Original Research Article

A comparative study of dexmedetomidine with propofol versus propofolalone for insertion of classical laryngeal mask airway

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Abstract

Background: Laryngeal mask is a new concept in airway management. It also obviates need for ventilation in some day care patients. Propofol has been preferred the most because of its potential suppressor effects on upper airway reflexes, but when used alone causes cardiovascular and respiratory depression. Dexmedetomidine shown to diminish airway and circulatory responses during intubation and extubation. **Aim:** To compare the adequacy of anaesthesia provided by propofol in combination with dexmedetomidine with that of propofol alone for insertion of LMA for minor to moderate elective surgical procedures. **Material and Methods:** A total of 60 patients were grouped as - Group I: Received Dexmedetomidine 1 µcgm/kg diluted upto 10cc over 2 mins. followed by Propofol 2 mg/kg and Group II: Received normal saline 10cc over 2 mins. followed by Propofol 2 mg/kg. Haemodynamic changes, ease of insertion of LMA was graded and any intraoperative complications were noted. **Results:** There was marked increase in HR, SBP, DBP, MAP throughout the study period following the LMA insertion in the group II (Propofol only group). There was decrease in HR, SBP, DBP, MAP throughout the study period following the LMA insertion in group I (dexmedetomidine with propofol group). No significant bradycardia or hypotension were found in both the groups. **Conclusion:** Intravenous dexmedetomidine given prior to propofol causes better maintenance of haemodynamic parameter as when compared with normal saline +propofol group. This technique will definitely add to the safety of anaesthetic management of patients who are at increased risk of harmful effects of stress response.

Key Word: Laryngeal mask airway, Dexmedetomidine, propofol, ease of insertion, hemodynamics, complications.

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INTRODUCTION

Laryngeal mask is a new concept in airway management. Laryngeal mask airway (LMA) is a supraglottic airway an alternative to both face mask[1] and endotracheal tube[2]supraglottic devices which have less stress response. LMA also obviates need for ventilation in some day care patients. Propofol has been preferred the most because of its potential suppressor effects on upper airway reflexes, but when used alone causes cardiovascular and respiratory depression.[3,4] So along with propofol shortnarcotic analgesic drugs like fentanyl and remifentanyl were used for insertion of LMA, unfortunately, these medications increased the incidence and duration of adrenoreceptor agonist has been shown to have sedative and analegesic properties.[5-7] Dexmedetomidine shown to diminish airway and circulatory responses during intubation and extubation.[8-10] The current study was conducted to compare the adequacy of anaesthesia provided by propofol in combination with dexmedetomidine with that of propofol alone for insertion of LMA for minor to moderate elective surgical procedures.

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MATERIAL AND METHODS

This prospective, double blind, randomized, single centre study included 60 patients. Informed written consent of patient was taken. After complete preanaesthetic evaluation all patients were divided in two groups. **Group I:** Received Dexmedetomidine 1 µcgm/kg diluted upto 10cc over 2 mins. followed by Propofol 2 mg/kg **Group II:** Received normal saline 10cc over 2 mins. followed by Propofol 2 mg/kg

Selection of cases: Patients under the study were undergo through preanaesthetic evaluation including detailed history, clinical examination and necessary investigations depending on age, sex, disease of patient. Preoperative preparation included a period of overnight fasting.

Inclusion criteria

1. Elective surgeries
2. Age 20-65 years
3. ASA grade I, II and III

Exclusion criteria

1. ASA grade IV and V
2. Age > 65 yrs.
3. Obese patient BMI > 30
4. Patient with obstructive lung disease, full stomach, patient with risk of aspiration, undergoing oral surgeries.

Technique: Patients were kept nil per oral for 6 hrs before surgery. Xylocaine sensitivity test (XST) was done. On arrival in the anaesthetic room, heart rate, oxygen saturation and non-invasive blood pressure monitoring was instituted.

