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Original Research Article

Comparison of Dexmedetomidine – Propofol and Clonidine – Propofol for ease of Insertion of Laryngeal Mask Airway

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Abstract: It is a common practice to use a Laryngeal mask for administration of anaesthetic and ventilation gases to patients. It has advantages over endotracheal tubes which are longer and seal the trachea below the vocal folds. However sometimes laryngeal mask airways can cause trauma to laryngeal walls. The aim is to compare the efficacy of Dexmedetomidine – Propofol combination and Clonidine – Propofol combination for LMA insertion in terms of Ease of insertion and Haemodynamic responses to LMA insertion. The study was conducted in MGM Hospital 60 patients aged between 20 and 50 years belonging to ASA I-II category with MPG grade I and II who were scheduled for short elective surgeries. Patients were divided into 2 groups randomly: Dp (Dexmedetomidine) or Cp (Clonidine) with 30 patients in each group. After pre-oxygenation for 3 minutes with 100% O_2 on mask, group Dp received 1µg/kg dexmedetomidine and group Cp received 1µg/kg of Clonidine diluted in 10ml normal saline respectively, i.v over 10 minutes. Thirty seconds later, patients were induced with intravenous injection of propofol 2.5mg/kg mixed with 1 ml of 2% lignocaine. 90 sec after propofol bolus, first attempt at insertion of LMA was made. If required, further increments of propofol 0.5mg/kg I.V were given every 30 seconds till loss of consciousness and loss of eyelash reflex. After insertion, cuff was inflated with recommended volume of air, and patient connected to breathing circuit. On comparing Post LMA, 1 min, 2mins, 3 mins mean heart rate to Pre LMA mean heart rate, in dexmedetomidine group there was not statistically significant difference ($p > 0.05$). We found a statistically better jaw relaxation in dexmedetomidine group compared to Clonidine group. No patient in dexmedetomidine group had coughing but 6 patients (20%) had grade 2 of coughing and 1 patient (3.33%) had grade 4 of coughing in Clonidine group. 1 patient (3.33%) required two attempts at LMA insertion in dexmedetomidine group and 5 patients (16.67%) in Clonidine group required two attempts at LMA insertion. There was no statistically significant difference between the respiratory rates between both the groups. From our study we came to a conclusion that dexmedetomidine gives better insertion conditions and better attenuation of pressor response to LMA insertion compared to Clonidine in the given doses and that dexmedetomidine can be used with an advantage for LMA insertions in short surgical procedures.
Keywords: Dexmedetomidine/Propofol, Clonidine/Propofol, Insertion of Laryngeal Mask Airway.

INTRODUCTION

The Laryngeal Mask Airway [LMA] has gained wide spread popularity for airway management during surgeries. The Laryngeal Mask Airway is an ingenious supraglottic airway device that is designed to provide and maintain a seal around the laryngeal inlet for spontaneous ventilation and allow controlled ventilation at modest levels (<15cms of H_2O) of positive pressure [1] LMA has been used in millions of patients and is accepted as a safe technique, in variety of surgical procedures. [2] It ensures a better control of airway than the facemask, leaving the anaesthetists hands free and avoids the disadvantages of endotracheal tube like pressor response during intubation and sore throat, croup, hoarseness postoperatively. Laryngeal mask also provides an effective and simple solution to many problems of difficult intubation. With use of LMA, muscle relaxation is unnecessary, laryngoscopy is avoided and hemodymanic changes are minimized during insertion[2]. LMA insertion requires adequate mouth opening, minimal upper airway reflexes such as coughing, gagging or laryngospasm. Intravenous

propofol has been preferred for LMA insertion because of its potential suppressor effects on upper airway reflexes. [2] When used alone without premedication, propofol provides conditions for LMA insertion that is far from satisfactory and causes cardio respiratory depression**.** [3] Dexmedetomidine, a selective alpha-2 adrenoceptor agonist has anaesthetic and analgesic effects in addition to its sedative effects. When dexmedetomidine is used perioperatively, the dose of propofol for induction and maintenance are significantly reduced**.** [4] Clonidine, an alpha-2 adrenergic agonist, produces sedation by decreasing the sympathetic nervous system activity and the level of arousal. Studies have shown that oral clonidine premedication reduces propofol requirement for LMA insertion. [5] This study was undertaken to compare the effects of intravenous dexmedetomidine and intravenous clonidine as adjuvants on ease of insertion of LMA, when used before induction agent propofol.

MATERIALS AND METHODS

The study was initiated after obtaining permission from the Institutional Ethics Committee. It was a prospective, randomized, double blind comparative study carried out in 60 patients aged between 20 and 50 years belonging to ASA I-II category with MPC grade I and II who were scheduled for short elective surgeries. Patients with asthma, respiratory or oropharyngeal tract pathology or those on anti-hypertensive drugs like β-blockers and calcium channel blockers, patients with risk of aspiration like full stomach, hiatus hernia, pregnancy, patients with known drug allergy were excluded from the study.

