min	55.82	4.57	53.08	5.16	0.006*
60 Min	55.50	4.60	53.20	8.32	0.183

Mean Arterial Pressure Variation:

There was a significant difference in the MAP distribution between the two groups at 1, 2, 3, 4 and 5 minutes. There was no significant difference in the MAP distribution between the two groups during other time intervals.

Table 5: MAP distribution comparison between two groups

MAP (mmHg)	Group				P value
	Group A		Group B		
	Mean	SD	Mean	SD	
0 Min	87.06	5.57	86.29	5.93	0.507
1 Min	81.06	7.18	77.25	6.87	0.008*
2 Min	75.40	4.70	72.50	5.60	0.006*
3 Min	74.62	7.45	70.66	5.10	0.003*
4 Min	78.08	12.25	70.14	8.40	<0.001*
5 Min	74.52	10.28	70.20	8.32	0.023*

10 Min	70.08	7.44	68.59	7.91	0.334

15 Min	66.92	4.39	67.42	4.35	0.570
20 Min	67.08	4.53	67.66	6.46	0.602
25 Min	68.06	4.99	67.92	6.36	0.900
30 Min	68.94	4.75	67.58	6.28	0.224
45 Min	68.96	4.99	66.29	5.57	0.013*
60 Min	68.86	4.81	66.72	7.44	0.187

$EtCO_2$ and SPO_2 Variation:

There was no significant difference in $EtCO_2$ and SPO_2 distribution between the groups during the study.

Comparison Between Size of LMA Used Between The Groups:

Ease of LMA insertion:

The ease of LMA insertion was graded based on the incidence of gagging, coughing and laryngospasm during LMA insertion. The grading scale was derived from the study conducted by Ahmed et al.

a) Comparison of incidence of gagging(5)**:**

In group A, 50% (n=25) of the patients had no gagging and 50% (n=25) of the patients had grade 2 gagging, that is, a further dose of induction agent was required to settle the gagging.

In group B, 60% of the patients had no gagging and 40% of the patients had grade 2 gagging.

b) Comparison of incidence cough:

In group A, 70% (n=35) of the patients had no incidence of cough and 30% (n=15) of the patients had cough on attempt to insert LMA.

In group B, 90% (n=45) of the patients had no incidence of cough and 10% (n=5) of the patients had cough on attempt to insert the LMA.

c) Comparison of incidence of laryngospasm:

None of the patients in the study had laryngospasm on attempt to insert LMA.

Based on the above observations, in group A, in 50% of subjects (n=25) the grade of ease of LMA insertion was excellent, in 20% (n=10) of subjects the grade of ease of LMA insertion was good and in 30% (n=15) of subjects the grade of ease of LMA insertion was poor. Whereas, in group B, the grade of ease of insertion of LMA insertion was excellent in 60% (n=30), good in 30% (n=15) and poor in 10% (n=5) of subjects. The p value is 0.04. There is a significant difference between both the groups with respect to ease of LMA insertion.

Table 6: Ease of insertion of LMA comparison between two groups:

		Group			
		Group A		Group B	
		Count	%	Count	%
LMA insertion conditions	Excellent	25	50.0%	30	60.0%
	Good	10	20.0%	15	30.0%
	Poor	15	30.0%	5	10.0%
	Total	50	100.0%	50	100.0%

$\chi 2 = 6.455$, df =2, p = 0.04*

DISCUSSION:

The increasing demand for day care anaesthesia has led to an increasing use of laryngeal mask airway[14]. It gives a hands-free experience for the anaesthesiologist compared to the face mask and creates only less pressor response compared to endotracheal tube. LMA does not require muscle relaxation for its insertion and

avoids complications associated with it. Successful insertion of LMA requires suppression of the airway

reflexes. This can also suppress the hemodynamic changes that occur during LMA insertion. The most commonly used induction agent for insertion of LMA is propofol as it obtunds the oropharyngeal reflexes[5].

We conducted this study to compare the ease of LMA insertion when propofol is combined with IV lignocaine v/s topical lignocaine spray, and also to compare the hemodynamic changes during LMA insertion when propofol is combined with IV lignocaine v/s topical lignocaine spray.