Premedication: All patients of both Groups were pre medicated with Inj. Ranitidine 1mg/kg and Inj. Metoclorpomide 0.2mg/kg body weight intravenously. Inj. Glycopyrrolate 0.004mg/kg body weight will be given intravenously 20 minutes before IV premedication. All patients were preoxyganated with 100% oxygen for Five minutes. 90 seconds prior to induction. Anaesthesia was induced with Inj. Propofol 2.0mg/kg body weight intravenously. Appropriate size of LMA will be inserted. Cuff of LMA was inflated and LMA was connected to Bain's circuit for controlled ventilation. Patients were paralyzed with Inj. Vecuronium 0.08mg/kg body weight. Anaesthesia was maintained on oxygen and nitrous oxide 50-50% and Isoflurane 0.8-1%. Haemo dynamic changes, ease of insertion of LMA was graded[11] and any intraoperative complications such as airway obstruction, regurgitation and laryngospasm or postoperative complications such as dysphagia, Hoarseness of voice and sore throat, hypotension, bradycardia if occurred were noted. After surgery, neuromuscular block was antagonize and with neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg). LMA was removed after deflating the cuff when the patient regained consciousness and protective airway reflexes. In the postoperative period, patients were asked about post op complications like sore throat. Dysphagia, hoarsness of voice within 24 hrs. and postoperative recovery of patient were observed with the help of modified alderete score.

Statistical analysis: All the above recorded observations were compared statistically and the results were analysed and concluded. Quantitative data was analyzed by student't' test and qualitative data was analysed by Chi-square test.

RESULTS

The mean age in group I was 36.16±9.86 and in group II was 33.83±10.22. p value is 0.3725. By conventional criteria, this difference is considered to be not statistically significant. Females predominated in both groups and are comparable in both groups. Sex distribution in both groups compared using chi square test.

Table 1:

Patient characteristics	Group I	Group II	P value
Age			0.3725
Mean	36.1667	33.83	>0.005
SD	9.86	10.22	Not significant
Sex			0.1770
Male	08	13	>0.005
Female	22	17	Not significant
Procedures			
Fibroadenoma excision	13	08	
Lipoma excision	06	07	--
Cyst excision	04	06	
Lumpectomy	03	05	
Upper limb debridement	04	04	

Table 2 shows the number of patients and their percentage which were divided in four groups. Grade I (Excellent) includes jaw is fully relaxed, no coughing, no laryngospasm with single attempt of insertion. Grade II (Good) includes

jaw mobility present but with someresistance felt with one or two coughing episode and no laryngospasm. Grade III (Poor) includes jaw is tight but mouth can open, cough is equal to 2 episodes, no laryngospasm and more than two attempts for LMA insertion. Grade IV (unacceptable) jaw cannot open, mouth opens with requirement of muscle relaxing coughing more than two episodes and laryngospasm may present. There were 23 patients in group I and 21 patients in group II in grade I category (excellent) 7 patients from group I and 9 patients from group II were in grade II (good). No patients were in grade III (poor) and grade IV (unacceptable) category.

Table 2: Grades of Ease of Insertion of LMA

Grades	Group I	Group II	P value
I (Excellent)	23	21	
II (Good)	7	9	
III (Poor)	0	0	0.56192
IV (Unacceptable)	0	0	
Total	**30**	**30**	

Baseline heart rate were comparable in both groups as p value = 0.409. After LMA insertion there was significant increase in heart rate in group II (p value < 0.001). This increase in the heart rate was persistent at 5 and 10 minutes after LMA insertion. No such increase in the heart rate was seen in group I patients.

