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A comparative analysis of bolus dose of dexmedetomidine and fentanyl in attenuating haemodynamic stress responses following laryngoscopy and intubation

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Abstract
Background: Laryngoscopy and tracheal intubation lead to tachycardia and hypertension due to increase in the plasma concentration of catecholamines subsequent to sympathetic stimulation. The present study was conducted to compare bolus dose of dexmedetomidine and fentanyl in attenuating haemodynamic stress responses following laryngoscopy and intubation.
Materials & Methods: 50 patients of ASA status I and II of both genderswere divided into two groups. Group I received 1 mcg/kg of Inj. Dexmedetomidine in 100 ml of normal saline over 10 minutes and 5ml of normal saline 3 minutes before induction. Group II received 100 ml of normal saline over 10 minutes and Inj. Fentanyl 2 mcg/kg diluted in 5 ml of normal saline 3 minutes before induction.
Results: The mean SBP was 92.5 mm Hg in group I and 93.2 mm Hg in group II, DBP was 58.2 mm Hg in group I and 62.1 mm Hg in group II. MAP was 69.0 mm Hg in group I and 72.2 mm Hg in group II, heart rate was 62.9 bets/min in group I and 70.4 beats/minute in group II. The difference was significant ($P < 0.05$).
Conclusion: Bolus injection of dexmedetomidine 1mcg/kg given intravenously over 10 minutes prior to intubation provided consistent and reliable protection against the pressor response during laryngoscopy and endotracheal intubation.

Keywords: Endotracheal intubation, laryngoscopy, dexmedetomidine

Introduction
Laryngoscopy and tracheal intubation lead to tachycardia and hypertension due to increase in the plasma concentration of catecholamines subsequent to sympathetic stimulation. The elevation in arterial pressure generally peaks in 1-2 minutes and returns to normal levels within five minutes [1]. This may be inconsequential in normal people but may lead to serious morbidity in patients with co-existing cerebrovascular or cardiovascular conditions. The laryngoscopic response in these patients can increase myocardial oxygen demand and may lead to complications in susceptible individuals [2].
Several strategies have been tried to obtund stress response following laryngoscopy and endotracheal Intubation like local anaesthetics, intravenous opioids, β blockers, α2 adrenergic agonists, vasodilators, magnesium or by increasing volatile anaesthetic concentrations. No single agent has been established as the most appropriate for this purpose. The disadvantages of these drugs vary from inadequate control of haemodynamics to various adverse effects like severe hypotension, bradycardia, arrhythmias, chest wall rigidity and delayed recovery [3]. Alpha 2 (α2) adrenergic agonists like clonidine decrease sympathetic tone and has been demonstrated to reduce the stress responses to laryngoscopy. Dexmedetomidine is an extremely selective α2 receptor agonist having eight times higher affinity and α2 selectivity contrasted with clonidine. The different benefits of dexmedetomidine are anxiolytic, sedation, analgesia and better haemodynamic control without any respiratory depression [4]. The present study was conducted to compare bolus doseof dexmedetomidine and fentanyl in attenuating haemodynamicstress responses following laryngoscopy and intubation.

Materials & Methodology

The present study comprised of 50 patients of ASA status I and II of both genders. Study conducted in SMHS dept. of anesthesiology and critical care medicine, gmc Srinagar from Feb 2020 to Feb 2021. All were informed regarding the study and their written consent was obtained.

