



## Evaluation of Dexmedetomidine for Attenuation of Haemodynamic Resonse to Tracheal Intubation in Treated Hyertensive Patients: a Comparison with Esmolol

### KEYWORDS

Hemodynamic Response, Treated Hypertensive, Dexmedetomidine, Esmolol

#### Raw B.K.

Assistant Professor Department Of Anaesthesiology and Critical Care, Moti Lal Nehru Medical College, Allahabad, Uttar Pradesh, India

#### Malviya P.S.

Professor Department Of Anaesthesiology and Critical Care, Moti Lal Nehru Medical College, Allahabad, Uttar Pradesh, India

#### Gupta Bhupesh K

Junior Resident Department Of Anaesthesiology and Critical Care, Moti Lal Nehru Medical College, Allahabad, Uttar Pradesh, India

### ABSTRACT

**Background:** Hemodynamic response to laryngoscopy and tracheal intubation is exaggerated in hypertensive patients even though rendered normotensive pre-operatively by antihypertensive medications. Various studies have found that dexmedetomidine and esmolol can suppress the hemodynamic response to laryngoscopy and intubation. **Objective:** The present study was aimed to compare the efficacy of Dexmedetomidine with Esmolol in blunting hemodynamic response to tracheal intubation in treated hypertensive patients undergoing non-cardiac surgery under general anaesthesia. **Methods:** It was a prospective, double-blind, randomized, controlled study conducted at MLN Medical College & associated SRN Hospital, after approval from the institutional Ethical Committee. A total of 96 controlled hypertensive patients of either sex of age 18 to 60 years belonging to American Society of Anaesthesiologists (ASA) physical status I or II were randomly divided into three groups with 32 patients in each. In Group C, 10 ml of normal saline was injected i.v. 5 min prior to intubation. In Group D, Dexmedetomidine 0.5ug/kg body weight diluted in 10ml normal saline was given i.v. over 10 min, 10 min prior to intubation. In Group E, Esmolol 0.5 mg/kg body weight diluted in 10 ml normal saline was given i.v. over 1 min, 5 min prior to intubation. Heart rate (H.R.), systolic blood pressure (S.B.P.), diastolic blood pressure (D.B.P) & SP02, were measured prior to administration of drugs under study and then at 1,5,10 & 15 minutes post intubation. **Results:** Both the drugs, dexmedetomidine and esmolol were effective in controlling the heart rate after intubation however, dexmedetomidine stood better due to its more effective control of systolic and diastolic blood pressures and having additional analgesic and sedative properties.

### INTRODUCTION

Laryngoscopy and tracheal intubation violate the patient's airway reflexes and predictably lead to hypertension and tachycardia. It has detrimental effects on the other organ systems. The pressor response to laryngoscopy and intubation is a sympathetic reflex that is provoked by stimulation of the orolaryngopharynx. Although the corresponding increase in blood pressure and heart rate are transitory and variable, they are more pronounced and unpredictable in hypertensive patients. Consequently, life-threatening complications may develop in these patients, such as pulmonary edema, cerebrovascular hemorrhage and myocardial infarction<sup>[1]</sup>. Hypertensive patients have increased activity of the sympathetic nervous system and may exhibit an exaggerated hemodynamic response to the induction of anaesthesia compared with normotensive patients.<sup>[2]</sup> Dexmedetomidine, a more specific and selective  $\alpha$ -2 adrenergic agonist has a shorter duration of action and because of its sedative and analgesic properties can be used as an adjunct to general anaesthetics, Esmolol hydrochloride is a cardio selective beta receptor blocker which has been used as a bolus and in infusion for blunting hemodynamic response to intubation by some authors and found it to be effective. This study was aimed to compare the efficacy of dexmedetomidine with esmolol in attenuating hemodynamic response to tracheal intubation in treated hypertensive patients undergoing non-cardiac elective surgery under general anaesthesia.

