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EVALUATION OF DEXMEDETOMIDINE IN ATTENUATION OF SYMAPATHOADRENAL RESPONSES TO LARYNGOSCOPY AND INTUBATION.

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ABSTRACT **Background and Aims:** Laryngoscopy is a basic and essential step during orotracheal intubation under general anaesthesia but both laryngoscopy and intubation are associated with haemodynamic changes which are transient and variable. These changes are well tolerated by normal healthy Patients but can be life threatening in compromised patients. Plan of our study is to evaluate the effect of dexmedetomidine in attenuating the presser response to laryngoscopy and intubation in patients posted for elective surgery under general anaesthesia.

Methods: It was a randomised, prospective, double-blind placebo-controlled study. After Institutional Ethical Committee clearance, fourty patients of American Society of Anesthesiologists Physical Status 1 were enrolled in the study and divided into two equal groups. Group C received normal saline 0.9% (20 ml) and Group D received Dexmedetomidine 0.5 µg/kg diluted up to 20 ml with 0.9% saline as infusion over 10 min before induction. Both groups were induced with standardised anaesthesia technique. The primary outcome measures were haemodynamic response at 0, 1, 3, 5 and 10 min after intubation. The secondary outcome measures were to observe any side effects. The statistical package used was SPSS version 15. Results: Groups were well matched for their demographic data. There was a statistically significant difference ($P < 0.05$) between dexmedetomidine and normal saline in heart rate, systolic, diastolic and mean arterial pressures and Rate Pressure Product at all time points after tracheal intubation. None of the patient had any adverse effects such as hypotension, bradycardia, respiratory depression and sedation. Conclusion: Intravenous dexmedetomidine in a dose of 0.5µg/kg is the good potion to attenuate stress response to laryngoscopy and endotracheal intubation without any side effects.

KEYWORDS :

Introduction

Laryngoscopy is a basic and essential step during orotracheal intubation under general anaesthesia but both laryngoscopy and intubation are associated with haemodynamic changes which are transient and variable[1]. These changes are well tolerated by normal healthy Patients but can be life threatening in compromised patients.

Several Measures have been used to attenuate haemodynamic changes as pharmacological measures are topical spray of lignocaine, Nitroglycerine, diltiazem, Esmolol, fentanyl, oral gabapentine ect but associated with related side effects[2,3,4,5,6,7]. Significant hypotension and cardiovascular collapse can occur under anaesthesia in susceptible patients[8].

Dexmedetomidine is a new alfa-2 adrenergic agonist having eight times more affinity for alfa-2 adrenoceptors as compared with clonidine. Pre treatment with dexmedetomidine attenuates haemodynamic response to laryngoscopy and intubation[9,10,11,12].

Plan of our study is to evaluate the effects of dexmedetomidine in attenuating the presser response to laryngoscopy and intubation in patients posted for elective surgery under general anaesthesia.

Method

After approval from the institutional ethical committee fourty patients of either sex belonging to American society of anaesthesiology physical status-I and II age group 20-60 years posted for elective surgery were selected for study.

Patients having history of cardiac disease any renal disease, hypertension, diabetes, anticipated difficult intubation, laryngoscopy and intubation time >20s, more than one attempt of intubation and those having known allergy to the anaesthetic agents used were excluded from the study.

All the patients were kept nil by mouth for 8 h before surgery. On the night before surgery tablet alprazolam 0.5 mg and ranitidine 150 mg were given to patients. Fourty patients were randomly allocated in two groups (20 patients in each group) using a sealed envelope technique and computer generated sequence of random numbers. Group C normal saline 0.9% (20 ml) and Group D received Dexmedetomidine 0.5 µg/kg diluted up to 20 ml with 0.9% saline as infusion over 10 min before induction. After receiving the patient in operation theatre, all base line monitoring were attached as electrocardiography (ECG), non invasive blood pressure (NIBP), peripheral oxygen saturation (SPO_2) and base line parameters recorded. Infusion of Ringer Lactate was started through previously secured peripheral intravenous line. The test drug was administered 10 min prior to induction as per group allocation and premedicated by Inj glycopyrrolate 0.01 mg/kg, Inj midazolam 0.03 mg/kg and Inj tramadol 2 mg/kg. Induction was done with Propofol 2-2.5 mg/kg, abolition of eye lash reflex was considered as end point of induction. Neuromuscular blockade was achieved by Inj vecuronium bromide 0.15 mg/kg intubation was completed with appropriate sized cuffed endotracheal tube by single operator in all cases. Anaesthesia was maintained with 66% Nitrous oxide in Oxygen sevoflurane and intermittent boluses of Inj vecuronium. Ventilation was adjusted to maintain an end tidal carbon dioxide ($ETCO_2$) value between 30 and 35 mm of Hg.

After completion of surgery neuromuscular blockade was reversed with Inj neostigmine 0.04 mg/kg and Inj glycopyrrolate 0.01 mg/kg and patients were extubated. Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean blood pressure (MAP) were recorded prior to induction, just after intubation and 1, 3, 5 and 10 min after orotracheal intubation. After 10 min surgery was allowed to commence to negate the influence of surgical stimulus on haemodynamic parameters. Intraoperative patients were monitored for any side effects as hypotension, bradycardia and arrhythmia, managed accordingly.

