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Original Research Article

A Randomized Controlled Study on Effect of Dexmeditomidine for Stress Response Attenuation due to Laryngoscopy and Intubation

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ABSTRACT

Aims: This study was designed to study the efficacy of intravenous dexmedetomidine for attenuation of cardiovascular responses to laryngoscopy and endotracheal intubation in patients in different age group, either sex belonging to ASA I and ASA II scheduled for elective surgical procedures under general anaesthesia.

Methods: Sixty adult patients scheduled for elective surgical procedures were randomly allocated to receive dexmedetomidine (0.5 mcg/kg) or normal saline over 20 min before intubation. Patients were compared for hemodynamic changes (HR, SBP, DBP, and MAP) at baseline, 1, 3, 5 & 10 min after intubation.

Results: Basal mean heart rate between group I and group II was not significant (p = .575) and as pre-induction, induction 1, 3, 5 & 10 minutes after intubation the HR changes were significant. In group II there was constant decrease in HR from the time of preinduction until 10 minutes of intubation which was statistically highly significant as compared to group I.

Basal mean SBP between group I and group II was not significant (p= .123), at preinduction was also not significant (P=.104), at induction, 1, 3, 5 & 10 minutes after intubation the SBP changes were highly significant (p= .000). In group II, SBP continued to remain below the base value from the time of pre-induction until 10 minutes after intubation which was statistically significant.

Basal mean DBP between group I and group II was not significant (p= .956), at preinduction was significant (P= .003), at induction, 1, 3, 5 & 10 minutes after intubation the DBP changes were highly significant (p= .000). In group II, there was constant decrease in DBP from the time of induction until 10 minutes after intubation which was statistically significant.

Basal mean MAP between group I and group II was not significant (p= .956), at preinduction was significant (p= .003), at induction, 1, 3, 5 & 10 min after intubation the DBP changes were highly significant (p=.000). In group II, there was a constant in MBP from the time of pre-induction until 10 minutes of intubation which was statistically significant.

Conclusion: From the present study it is obvious that dexmedetomidine produces stable heart rate, provides greater cardiovascular stability, attenuates pressure response as well as tachycardia and prevents postoperative shivering, nausea and vomiting.

Keywords: Dexmedetomidine, Laryngoscopy, General Surgeries.

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INTRODUCTION

Direct laryngoscopy and endotracheal intubation following induction of anesthesia is associated with hemodynamic changes due to reflex sympathetic discharge caused by epipharyngeal and laryngopharyngeal stimulation.[1] This increase in blood pressure and heart rate are usually transient, variable and unpredictable. Transient hypertension and tachycardia are probably of no consequence in healthy individuals, but can evoke life threatening condition in susceptible patients.[2] A variety of drugs have been used to control this hemodynamic response, such as vasodilators,[3,4] beta blockers,[5,6] calcium channel blockers,[7-9] alfa$_2$ agonists[10] and opioids.[11-13] However, no modality was devoid of drawbacks and limitations. Dexmedetomidine is a highly selective alfa$_2$ adrenergic agonist that has sedative and analgesic effects. Dexmedetomidine has been shown to decrease induction doses of intravenous anaesthetics and to decrease intraoperative opioid and volatile anaesthetic requirements for maintenance of anaesthesia. In addition, it has been shown to decrease perioperative catecholamine concentrations and promote perioperative hemodynamic and adrenergic stability.[14-21] This study was done to evaluate the efficacy of a single dose of I.V. dexmedetomidine 0.5 mcg/kg body weight in attenuating the stress response to laryngoscopy and endotracheal intubation.

MATERIALS AND METHODS

The present study was carried out on 60 patients in the department of surgery and anaesthesia of Rama Medical College Hospital & Research Centre, Hapur, Uttar Pradesh (India). After approval from the institutional ethical committee and informed written consent from the patients, 60 patients of ASA group I or II of different age group are selected for the study from the routine list of general surgeries. All of them were randomly divided into 2 groups of 30 each as group I and group II. All the patients were examined for any major medical diseases. After sifting the patients in the OT and attaching all monitors, patient's vitals were recorded after 5 min of settling on the OT. After securing IV line, the patients were medicated as follows.

