

## Original Research Article

# Intravenous dexmedetomidine 1µg/kg as premedication to attenuate hemodynamic response to laryngoscopy and endotracheal intubation in surgeries under general anesthesia

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## ABSTRACT

**Background:** Choice of premedication and hemodynamic stability are always remain important concerns during laryngoscopy and endotracheal intubation for Anesthesiologists. Dexmedetomidine offers anxiolytic, sedation, hypnosis, analgesia, antisialagogue action as well as sympatholysis which make most suitable drug as premedication. Our aims for this study to evaluate efficacy of Injection Dexmedetomidine 1µg/kg intravenously as premedication on attenuation of hemodynamic changes to laryngoscopy and intubation as well as requirement of injection Propofol as an induction agent.

**Methods:** In Present study, 60 patients of ASA I, II of age 18 to 45 years were randomly divided in to two groups of 30 each. In group NS, 10 ml normal saline and in group D1 injection Dexmedetomidine 1µg/kg diluted in 10 ml of normal saline was used. In both groups study solutions administered over 10 minutes. Both the groups were administered standard general anaesthesia and requirement of Propofol was noted as an induction agent. Heart rate, blood pressure (systolic, diastolic and mean arterial pressure) were compared at baseline, 2 min, 5 min, 10 minutes (SD2, SD5, SD10) after study drugs administration, before induction (BI), after induction (AI), 1 minute (T1), 2 minutes (T2), 5 minutes (T5) and 10 minutes (T10) after laryngoscopy and intubation in both groups.

**Results:** HR, SBP, DBP and MAP highly significantly reduced at 2 min, 5 min and 10 minutes after infusion of Dexmedetomidine in group D1 as compared to group NS. (P<0.01). After induction values are highly significant in group D1 than group NS from baseline (P<0.01). Highly significant mean rise in hemodynamic parameters (HR, SBP, DBP and MAP) from baseline were observed in group NS compared to group D1 after laryngoscopy and intubation (P<0.01). Induction dose requirement of inj. Propofol significantly reduced in group D1 compared to other group (P<0.01).

**Conclusions:** Injection Dexmedetomidine 1µg/kg provides effective and complete attenuation of pressure response to laryngoscopy and endotracheal intubation as premedication with decreased requirement of inj. Propofol for induction without any side effects.

**Keywords:** Dexmedetomidine, Endotracheal intubation, Hemodynamic, Laryngoscopy, Premedication

## INTRODUCTION

Anesthesiologists are master in airway management. Skilled direct laryngoscopy and endotracheal intubation are most critical and day to day essential procedure for an anesthesiologist. Direct laryngoscopy and intubation are noxious stimuli and associated with transient, unpredictable and variable hemodynamic changes. This reflex sympathetic discharge is caused by stimulation of laryngopharynx, epipharynx and trachea, which are innervated by parasympathetic innervations via vagus and glossopharyngeal nerves and sympathetic via superior cervical ganglion.<sup>1</sup> These pressure response changes depend on premedication, force and duration of laryngoscopy and intubation, depth of anesthesia and use of any drugs or methods. These consequences of laryngoscopy and intubation usually not hazardous to normal healthy, ASA I and II patients but may precipitate ischemia, arrhythmias, CV stroke, pulmonary edema, increase intracranial pressure etc. in poor cardiac compliance patients, may have deliberate effects on cardiovascular, respiratory and neurological systems.<sup>1-3</sup>

Premedication is one of the most valuable element for anesthesia. Good premedication provide pleasant preoperative psychological conditions, relieves anxiety and emesis, produce sedation, hypnosis and analgesia, antisialagogue action, sympatholysis. All these play beneficial role to achieve depth of anesthesia and provide excellent condition for direct laryngoscopy and intubation.<sup>4,5</sup>

Till date, variety of agents and drugs have been tried to attenuate stress response, such as opioids, vasodilators, beta blockers,  $Ca^{+2}$  channel blockers, i.v. lignocaine, topical sprays, volatile agents,  $\alpha_2$  agonists but no one proved as ideal.<sup>3,6-8</sup> Dexmedetomidine, highly selective  $\alpha_2$  agonist, has sedative, hypnotic, anxiolytic, analgesic antisialagogue, sympatholytic properties and promotes cardiac, respiratory and neurological stability. Moreover, it offers anesthetic sparing properties in dose dependent manner. In addition, it decreases perioperative catecholamine release.<sup>10-12</sup>

So, we designed this study to evaluate efficacy and use properties of intravenous Dexmedetomidine  $1\mu\text{g/kg}$  as pre-medication in surgeries under general anesthesia to attenuate hemodynamic responses to laryngoscopy and endotracheal intubation. Other objectives were to study dose requirement of Injection Propofol as induction agent and any complications/side effects associated with Dexmedetomidine, laryngoscopy and intubation.

