



## **To Compare Two Doses of Intravenous Dexmedetomidine in Attenuation of Haemodynamic Response to Laryngoscopy and Endotracheal Intubation**

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### **Abstract**

**Introduction:** Laryngoscopy and endotracheal intubation are practiced for the safe conduct of general anaesthesia. The precise mechanism of laryngoscopic response is elusive but it has both sympathetic and parasympathetic elements. The net effect of this autonomic surge results in hypertension, tachycardia. We conducted this study to compare two doses of intravenous dexmedetomidine in obtunding this response in patients undergoing elective general surgery under general anaesthesia .

**Material and Methods:** One hundred thirty five patients belonging to American Society of Anesthesiologists (ASA) grade I or II of either sex belonging to age group 18-50 years presenting for elective surgery under general anaesthesia were included after institutional ethical committee clearance. Group I was given 20ml of iv normal saline over 10 min. Group II was given iv dexmedetomidine 0.5 mcgkg<sup>-1</sup> diluted to 20ml with normal saline over 10 min. Group III was given iv dexmedetomidine 0.75 mcgkg<sup>-1</sup> diluted to 20ml with normal saline over 10

min. A uniform anaesthetic technique was used in all three groups. Haemodynamic responses were compared in between groups by measuring heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), rate pressure product (RPP) at baseline, before administration of study drug (B), after administration of study drug (BI), just before intubation (AI), after intubation at 1 min, 3 min, 5 min (T<sub>1</sub>, T<sub>3</sub>, T<sub>5</sub>). Ramsay sedation score was noted post-operatively for two hours at 30 min interval.

**Results:** Groups were well matched for their demographic data. There was a statistically significant difference (p<0.05) between the group receiving dexmedetomidine and the group receiving normal saline with respect to heart rate, systolic blood pressure, mean arterial pressure at all the time intervals after laryngoscopy and endotracheal intubation with dexmedetomidine in the dose 0.75mcgkg<sup>-1</sup> being the most effective. Sedation scores were more with dexmedetomidine group.

**Conclusion:** Dexmedetomidine in the dose range 0.75mcgkg<sup>-1</sup> better obtunded the haemodynamic responses to laryngo-scopy and endotracheal intubation.

**Keywords:** General Anaesthesia, dexmedetomidine, endotracheal intubation and laryngoscopy.

### Introduction

Laryngoscopy and endotracheal intubation are practiced for the safe conduct of general anaesthesia. Intubation, in turn is preceded by laryngoscopy, which is done to visualize larynx and adjacent structures. The precise mechanism of laryngoscopic response is elusive but it has both sympathetic and parasympathetic elements.<sup>1</sup>The net effect of this autonomic surge results in hypertension, tachycardia, increased pulmonary artery wedge pressure and decreased ejection fraction. Although these circulatory responses lasts only for short period of time and of little consequence in patients with normal circulatory system but they may be amplified in patients having intracranial pathology, reactive airways and coronary artery disease. Dexmedetomidine, the pharmacologically active dextrorotatory S-enantiomer of medetomidine, is also a relatively selective second generation  $\alpha_2$  agonist having analgesic, sedative, sympatholytic and amnesic properties. Dexmedetomidine has greatest  $\alpha_2/\alpha_1$  affinity, which makes it eight to ten times more potent and selective than its counterpart clonidine. Due to its wide spectrum of actions, dexmedetomidine is considered to be ideal agent for providing preoperative, intraoperative and procedural sedation as well as an adjuvant in regional anaesthesia.<sup>2-4</sup> Role of intravenous dexmedetomidine in obtunding the haemodynamic response to laryngoscopy and endotracheal intubation is well established, thus we conducted this study to

compare two doses of intravenous dexmedetomidine in obtunding this response in patients undergoing elective general surgery under general anaesthesia.

**Aims & Objectives:** To compare the two doses of intravenous dexmedetomidine in attenuating the haemodynamic response to laryngoscopy and intubation with regards to Blood pressure (BP), Heart rate(HR) and Rate pressure product (HR\*SBP)

### Material And Methods

This is a prospective double-blind and randomized study. One hundred thirty five patients belonging to American Society of Anesthesiologists (ASA) grade I or II of either sex belonging to age group 18-50 years presenting for elective surgery under general anaesthesia were included after taking clearance from institutional ethical committee. Patients having anticipated difficult intubation (MPG - III and IV), oropharyngeal pathology or high airway resistance, hyperthyroidism, low pulmonary compliance, ischaemic heart disease, diabetes mellitus, hypertension and pregnant females were not taken into consideration. Patients were randomly allocated into three groups comprising of 45 patients. Group I were given 20ml of iv normal saline over 10 min. Group II were given iv dexmedetomidine 0.5 mcgkg<sup>-1</sup> diluted to 20ml with normal saline over 10 min. Group III were given iv dexmedetomidine 0.75 mcgkg<sup>-1</sup> diluted to 20ml with normal saline over 10 min. The purpose and protocol of study was well explained to all the patients and informed written consent was obtained. The study drug was given by blinded observer and haemodynamic parameters were recorded. A uniform anaesthetic technique was used in all three groups. Prior to induction iv glycopyrrolate 0.2mg was administered. Patients were preoxygenated with 100% O<sub>2</sub> for 3 min and induction was done with thiopentone sodium