Group I: (Saline group) patients receive 100 ml saline infused over 20 min.

Group II: (Dexmedetomidine group) receives intravenous dexmedetomidine 0.5 mcg/kg in 100 ml normal saline infused over 20 min dose not exceeding 50 mcg totally.

After 5 min of stabilization; SBP, DBP, MAP, HR, SPO_2 (T1) was recorded. Prior to induction, inj. glycopyrrolate 0.2 mg and inj. ondansetron 4 mg administered IV. All the patients were induced with the inj. propofol 2mg/kg and inj. vecuranium 0.1 mg/kg to facilitate laryngoscopy and intubation. Anaesthesia was maintained with 50% O_2 and 50% N_2O by positive pressure mask ventilation. At 2 min after induction SBP, DBP, MAP, HR, SPO_2 was recorded. At 3 min after induction, appropriate sized ETT was introduced. Anaesthesia was maintained with O_2, N_2O, Sevoflurane. SBP, DBP, MAP, HR, SPO_2 were recorded at 1(T3), 3(T4), 5(T5), 10(T6) after laryngoscopy and intubation.

OBSERVATION AND RESULTS

In group I mean age of patients were 38.77±12.75 years and mean weight were 58.37±12.64 kgs. In group II mean age of patients were 38.93±11.40 years and mean weight were 62.93±9.37 kgs as shown in the table 1.

Statistical evaluation between the groups showed that the basal mean heart rate between group I and group II was not significant (p = .575) and as pre-induction, induction 1, 3, 5 & 10 minutes after intubation the HR changes were significant. In group II there was constant decrease in HR from the time of preinduction until 10 minutes of intubation which was statistically highly significant as compared to that of group I as shown in table 2.

Statistical evaluation between the group that the basal mean SBP between group I and group II was not significant (p= .123), at preinduction was also not significant (P=.104), at induction, 1, 3, 5 & 10 minutes after intubation the SBP changes were highly significant (p= .000) as shown in the table 3.

Table 1: Demographic data

		Group I	Group II
Age (years)	**Mean±SD**	38.77±12.75	38.93±11.40
Weight (kgs)	**Mean±SD**	58.37±12.64	62.93±9.37

Table 2: Intergroup comparison of mean heart rate (BPM) changes in response to laryngoscopy and intubation between saline group and dexmedetomidine group

Time	Saline	dexmedetomidine	P value	Remarks
To(basal)	89.13±11.40	87.50±11.02	0.575	NS
T1(preinduction)	87.37±11.10	70.47±11.09	0.000	HS
T2(induction)	87.37±10.78	69.93±10.26	0.000	HS
T3(1min)	101.33±11.55	80.13±10.05	0.000	HS
T4(3 min)	99.53±11.64	77.47±9.74	0.000	HS
T5(5min)	95.63±10.74	73.90±9.30	0.000	HS
T6(10 min)	92.47±10.23	73.17±9.68	0.000	HS

Table 3: Intergroup comparison of mean systolic blood pressure (SBP in mm Hg) changes in response to laryngoscopy and intubation between saline group and dexmedetomidine group

Time	Saline	Dexmedetomidine	P value	Remarks
To(basal)	121.07±9.47	125.37±11.68	0.123	NS
T1(preinduction)	118.63±8.47	114.87±9.17	0.104	NS
T2(induction)	119.10±8.46	107.47±9.06	0.000	HS
T3(1min)	125.77±7.90	114.33±8.70	0.000	HS
T4(3 min)	122.43±7.57	111.63±7.54	0.000	HS
T5(5min)	119.47±6.99	110.00±8.09	0.000	HS
T6(10 min)	118.03±7.12	108.53±8.45	0.000	HS

Table 4: Intergroup comparison of Mean diastolic blood pressure (DBP in mm Hg) changes in response to laryngoscopy and intubation between saline group and dexmedetomidine group.