The groups were homogenous with respect to age, sex, height, weight, BMI, ASA physical status, type of LMA and duration of surgery.

In this study we noticed a significant difference in ease of insertion of LMA among the two groups. The insertion of LMA was easier in the group in which topical lignocaine was sprayed to the posterior pharyngeal wall and its either side (group B) prior to LMA insertion. Similar results were found in the studies done by Geetha Bhandari, Ahmed, Cook and Changchien[1,5,8,10].

In our study, the results were comparable to the previous studies which showed that successful insertion of LMA was provided by topical airway anaesthesia and the conditions of LMA insertion were better with topical lignocaine compared to IV lignocaine. This is explained by complete suppression of airway reflexes by topical anesthesia of airway by lignocaine spray. Intravenous lignocaine is also known to suppress the airway reflexes and is dose dependent. The suggested mechanism of action is a depressant effect of intravenous lignocaine on the CNS as suggested by a rapid equilibration of local anesthetics between blood and brain. This effect is similar to increasing the depth of anaesthesia. The airway reflexes like cough reflex get suppressed at a plasma lignocaine concentration of more than 3mcg/ml as proven by study conducted by T. Nishino et al[15].

The study conducted by T.M Cook et al, showed that the even when IV lignocaine dose is increased from 0.5 mg/kg to 1.5 mg/kg, the LMA insertion conditions provided are inferior to that provided by topical lignocaine[10]. Our study showed similar results.

The secondary objective of our study was to compare the hemodynamic responses to LMA insertion with IV lignocaine and topical lignocaine. The hemodynamic parameters – HR, SBP, DBP, MAP, SPO_2 and

$EtCO_2$ were observed from the baseline upto 60 minutes. The LMA was inserted at 3^{rd} or 4^{th}minute from beginning of anaesthesia. For the initial 5 minutes these parameters were recorded every minute and thereafter

every 5 minutes for 25 minutes and every 15 minutes for the next 30 minutes. Taking each variable into consideration, the heart rate showed a significant difference only at 4^{th} minute from the beginning of anaesthesia (significantly more in IV lignocaine group)

SBP showed a significant difference only at 4^{th} minute from the beginning (it is significantly more in IV lignocaine group).

DBP was significantly more in IV lignocaine group at 3^{rd}, 4^{th} and 5^{th} minute from the beginning of anaesthesia.

MAP was significantly high in the IV lignocaine group at 1^{st} to 5^{th} minute from the beginning of anesthesia.

SPO_2 and $EtCO_2$ did not show any clinically significant difference among both the groups.

The heart rate and BP increase by only 0 to 20% when compared to 25 to 50% increase with tracheal intubation[16]. This is due to less noxious stimulus caused by LMA on the airway compared to laryngoscopy. Airway stimulation causes reflex sympathetic activation leading to tachycardia and hypertension.

In a study conducted by Ahmed et al, it was found that IV lignocaine 1.5 mg/kg and topical lignocaine 10% provides same level of hemodynamic stability during LMA insertion using propofol as inducing agent[5]. The increase in HR, SBP, DBP and MAP post LMA insertion were similar in both the groups and p values for these variables were >0.05

A study conducted by Geetha Bhandari et al, also showed that hemodynamic stability was similar using IV lignocaine and topical lignocaine, when combined with thiopentone[1].

In our study, there was a transient increase in HR, SBP, DBP and MAP lasting maximum for up to 5minutes from the beginning of anaesthesia in both the groups. IV lignocaine group showed significantly higher values of these parameters during the initial 5 minutes compared to topical lignocaine group. This can be attributed to the airway stimulation which activated the airway reflexes like gagging and coughing, which

would also have activated the sympathetic nervous system causing tachycardia and hypertension. It is observed that the tachycardia and hypertension is seen only during the initial 5 minutes. This coincides with the time of LMA insertion and possible airway stimulation.