### MATERIAL AND METHODS

After approval from the Ethical Committee of institution, a total of 96 controlled hypertensive patients of either sex of age 18 to 60 years belonging to ASA physical status I or II undergoing non-cardiac general surgery were ran-

domly divided (sealed envelope method) into three groups with 32 patients in each. Patients were informed and explained about the procedure and any doubts or apprehension were clarified. A written and informed consent was obtained. Patients having bronchial asthma, COPD or any other respiratory diseases, cardiac failure, valvular heart diseases, conduction blocks and history of ischemic heart disease, renal failure, neurological illnesses, history of stroke and having any specific contraindication related to drugs in study were excluded from this study. Patients were ordered to take their antihypertensive medication in the morning of day of surgery with a sip of water. Angiotensin Converting Enzyme (ACE) inhibitors and angiotensin II antagonists (AIIAs) were discontinued in the morning due to increased chance of intraoperative hypotension, when these drugs are continued.<sup>[3]</sup>

All the patients were given inj. glycopyrrolate 0.2 mg. i.v., 15 min. before induction. In Group C, 10ml of normal saline was injected i.v. 5 min prior to intubation. Patients in Group D received Dexmedetomidine 0.5  $\mu$ g/kg body weight diluted in 10 ml normal saline given i.v. over 10 min, 10 min prior to intubation while in Group E, Esmolol 0.5 mg/kg body weight diluted in 10 ml normal saline was given i.v. over 1 min, 5 min prior to intubation. Study drugs in each group were given by anaesthesiologists who were not involved in this study. The investigator also remained blind regarding the content of these solutions prepared for the patients. All the patients were pre-oxygenated with 100% O<sub>2</sub> for 3 min. Anaesthesia was induced with i.v injection of propofol 1-2 mg/kg until loss of response to verbal command. Succinylcholine 1-1.5 mg/kg was given to facilitate the endotracheal intubation and anaesthesia was maintained with 67:33 (N<sub>2</sub>O:O<sub>2</sub>) & isoflurane (0.5%

- 1%) on soda lime closed breathing circuit. Muscle relaxation was maintained with vecuronium (0.04-0.07 mg/kg) followed by supplementary dose (0.01mg/kg) every 10 to 20 mins. After completion of surgery, residual paralysis was reversed with neostigmine (0.05 ml/kg) and glycopyrrolate (0.01mg/kg). Heart rate (H.R.), systolic blood pressure (S.B.P.), diastolic blood pressure (D.B.P.) & SPO<sub>2</sub> were measured prior to administration of drugs under study and then at 1,5,10 & 15 minutes post- intubation. Any Hypotension (SBP < 20% of baseline), or Bradycardia (HR < 60 beats/minute), was noted and scheduled to be treated with vasopressors and atropine respectively.

Statistical analysis was performed using IBM SPSS software version 16. chi-square test, student t-test (paired & unpaired) and one way ANOVA were used where appropriate, to test the significance of data. Data are presented as mean ± S.D.A. 'p' value of <0.05 was considered significant.

**RESULTS**

In our study, patients in all the three groups were comparable in respect to demographic data such as age, sex, body weight, height and pre-intubation vital parameters [table 1&2]. In Group C, significant increase in H.R., S.B.P. & D.B.P. was observed at 1, 5, 10 & 15 min after intubation (p<0.01) [figure 1, 2 & 3]. In Group D, significant decrease in H.R. was seen at 1 min post- intubation which remained below baseline at 5, 10 & 15 min after intubation (p<0.01). S.B.P. in this group did not show rise instead remained same at 1 min after intubation (p>0.05) and a fall below baseline value was seen at 5,10 and 15 min after intubation (p,0.01). D.B.P. was same as baseline upto 5 min after intubation (p>0.05), but thereafter a fall was seen (p<0.01) [figure 1, 2 & 3]. In Group E, H.R. significantly increased from baseline value, 1 min after intubation but decreased thereafter and remained below baseline at 5,10,&15 min after intubation (p<0.05). S.B.P. increased from baseline value at 1 min after intubation although it decreased thereafter and remained below baseline at 5, 10 & 15 min after intubation (p<0.01). D.B.P. also increased significantly at 1 min after intubation (p<0.01) but returned to baseline value at 5 min (p>0.05) and decreased below it thereafter (p<0.01) [figure 1, 2 & 3].

