

EFFECT OF DEMEDITOMIDINE ON THE HAEMODYNAMIC CHANGES DURING ENDOTRACHEAL INTUBATION IN ELECTIVE LAPROSCOPIC SURGERIES - PROSPECTIVE COHORT STUDY

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Abstract

Background: The laryngoscopic response during intubation causes significant hemodynamic changes. Pneumoperitoneum using CO₂ during laparoscopic surgeries further increases stress response. The aim of this study is to compare the hemodynamic effects of dexmedetomidine with a placebo during intubation, for patients undergoing elective laparoscopic surgery. **Materials and Methods:** Following patient's agreement, total of 60 patients divided into two groups of 30 each(A,B) were randomly chosen. Group A: Dexmedetomidine, single bolus dose of 0.5microgm/kg made upto 50ml with normal saline, given 10 min prior to induction by syringe pump. Group B: 50ml Normal saline, given 10 min prior to induction by syringe pump. All patients were induced with fentanyl (2mcg/kg), IV propofol (2mg/kg), following which they were paralysed with succinylcholine (2mg/kg).Laryngoscopy and intubation was performed as soon as fasciculations stopped.HR, Systolic blood pressure(SBP) ,diastolic blood pressure(DBP),Mean arterial pressure(MAP),additional fentanyl required and level of sedation (Ramsay sedation score) were observed.Heart rate , systolic blood pressure, diastolic blood pressure, mean arterial pressure , was monitored 5minutes after giving the drug and 1,2,3,5 minutes after intubation, then once in 5 minutes for 15 minutes, and once in 10 minutes till the end of the surgery. Sedation score was monitored until the patient was induced. **Result:** Mean HR of group A is not increased after intubation and at 1,2,3,5,10 minutes and statistically significant. Similarly ,the mean SBP ,DBP ,MAP ,of group A was decreased after intubation and at 1,2,3,5,10 minutes when compared to group B. All the values were found to be statistically significant.(p<0.005). **Conclusion:** Dexmedetomidine is effective in attenuating the haemodynamic changes after endotracheal intubation for elective laparoscopic surgery when compared with a placebo.

INTRODUCTION

As widely known, the ideal choice for laparoscopic surgeries is general anesthesia(GA). However, pneumoperitoneum using CO₂ during laparoscopic surgeries affects several homeostatic systems leading to increased intra-abdominal pressure, alterations in acid-base balance, cardiovascular physiology and stress response.^[1] The extent of cardiovascular changes associated with pneumoperitoneum includes tachycardia, increase in Mean Arterial pressure, and increase in systemic vascular resistance which in turn compromises tissue perfusion. Various antihypertensive drugs-nitroglycerine, xylocard have been used to attenuate this response.^[2-5]

Dexmedetomidine is a more specific selective Alpha₂ agonist and also has sedative and analgesic properties. It has been given as bolus dose prior to intubation to reduce the hemodynamic variability during intubation and pneumoperitoneum. Dexmedetomidine if used as a pre-anaesthetic medication and intraoperative infusion, decreases intraoperative anaesthetic requirement. It has significant opioid and anaesthetic sparing property.^[6-11] The purpose of this study is to evaluate and compare the hemodynamic effects of dexmedetomidine with a placebo during intubation, for patients undergoing elective laparoscopic surgery.

MATERIALS AND METHODS

This prospective, comparative study was conducted in the Department of Anaesthesiology and Critical care of Dr. Jeyasekharan Hospital and Nursing Home, Nagercoil. Total of 60 patients divided into two groups of 30 each(A,B), were included in this one year study. Informed consent and institute ethical approval was obtained. They were aged between 18-58 years, belonging to ASA I & II, posted for elective laparoscopic surgeries under general anaesthesia. Patients with heart rate < 60/min, difficult airway and emergency surgeries were excluded.