Time	Saline	Dexmedetomidine	P value	Remarks
To(basal)	77.33±8.02	77.47±10.36	0.956	NS
T1(preinduction)	76.00±7.83	69.57±8.14	0.003	S
T2(induction)	76.10±7.19	65.60±7.26	0.000	HS
T3(1min)	82.43±5.90	72.43±7.12	0.000	HS
T4(3 min)	78.40±7.15	67.90±6.38	0.000	HS
T5(5min)	75.77±7.03	66.70±5.84	0.000	HS
T6(10 min)	75.77±7.26	64.50±5.20	0.000	HS

Table 5: Intergroup comparison of Mean mean arterial blood pressure (MAP in mm Hg) changes in response to laryngoscopy and intubation between saline group and dexmedetomidine group

Time	Saline	Dexmedetomidine	P value	Remarks
To(basal)	91.40±8.05	93.20±10.58	0.956	NS
T1(preinduction)	89.83±7.65	84.80±8.61	0.003	S
T2(induction)	89.77±7.50	79.60±7.38	0.000	HS
T3(1min)	96.33±6.15	86.53±7.12	0.000	HS
T4(3 min)	92.43±6.73	82.43±5.95	0.000	HS
T5(5min)	89.50±6.52	80.97±6.06	0.000	HS
T6(10 min)	88.90±6.52	79.13±5.61	0.000	HS

In group II, SBP continued to remain below the base value from the time of pre-induction until 10 minutes after intubation which was statistically significant.

Statistical evaluation between the group that the basal mean DBP between group I and group II was not significant (p= .956), at preinduction was significant (P= .003), at induction, 1, 3, 5 & 10 minutes after intubation the DBP changes were highly significant (p= .000) as shown in the table 4.

In group II, there was constant decrease in DBP from the time of induction until 10 minutes after intubation which was statistically significant.

Statistical evaluation between the groups showed that the basal mean MAP between group I and group II was not significant (p= .956), at preinduction was significant (p= .003), at induction, 1, 3, 5 & 10 min after intubation the DBP changes were highly significant (p=.000) as shown in table 5. In group II, there was a constant in MBP from the time of pre-induction until 10 minutes of intubation which was statistically significant.

DISCUSSION

Laryngoscopy and endotracheal intubation are noxious stimuli capable of producing a huge spectrum of stress responses such as tachycardia, hypertension, laryngospasm, bronchospasm, raised intracranial pressure and intraocular pressure.[22]

The haemodynamic changes brought about by laryngoscopy and intubation was first described by Reid and Brace. The haemodynamic response is initiated within seconds of direct laryngoscopy and further increases with the passage of the endotracheal tube. The response is initiated within 5s of laryngoscopy, peaks in 1–2 min and returns to normal levels by 5 minutes.[23]

Various drug regimens and techniques such as lignocaine, opioids, nitro-glycerine, calcium channel blockers such as diltiazem and β-blockers such as esmolol have been tried for obtunding the stress response.[26-29] α-2 receptor agonists mediate their action through α-2A receptors located in locus caeruleus, the predominant noradrenergic nuclei of upper brainstem.

So for present study, 60 patients were selected from the routine list of general surgery. Patients were divided in two groups each of 30 patients. Dexmedetomidine group was compared with saline group in attenuating pressor response due to laryngoscopy and intubation.

In dexmedetomidine group HR, SBP, DBP, MAP showed significant decrease throughout the study period.

Hence intravenous dexmedetomidine given 20 min before induction in a dose of 0.5 mcg/kg body weight as infusion effectively attenuate the stress response after laryngoscopy and intubation.

CONCLUSION

From the present study it is obvious that dexmedetomidine produces stable heart rate, provides greater cardiovascular stability, attenuates pressure response as well as tachycardia and prevents postoperative shivering, nausea and vomiting.

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