SPO_2 did not show a significant difference among both the groups. This can be attributed to the observation that there was no significant period of apnea that led to an arterial saturation fall. Also, the patients were preoxygenated for 3minutes that would have prolonged the apnea time. There was no incidence of laryngospasm in both the groups which would have led to arterial saturation fall.

Thus, the hemodynamic changes were only transient in both groups and were slightly higher in IV lignocaine group which can be attributed to inadequate depth of anaesthesia provided by IV lignocaine during LMA insertion, whereas in topical lignocaine group the airway reflexes were completely obtunded and there was much lesser airway stimulation.

In our study, we found that the ease of insertion of LMA was better with topical lignocaine as the incidence of gagging and coughing was significantly lower in topical lignocaine group. Also, the hemodynamic responses to LMA insertion was lower with topical lignocaine. Therefore, we have suggested that, topical anaesthesia to the airway with 10% lignocaine prior to LMA insertion, to be included as our institutional protocol.

SUMMARY AND CONCLUSION:

Type of study: Randomized controlled trial

Place of study: St Johns Medical College And Hospital, Bangalore

Study period: November 2019 to November 2021.

Randomization: Sealed envelope method

Methodology: 100 patients of ASA 1 and 2 physical status of age group 20 to 50 years who underwent various elective surgical procedures was the study population. They were allocated into two groups of 50 each by randomization by sealed envelope method. The patients were kept NPO according to standard NPO guidelines. All patients were premedicated with glycopyrrolate 10 mcg/kg, ondansetron 0.1mg/kg and midazolam 0.02mg/kg administered intravenously. Induction was done with injection propofol 2mg/kg IV. In group A,

after preoxygenation with 100% oxygen for 3 minutes and premedication, IV fentanyl 2mcg/kg was administered. Lignocaine 1.5mg/kg was administered intravenously 90 seconds prior to LMA insertion.

Induction was done with IV propofol 2mg/kg. Classic LMA of appropriate size was inserted using standard technique by an anesthesiologist with 2 years of experience and cuff was inflated according to the standard guidelines. In Group B, after pre-oxygenation with 100% oxygen for 3 minutes and premedication, IV fentanyl 2mcg/kg was administered. Lignocaine aerosol 10% was sprayed to posterior pharyngeal wall and its either side 3 minutes prior induction with 2mg/kg of propofol. Classic LMA of appropriate size was inserted using standard technique by an anesthesiologist with 2 years of experience and cuff was inflated according to the standard guidelines. The conditions for LMA insertion were recorded based on incidence of gagging, coughing and laryngospasm. Hemodynamic parameters- HR, SBP, DBP, SPO_2 and $EtCO_2$ were recorded every 1 minute for initial 5 minutes and thereafter every 5 minutes up to 30 minutes and at every 15 minutes interval for next 30 minutes.

Results: In our study both the groups were comparable with respect to age, gender and weight. The incidence of coughing and gagging were more in IV lignocaine group. Overall, the ease of LMA insertion was better in topical lignocaine group and is statistically significant (p value=0.04). HR, SBP, DBP and MAP increased transiently in both the groups. The HR, SBP, DBP and MAP showed a significant increase in IV lignocaine group compared to the topical lignocaine group. $EtCO_2$ also showed a significant increase in IV lignocaine group immediately after LMA insertion. SPO_2 did not show significant difference in both the groups.

Conclusion: To conclude, our study showed that ease of insertion of LMA is more on application of topical lignocaine spray to the posterior pharyngeal wall and it's either side compared to IV lignocaine, prior to induction with propofol. There was a significant but transient rise in hemodynamic parameters in the IV lignocaine group compared to topical lignocaine group during and immediately after LMA insertion.

CONCLUSION:

1. The ease of insertion of LMA was better with topical lignocaine compared to intravenous lignocaine
2. Hemodynamic responses to LMA insertion were transient in both the groups, that is, lasted for only

the initial 5 minutes from the beginning of anaesthesia.

3. Hypertension and tachycardia were more in IV lignocaine group during and immediately after LMA insertion.

4. We recommend that, topical anaesthesia of the airway using 10% lignocaine spray prior to LMA insertion, to be included in our institutional protocol.

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