After pre anesthetic work up and examination, all patients received 0.25 mg alprazolam, night before surgery and 2 hours before the surgery.18G intravenous access(IV) was obtained and premedication of injection. Ondansetron 4mg was given. Baseline heart rate, Systolic BP, Diastolic BP, Mean arterial pressure and Sedation score were recorded. Group A: Dexmedetomidine, single bolus dose of 0.5microgm/kg made upto 50ml with normal saline, given 10 min prior to induction by syringe pump. Group B: 50ml Normal saline, given 10 min prior to induction by syringe pump. All patients were induced with fentanyl (2mcg/kg), IV propofol (2mg/kg), following which they were paralysed with succinylcholine (2mg/kg). Laryngoscopy and intubation was performed as soon as fasciculations stopped. Parameters observed were - HR, Systolic

blood pressure(SBP), diastolic blood pressure(DBP), Mean arterial pressure (MAP), additional fentanyl required and level of sedation (Ramsay sedation score).Heart rate , systolic blood pressure, diastolic blood pressure, mean arterial pressure , was monitored 5minutes after giving the drug and 1,2,3,5 minutes after intubation, then once in 5 minutes for 15 minutes, and once in 10 minutes till the end of the surgery. Sedation score was monitored until the patient was induced.

RESULTS

The mean age of both group A and B was 35.5 years. The mean weight of group A 66.9+/- 11.5 kg and group B 64.1+/-12kg. the mean heart rate of group A after 5 min of dexmedetomidine infusion was 68.5+/- 7.9 where as group B had 79.3+/-12 [TABLE 1].Mean HR of group A is not increased after intubation and at 1,2,3,5,10 minutes when compared to group B and statistically it is significant. Similarly it was found that ,the mean SBP ,DBP ,MAP ,of group A was decreased after intubation and at 1,2,3,5,10 minutes when compared to group B .All the values were found to be statistically significant.(p<0.005)[TABLE 2][TABLE 3].We also monitored changes in levels of sedation which showed a significant reduction in additional requirement of fentanyl in group A.(p = 0.001) [Table 4]

Table 1: changes in heart rate [Mean(SD)]

Parameters	Group A Mean SD	Group B Mean SD	P Value
Heart rate before drug	85.20 ±7.993	79.66 ±11.071	0.030
Heart rate 5 min after drug	68.46 ±9.507	79.33 ±12.143	0.000
Heart rate 1 min after drug intubation	67.70 ±9.169	85.20 ±13.134	0.000
Heart rate 2 min after drug intubation	69.23 ±10.483	83.40 ±12.807	0.000
Heart rate 3 min after drug intubation	68.63 ±10.726	78.66 ±16.707	0.008
Heart rate 5 min after drug intubation	68.76 ±10.529	79.50 ±11.162	0.000
Heart rate 10 min after drug intubation	67.23 ±10.257	77.10 ±10.413	0.000

[Table 1]: Shows the mean HR just before giving the drug , before & after intubation at 1,2,3,5,10 min of Group A & B.

*Mean HR of group A is not increased after intubation and at 1,2,3,5,10 minutes when compared to group B and statistically it is significant.

Table 2: changes in systolic blood pressure[Mean(SD)]

SYSTOLIC BP	GROUP A Mean SD	GROUP B Mean SD	P Value
Before drug	130.13 ±7.468	125.23 ±8.407	0.021
SBP 5 min after drug	112.70 ±11.246	123.13 ±9.754	0.000
SBP 1 min after intubation	111.03 ±18.033	130.80 ±13.399	0.000
SBP 2 min after intubation	108.97 ±14.089	127.13 ±17.553	0.000
SBP 3 min after intubation	110.60 ±13.505	122.60 ±18.361	0.006
SBP 5 min after intubation	110.0 ±14.014	119.20 ±15.884	0.021
SBP 10 min after intubation	109.33 ±14.730	117.53 ±14.977	0.037

[Table 2] Shows systolic BP just before giving the drug , before & after intubation at 1,2,3,5,10 min of Group A & B.

*Mean Systolic BP of group A is not increased after intubation and at 1,2,3,5,10 minutes when compared to group B and statistically it is significant.

Table 3: changes in diastolic blood pressure[Mean(SD)]

DIASTOLIC BP	GROUP A Mean SD	GROUP B Mean SD	P VALUE
DBP Before drug	83.16 ±3.895	78.9 ±6.629	0.004
DBP 5 min after drug	71.63 ±5.635	76.90 ±7.097	0.002
DBP 1 min after intubation	69.10 ±11.077	81.50 ±10.766	0.000

DBP 2 min after intubation	67.16 ±7.737	79.83 ±12.711	0.000
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[Table 3] Shows the diastolic BP just before giving the drug , before & after intubation at 1,2,3,5,10 min of Group A & B

*Mean diastolic BP of group A is not increased after intubation and at 1,2 minutes when compared to group B and statistically it is significant.

