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Original Research Article

Evaluation of the efficacy of single dose of 0.6mcg/kg of iv dexmedetomidine for the attenuation of sympathoadrenal response to extubation

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ABSTRACT

Background: General anaesthesia with endotracheal intubation is the definite way of securement of airway. Tracheal extubation is associated with increased sympathoadrenal response which leads to deleterious consequences in susceptible patients. This study aims to evaluate the efficacy of dexmedetomidine 0.6mcg/kg iv in the suppression of sympathoadrenal response to tracheal extubation.
Materials and Methods: Sixty participants aged between 18-55yrs belonging to ASA 1 or 2 were randomly allocated into 2 groups. Group Dxd received injection Dexmedetomidine 0.6mcg/kg iv and Group Cl received normal saline. Heart rate, systolic and diastolic blood pressure were recorded at baseline, 2, 5, 8 minutes after drug infusion, at extubation and 1,3,5,8,10 and 15 minutes post extubation.
Results: Group Dxd showed lower heart rate, systolic and diastolic blood pressure at extubation, and till 15minutes postextubation compared to Group Cl.
Conclusion: Dexmedetomidine 0.6mcg/kg iv effectively attenuates the sympathoadrenal response to tracheal extubation.

1. Introduction

Tracheal extubation is the routine procedure done after the surgery conducted under general anaesthesia with endotracheal intubation. The extubation procedure is associated with activation of sympathetic nervous system which leads to increased levels of epinephrine and norepinephrine which inturn leads to increased heart rate and blood pressure.[1,2]

Stormy extubation is associated with complications such as increased coughing, bronchospasm, arrhythmias, myocardial insufficiency, pulmonary edema, and cerebrovascular accidents. Various techniques such as usage of topical lignocaine spray, deeper planes of volatile agents, opioids, verapamil, esmolol[3] have been tried but they are not of much efficacy in the attenuation of extubation response.[4]

Dexmedetomidine a second generation alpha-2 adrenergic receptor agonist. It is a pharmacologically active d-isomer of medetomidine.[5] Dexmedetomidine has a preferential high ratio of alpha-2/alpha-1 activity (1620:1 as compared to 220:1 for clonidine) and thus has more effect on alpha-2 adrenoceptor. This ratio is responsible for its potent action on the central nervous system and avoids undesirable effects on cardiovascular system by alpha-1 receptor activation.[6]

Presynaptic activation of alpha-2 receptors inhibit the release of norepinephrine and thus propagation of pain signals will be terminated. Postsynaptic activation of alpha-2 receptors in the central nervous system inhibits the sympathetic activity which leads to decrease in blood pressure and heart rate.[3]

Thus the present study is undertaken to evaluate the efficacy of single dose of dexmedetomidine 0.6mcg/kg iv in attenuating the sympathoadrenal response to extubation.

2. Materials and Methods

After obtaining informed risk consent from all the participants and ethical committee clearance, the 60

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participants of age group 18-55 yrs belonging to ASA class 1 or 2 were allocated into two groups of 30 each based on shuffled opaque sealed envelopes containing the name of the group. Patients with cardiac, renal and hepatic impairement, cerebral disease, difficult airway, heart blocks, bradycardia (heart rate <60bpm) were excluded from the study.

Group Cl - received 10ml of normal saline intravenously over 10minutes before extubation.

Group Dxd - received injection Dexmedetomidine 0.6μg/kg body weight diluted upto 10ml with normal saline intravenously over 10 minutes using a syringe pump, before extubation.

All the subjects were premedicated with injection Midazolam 0.05mg/kg body weight and injection ondansetron 0.1mg/kg body weight and induced with injection thiopentone 5mg/kg and injection vecuronium 0.1 mg/kg.

Anaesthesia was maintained with oxygen, nitrous oxide, isoflurane with intermittent dose of injection vecuronium.

Group Dxd received injection Dexmedetomidine 0.6μg/kg body weight diluted upto 10ml with normal saline intravenously over 10 minutes using a syringe pump, before extubation and Group Cl - received 10ml of normal saline intravenously over 10minutes using a syringe pump before extubation. At the end of the procedure, neuromuscular blockade was reversed with Inj neostigmine 0.05mg/kg body weight and Inj glycopyrrolate 0.01mg/kg body weight. When patients gained adequate spontaneous respiratory efforts and obeying commands patients were extubated.