We divided patients into 2 groups: Dp (dexmedetomidine) or Cp (Clonidine) with 30 patients in each group. Randomization was done by random table method (computer generated randomization table); random sequence was generated by random allocation software. On arrival in operating room, monitoring with electrocardiogram (ECG), pulse-oximeter, Non-Invasive Blood Pressure (NIBP) was started. After securing I.V line, infusion of Ringer lactate (RL) was started at the rate of 10ml/kg. Patients were premedicated with Inj. Ranitidine 1mg/kg I.V, Inj. Ondansetron 0.1mg/kg I.V, Inj. Midazolam 0.03mg/kg I.V, and Inj. Glycopyrrolate 0.004mg/kg I.V.

After pre oxygenation for 3 minutes with 100% O_2 on mask, group Dp received 1µg/kg dexmedetomidine and group Cp received 1µg/kg of Clonidine diluted in 10ml normal saline respectively, I.V over 10 minutes. Thirty seconds later, patients were induced with intravenous injection of propofol 2.5mg/kg mixed with 1 ml of 2% lignocaine. 90 sec after propofol bolus, first attempt at insertion of LMA was made. If required, further increments of propofol 0.5mg/kg I.V were given every 30 seconds till loss of consciousness and loss of eyelash reflex. After insertion, cuff was inflated with recommended volume of air, and patient connected to breathing circuit. Patients were kept on spontaneous ventilation. If the attempt was unsuccessful, patients received additional bolus dose of propofol 0.5mg/kg I.V. Insertion was planned to be tried for a maximum of three attempts.

However, the conditions during LMA insertion were graded only during first attempt. All the LMA insertions in patients were done by single person involved in the study. Jaw was opened using scissoring technique with left hand and LMA was inserted using Classical insertion technique. Insertion was confirmed by the appearance of End tidal CO_2 ($EtCO_2$) waveform and by five point auscultation. Patients were monitored for hemodynamic responses like heart rate (HR), blood pressure (BP), respiratory rate (RR), at following time intervals: baseline, just after administering the study drug (Pre-med), immediately before LMA insertion (Pre LMA), 30 seconds after LMA insertion (Post LMA), 1min, 2mins, 3mins, 5mins, 7mins, 10mins after insertion.

In order to monitor conditions for LMA insertion, scoring system, modified from Muzi *et al;* [6] was used as follows:

JAW RELAXATION	
Fully Relaxed	Grade 1
Mild Resistance	Grade 2
Tight but Opens	Grade 3
Closed	Grade 4
COUGHING	
None	Grade 1
One or Two Coughs	Grade 2
Three or More Coughs	Grade 3
Bucking or Movements	Grade 4

In each category scores less than 2 were defined as acceptable for LMA insertion. Sevoflurane was started at a dial concentration of 1 in both the groups 3 minutes after LMA insertion. For maintenance 50% N_2O and sevoflurane in oxygen was used. Sevoflurane concentration was adjusted to maintain hemodynamic parameters within 15% of baseline. Bradycardia defined as heart rate less than 15% of the baseline or less than 50/mins was treated with Inj. Atropine 0.01mg/kg I.V. Hypotension defined

as BP less than 30% of baseline was treated with 3mg aliquots of Inj. Mephenteramine I.V. On completion of surgery, LMA was removed and patients were shifted to Recovery room. Statistical analysis was done by using the SPSS 17.0 version and Graph Pad Prism 5.0 and p< 0.05 is considered as level of significance.

RESULTS

60 adult patients of ASA I and II between the age groups 18-60 years of either sex posted for different surgeries were selected for the study. They were randomly divided into two groups Dp and Cp. Dp denotes patients who received dexmedetomidine and propofol the table 1 shows the age wise distribution of the patients in both groups.

Table 1: Comparison of Age in Both Groups

Age (yrs)	Dexmed Group	Clonidine Group	p-value
21-30 yrs	14 (46.67%)	11 (36.67%)	0.61
31-40 yrs	6 (20%)	7 (23.33%)	0.73
41-50 yrs	10 (33.33%)	12 (40%)	>0.05
Mean ± SD	33.76 ± 10.99	37.13 ± 12.17	

