ORIGINAL RESEARCH PAPER

Volume-7 | Issue-4 | April-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

INTRAVENOUS DEXMEDETOMIDINE AS AN ADJUNCT TO ANAESTHETIC INDUCTION TO ATTENUATE HAEMODYNAMIC RESPONSE TO LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION

Anesthesiology

Dr. Savita Meena* Assistant Professor, Deptt. Anaesthesia, SMSMC, Jaipur, Rajasthan *Corresponding Author

Dr. Kavita Jain Senior Professor, Deptt. Anaesthesia, JLNMC, Ajmer

Dr. Neena Jain Senior Professor & Head , Deptt. Anaesthesia, JLNMC, Ajmer

ABSTRACT

Background: The purpose of this study was to evaluate the effect of a single pre-induction intravenous dose of dexmedetomidine 1mcg\kg on cardiovascular response resulting from laryngoscopy and endotracheal intubation.

Methods: Sixty patients ASA grade I and II scheduled for elective surgery under general anaesthesia were randomized into two groups (dexmedetomidine group {B} and placebo group {A}, n=30 in each group). Haemodynamic parameters and adverse effects were recorded before intubation and during intubation.

Result: In the present study, two groups were comparable. Mean (±SD) heart rate (beats/min) increased from the basal value of 84.20±13.16 to 107.07±11.47 (21.4%) during laryngoscopy and endotracheal intubation in group A whereas in group B it increased from basal value of 82.97±7.69 to 84.13±7.33(2.38%) ($p<0.01$). Mean (±SD) SBP increased from basal value of 125.40±10.97 to 143.61±11.59 mm Hg (12.58%) in group A whereas in group B it increased from 126.93±7.63 to 128.60±9.62 mm Hg (1.56%) ($p<0.01$). Mean DBP increased from basal value of 80.90±5.58 to 92.57±5.89 (13.04%) in group A whereas in group B it increased from basal value of 81.63±4.19 to 83.00±6.49 (2.4%) ($p<0.01$). Mean arterial pressure increased from basal value of 95.71±7.02 to 109.57±7.31 (12.8%) in group A whereas in group B it increased from 96.74±4.87 to 98.17±7.01 (2.04%) ($p<0.01$). Thus the increase in heart rate, SBP, DBP and MAP were significantly lower in Dexmedetomidine group ($p<0.01$).

Conclusion: Preoperative administration of a single IV dose (1μg/kg) of dexmedetomidine can be used as an adjuvant to anesthetic induction to attenuate haemodynamic responses during laryngosopy and endotracheal intubation.

KEYWORDS

Dexmedetomidine, α2-agonist

INTRODUCTION

Endotracheal intubation is an integral part of the anaesthesiologists contribution to patient care. It becomes an essential component of general anaesthesia as it serves many purposes.

- It maintains the patency of upper airway, helps in ventilation, reduces the risk of aspiration.
- It delivers the inhalational anaesthetic agents from anaesthesia machine to the patients through breathing circuits.

Laryngoscopy and tracheal intubation are noxious stimuli that provoke transient but marked sympathetic responses manifestating as hypertension, tachycardia, arrhythmia, myocardial ischemia, increased catecholamine concentration in susceptible individuals. These haemodynamic responses are insignificant in healthy individuals. Number of drugs have been used to attenuate these haemodynamic changes :

- Lidocaine spray, I.V. lignocaine
- Opiods
- Droperidol
- Propranolol
- Nitroglycerine ointment and isosorbite dinitrate.
- Cal. Channel blocker
- Esmolol, $MgSO_4$
- α-2 agonist (clonidine, dexmedetomidine)
- Dexmedetomidine is new alpha-2 agonist that received FDA approval in 1999. It is a D-enantiomer of medetomidine. Chemically it is (+) -4-(S)–{1-(2,3-dimethylphenylethyl} –1H–imidazole monohydrochloride. It's empirical formula is $C1_3H_{16}N_2HCl$. In comparison to clonidine, it has a higher ratio of specificity for alpha-2 receptors (alpha2/alpha1 = 1600 : 1). causes sedation, analgesia, effective in maintaining haemodynamic stability during intubation. It reduces anaesthetic requirement approved for ICU sedation. It's antagonist is atipamizole.