Extubation quality was rated using 5-point scale (1. No coughing, 2. Smooth extubation, minimal coughing, 3. Moderate coughing (3 or 4 times), 4. Severe coughing (5 to 10 times) and straining, 5. Poor extubation, very uncomfortable (Laryngospasm and coughing >10 times).

Haemodynamic parameters such as heart rate, systolic and diastolic blood pressure were recorded at baseline, 2,5,8 minutes after drug infusion, at the time of extubation and at 1,3,5,8,10 and 15 minutes postextubation.

2.1. *Statistical analysis*

The calculation of sample size was done after discussion with the statistician, on the basis of pilot study observations. The observation conducted showed approximately each group should have 23 patients for ensuring a power of study 0.80. With assumption of 5% patients would drop out, the final study sample size was fixed at 30 patients in each group.

3. Results

Demographic variables were comparable with respect to age, sex and weight.

3.1. *Heart rate*

The baseline heart rate was comparable and was statistically insignificant between the two groups.

There was a statistically significant decrease in heart rate in group Dxd after drug infusion, 1, 3, 5, 8, 10 and 15 minutes postextubation compared to group Cl and the heart rate remained below the baseline even at 15th minute postextubation in group Dxd which was statistically significant.

At extubation the mean heart rate was increased by 2bpm in dexmedetomidine group compared to baseline whereas in control group the mean heart rate was increased by 40bpm compared to baseline which was statistically significant.

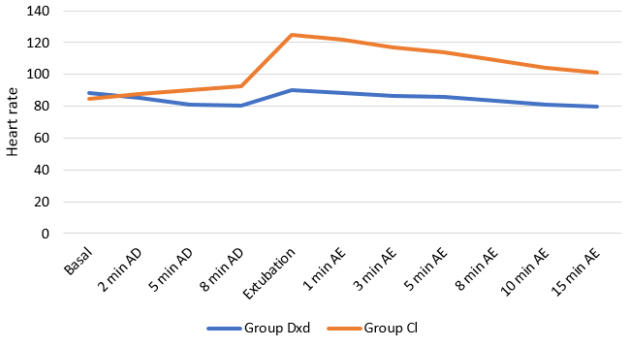

Fig. 1: Showing changes in mean heart rate between Dexmedetomidine and Control group

3.2. *Systolic and diastolic blood pressure*

The baseline systolic and diastolic blood pressure were comparable and were statistically insignificant. Group Dxd showed statistically significant decrease in mean systolic and diastolic blood pressure after drug infusion and 1,3,5,8,10 amd 15 minutes postextubation compared to group Cl which was statistically significant and the systolic and diastolic blood pressure remained below the baseline value at 15th minute postextubation in group Dxd which was statistically significant.

At extubation, the mean systolic blood pressure was increased by 5mmhg in dexmedetomidine group compared to baseline whereas in control group, the mean systolic blood pressure was increased by 22mmhg compared to baseline which was statistically significant.

At extubation, the mean diastolic pressure was increased by 3mmhg in dexmedetomidine group compared to baseline whereas in control group, the mean diastolic pressure was increased by 20mmhg compared to baseline which was statistically significant.

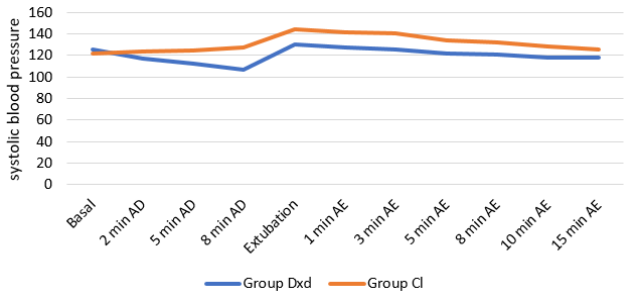

Fig. 2: Showing changes in mean systolic blood pressure between Dexmedetomidine and Control group.