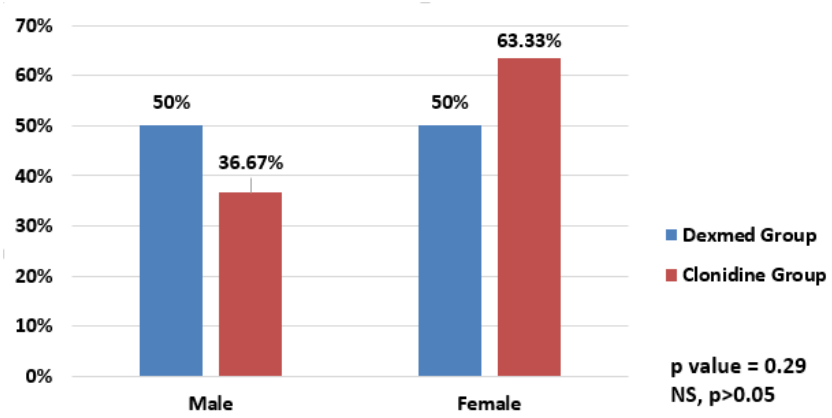

Fig 1: Comparison of Sex Distribution in Both Groups

The mouth opening of the patients were determined in both groups and the mean values of mouth opening in Dexmed group was 2.95 finger widths and Clonidine group was 2.93 finger widths. The MPG grading [Mallampati Grading] to predict the ease of endotracheal intubation was done in both groups and most of the individuals were with Grades I and Grades II given in table 2. The ASA grading was done in all the subjects there were 24(80%) grade I in Dex group and 6(20) were grade II. In clonidine group 26 (86.67%) were as grade I and 4(13.33% were recorded as grade II given in table 2. There is no statistically significant difference in mouth opening MPG grading, ASA grading. The data was comparable in both groups.

Table 2: Comparison of Mouth Opening, MPG Grading and ASA Grading

Mouth Opening	Dexmed Group	Clonidine Group	p-value
2 to ≤ 3Fingers	3 (10%)	4 (13.33%)	0.16
>3 Fingers	27 (90%)	26 (86.67%)	0.68
Mean ± SD	2.95 ± 0.15	2.93 ± 0.17	> 0.05
MPG Grading			
I	21 (70%)	20 (66.67%)	0.07
II	9 (30%)	10 (33.33%)	>0.05
ASA Grading			
I	24 (80%)	26 (86.67%)	0.48
II	6 (20%)	4 (13.33%)	>0.05

We found a statistically better jaw relaxation in dexmedetomidine group compared to Clonidine group. No patient in dexmedetomidine group had coughing but 6 patients (20%) had grade 2 of coughing and 1 patient (3.33%) had grade 4 of coughing in Clonidine group. 1 patient (3.33%) required two attempts at LMA insertion in dexmedetomidine group and 5 patients (16.67%) in Clonidine group required two attempts at LMA insertion. This difference was not statistically significant. (p value = 0.08) see table 3 and table 4.

Table 3: Comparison of Jaw Relaxation in Both the Study Groups

Jaw Relaxation	Dexmed Group	Clonidine Group	p-value
Grade 1	29 (96.67%)	22 (73.33%)	6.53
Grade 2	1 (3.33%)	6 (20%)	0.032
Grade 3	0 (0%)	2 (6.67%)	<0.05*
Grade 4	0 (0%)	0 (0%)	
Total	30 (100%)	30 (100%)	

Table 4: Comparison of Coughing or Movements in Both Study Groups

Coughing or Movements	Dexmed Group	Clonidine Group	
Grade 1	30 (100%)	23 (76.67%)	
Grade 2	0 (0%)	6 (20%)	7.92
Grade 3	0 (0%)	0(0%)	<0.010*
Grade 4	0 (0%)	1 (3.33%)	<0.05*
Total:	**30 (100%)**	**30 (100%)**	

The mean heart rate [see table 5] showed a decreasing trend throughout the study duration in dexmedetomidine group and in Clonidine group compared to baseline. The mean heart rates were comparable between both the study groups throughout the study duration except for the Post LMA phase where the mean heart rate in Clonidine group showed statistically significant rise compared to dexmedetomidine group (p value =0.0006).

Table 5: Comparison of pre LMA Mean Heart Rate to post LMA 1min 2min 3min Mean Heart Rate between the Two Groups

Time	Dexmed Group				Clonidine Group			
	Mean	**SD**	**z- value**	**p-value**	**Mean**	**SD**	**z-value**	**p-value**
Pre LMA	74.20	13.38	-		80.70	17.01	-	-
Post LMA	76.00	14.99	1.45	>0.05	90.70	16.24	7.531	<0.05
1 min	75.80	13.90	1.32	>0.05	82.5	15.87	0.900	>0.05
2 min	76.00	14.31	1.27	>0.05	81.06	15.03	0.193	>0.05
3 min	75.46	12.97	0.93	>0.05	80.03	15.08	0.310	>0.05