The study was undertaken to assess the efficacy and safety of dexmedetomidine in attenuating sympathoadrenal response to tracheal intubation.

METHODS :

After obtaining approval from the institutional ethical committee, a randomised controlled study was formulated. The study population comprised 60 patients with ASA physical status I & II aged 20-60 years. Pregnant and nursing women, patients with morbid obesity, heart block, and hypertensive patients on Beta blockers were excluded from the study. The patients were randomly assigned to one of the two groups each containing 30 patients. None of the patients were on any significant drug therapy pre-operatively.

The grouping is as follows :

Group A – Placebo (normal saline) control group..

Group B – Dexmedetomidine group. Concentration used 1 mcg/kg

All baseline parameters (SPO_2, PR, SBP, DBP) were recorded. IV line secured. All patients were premedicated with Inj. Glycopyrolate (0.05 mg/kg) and Inj. Tramadol (2 mg/kg) by IV route. Patients in Group B received Dexmedetomidine 1 mcg/kg B.W. diluted in 100 ml NS and infused in 15 minutes and patients in Group A received 100 ml NS infused in 15 minutes.

After a stabilization period of 5 minutes, haemodynamic parameters and SPO_2 were recorded. At the end of infusion (15 min.) haemodynamic parameters and SPO_2 were recorded again. Patient were preoxygenated with 100% O_2 by face mask.

General anaesthesia was induced with Inj. Propofol 2 mg/kg B.W. followed by Inj. Succinylcholine 1.5 mg/kg body weight intravenously. IPPV was done for 60 seconds, which was followed by laryngoscopy and intubation with appropriate size cuffed tube and haemodynamic parameters were recorded during laryngoscopy and intubation then endotracheal tube checked and fixed. Haemodynamic parameters were recorded at 1, 3 and 5 minutes after intubation. At this point our study was terminated, however to complete the surgical procedure, anaesthesia was maintained wih N_2O (66.6%), oxygen (33.3%) and a non-depolarising muscle relaxant on closed anaesthetic circuit under controlled ventilation. At the end of surgical procedure residual effect of muscle relaxant was reversed with a combination of Inj. Glycopyrolate (0.005–0.01) mg/kg B.W. and neostigmine 0.06 mg/kg B.W.

Any complications like changes in blood pressure, heart rate, low SPO_2, ECG changes during study along with postoperative complications nausea, vomiting, shivering, respiratory depression, sedation, restlessness, hypotension, bradycardia etc. were recorded and managed.

Parameters studied :

All the parameters and results from the two groups (Group A and Group B) were entered in the predesigned study proforma sheet.

S. No.	Observation Time	Pulse (bpm)	Blood Pressure (mm of Hg)			SPO_2
			SBP	DBP	MAP	
1	Pre-operative value (Baseline)					
2	5 minute after start of infusion					
3	15 minute (at end of infusion)					
4	During laryngoscopy and intubation					
5	1 minute after intubation					
6	3 minute after intubation					
7	5 minute after intubation					

STATISTICALANALYSIS :

The observations were recorded and subjected to statistical analysis using student t-test. All the quantitative data were summarized in the form of Mean+SD.