## METHODS

A randomized, prospective comparative study was carried out at GMERS medical college and hospital, Dharpur-Patan between September 2016 to February 2017. A written informed valid anesthesia consent was obtained and explaining regarding drug and procedure in

details to patients of ASA I, II of elective surgeries under general anesthesia were selected. They were divided in to two groups. Patients in group NS (n=30) received 10 ml of normal saline over 10 minutes while in group D (n=30) received inj. Dexmedetomidine  $1\mu\text{g/kg}$  diluted in 10 ml normal saline administered over 10 minutes intravenously.

Inclusion criteria were patients with mallampatti grade I, age group 18-45 Years and elective surgeries. Exclusion criterias were patients with difficult airway, obesity, age <18 and >45 years, emergency, history of allergy to any drugs, pregnancy and systemic diseases (i.e. HT/DM/Renal/CNS/cardiac/RS disease). If laryngoscopy and intubation period exceeds more than 15 seconds, patients were excluded from study.

Detailed preanesthesia checkup, airway assessment and all necessary investigations (Blood, urine, ECG and Radiology) were carried out a day before surgery. Patients were kept nil by mouth for 10 hours before surgery. They were kept in calm, comfortable and peaceful preoperative room. Heart rate, Blood pressure (SBP, DBP and MAP),  $\text{SpO}_2$ , respiratory rate was noted. I.V. line secured with 18 G cannula and inj. DNS was started. At operative room, HR (ECG), SBP, DBP and MAP recorded via multipara monitor Drager Vista 120, referred as baseline. Patients were premedicated with Injection Glycopyrrolate 0.2 mg iv and Injection Ondansetron 4 mg iv. After 10 minutes, Study drug (Dexmedetomidine vs Normal saline) was administered according to groups and heart rate, blood pressure (SBP, DBP, MAP) observed at 2 min, 5 min and 10 minutes interval after study drug administration, referred as SD2, SD5 and SD10 respectively. Before induction (BI) parameters noted. Patients were preoxygenated for 3 minutes. Induction was done with injection Propofol in 10 mg/ml incremental dose till loss of eye reflexes. Endotracheal intubation was facilitated with inj. Suxamethonium 1.5mg/kg. Heart rate, systolic and diastolic blood pressure and mean arterial pressure recorded and referred as after induction(AI) value. Here required dose of inj. Propofol for induction was noted. Laryngoscopy performed with appropriate size of MacAnotosh blade, lasting not more than 15 seconds and intubation was performed with endotracheal tube.

Hemodynamic parameters in terms of Heart rate, systolic and diastolic blood pressure, mean arterial pressure observed and recorded at 1 min, 2 min, 5 min and 10 minutes interval after laryngoscopy and intubation, referred as T1, T2, T5 and T10. Anesthesia was maintained on 50%  $\text{O}_2$ , 50%  $\text{N}_2\text{O}$ , 1% Savoflurane and injection Vecuronium bromide 0.008 mg/kg immediate after intubation.

No any surgical or other procedure allowed till 10 minutes of intubation. We had decided to end study after 10 minutes of intubation with administration of inj. Fentanyl 2  $\mu\text{g/kg}$  as analgesic. We also observed and

assessed any complication or side effects like hypotension (blood pressure <20% of baseline), Tachycardia (>25% of baseline), bradycardia (<60 beats/minute), arrhythmias, bronchospasm or any other in relation to drug or procedure.

### Statistical analysis

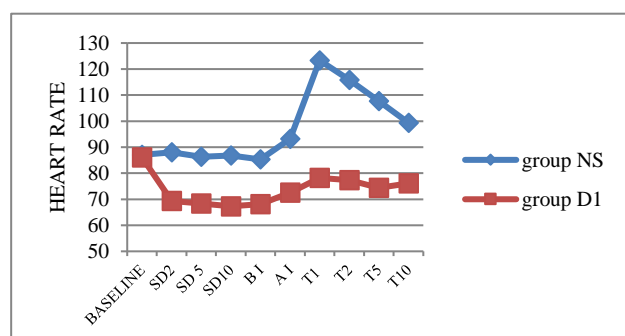
It is performed using “unpaired student t-test”. p value was calculated using software. p value < 0.01 indicates highly significant difference. p < 0.05 suggests significant difference and p > 0.05 means no significant difference between two groups.