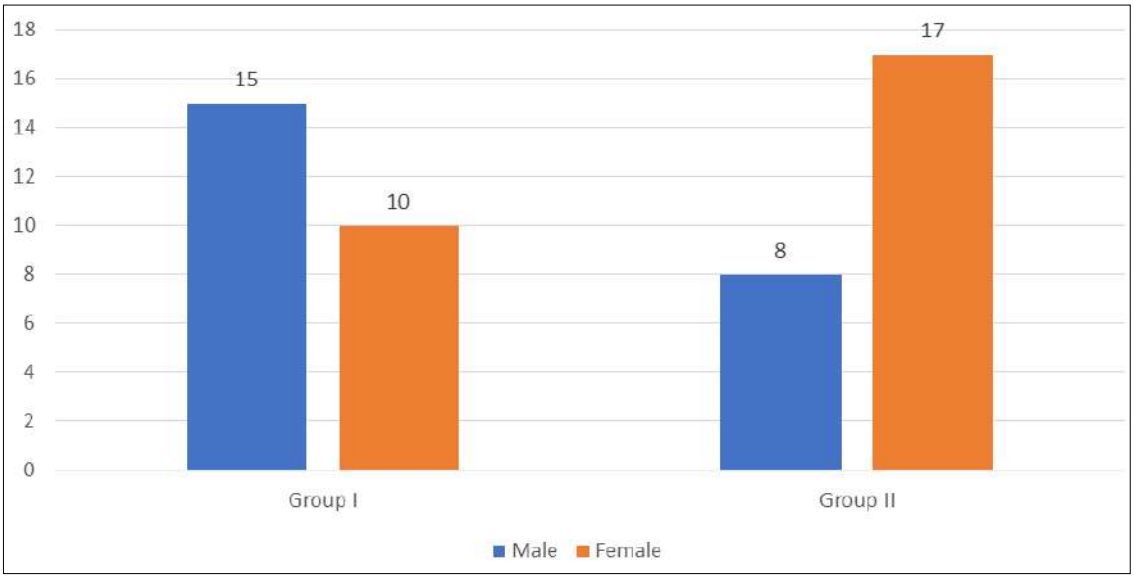
Data such as name, age, gender etc. was recorded. All the patients were assessed preoperatively and premedicated with Alprazolam 0.5mg orally on the night before surgery. Patients were divided into two groups. Group I received 1 mcg/kg of Inj. Dexmedetomidine in 100 ml of normal saline over 10 minutes and 5ml of normal saline 3 minutes before induction. Group II received 100 ml of normal saline over 10 minutes and Inj. Fentanyl 2 mcg/kg diluted in 5 ml of normal saline 3 minutes before induction. Endotracheal intubation was performed with the appropriate size cuffed endotracheal tube. Anaesthesia was maintained with controlled ventilation with nitrous oxide 66% and oxygen 33% with Sevoflurane 1.6%. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table I: Distribution of patients

Groups	Group I	Group II
Male	15	8
Female	10	17

Table I, graph I shows that group I had 15 males and 10 females and group II had 8 males and 17 females.

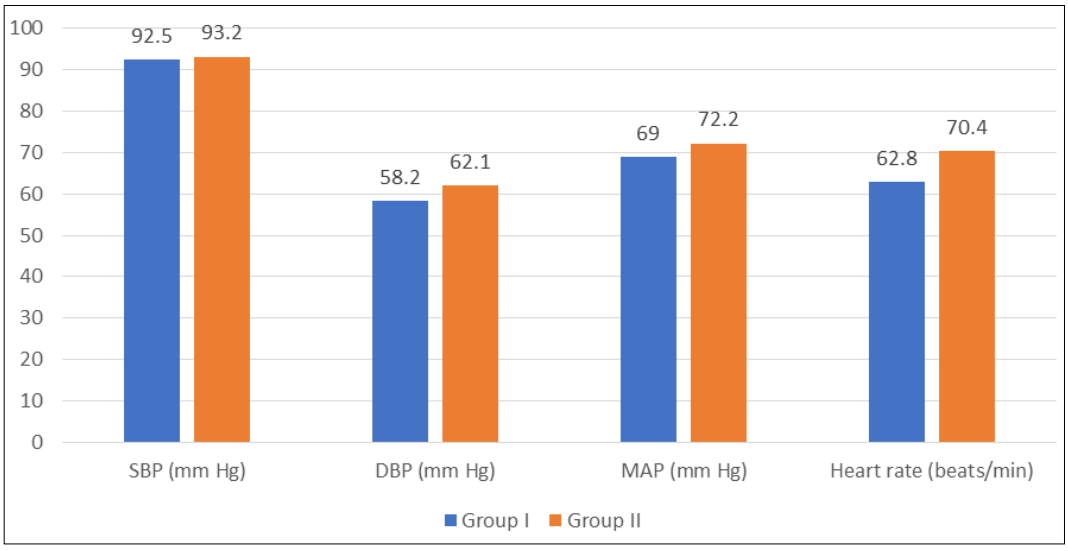


Graph 1: Distribution of patients

Table II: Comparison of parameters

Parameters	Group I	Group II	P values
SBP (mm Hg)	92.5	93.2	0.19
DBP (mm Hg)	58.2	62.1	0.0
MAP (mm Hg)	69.0	72.2	0.05
Heart rate (beats/min)	62.8	70.4	0.01