P<0.01-Statistically highly significant
P<0.05-Statistically significant
P>0.05-Statistically insignificant

RESULTS :

The two groups were comparable in patient characteristics (Table 1). Dexmedetomidine was well tolerated and no drug related adverse effects were observed (Table 2)

Table : 1

Patients characteristics	Group A	Group B
Age	36.47±9.74	39.47±12.1
Sex	15/15	17/13
Weight	61.2±9.57	61.13±7.76
ASA	25/5	26/4

Table : 2

Observation	Group A	Group B
Hypotension	4 (13.3%)	5 (16.6%)
Hypertension	6 (20%)	1 (3.3%)
Bradycardia	0 (0%)	2 (6.6%)
Bronchospasm	0 (0%)	0 (0%)
Laryngospasm	2 (6.6%)	0 (0%)
Respiratory depression	0 (0%)	0 (0%)
Nausea	3 (10%)	3 (10%)
Vomiting	2 (6.6%)	1 (3.3%)

Before administration of the study drugs in the operating room, HR and BP values between the two groups did not differ (Table 3).

Table : 3

	Baseline PR	Baseline SBP	Baseline DBP	Baseline MAP	Baseline SPO_2
Group A	84.20+13.16	125.40+10.97	80.90+5.58	95.71+7.02	98.6+0.72
Group B	82.97±7.69	126.93±7.63	81.63±4.19	96.74±4.86	98.20±0.55
P value	0.66	0.53	0.57	0.51	0.02
Significance	NS	NS	NS	NS	S

In Group B, patients receiving dexmedetomidine infusion, a fall in HR and BP was observed.

In both the groups, the maximal increase in heart rate and blood pressure occurred immediately after tracheal intubation when compared to baseline arterial blood pressure. The increase in HR after intubation was 21.4% in Group A as compared to 2.38% in Group B (P<0.01). Similarly, significant increase in systolic pressure was observed in Group A which was 12.58% as compared to 1.56% in Group B (P<0.01) while increase in diastolic pressure was 13.04% and 2.4% in Group A and Group B respectively (P<0.001). Significant rise in MAP is also seen. In Group A, it increases 12.8% as compared to 2.04% in Group B (P<0.01) (Figure 1).

Figure 1 : Heart rate

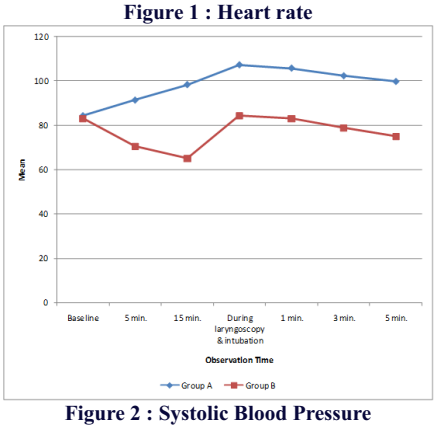


Figure 2 : Systolic Blood Pressure

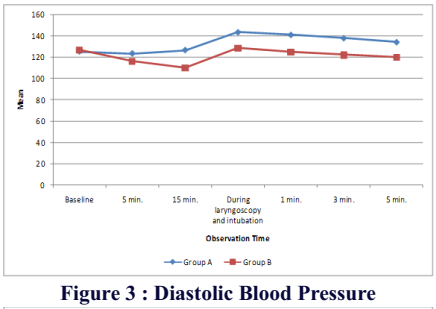


Figure 3 : Diastolic Blood Pressure

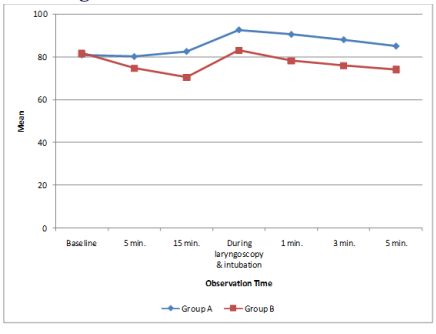
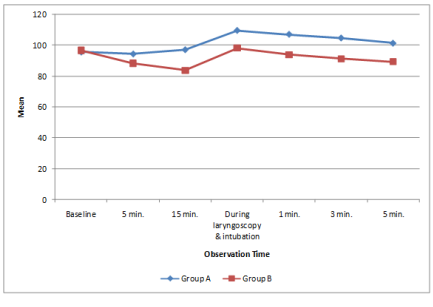


Figure 4 : Mean Arterial Blood Pressure



Bradycardia was observed in two patients in Group B intraoperatively which promptly responded to Inj. Atropin 0.6 mg intravenously. Incidence of hypertension was more in control group. Incidence of hypotension, nausea and vomiting was almost similar in both the groups.