Table 4: changes in level of sedation & additional supplementation

Parameters	Group A Mean SD	Group B Mean SD	P Value
Sedation after 5 min of giving drug	3.46 ±0.0628	2.00 ±0.000	0.000
Additional supplementation given	11.67 ±25.200	47.00 ±45.402	0.001
Additional sevoflurane used	0.22 ±0.568	0.92 ±0.891	0.001

DISCUSSION

Laryngoscopy and endotracheal intubation leads to reflex sympathetic responses which includes hypertension, tachycardia, increased intraocular and intracranial pressure, bronchospasm, and myocardial ischaemia.^[12] The use of alpha 2 agonists in the preoperative period has been associated with attenuated HR and BP responses to stressful events. Opioids, adrenergic blocking agents, vasodilating agents and local anaesthetics have been used to attenuate the hemodynamic effects of endotracheal intubation. Lidocaine and nitroglycerine were found to be ineffective in controlling the hemodynamic response to laryngoscopy and intubation.^[3]

Jaakola et al,^[4] showed that dexmedetomidine attenuated the increase in HR and BP during intubation similar to our study.

Lawrence et al,^[5] found that a single dose of dexmedetomidine before induction of anaesthesia attenuated the hemodynamic response to intubation and extubation.

The analgesic, sedation, anxiolytic, sympathetic and blunting of exaggerated hemodynamic responses by administration of dexmedetomidine are being extensively studied and are mainly mediated by the activation of alpha 2 receptors located in the post synaptic terminals in the central nervous system, which causes decreased neuronal activity and augmentation of the vagal activity.^[8]

The role of alpha 2 agonist in regulating the autonomic and cardiovascular responses is well understood, whereby they inhibit release of catecholamines (noradrenaline) from the sympathetic nerve terminals by augmentation of a vasoconstrictive effect.^[7] Sukhminder Jit Singh Bajwa et al found that the ability of intravenous dexmedetomidine in decreasing the dose of opioids and anaesthetics for attenuation of haemodynamic responses during laryngoscopy and tracheal intubation.^[6]

Dexmedetomidine has been successfully used to attenuate the hemodynamic responses to tracheal intubation. Based on its characteristics of sedation, hemodynamic stability, and lack of respiratory depression, with its relatively short half-life and analgesic effects, the present study was conducted to evaluate the effect of dexmedetomidine in a dose of 0.5 mcg/kg on hemodynamic responses during intubation, the level of sedation score after giving the

drug and the requirement of additional supplementation.^[9] The parameters observed were changes in heart rate, systolic BP, diastolic BP, mean arterial pressure ,sedation score and additional supplementation required at various intervals.

In the present study, the dose of 0.5 micrograms/kg of dexmedetomidine was given as bolus dose before induction, which attenuated the sympathetic responses due to laryngoscopy and intubation when compared to group B where normal saline is used as placebo before induction. Significant difference in change in heart rate, systolic BP, diastolic BP, mean arterial pressure, additional supplementation required, were seen in both the groups. Group A, who received dexmedetomidine before intubation had mean change in heart rate of 67.70 (9.169) when compared to Group B, where the mean change in heart rate was 85.20 (13.134) and the mean change in mean arterial pressure in group A, was 82.66 (13.121) and in group B 98.60 (10.193), recorded one minute after intubation.

Even the requirement of inhalational anaesthetic for maintenance of anaesthesia during entire surgical procedure was reduced in group A as compared to group B. Aho et al., showed 25% reduction of maintenance concentrations of isoflurane in patients undergoing hysterectomy.^[10]

The activation of alpha2 adrenoceptors ,imidazole – preferring receptors or both in the ventrolateral medulla and especially in the solitaries nucleus tract by dexmedetomidine causes Bradycardia. In our present study the incidence of Bradycardia and hypotension was not much appreciable in both groups.

CONCLUSION

Dexmedetomidine is effective in attenuating the haemodynamic changes after endotracheal intubation for elective laparoscopic surgery when compared with other group, where normal saline is used as placebo instead of dexmedetomidine before induction.

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