Original Article

Indian Journal of Anaesthesia and Analgesia
Volume 4 Number 2, April - June 2017 (Part–2)
DOI: http: / / dx.doi.org / 10.21088 / ijaa.2349.8471.4217.22

A Comparative Study of Dexmedetomidine and Clonidine as Adjuvant to Propofol for Insertion of Laryngeal Mask Airway

Allauddin Farooqy*, Vishalakshi Patil*, Shashikala Ramakrishna, Mohammed Mohsine Ali**, Mohammed Shakeeb Yusufl****

Abstract

Objective: To evaluate theease of insertion ofLaryngeal Mask Airway (LMA) and hemodynamic response during insertion of LMA with two adjuvants, dexmedetomidine & clonidine along with induction agent propofol. *Methods*: Hundred patients scheduled for elective surgical procedures were recruited in this study. The hemodynamic effects and ease of insertion of LMA with adjuvants, dexmedetomidine & clonidine with propofol was compared. The hemodynamic responses were assessed byheart rate, non-invasive blood pressure, respiratory rate and oxygen saturation. The overall conditionof patient was assessed according to modified scheme of Lund and Stovener. The condition of insertion was assessed as jaw relaxation and response to LMA insertion in the form of coughing, gagging, laryngospasm and involuntary limb movements. *Results:* The incidence of coughing, gagging, laryngospasm and involuntary limb movements were comparable in both the group, whereas, jaw relaxation, overall insertion condition and hemodynamic responses were better {p value for heart rate:<0.001} in dexmedetomidine group. *Conclusion:* Dexmedetomidine as an adjuvant to propofol provides better LMA insertion conditions, fewer side effects & prevent hemodynamic response to LMA insertion compared to clonidine.

Keywords: LMA Insertion; Propofol; Dexmedetomidine; Clonidine.

Introduction

The laryngeal mask airway has been used as an alternative to bag mask ventilation to provide hands free airway management during surgery with the benefit of less gastric distension. It's a supraglottic airway device that is designed not only to provide and maintain a tight seal around the laryngeal inlet for spontaneous ventilation but alsoto allow controlled ventilation with modest levels (<15cm 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 avoids several disadvantages of tracheal intubation like, hemodynamic response during intubation, use of neuromuscular blocking agents and sore throat, croup and hoarseness postoperatively. LMA has been used even in emergency setting as an important accessory device for management of difficult airway and for cardiopulmonary resuscitation. The increasing emphasis on day care anaesthesia has led to greater use of LMA as an alternative to the face mask and in some cases to tracheal intubation.

Ideal induction agent for LMA insertion should provide loss of consciousness, jaw relaxation, and blunt upper airway reflexes rapidly without cardio-respiratory compromise. Propofol is considered as a best intravenous induction agent for LMA insertion [3] because of its favourable recovery profile and low incidence of side effects but however, when used alone the dose of propofol required for induction is considerably higher and it is associated with pain on injection and cardiopulmonary depression [4]. Hence to decrease these side effects number of adjuvant drugs are used with propofol. Dexmedetomidine, a selective α_2- adrenoceptor agonist,

Author's Affiliation:
*Assistant Professor
**Postgraduate Resident, Dept of Anesthesiology & Critical Care, Navodaya Medical College, Hospital & Research Centre, Raichur, Karnataka, India.

Corresponding Author:
Vishalakshi Patil, Assistant Professor, Dept of Anesthesiology &Critical Care, Navodaya Medical College Hospital and Research Centre, Raichur – 584103, Karnataka, India.
E-mail: drvishalakshi_patil@yahoo.co.in

Received on 01.03.2017
Accepted on 07.03.2017

has anaesthetic and analgesic properties in addition to sedative effect at a dosage of 0.5-2mcg/kg. It also diminishes airway and circulatory responses during insertion of LMA.When dexmedetomidine is used perioperatively, the dose of propofol for induction and maintenance is significantly reduced [5].

Clonidine, an α_2-adrenergic agonist, produces sedation by decreasing the sympathetic nervous system activity and the level of arousal. Studies have shown that clonidine premedication reduces propofol requirement for LMA insertion [6].

The aim of this prospective, double-blinded randomised study was to evaluate the efficacy of dexmedetomidine and clonidine as adjuvant to propofol in ease of insertion of LMA and hemodynamic responses during insertion.