Table 3: Changes in PR at Various Term Periods

Pulse rate	Group I	Group II	P value	Inference
Pre-operative (Baseline)	79.93±8.09	81.86±9.91	0.409	NS
After Premedication	82.46±8.14	81.96±9.37	0.0058	NS
After Induction	76.1±7.29	85.26±8.50	0.0001	S
After LMA Insertion	73.2±6.95	87.1±8.51	0.0001	S
After 10 min (Intraop)	72.33±6.81	86.36±8.75	0.0001	S
After 20 min (Intraop)	71.63±6.69	87.26±8.78	0.0001	S
After 30 min (Intraop)	70.93±6.48	87.13±8.41	0.0001	S
After 40 min (Intraop)	73.44±4.79	87.81±9.31	0.0003	S
After 50 min (Intraop)	72.5±6.36	85±2.64	0.048	S
Immediately after removal of LMA	72.63±7.4	87.4±8.54	0.0001	S
10 min after LMA removal	72.13±6.95	87.4±8.54	0.0001	S
20 min after LMA removal	71.4±6.54	86.16±8.10	0.0001	S
30 min after LMA removal	71.66±6.40	85.3±8.68	0.0001	S

After LMA insertion there was significant increase in the SABP in group II (P value highly significant). This increase was persistent at 5 minutes but at 10 minutes after LMA insertion SABP returned to baseline values. No such increase was observed in group I patients and changes in SABP were not significant.

Table 4: Changes in SBP at Various Term Periods

Systolic blood pressure	Group I	Group II	P value	Inference
Pre-operative (Baseline)	122.73±11.11	121.06±8.56	0.516	NS
After Premedication	126.73±10.98	121.8±9.95	0.0736	NS
After Induction	118.06±9.91	126.66±9.70	0.0012	NS
After LMA Insertion	114.13±10.30	129.4±8.94	0.0001	S
After 10 min (Intraop)	112.26±9.37	130.2±8.12	0.0001	S
After 20 min (Intraop)	111.06±9.19	130.2±8.12	0.0001	S
After 30 min (Intraop)	109.72±8.25	130.53±6.94	0.0001	S
After 40 min (Intraop)	108.66±8.36	130.5±7.98	0.0001	S
After 50 min (Intraop)	109±1.41	128.6±8.08	0.0001	S
Immediately after removal of LMA	114.2±9.56	131.4±7.39	0.0001	S
10 min after LMA removal	113.13±8.76	130.33±6.54	0.0001	S
20 min after LMA removal	113.13±8.33	129.66±6.19	0.0001	S
30 min after LMA removal	113.6±7.70	128.73±6.71	0.0001	S

After LMA insertion there was significant increase in the DABP in group II (P value <0.001)highly significant. No such increase was observed in group I.

Table 5: Changes in DBP at Various Term Periods

Diastolic blood pressure	Group I	Group II	P value	Inference
Pre-operative (Baseline)	78.06±6.65	75.26±5.23	0.0764	NS
After Premedication	80.2±5.90	75.66±5.94	0.0043	NS
After Induction	73.8±6.75	80.66±6.11	0.0001	S
After LMA Insertion	71.53±6.63	82.8±6.48	0.0001	S
After 10 min (Intraop)	69.2±5.47	83.33±5.31	0.0001	S
After 20 min (Intraop)	69.06±6.57	83.33±5.31	0.0001	S
After 30 min (Intraop)	68.96±5.77	84.13±4.03	0.0001	S
After 40 min (Intraop)	70.22±4.52	84.37±3.36	0.0001	S
After 50 min (Intraop)	74±5.65	82.66±2.30	0.0001	S
Immediately after removal of LMA	72.4±6.06	83.73±5.37	0.0001	S
10 min after LMA removal	71.53±5.45	82.6±4.14	0.0001	S
20 min after LMA removal	72.26±5.00	82.0±4.0	0.0001	S
30 min after LMA removal	72.0±4.98	81.86±4.48	0.0001	S

There was marked increase in HR, SBP, DBP, MAP throughout the study period following the LMA insertion in the group II (Propofol only group).There was decrease in HR, SBP, DBP, MAP throughout the study period following the LMA insertion in group I (dexmedetomidine with propofol group).No significant bradycardia or hypotension were found in both the groups.