5mgkg<sup>-1</sup>, fentanyl 2 mcgkg<sup>-1</sup> and vecuronium 0.1mgkg<sup>-1</sup> so as to facilitate laryngoscopy and intubation. All patients were ventilated for 3 min using 1% isoflurane in O<sub>2</sub>. Intubation was done with size 7mm ID (internal diameter) endotracheal tube (ETT) in female and 8mm ID ETT in male patients. Laryngoscopy and intubation was done by the trained person who had performed more than fifty intubations in all the cases for consistency of observations. The patients didn't come under data analysis if there was bucking, laryngospasm on laryngoscopy and intubation, if more than one attempt was taken to intubate and if duration for intubation exceeded more than 20 seconds, if ETT used was larger or smaller than above mentioned internal diameter. At the end of surgery, when patients had spontaneous respiratory efforts, residual neuromuscular blockade was reversed with inj. neostigmine 0.05mgkg<sup>-1</sup> and inj. glycopyrrolate 0.01mgkg<sup>-1</sup>. Recovery was assessed and extubation was done after throat suction. After complete recovery from neuromuscular blockade, patients were transferred to post anaesthesia care unit and observed for bradycardia, hypotension and sedation for two hours at every 30 min interval. Haemodynamic responses were compared in between groups by measuring heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), rate pressure product (RPP) at baseline, before administration of study drug (B), after administration of study drug (BI), just before intubation (AI), after intubation at 1 min, 3 min, 5 min (T<sub>1</sub>, T<sub>3</sub>, T<sub>5</sub>). Ramsay sedation score was noted post-operatively for two hours at 30 min interval.<sup>5</sup>

### Statistical Analysis

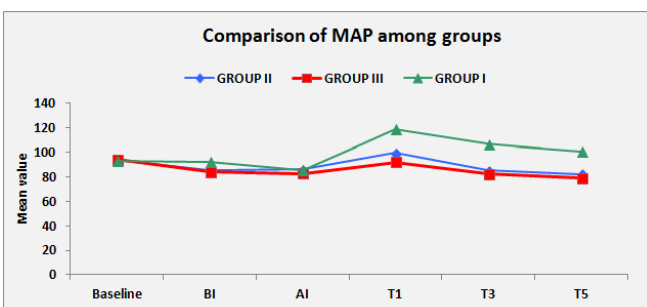
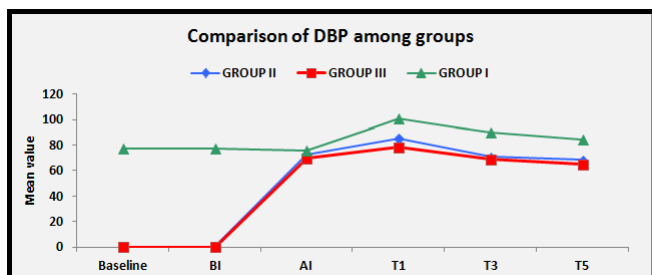
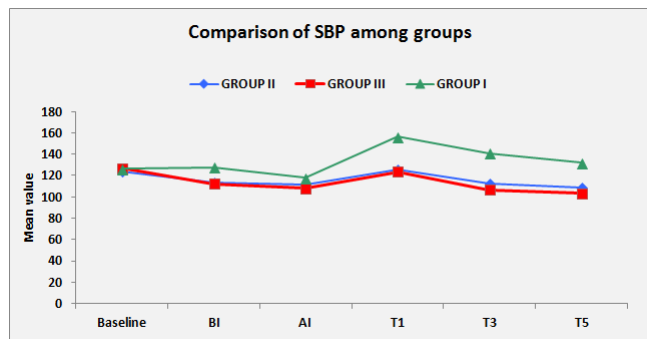
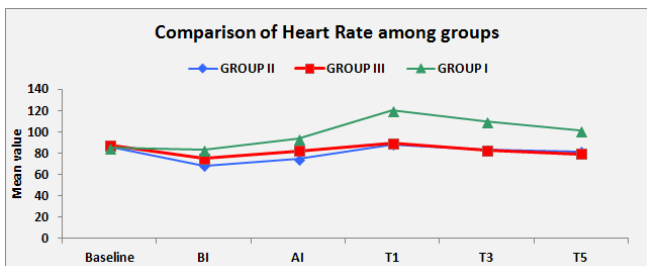
At the end of the study, all the data thus collected was compiled and analyzed using Student's 't' test (paired

and unpaired) for continuous data and chi-square test or Fisher's exact test was applied for nominal categorical data and association between groups with respect to various characteristics. Non-normal distribution continuous data will be compared using Mann Whitney U test. For all statistical tests, a p value less than 0.05 will be taken to indicate a statistically significant difference and p value less than 0.001 will be taken to indicate statistically highly significant difference.