Materialsand Methods

This prospective randomised double blinded study was approved by the institutional ethical committee. 100 male and female patients aged between 18-50 years who were scheduled for elective surgeries were enrolled in the study after written informed consent was obtained. Patients with different diseases like umbilical hernia, fibroadenoma, bleeding per vagina, lipoma, antibioma, incisional hernia, breast lump, lymphadenopathy and fracture radius and ulna were included in the study. Exclusion criteria were American Society of Anaesthesiologists (ASA) physical status III or more, respiratory diseases, low pulmonary compliance, pharyngeal pathology, risk of gastric aspiration, oral surgeries and allergy to adrenergic agonists and propofol.

All patients in the study were assessed by pre-anaesthetic examination, size of LMA was chosen according to the manufacturer'srecommendation. All patients were premedicated with injection glycopyrrolate 0.005mg/kg and injection midazolam 0.02mg/kg intravenously. Patients were randomly allocated into two groups by sealed envelope method. Group-D or dexmedetomidine-propofol group were given injection dexmedetomidine 1mcg/kg diluted in 10ml normal saline,intravenously over 10minutes. Group-C or clonidine-propofol group patients were given injection clonidine 1.5mcg/kg intravenously diluted in 10 ml normal saline over 10 minutes. Patients in both groups were induced with injection propofol 2mg/kg, without neuromuscular blocking agent. LMA was inserted after propofol injection by an anaesthesiologist who was unaware of adjuvant anaesthetic agents. Additional bolus dose of propofol 0.5mg/kg was administered on first unsuccessful attempt. A maximum of 3 attempts were given for insertion. However, the parameters under study were recorded only for LMA insertion at first attempt.

After confirmation of proper placement of LMA, Patients were maintained on spontaneous ventilation with sevoflurane, N_2O, O_2. Injection fentanyl 2mcg/kg intravenously, was used for analgesia after insertion of LMA. At the completion of surgery sevoflurane, N_2O was stopped and LMA was removed. Oxygen was given via face mask till recovery. ECG, heart rate(HR), non-invasive blood pressure (NIBP), respiratory rate(RR), pulse oximeter, and $ETCO_2$were monitored throughout the procedure. HR, NIBP, RR, and SpO2 were recorded at baseline, before, immediately and after induction and at 3,5,10 minutes after insertion of LMA. Laryngospasm and movements were assessed on a 3-point scale (nil, mild, severe). Lacrimation was assessed by either present or absent. Jaw relaxation was assessed according to Young's criteria: absolutely relaxed with no muscle tone: 1, moderately relaxed with some muscle tone: 2, poorly relaxed with full muscle tone: 3. Scoring system to grade coughing/movements: 1-none, 2-one or two coughs, 3-three or more coughs, 4-bucking/movement. The overall conditions according to Modified scheme of Lund and Stovener [7]: excellent: no gagging or coughing, no patient movement or laryngospasm, good: mild to moderate gagging, coughing or patient movement with no laryngospasm, poor: moderate to severe gagging, coughing or patient movement with no laryngospasm, unacceptable: severe gagging, coughing or patient movement or laryngospasm.

With the power of study being 80% and confidence limit at 95%, a sample size of 43 patients in each group was required. We enrolled 50patients in each group considering thepossibility of dropouts. SPSS 15.0, SAS 9.2, STATA 10.1, Med Calc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for statistical analysis of data. The normally distributed data was compared by student 't' test. The categorical variables were analysed with Fischer's exact test or chi-square test as appropriate. The data was expressed as mean± SD and $p \leq 0.05$ was considered statistically significant.

Results

There was no statistically significant differences between the two group in regard to demographic data i.e. age (p: 0.397), gender (p: 0.790) and weight (p: 0.163). Hence both the groups were comparable.

Patients with different diseases were involved in this study like umbilical hernia, fibroadenoma, bleeding per vagina, lipoma, antibioma, incisional hernia, breast lump and fracture radius and ulna.

Coughing and gagging in response to insertion of LMA wasstatistically insignificant in the study (Table 1,2). Laryngospasm (p-0.678), involuntary movements (p-0.557), lacrimation (0.137) were higher in group-C as compared to group-D. However, these responses were found to be statistically insignificant. Also, ease of insertion and jaw relaxation were better in group-D even though it had statistical insignificance (Table 3,4). The respiratory rate (p: 0.748) and oxygen saturation (p: 0.365) were statistically insignificant. There was statistically significant difference in mean HR and mean arterial blood pressure between 2 groups throughout the study (Table 5,6).