The duration of recovery was similar in both the groups. All the patients were immediately available to obey commands upon arrival into recovery room. None of the patients has explicit recall of awareness or complained of any discomfort when interviewed after operation.

DISCUSSION :

We conducted this prospective randomised study in an attempt to examine whether administration of dexmedetomidine to a commonly administered balanced anaesthetic regimen improves perioperative haemodynamic stability in patients undergoing major surgical procedure.

Dexmedetomidine is a highly selective $\alpha 2$ – agonist that has been shown to have sedative, analgesic and anaesthetic sparing effects. It causes a dose dependent decrease in arterial blood pressure and heart rate, associated with decrease in serum nor-epinephrin concentration.

Dexmedetomidine was well tolerated, and no serious side-effects occurred in the present study. Our observations are in accordance with the findings of King BD et al who showed that during light general anaesthesia, direct laryngoscopy and ET intubation is capable of producing circulatory effect characterised by average rises in heart rate of 23 beats/min.

Bruder N et al also showed that in patients ranked ASA I, laryngoscopy and intubation lead to an average increase in heart rate of 20%.

The increase in heart rate results from the baroreceptor mediated sympathetic reflex stimulation of the heart in response to the decrease in cardiac output and pressure.

The abrupt rise in all haemodynamic variables seen during and immediately after laryngoscopy and intubation is due to stress response to the mechanical stimulation of upper respiratory tract, the afferents are carried by the glossopharyngeal nerve and from the tracheobronchial tree via the vagus nerve which enhances the activities of the cervical sympathetic afferent fibres resulting in transient rise in heart rate and blood pressure.

Scheinin B et al studied the efficacy of dexmedetomidine 0.6 μg/kg given IV 10 minute before induction of anaesthesia in 24 patients (ASAI). Dexmedetomidine attenuate the cardiovascular responses to laryngoscopy and tracheal intubation. They observed that the maximal average increase in heart rate (vs baseline) were 6% and 29% in dexmedetomidine and saline group respectively. Maximal average increase in systolic blood pressure (vs baseline) were 1% and 21% in dexmedetomidine and saline groups respectively. Maximal average increase in diastolic blood pressure (vs baseline) were 23% and 46% in dexmedetomidine and saline group respectively.

The present study findings corroborate with those of previous studies. No adverse cardiovascular effects from the drug were seen in the present study. Bradycardia, a possible consequence of administration of $\alpha 2$ agonist, was counter acted by the use of atropine 0.6 mg.

CONCLUSION :

Preoperative administration of a single IV dose (1mcg/kg) of dexmedetomidine can be used as an adjuvant to anaesthetic induction to attenuate haemodynamic responses during laryngoscopy and endotracheal intubation. It significantly attenuates sympathoadrenal response to tracheal intubation.

REFERENCES :