## RESULTS

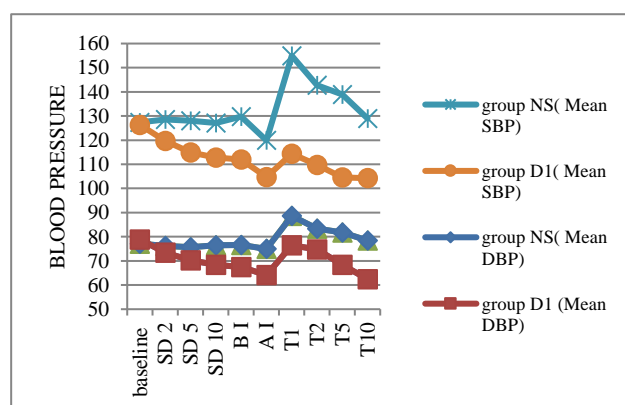
As shown in Table 1, Mean Age, Sex, and weight-Demographic data were comparable in both groups.

**Table: 1 Demographic data.**

Variables	Group NS	Group D1
Age (Years) (Mean ± SD)	33.21±7.28	32.52±5.85
Gender M: F	18:12	17:13
Weight (Kgs) (Mean ± SD)	55.34±7.54	57.12 ± 6.12



**Figure 1: Mean heart rate changes at different time intervals compared to baseline.**



**Figure 2: Mean blood pressure (systolic and diastolic) changes in both groups compared to baseline at different time interval.**

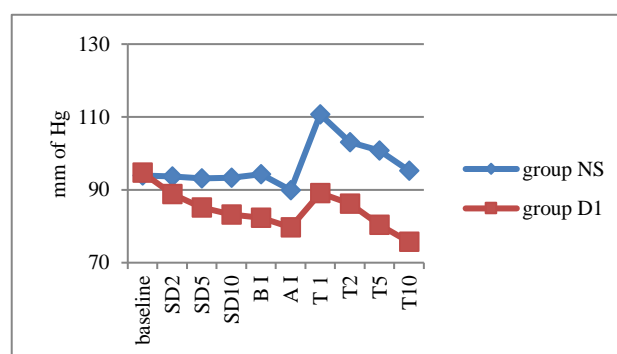
As shown in Figure 1, 2 and Table 2, Baseline mean heart rate, mean systolic and diastolic and mean mean arterial pressure were comparable in both the groups.

After 2 min, 5 min and 10 minutes (SD2, SD5 and SD10) of Inj. Dexmedetomidine administration, Significant reduction in mean heart rate, systolic and diastolic blood pressure, mean arterial pressure observed in Group D1 but no changes seen in Group NS. (P < 0.01).

**Table: 2 Mean arterial pressure changes at various intervals.**

Time	Group NS Mean ± SD	Group D1 Mean ± SD
Baseline	93.89±4.17	94.72±4.93
2 SD	93.67±3.11	88.85±4.27
5 SD	93.13±3.96	85.16±3.41
10 SD	93.34±3.17	83.17±4.14
B I	94.30±3.29	82.31±5.22
A I	89.92±4.15	79.69±4.65
T <sub>1</sub>	110.72±6.81	89.13±8.22
T <sub>2</sub>	103.11±5.94	86.18±6.50
T <sub>5</sub>	100.82±7.24	80.43±5.56
T <sub>10</sub>	95.26±6.59	75.70±6.85

At 1 minute of laryngoscopy and intubation (T1), Increase in mean heart rate (40 beats/minute in group NS vs 6 beats/minute in group D1), Change in mean systolic blood pressure (from 119.88±13.08 to 154.94±8.64 in group NS vs from 104.69±10.23 to 114.35±14.22 in group D1) and rise in mean diastolic blood pressure (14 mm Hg in group NS vs 9 mm Hg in group D1) from after induction value recorded. These changes are statistically highly significant (p < 0.01).

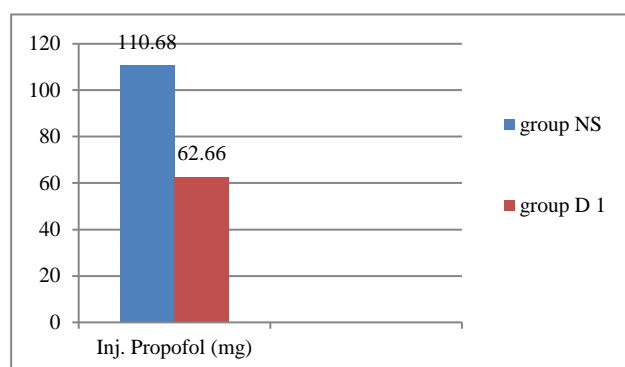


**Figure 3: Mean arterial pressure changes.**

Mean heart rate, mean blood pressure and mean arterial pressure were remain low after 2 minutes, 5 minutes and 10 minutes (T2, T5 and T10) of laryngoscopy and intubation when compared to baseline parameters in group D1. Results were highly significant (<0.01) compared to group NS.