Table 1: Coughingscore in two groups

Coughing	Dexmedetomidine		Clonidine	
	No	%	No	%
1	43	86.0	39	78.0
2	6	12.0	8	16.0
3	1	2.0	3	6.0
Total	50	100.0	50	100.0

P=0.551, Not Significant, Fisher Exact test

Table 2: Gagging score in two groups

Gagging	Dexmedetomidine		Clonidine	
	No	%	No	%
1	44	88.0	39	78.0
2	5	10.0	8	16.0
3	1	2.0	3	6.0
Total	50	100.0	50	100.0

P=0.397, Not Significant, Fisher Exact test

Table 3: Jaw relaxation score in two groups

Jaw relaxation	Dexmedetomidine		Clonidine	
	No	%	No	%
1	43	86.0	36	72.0
2	6	12.0	11	22.0
3	1	2.0	3	6.0
Total	50	100.0	50	100.0

P=0.252, Not significant, Fisher Exact test

Table 4: Ease of insertion in two groups

Results	Dexmedetomidine		Clonidine	
	No	%	No	%
Excellent	42	84.0	36	72.0
Good	7	14.0	11	22.0
Poor	1	2.0	3	6.0
Total	50	100.0	50	100.0

P=0.341, Not significant, f\Fisher Exact test

Table 5: Comparison of Heart Rate (bpm) in two groups

Heart Rate (bpm)	Dexmedetomidine	Clonidine	P value
Baseline	75.24±3.58	75.44±4.16	0.797
Before induction	62.10±5.39	74.10±3.82	<0.001**
After induction	64.22±6.55	73.58±3.84	<0.001**
After insertion of LMA	67.02±5.27	75.66±3.66	<0.001**
3 min	68.98±5.14	77.22±3.59	<0.001**
5 min	69.26±5.35	76.38±3.63	<0.001**
10 min	70.72±5.18	76.76±3.66	<0.001**

Table 6: Comparison of MAP (mm Hg) in two groups

MAP (mm Hg)	Dexmedetomidine	Clonidine	P value
Baseline	86.71±2.64	86.00±2.36	0.221
Before induction	79.98±2.22	84.30±2.43	<0.001**
After induction	79.38±2.09	84.22±2.54	<0.001**
After insertion of LMA	81.38±2.07	85.52±1.99	<0.001**
3 min	82.60±2.35	86.32±1.96	<0.001**
5 min	84.00±2.44	86.30±2.32	<0.001**
10 min	85.18±2.33	87.30±1.79	<0.001**

Discussion

The findings of the current study suggest that dexmedetomidine with propofol provides favourable conditions for insertion of LMA with insignificant hemodynamic response compared to clonidine.

The favourable conditions for LMA insertion is reflected by jaw relaxation and response to insertion by coughing, gagging, laryngospasm and involuntary movements. As similar to findings of Patrick Scanlon and colleagues [8], propofol was better choice as an intravenous induction agent, as it blunted airway reflexes which occurs at insertion of LMA. But however, when propofol was used alone without an adjuvant it causes cardio-respiratorydepression.

In a study comprising dexmedetomidine and propofol v/s fentanyl and propofol for condition of LMA insertion in elective surgeries Surabhi. A. Lande and et. al. [9], have found patient in dexmedetomidine group had fully relaxed jaw and no coughing. Ashwini. et. al. [7], hypothesized in their study that dexmedetomidine provides acceptable conditions for LMA insertion using modified scheme of Lund and Stovner for overall insertion conditions.However, none of their patients had lacrimation in response to LMA insertion but, in the present study only 8% patients in group-D and 18% patients in group-C did have lacrimation. Dexmedetomidine is a newer selective α_2 -agonist with a site of action at the locus ceruleus. It reduces presynaptic release of norepinephrine that is responsible for its sedation and hypnotic effects. The analgesic effects occur because of activation of α_2- adrenoceptor in the descending medulla-spinal noradrenergic pathway. There is no significant change in HR after induction with propofol. On contrary dexmedetomidine decreases the HR by 27% at 5 minutes after induction which returns to normal by 15 minutes [10] which correlates with the study of F.Uzumcuzil and colleagues, whereas, clonidine decreases HR by 26% [11,12]. Current study supports the data by Ebert and colleagues with regard to cardiovascular effects i.e. no gross variations in blood pressure and heart rate in group-D [13] but patients in group-C had mild decrease in systolic blood pressure and heart rate.In this study, we found that patients receiving dexmedetomidine had lower HR after drug administration in comparison with patients receiving clonidine. The fall in HR due to dexmedetomidine has been explained by its effect on sympathetic outflow and reducing levels of epinephrine and norepinephrine. The fall in blood pressure and HR was within acceptable limits for the age of the patients and did not require the use of chronotropic agents, fluids or inotropes. Dexmedetomidine has synergistic effects on analgesic requirements during the surgery. With respect to RR, Lawerence and colleagues [14] reported no changes whereas HsuYW; Cortinez LI. et. al. [15] found increase in RR, which is similar to our study with slight increase in RR which was statistically insignificant. Oxygen saturation was comparable between both groups throughout the study. Surabhi A. Lande and et al [9] concluded in their study that dexmedetomidine provides better LMA insertion conditions and also attenuates pressor response to insertion which is similar to our study. Comparable to study results, Ramaswamy AH and et al [16] in their study comparing dexmedetomidine and fentanyl as adjuvants to propofol found that dexmedetomidine provided optimum LMA insertion conditions without causing apnea. However, the present study has certain limitations, control group, i.e. propofol alone for insertion of LMA was not included as several reports have shown inadequate LMA insertion conditions and cardio-respiratory depression with increasing doses. Also, pain, recovery and sedation scale were not included as the study was limited only to LMA insertion conditions.