Table 6: Changes in MAP at Various Term Periods

Mean blood pressure	Group I	Group II	P value	Inference
Pre-operative (Baseline)	92.95±7.87	90.53±5.96	0.184	NS
After Premedication	95.71±7.26	91.04±6.88	0.0132	NS
After Induction	88.55±7.48	96±6.99	0.0002	S
After LMA Insertion	85.73±7.54	98.33±7.002	0.0001	S
After 10 min (Intraop)	83.55±6.51	98.95±5.88	0.0001	S
After 20 min (Intraop)	83.06±7.11	98.95±5.88	0.0001	S
After 30 min (Intraop)	82.55±6.26	99.6±4.63	0.0001	S
After 40 min (Intraop)	83.03±5.26	99.75±4.55	0.0001	S
After 50 min (Intraop)	85.66±3.29	98±4.16	0.0001	S
Immediately after removal of LMA	86.33±6.87	99.62±5.88	0.0001	S
10 min after LMA removal	85.46±6.31	98.51±4.73	0.0001	S
20 min after LMA removal	85.88±5.66	97.88±4.48	0.0001	S
30 min after LMA removal	85.86±5.41	97.48±5.03	0.0001	S

Postoperative complications in group I and group II by clinical observation showed that sorethroat incidence was more in group I 4 (13%) as compared to group II 3 (10%). But these finding were statistically insignificant. Dysphagia, hoarseness of voice, hypotension and bradycardia was not seen in any of the groups. Patients in group I had mean of 9.36±0.409 and in group II was 9.5±0.508 and statistically compared with paired t test, p value was found 0.306 which was not significant. So, there was significant difference in the recovery of patients in both groups.

DISCUSSION

The supraglottic airway devices have gained popularity in this era of minimal invasiveness. These devices have proved to be very useful means between face mask and endotracheal intubation. Also they act as a great rescue in life situations. As these devices are less invasive they produce less hemodynamic effects and stress response. They are of great value in professional singers, public speakers etc. as they are less traumatic and produce less perioperative and postoperative complications. The laryngeal mask airway secures airway by means of low pressure seal around the laryngeal inlet by use of an inflatable cuff. It is of great value in difficult airway situation. Smooth insertion of LMA needs sufficient depth of anaesthesia to suppress the airway reflexes and relax the jaw muscles. Though it has been shown that insertion of LMA required lighter anaesthesia thanendotraceal intubation.[12] Inadequate depth of anaesthesia may provide coughing, gagging, laryngospasm which may lead to hemodynamic changes. Propofol is known induction of 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, apnea and pain on injection, but used alone causes cardiovascular and respiratory depression.[3,4] So along with propofol short narcotic analgesic drugs like fentanyl and remifentanil were used for insertion of LMA, unfortunately, these medications increased the incidence and duration of apnea. Dexmedetomidine highly selective alpha-2 adernoreceptoragonist has been