**TABLE 1: COMPARISON OF AGE, WEIGHT & HEIGHT IN THREE GROUPS**

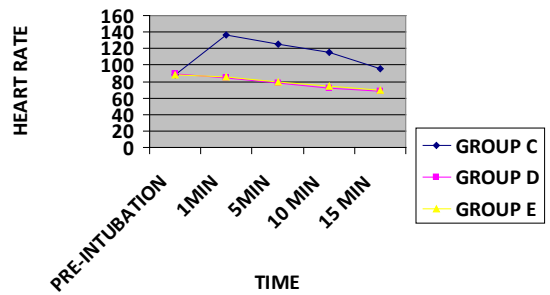
DEMO-GRAPHIC PROFILE	GROUP-C	GROUP-D	GROUP-E	p value
AGE (yrs) (MEAN±SD)	49.50±6.12	49.87±5.97	51.21±5.30	>0.05
WEIGHT(kg) (MEAN±SD)	62.12±5.54	60.84±6.23	61.84±5.37	>0.05
HEIGHT (cm) (MEAN±SD)	162.68±5.22	160.68±5.69	162.87±6.22	>0.05

**TABLE 2: PFE- INTUBATION VITAL PARAMETERS (TIME T.)**

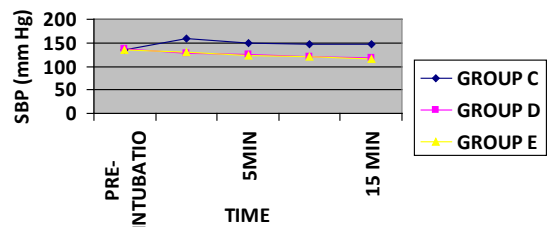
PRE-INTUBATION VITAL PARAMETERS	GROUP-C MEAN±SD	GROUP-D MEAN±SD	GROUP-E MEAN±SD	p value
Heart Rate (HR) (bpm)	87.90±6.64	89.59±7.29	88.09±5.78	>0.05

Systolic blood pressure (SBP) (mmHg)	136.37±6.43	133.87±9.55	135.25±5.58	>0.05
Diastolic blood pressure (DBP) (mmHg)	88.0±6.30	89.65±6.92	86.94±9.57	>0.05
SpO <sub>2</sub>	100+0	100+0	100+0	>0.05

**FIGURE 1: CHANGES IN H.R. IN THREE GROUPS AT VARIOUS TIME INTERVALS AFTER INTUBATION**



**FIGURE 2: CHANGES IN SBP IN THREE GROUPS AT VARIOUS TIME INTERVALS AFTER INTUBATION**



**DISCUSSION**

Direct acting alpha-2 adrenoceptor agonists (clonidine and dexmedetomidine) represent clinically significant effects on the anesthetic requirements and on the sympathoadrenal and hemodynamic responses induced by tracheal intubation, anesthesia and surgery. [4]

Our observations are consistent with Aanta et al., [5] who conducted a randomized, double blind, controlled study to know the effect of dexmedetomidine on haemodynamic, catecholamine and hormonal response to surgery and observed that, 10 min after dexmedetomidine administration there was an average decrease of 10% in SBP and DBP. Marja Leena et al., [6] conducted a double blind randomized controlled study to investigate hemodynamic effect of dexmedetomidine and they observed that there was a significant decrease in systolic and diastolic blood pressure with all doses of dexmedetomidine and no change with fentanyl. The decrease in systolic blood pressure was 11% with 0.5 µg/kg body weight of dexmedetomidine. Jakola et al., [7] studied the effects of a single intravenous dose of dexmedetomidine and concluded that a single intravenous dose of dexmedetomidine 0.6 µg/kg attenuated sympathoadrenal responses associated with laryngoscopy and

intubation. Basar et al.<sup>[8]</sup> concluded that a single dose of 0.5  $\mu\text{g}/\text{kg}$  body weight of dexmedetomidine given preoperatively 10 min before induction blunted haemodynamic response to intubation. Our study which has used dexmedetomidine in a dose of 0.5 mcg/kg body weight given 10 min prior to intubation over a period of 10 minutes, has given similar findings in attenuation of hemodynamic response to laryngoscopy and intubation as mentioned in above studies.

Bradycardia and hypotension have been reported in studies evaluating the effect of dexmedetomidine administration on perioperative hemodynamics. In contrast to the previously mentioned studies, we did not detect any excessive reduction in HR or blood pressure values in the dexmedetomidine group compared to other groups.