Conclusion

Dexmedetomidine as an adjuvant with propofol provides better LMA insertion conditions, fewer adverse effects and prevents hemodynamic responses to LMA insertion compared to clonidine.

References

1. Martin S. Bogetz, using the laryngeal mask airway to manage the difficult airway: AnesthesiologyClin N America 2002; 20:863–870.
2. Robert G Krohner, SivamRamanathan. Anatomy of airway in Benumofs airway management 2nd edition. 2006; 1–19, 476–497, 1027–29.
3. Joseph R Brimcombe. Laryngeal mask anaesthesia-principles and practice, 2nd edition page 35, 41, 115.
4. RavikumarKoppula&AnithaShenoy "Comparison of Sevoflurane with propofol for laryngeal mask airway insertion in adults" Anesth. ClinPharmacol 2005; 21(3):271-274.
5. Dr.JayashreeSood. Laryngeal mask airway and its variants. Indian journal of anaesthesia 2005; 49(4): 275-280.
6. Noel WL, Joel OJ. Autonomic nervous system: Physiology and pharmacology clinical Anaesthesia. 2006; 5th edition: 275-333.
7. Lund I, Stovener J. Dose responses curves fortubocurarine; alcuronium and pancuronium. ActaAnaesthesiol Scand 1970; 37:238-42.
8. Patrick Scanlon, Micheal Carey, Micheal Power. Patient response to Laryngeal masks insertion after induction of anaesthesia with Propofol or Thiopentone. Can Janaesth 1993; 40:9:816-818.
9. Surabhi A. Lande, C. P. Gadkari, A. R. Bhure, SobhanAich. "Comparison of Dexmedetomidine Propofol Virus Fentanyl – Propofol for Conditions of Laryngeal Mask Airway Insertion in Elective Surgeries". Journal of Evolution of Medical and Dental Sciences 2014 April 14; 3(15): 4042-4051.
10. Miller RD, ed. Anesthesia, 7th ed. Newyork: Churchill Livingstone, 2010.p.720–28.
11. Noel WL, Joel OJ. Autonomic nervous system: Physiology and pharmacology clinical Anaesthesia. 2006; 5th edition:275-333.
12. J Cardiovasc Pharmacology. 1991.Jun; 17(6):935-40
13. Ebert TJ, Hall JE, Barney JA, Uhrich TD, ColincoMD.The effects of increasing plasma concentrations of dexmedetomidine in humans. Anesthesiology. 2000 Aug; 93(2):382-94.
14. C. J. Lawrence and S. De Lange Effects of a single pre-operative dexmedetomidinedose on isoflurane requirements and peri-operative haemodynamic stability Anaesthesia, 1997; 52:736–744.
15. Hsu YW, Cortinez LI, Robertson KM, Keifer JC,.Dexmedetomidine pharmacodynamics: part I: crossover comparison of the respiratory effects of dexmedetomidine and remifentanil in healthy volunteers.Anesthesiology. 2004 Nov; 101(5): 1066-76.
16. J Anaesthesiol Clin Pharmacol.2015Apr Jun; 31(2): 21720.doi:10.4103/09709185.155152.