shown to have sedative and analegesic properties.[5,6,7] Dexmedetomidine shown to diminish airway and circulatory responses during intubation and extubation.[8,9,10] In our study, all patients were comparable with to demographic parameters like age and sex.We found that jaw relaxation is better in group I than group II. In both groups no patient had coughing or laryngospasm with the help of paired 't' test (p=0.56112). The difference was not statistically significant. Similar ease of insertion results were found by Jayaram *et al* in their study in which the groups were comparable.[11]Similar results were found by Repalle *et al*.[12] They 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. One 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. Baseline pulse rate in both groups were comparable and there was no statistically difference. In group I and II after premedication there was increase in pulse rate but not significant statistically, can be comparable. In group I after induction and LMA insertion there was no significant change in heart rate or there is slight decrease. While in group II there was increase in heart rate after induction and LMA insertion t and the increase in heart rate was statistically significant. There was significant difference between pulse rate of two groups after induction, after LMA insertion intra operatively (10, 20, 30, 40, 50 mins.) and postoperatively (10, 20, 30 mins.). Initially there was increasing pulse rate in both groups after premedication, in group I there was decrease in the pulse rate after induction after LMA insertion and throughout intra operatively duration and upto 30 mins. postoperatively. In group II there was increasing or variable pulse rate throughout intra operative period. Similar haemodynamic parameters (pulse rate) results were found by Jayaram *et al*.[11] In their study, baseline pulse rate was similar in both groups. Their study showed that there was a lesser fall in pulse rate in group D (dexmedetomidine+propofol) after study drug when compared to group F (fentanyl+propofol). Also the magnitude of decrease in pulse rate from baseline to that after the study drug was significantly more in group D than in group F (18% vs 3%; p<0.001). The fall in the pulse rate form the baseline towards the end of the study period was not significant in the group F (p=0.32) but significant in group D (p<0.05). Similar haemodynamic (pulse rate) results were found by Repalle *et al*.[12] In their study they found mean heart rate showed a decreasing trend throughout the study duration in dexmedetomidine+propofol group and in clonidine+propofol 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 = 0.006). In the study done by Taittonen *et al*,[13] they found that in group with dexmedetomidine premedication the heart rate were on lower sideandstable as compared with Placebo group. Basar *et al*[14] noted that following laryngoscopy and intubation HR decreased by 8 bpm in dexmedetomidine group and increased by 10 bpm in control group which was statistically highly significant. In our study, initially there was increase in blood pressure in both groups after premedication. After induction and LMA insertion there was increase in blood pressure in group II, while in group I there is no increase in blood pressure. Group I shows statistically significant lower or stable blood pressure as compared to their baseline values, whereas there was no fall (no change or increase) in group in terms of systolic and diastolic blood pressure. And so there was a significant fall in mean arterial pressure in group I patients as compared to their baseline values. There was decrease in HR, SBP, DBP, MAP throughout the study period following LMA insertion and LMA removal in dexmedetomidine group. Similar haemodynamic parameters (SBP, DBP, MAP) results were found by Jayaram *et al*.49 In their study, they found that there was significant decrease in blood pressure in both groups from baseline but fall was much significant in group F. In group D there was initial rise in blood pressure, but decrease that was evident 1min after LMA insertion till end of study (p<0.001).Jakola *et al*[15] have observed a fall of 17 mmHg in SBP 5 minutes after intubation in dexmedetomidine group and in control group an increase of SBP by 10 mmHg, compared to the basal values and is similar to our study. Yildiz *et al*[16] studied the effect of single pre induction intravenous dose of pressure after intubation were significantly low in dexmedetomidine group (p<0.05) compared to placebo group as in occurrence with our study. Taittonen *et al*,[13] found that in group with dexmedetomidine premedication the Blood pressure were on lower side and stable as compared with Placebo group in intra operative and postoperative period. Bajwa *et al*[17] found that mean MAP was significantly lower in group D, 20 minutes after infusion of study drug compared with similar parameter in group F (P=0.0015). Patients were monitored throughout intra operative and postoperative period.In our study no patient had a significant bradycardia heart rate <60/min. in intra operative and postoperative period. In our study no

patient had hypotension i.e. MAP <60 mm of Hg in intra operative and postoperative period, it may be due to adequate fluid maintenance throughout procedure, low dose of dexmedetomidine premedication with no intra operative infusion dose. Intra operative complications like Airway obstruction, Regurgitation and Laryngospasm was not found in any patients in both groups. There were complaints of sore throat in 13% patients in group I and 10% in group II patients. No incidence of dysphagia or hoarseness of voice was observed. Incidence of complications was compared using Z-test of proportion and was found statistically insignificant. After the surgical procedure, patients were monitored in recovery room. Modified Alderete score was applied after 30 min of procedure, to discharge the patients from recovery room to ward. There was significant difference in the recovery of patients in both groups.

CONCLUSION

From this study it concluded that intravenous dexmedetomidine given prior to propofol causes better maintenance of haemodynamic parameter as when compared with normal saline +propofol group. In our study, iv dexmedetomidine 1 mcg/kg maintained haemodynamic parameters and prevented the pressor response better than other group (normal saline+propofol).There were no any adverse effects found with i.v. dexmedetomidine. This technique will definitely add to the safety of anaesthetic management of patients who are at increased risk of harmful effects of stress response.

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