### Observations and Results

All the three groups were comparable regarding patients demographic profile (age, weight and sex distribution) and there was no statistically significant difference (p>0.05) between the groups. Baseline heart rate in all the groups were comparable to each other and there was no statistical significant difference between them (p>0.05). HR decreased in both the groups II and III after giving dexmedetomidine as compared to group I where it was markedly increased. At 1 min following intubation, HR was increased in all three groups but it was lesser in group III as compared to other two groups and thereafter HR started declining in group III at 3 min whereas it started reaching the baseline 3 min after intubation in group II (p<0.001). Mean SBP, DBP and MAP were lower in group III as compared to group II at all levels of assessment which is statistically significant (p<0.001) except after induction where no statistical significant difference was found in mean DBP in both the groups II and III (p>0.05). Mean sedation scores were higher in group III as compared to group I and II during the postoperative period. Bradycardia (HR<60beats per min) and hypotension (<90/60mmHg) occurred in 6% of patients in group III in comparison to 4% in group II, which didn't require any treatment and got relieved on its

own. There were no episodes of dysarrhythmias or desaturation in any of the patient.



## Discussion

Laryngoscopy and endotracheal intubation frequently induce haemodynamic stress response which is characterized by hypertension and tachycardia. This sympatho-adrenal stress response is responsible for the occurrence of transient but significant tachycardia and hypertension during intubation resulting in increased myocardial O<sub>2</sub> demand leading to ischemia and acute

heart failure in susceptible individuals. In an attempt to blunt these potentially adverse haemodynamic responses, different agents and techniques were used by many with varying success.<sup>6-7</sup>

Non-pharmacological methods include smooth swift laryngoscopy and decreasing the duration of laryngoscopy to less than 15 seconds. Pharmacological agents include inhalational anaesthetics, lidocaine, ACE inhibitors, beta blockers, calcium channel blockers, vasodilators, topical anaesthetics, magnesium, narcotic analgesics, or by increasing volatile anaesthetic concentration but variable results have been seen.<sup>8-9</sup> The disadvantages of these pharmacological agents vary from inadequate control of haemodynamics to deleterious side effects like hypotension, bradycardia, arrhythmias, chest wall rigidity and delayed recovery.<sup>10</sup>

Dexmedetomidine being a highly selective  $\alpha_2$  agonist, exhibits a unique pharmacological profile of haemodynamic stability along with the advantage of avoiding respiratory depression.<sup>11</sup> In our study, mean HR decreased in both the groups II and III but it significantly increased in group I 1 min after intubation after giving the study drug (Group I>II>III). The increase in HR after induction and 1 min after intubation in both the groups even after pretreatment with dexmedetomidine is probably because in our study all the patients were premedicated with inj. Glycopyrrolate. Mean SBP, DBP and MAP were lower in group III as compared to group II at all levels of assessment which is statistically significant ( $p<0.001$ ) except after induction where no statistical significant difference was found in mean DBP in both the groups II and III ( $p>0.05$ ). This is probably because onset of action of dexmedetomidine is less than 5 minutes and peak effect comes within 15 minutes. Sebastian et al (2017) studied the effect of optimal dose of

dexmedetomidine in attenuating the stress response to laryngoscopy and endotracheal intubation by comparing it with normal saline.<sup>12</sup> The results of our study were not in concordance with those of results seen in Sebastian et al.

### Conclusion

We conclude from our study that i.v. dexmedetomidine in the dose range of 0.5 and 0.75mcgkg<sup>-1</sup> reduce the rise in HR, SBP, DBP, MAP and RPP associated with laryngoscopy and endotracheal intubation during general anaesthesia. However the response to laryngoscopy and endotracheal intubation was better attenuated by the dose 0.75mcgkg<sup>-1</sup>. Thus, it provides better perioperative hemodynamic stability in ASA I and II grade patients during general anaesthesia as dexmedetomidine has sedative, anxiolytic and sympatholytic properties. Hence, dexmedetomidine infusion dose 0.75mcgkg<sup>-1</sup> over 10 min as an anaesthetic adjuvant can be used during general anaesthesia because it significantly obtunds the heart rate and blood pressure response following laryngoscopy and intubation and it facilitates smooth emergence from anaesthesia as compared to dexmedetomidine infusion dose 0.5mcgkg<sup>-1</sup> over 10 min.

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