Figure 4 showing that reduction in requirement of mean dose of injection Propofol as induction agent

(110.68±15.08 mg in group NS vs 62.66±7.58 mg in group D1) which was highly significant (<0.01).



**Figure 4: Mean dose of propofol required for induction.**

## DISCUSSION

Dexmedetomidine was used and compared for premedication alone or with other drugs to attenuate pressure response to laryngoscopy and intubation by various authors.<sup>8,13-15</sup> They compared different doses of inj. Dexmedetomidine to study dose dependent efficacy. They conclude that intravenous Dexmedetomidine 1 µg/kg was more effective than 0.5 µg/kg. while inj. Dexmedetomidine 0.3 µg/kg found very less effective to attenuate pressure response.<sup>16</sup> It is seen that distribution half-life of i.v. Dexmedetomidine is approximately 6 minutes and onset of action is 10 to 15 minutes.<sup>11</sup> So in present study we administered injection Dexmedetomidine 1 µg/kg diluted in 10 ml of normal saline and infused over 10 minutes intravenously.

Studies on high plasma concentration, high dose 2 µg/kg with rapid and bolus administration of inj. Dexmedetomidine were done by SS Nath et al, Belleville et al, Ebert TJ et al.<sup>17-19</sup> They observed severe hypertension (due to peripheral α<sub>2</sub> β adrenoreceptor stimulation of vessels) followed by reflex bradycardia & severe hypotension as well as irregular ventilation and apnea.

The α<sub>2</sub> adrenoreceptors are involved in regulating the autonomic nervous system and cardiovascular system. α<sub>2</sub> adrenoreceptor are located on blood vessels, where they mediate vasoconstriction as well as on sympathetic pre-synaptic terminals where they inhibit epinephrine and norepinephrine release. Effect of α<sub>2</sub> agonists within locus ceruleus and their activation leads to sedation and hypnosis. A reduction of tonic levels of sympathetic outflow and an augmentation of vagal activity results in a decrease heart rate and cardiac output.<sup>9-11</sup> We observed that mean heart rate, blood pressure and mean arterial pressure gradually but significantly reduced after 10 minutes of intravenous Dexmedetomidine administration. Our results are supported by previous studies.<sup>13-15,20,22.</sup>

In group D1, we observed that hemodynamic parameters like heart rate, systolic and diastolic blood pressure and mean arterial pressure remain lower at all time intervals when compared to baseline value after intubation. α<sub>2</sub> agonists produce hyperpolarization of noradrenergic neurons and suppression of neuronal firing in the locus ceruleus leads to decreased systemic noradrenalin release. The baroreceptor reflex is well preserved in patients who received Dexmedetomidine and reflex heart rate response to a pressure stimulus is augmented results in attenuation of sympathoadrenal responses and hemodynamic stability during laryngoscopy and tracheal intubation.<sup>11,12</sup> Thus, we demonstrated that inj. Dexmedetomidine 1 µg/kg provide excellent and effective attenuation of hemodynamic changes occurred during laryngoscopy and intubation. Various authors had also considered injection Dexmedetomidine for attenuation and hemodynamic stability.<sup>8,13-15,21</sup>

Sujit sulaiman et al, Menda F et al had studied and demonstrated that α<sub>2</sub> adrenoreceptor agonists can beneficially modulate coronary blood flow by preventing transmural redistribution of blood flow by specific epicardially vasoconstriction effects leading to improvement in endocardial perfusion and lower heart rate.<sup>20,21</sup> So role of Dexmedetomidine was not limited for attenuation of pressure response in healthy patients but also in cardiac patients where it plays cardioprotective role.

The anesthetic and opioid sparing effect (due to a decrease in central noradrenergic transmission), sedative, hypnosis and analgesic properties of Dexmedetomidine reduce anesthetic drugs, volatile agents requirements.<sup>10-12,22,23,26</sup> Inj. Propofol is commonly used induction agent and we observed that mean induction dose of propofol significantly reduced by 40% in Dexmedetomidine group. Various studies are available on propofol requirement, they found same results.<sup>23,24,26</sup> In study of Poonam Ghodki et al, they observed reduction in propofol dose by 62 %.<sup>25</sup>

We did not observe any complication or side effects related to Dexmedetomidine infusion, laryngoscopy and intubation in present study.

## CONCLUSION

Injection Dexmedetomidine 1 µg/kg as premedication can be used safely and effectively to attenuate hemodynamic response to laryngoscopy and endotracheal intubation and also reduce requirement of induction agent in surgeries under general anesthesia.

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*Conflict of interest: None declared*

*Ethical approval: The study was approved by the institutional ethics committee*



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