1. Aho M, Scheinin M, Lehtinen AM, Erkola O, Vuorinen J et al. Intramuscularly administered demedetomidine attenuates hemodynamic and stress hormone responses to gynecologic laparoscopy. Anesth Analg 1992; 75 : 932-9.
2. Bloor BC, Ward DS, Belleville JP, Maze M. Effect of intravenous dexmedetomidine in humans. II. Hemodynamic changes. Anesthesiology, 1992 Dec; 77 (6) : 1134-42.
3. Bruder N, Granthil C, Ortega D. Consequences and prevention methods of hemodynamic changes during laryngoscopy and intubation. Ann Fr Anaesth Reanim 1992; 11 (1) : 57-71.
4. Curran J, Crowley M and Sullivan GO: Droperidol and endotracheal intubation: Attenuation of pressure response to laryngoscopy and intubation. Anaesthesia, 1980; 35: 290 -294.
5. Dahlgren N and Messeter K: Treatment of stress response to laryngoscopy and intubation with Fentanyl. Anaesthesia 1981; Nov; 36 (11) : 1022-6.
6. Ebert DO, John P, Pearson JD, Gelman S, Harris C and Bradley EL: Circulatory responses to laryngoscopy: The comparative effects of placebo, Fentanyl and esmolol. Can. J. Anaesth. 1989; 36: 301-6.
7. Elkayam, Uri and Wilbert S Aronow: Glyceryl trinitrate (Nitroglycerine) ointment and isosorbide dinitrate: review of their pharmacological properties and therapeutic use. Drugs 1982; 23: 165.
8. Fox EJ, Sklar GS, Hill OH, Vilaneur R and King BD: Complications related to the pressor response to endotracheal intubation. Anaesthesiology 1977; 47: 524-525.
9. James Michael FM, Beer Eryk R and Esser Jan D: Intravenous Magnesium sulfate inhibits catecholamine release associated with tracheal intubation. Anesth Analg June 1989; 68:772-776.
10. King BD, Harris LC, Greifenstein FE, Elder JD, Dripps RD. Reflex circulatory responses to direct laryngoscopy and tracheal intubation performed during general anesthesia. Anesthesiology 1951; 12: 556-66.
11. Lawrence CJ, De Lange S. Effects of a single pre-operative dexmedetomidine dose on isoflurane requirements and peri-oprative haemodynamic stability. Anaesthesia. 1997 Aug; 52 (8) : 736-44.
12. Malde DpA , Sarode V. Attenuation of the hemodynamic response to Endotracheal Intubation: Fentanyl versus Lignocaine. The Internet Journal of Anesthesiology 2007; Volume 12 Number 1.
13. McCammon RL, Hilgenberg JC and Stoelting RK: Effect of propranolol on circulatory responses to induction of diazepam- Nitrous oxide anesthesia and to endotracheal intubation. Anesth. Analg. 1981 Aug; 60(8): 579-83.
14. Mendas F, Koner O, Saym M, Ture H, Imer P et al. Dexmedetomidine as an adjunct to anesthetic induction to attenaute hemodynamic response to endotracheal intubation in patients undergoing fast-track CABG. Annals of CAdiac Anaesthesia, Vol. 13:1, Jan-Apr 2010.
15. Puri GD, Marudhachalam KS, Chari Pramila and Suri RK: The effect of Magnesium sulphate on haemodynamics and its efficacy in attenuating the response to endotracheal intubation in patients with coronary artery disease. Anesth Analg 1998; 87: 808-11.
16. Pyrs-Roberts, Foex P, Biro GP and Roberts JG: Studies of anaesthesia in relation to hypertension V: Adrenergic Beta receptor blockade. Br. J. Anaesth. 1973; 45: 671.
17. Reid LC and Brace DE: Irritation of the respiratory tract and its reflex effect upon the heart. Surg Gynaec & obst 1940; 70: 157-62.
18. Russel WJ, Morris RG, Frewin DB and Drem SE: Changes in plasma catecholamine concentrations during endotracheal intubation. Br J Anaesth 1981; 53: 837.
19. Shribman AJ, Smith G and Achola KJ: Cardiovascular and catecholamine response to laryngoscopy with and without tracheal intubation. Br. J Anesth 1987; 59: 295-9.
20. Stoelting RK and Peterson C: Circulatory changes during direct laryngoscopy and tracheal intubation: influence of duration of laryngoscopy with or without prior lidocaine. Anaesthesiology 1977; 47: 381.
21. Yildiz M, Tavlan A, Tuncer S, Reisli R, Yosunkaya A et al. Effect of demedetomidine on haemodynamic resonses to laryngoscopy and intubation: perioperative haemodynamics and anaesthetic requirements. Drugs RD. 2006;7(1):43-52.