The SBP showed a decreasing trend in dexmedetomidine and Clonidine group compared to baseline. Comparing the Pre LMA values to baseline, there is a fall in SBP in both the groups, at insertion however there was a statistically significant rise in SBP in Clonidine group, as against this SBP in dexmedetomidine group showed a lower reading (no rise). After 1 min there was lowering of SBP in both the groups, a statistically significant fall (p value < 0.05) in mean SBP was seen in the Post LMA, 1 min, 2 mins, 3mins compared to the Pre LMA mean SBP in dexmedetomidine group. In Clonidine group statistically significant rise (p value = 0.003) in mean SBP was seen in Post LMA phase compared to the Pre LMA mean SBP, followed by a non-significant change in mean SBP compared to Pre LMA mean SBP in 1min, 2 mins, 3 mins. (p >0.05) There was no statistically significant difference (p value > 0.05) between the mean DBP of the dexmedetomidine and Clonidine group throughout the study duration. There was no statistically significant difference between the respiratory rates between both the groups.

DISCUSSION

LMA has an advantage of being less stimulating than the tracheal intubation [7, 8] and with lesser hemodynamic response to insertion compared to that found during tracheal intubation. [9] Though it has

been shown that insertion of LMA requires lighter anaesthesia than endotracheal intubation [7] inadequate depth of anaesthesia may provoke coughing, gagging, laryngospasm, which may lead to adverse hemodynamic changes. Therefore, optimal conditions for LMA insertion necessitate generous use of anaesthetic agents for induction. Propofol is a known induction agent for insertion of LMA with excellent jaw relaxation and allowed easy insertion of LMA. But is no means ideal as it has been associated with several adverse effects including hypotension, apnoea and pain on injection. Alpha 2 adrenergic mechanism of analgesia has been exploited for more than 100 years. Clonidine, an imidazoline compound is a selective agonist for alpha 2 adrenoreceptors with an alpha 2: alpha 1 selectivity ratio of approximately 220:1. Dexmedtomidine is an newer alpha 2 agonist drug, that has been approved by FDA as an intravenous sedative and analgesic drug in intubated patients in the intensive care settings, its alpha 2: alpha 1 selectivity that is higher than that of clonidine.

Induction of general anaesthesia and LMA insertion are associated with changes in cardiovascular variables due to both the specific effects of the anaesthetic drugs administered perioperatively and the adrenergic state of the patient. The hemodynamic response to LMA insertion is expected to manifest in form of rise in HR and BP. In order to attenuate these responses Clonidine had been used more commonly but now dexmedetomidine is being considered for attenuation of these responses. The study done by Pradeep M.S. *et al;* [10] has shown the decrease in the dose of IV induction agent when clonidine is used as oral premedication. Successful attenuation of the stress response by the drug can be judged by comparing the HR, BP of the patients prior to LMA insertion and after LMA insertion. Hence we studied Clonidine and dexmedetomidine for their effects on the ease of insertion of LMA and the hemodynamic changes associated with LMA insertion. The study done by Higuchi *et al*; [11] have shown reduction in the dose of induction agent propofol when clonidine is used as an oral premedication. It has been found that LMA insertion elicits lesser hemodynamic responses as compared tracheal intubation, Suparto *et al*; [12] compared dexmedetomidine and fentanyl for attenuating sympathetic responses to laryngoscopy and intubation and reported that the mean heart rate was 18% higher than baseline measurements in the fentanyl group 60 seconds post intubation whereas heart rates of the patients in the dexmedetomidine group at 60 seconds post intubation returned slightly lower than baseline values.

We found a significant rise of mean HR in group Cp as compared with group Dp at intubation ($P<0.001$). Our findings for heart rate changes are similar to the study by Uzumcugil. F *et al;* [4] except that we have found a significant rise in post LMA mean HR in Clonidine group. In our study, in Clonidine group we found a significant rise in SBP in the Post LMA phase which was not seen in dexmedetomidine group, though in study by Uzumcugil F *et al;* [4] they found no difference in SBP between dexmedetomidine and fentanyl. Suparto *et al*; [12] found that SBP increased by 40% in the fentanyl group compared to 25%-28% in the dexmedetomidine group. As against the results of this study, there was no rise in blood pressure in dexmedetomidine group in our study. The difference may be due the fact that they studied the drugs for laryngoscopy and intubation.

We found no statistically significant difference in the RR between both the groups. Lawrence *et al*; [13] studied effects of 2µg/kg dexmedetomidine and reported no change in respiratory rate. Uzumcugil F *et al;* [4] found an increase in RR with dexmedetomidine which we also found but the rise was statistically insignificant.

CONCLUSION

From our study we came to a conclusion that dexmedetomidine gives better insertion conditions and better attenuation of pressor response to LMA insertion compared to Clonidine in the given doses and that dexmedetomidine can be used with an advantage for LMA insertions in short surgical procedures.

Conflict of interest: None

Source of support: Nil

Ethical Permission: Obtained

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