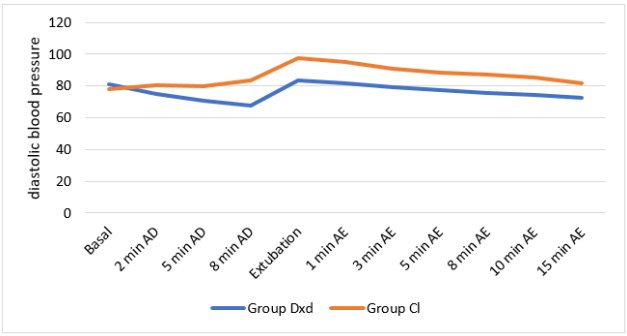

Fig. 3: Showing changes in mean diastolic blood pressure between Dexmedetomidine and Control group

4. Discussion

The procedures done under general anaesthesia with endotracheal intubation technique is followed by endotracheal extubation after the completion of the procedure. Extubation process evokes various sympathoadrenal response which causes deleterious consequences in susceptible patients.

Dexmedetomidine has activity at the imidazoline receptors involved in central arterial blood pressure control. It causes a dose-dependent decrease in mean arterial blood pressure (MAP) and Heart rate (HR) and a reduction in sympathetic nervous system activity. Dexmedetomidine induces sedation, hypnosis, analgesia and anxiolysis.[7]

In CNS, the presynaptic type of alpha-2 receptors which are present in the locus coeruleus of upper brain stem and substantia gelatinosa in spinal cord are responsible for regulating the release of Noradrenaline and Adenosine triphosphate through negative feedback mechanism.[8]

Dexmedetomidine had been used in various preanaesthetic doses in several studies for the attenuation of intubation response but we used dexmedetomidine 0.6mcg/kg for the attenuation of extubation response.

Dexmedetomidine helps in the suppression of airway reflexes such as coughing, bucking associated with the exubation and thereby improves the better extubation quality score[9] in our study 69% patients showed score 1 and 31% patients showed score 2 in group Dxd and 50% patients showed score 1 and 50% patients showed score 2 in group Cl.

In our study group Dxd showed a lesser haemodynamic variation in terms of heart rate and blood pressure compared to group Cl.

In our study the mean heart rate was increased by 2bpm, the mean systolic blood pressure was increased by 5mmhg, the mean diastolic pressure was increased by 3mmhg in dexmedetomidine group whereas the mean heart rate was increased by 40bpm, the mean systolic blood pressure was increased by 22mmhg, the mean diastolic pressure was increased by 20mmhg in control group compared to baseline at extubation. This is probably because suppression of sympathetic outflow centrally by dexmedetomidine.[10]

In the study conducted by Rath A et al[11] the mean heart rate was increased by 3bpm compared to baseline in dexmedetomidine group at extubation and the mean arterial pressure was increased by 3bpm in Dexmedetomidine group compared to baseline. This is probably because of change in dosage and timing of administration of the drug.

The results of our study correlates with the studies such as Kotak A et al.[12]

Our study results were at par with the study conducted by Bindu B et al[13] where the mean heart rate was increased by 3bpm, the mean systolic blood pressure was increased by 6mmhg and the mean diastolic blood pressure was increased by 2mmhg at extubation.

The effects of Dexmedetomidine in various doses on haemodynamic parameters have been studied by various studies such as Schenin B et al,[14] Jaakola et al,[15] Srivatsava VK et al,[16] Suaiman S et al[17] Al these studies showed that Dexmedetomidine was unique in maintaining better haemodyamic parameters.

Postoperatively intravenous Dexmedetomidine reduces the incidence of nausea, vomiting, shivering and decreases the postoperative morbidity.[18]

There was no statistically significant side effects in our study probably because of the usage of lower dose of Dexmedetomidine compared to other studies.

5. Conclusion

We found that single dose of IV Dexmedetomidine at a dose of 0.6mcg/kg attenuated the sympathoadrenal response to extubation more effectively and had a better postextubtaion recovery compared to control group.

6. Source of Funding

None.

7. Conflict of Interest

None.

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