Table II, graph I shows that mean SBP was 92.5 mm Hg in group I and 93.2 mm Hg in group II, DBP was 58.2 mm Hg in group I and 62.1 mm Hg in group II. MAP was 69.0 mm Hg in group I and 72.2 mm Hg in group II, heart rate was 62.9 bets/min in group I and 70.4 beats/minute in group II. The difference was significant (P< 0.05).



Graph II: Comparison of parameters

Discussion

Laryngoscopy and endotracheal intubation increase the plasma concentration of catecholamines due to sympathetic stimulation which can result in tachycardia and hypertension in most of the individuals. The longer the duration and greater the force of laryngoscopy, severe is going to be the haemodynamic stress response [5]. The elevation in arterial pressure generally starts before five seconds of laryngoscopy, peaks in 1–2 min and returns to normal levels inside 5 min. This may not bring on any unfriendly consequences for normal people but rather could be dangerous in patients with cerebrovascular diseases, hypertension or myocardial insufficiency [6]. The laryngoscopic response in these patients can increase myocardial oxygen demand and may lead to complications in susceptible individuals. In spite of the availability of numerous drugs to blunt the haemodynamic response, the search for an ideal drug with minimal adverse effect continues [7]. The present study was conducted to compare bolus dose of dexmedetomidine and fentanyl in attenuating haemodynamicstress responses following laryngoscopy and intubation.

In present study, group I had 15 males and 10 females and group II had 8 males and 17 females. Mahiswar *et al*. [8] in their study one hundred patients admitted for routine surgical procedures under general anesthesia were enrolled into two groups: Group F received injection of fentanyl 2 µg.kg-1 and Group D received injection of dexmedetomidine 0.5 µg.kg-1 diluted up to 5 mL by adding normal saline intra-venously over 60 seconds. The difference in heart rate and mean arterial pressure of patients in two groups after laryngoscopy and intubation was not statistically significant at any point of time. The hemodynamic changes did not require any intervention in the form of administration of rescue medication.

Conclusions

We found that the mean SBP was 92.5 mm Hg in group I and 93.2 mm Hg in group II, DBP was 58.2 mm Hg in group I and 62.1 mm Hg in group II. MAP was 69.0 mm Hg in group I and 72.2 mm Hg in group II, heart rate was 62.9 bets/min in group I and 70.4 beats/minute in group II. Gunalal *et al*. [9] in their study 60 patients who were fixed to undergo elective surgeries under general anaesthesia were randomly divided into 2 groups. Group 1 received 1 mcg/kg of dexmedetomidine over 10 minutes and group 2 received fentanyl 2mcg/kg before induction. Anaesthesia was standardized in both the groups and vital parameters were recorded for up to 10 minutes after intubation. Dexmedetomidine in a dose of 1mcg/kg prevented an increase in heart rate following laryngoscopy when compared to fentanyl group. This effect lasted for 10 minutes after intubation is performed. Though dexmedetomidine prevented an increase in blood pressure, this effect was statistically significant only for 2 minutes after intubation when compared to fentanyl group.

The hemodynamic effects of dexmedetomidine results from both peripheral and central mechanism [10]. There is a biphasic, dose-dependent effect on hemodynamics. At low doses, it causes a reduction in sympathetic tone that is mediated by a reduction of norepinephrine release at the neuroeffector junction. This causes an inhibition of neuro-transmission in sympathetic nerves [11]. Ultimately, there is a significant reduction in circulating catecholamines, leading to a slight decrease in blood pressure and a modestreduction in heart rate. Fentanyl predominantly acts on opioid receptors. Fentanyl decreases sympathetic tone and increases parasympathetic tone via its action on cardiovascular and autonomic regulatory areas [12].

Conclusion

Authors found that bolus injection of dexmedetomidine 1mcg/kg given intravenously over 10 minutes prior to intubation provided consistent and reliable protection against the pressor response during laryngoscopy and endotracheal intubation.

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