Compared with other  $\hat{\alpha}$ -adrenergic blocking drugs, esmolol seems to be an appropriate selection for attenuating the hemodynamic response to laryngoscopy and tracheal intubation due to its cardioselectivity, rapid onset of action, and short elimination half-life.<sup>[9]</sup> There have been several reports discussing the effects of esmolol on both HR and arterial blood pressure during laryngoscopy and tracheal intubation compared to placebo. Miller et al. reported that 100 mg bolus of esmolol was effective for controlling the hemodynamic response to tracheal intubation in a Canadian multicentre trial.<sup>[10]</sup>

Sharma et al. demonstrated that 100 mg esmolol suppressed the hemodynamic response to tracheal intubation in hypertensive patients.<sup>[11]</sup> Although esmolol is considered to have a significant effect on both tachycardia and hypertensive reaction following intubation, Oxorn et al found that esmolol in bolus doses of 100 mg and 200 mg affects solely the laryngoscopy response.<sup>[12]</sup> Similarly, Kindler et al found that esmolol administration before laryngoscopy was sufficient to control HR after intubation but it was on attenuating the chronotropic response to tracheal intubation<sup>[13]</sup>.

## CONCLUSION

In conclusion, dexmedetomidine in a dose of 0.5  $\mu\text{g}/\text{kg}$  given i.v over a period of 10 minutes preop to induction and esmolol in a dose of 0.5 mg/kg given i.v over 1 min were effective in controlling the heart rate after intubation, however dexmedetomidine stands better due to its more effective control of systolic and diastolic blood pressure due to sedative and analgesic effect after tracheal intubation in hypertensive patients.

## REFERENCES

1. Fox DJ, slar CS, Hill CH, Villanueva R, King BD. Complications related to the pressor response to endotracheal intubation. *Anesthesiology*. 1977;47:524-25.
2. FujiiY, Tanaka H, Toyooka H. Circulatory responses to laryngeal mask airway insertion or tracheal intubation in normotensive and hypertensive patients. *Can J Anaesth*. 1995;42:32-36.
3. Saber W. Perioperative medication management: A case-based review of general principles. *Cleve Clin J Med* 2006;73 (Suppl 1): S82e7.
4. Montazeri K, Kashefi P, Honarmand A, Safavi M, Hirmanpour A. Attenuation of the pressor response to direct laryngoscopy and tracheal Intubation: oral clonidine vs. oral gabapentin premedication. *j Res med Sci*. 2011;16(Special Issue):377-86.
5. Aanta R, Kanto J, Scheinin H, Kallio A. Dexmedetomidine n alpha-2 adrenoceptor agonist reduces anaesthetic requirements for patients undergoing minor gynaecological surgeries. *Anesthesiology* 1990;73:230-5.
6. Jaakola ML, Salonen M, Lentinen R, Scheinin H. The analgesic action of dexmedetomidine - a novel alpha-2 drenoceptor agonist in healthy volunteer. *Pain* 1991;46:281-5.

7. Jakola ML, Ali-Melkka T, Kanto L, Kallio A, Scheinin H, Scheinin M. Dexmedetomidine reduces intraocular pressure, intubation and anaesthetic requirements in patients undergoing ophthalmic surgery. *Br. J Anaesth* 1992;68:570-5.
8. Basar H, Akpınar S, Dogancı N, Buyukkocak U, kaymak C, Sert O, et al. The effect of preanaesthetic, single dose dexmedetomidine on induction, haemodynamic and cardiovascular parameters. *J Clin Anaesth* 2008;20:431-6.
9. Sum CY, Yacobi A, Kartzinel R, Stampfli H, Davis CS, Lai CM. Kinetics of esmolol, an ultra-short-acting beta blocker, and of its major metabolite. *Clin Pharmacol Ther*. 1983;34(4):427-34.
10. Miller DR, Martineau RJ, Whnands JE, Hill J. Bolus administration of esmolol for controlling the haemodynamic response to tracheal intubation: the Canadian Multicentre Trial. *Can J Anaesth*. 1991;38(7):849-58.
11. Sharma S, Mitra S, Grover VK, Kalra R. Esmolol blunts the haemodynamic responses to tracheal intubation in treated hypertensive patient S. *Can J Anaesth*. 1996;43:778-82.
12. Oxorn D, Knox JW, Hill J. Bolus doses of esmolol for the prevention of perioperative hypertension and tachycardia. *Can J Anaesth*. 1990;37:206-9.
13. Kindler CH, Schumacher PG, Schneider MC, Urwyler A. Effects of intravenous lidocaine and/or esmolol on hemodynamic responses to laryngoscopy and intubation: a double-blind, controlled clinical trial. *J Clin Anesth*. 1996;8:491-6.