Statistical analysis

Data were entered analysed using MS Excel and Epi v4.04 system. Data related to patient distribution according to age, weight, indication for surgery were presented as number and compared using Pearson chi- square test. All parameters like HR, SBP, DBP, MAP and RPP were expressed as mean ± SD and compared using student t- test (paired) and for the mean values of the two groups, analysed using SPSS16 software.

Results

There was no statistical difference in respect of demographic data between the two groups. The groups were comparable in respect of

age, sex, weight, type of surgery and duration of surgery, all three groups were comparable in base line blood pressure, heart rate values and duration of laryngoscopy.

There was statistically no significant increase of Herat rate throughout study period in Group D but statistically significant increase was observed at 0 min and 1 min after laryngoscopy and tracheal intubation in group C (Figure-1). In systolic and diastolic BP no statistically significant increase from base line occurred in group D throughout the study period but significant increase in systolic as well as diastolic BP were observed at 0, 1 and 3 min post operative intubation in Group C. MAP in group D was less at all time intervals after laryngoscopy and tracheal intubation (Figure-2). In group C RPP was less at all the time intervals but statistically highly significant rise in RPP was observed at 1 min after intubation and significant rise was observed at 0 min and 3 min post intubation (Figure-3). In group D RPP was less at all the time intervals throughout study period.

Neither bradycardia nor hypotension was observed in any of the patients. In none of the patients of any group did the SpO2 fall below 95%. None of the patients in any of the group needed oxygen supplementation.

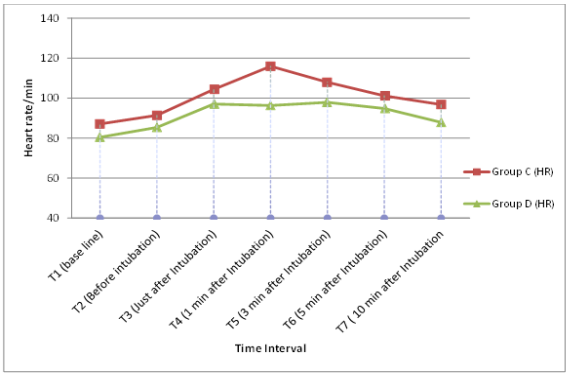

Figure-1 Change in Heart Rate at various time intervals as compared to base line in Group C and D

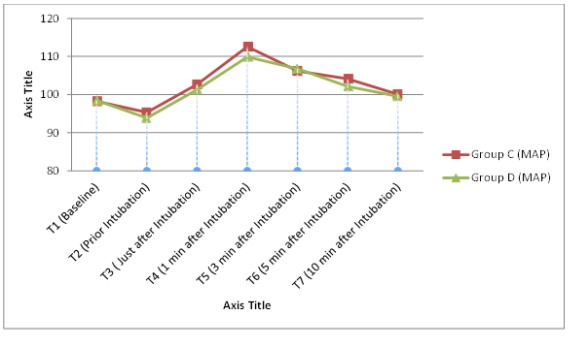

Figure-2 Change in Mean Arterial Pressure at various time intervals as compared to base line in Group C and D

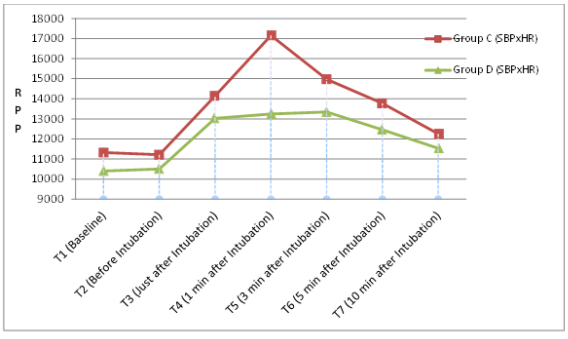

Figure- Change in Rate Pressure Product at various time intervals as compared to base line in Group C and D

Discussion

Laryngoscopy and tracheal intubation are universally recognized as one of the most noxious stimuli occurring during general anaesthesia and surgery which causes exaggerated sympathetic response resulting hypertension, tachycardia due to catecholamine release[15,16]. These responses to laryngoscopy and intubation are well tolerated by normal healthy patients but potentially dangerous in compromised patients which are maximum at 1 min after intubation and mostly last for 5-10 min.[18]

Several Measures have been used to attenuate haemodynamic changes as pharmacological measures are topical spray of lignocaine[2], Nitroglycerine, diltiazem, Esmolol, fentanyl etc but associated with related side effects.

Dexmedetomidine has been shown to attenuate the pressor response effectively. It offers an unique pharmacological profile with sedation, sympatholysis, analgesia, cardiovascular stability and with great advantage to avoid respiratory depression[17]. Dexmedetomidine increases the haemodynamic stability by altering the stress induced sympatho-adrenal responses to intubation during surgery and during emergence from anaesthesia[3,4,5,6,7].

Duration of laryngoscopy is itself a significant contributory factor to the pressor response. It produces progressive increase in mean arterial pressure during the first 30-45 seconds there after tracheal intubation contributes this response.[13] Limiting the duration of laryngoscopy to <20 seconds reduces the intensity of pressor response to an extent so to minimise the effects of prolong laryngoscopy we excluded those cases from our study who required >20sec for laryngoscopy. Heart rate was significantly less in group D compare to group C at 1 min, 5 min and 10 min post intubation.

Reddy et al[11] observed insignificant rise of heart rate at all the time interval at dexmedetomidine group which are similar to our study although a larger dose was used in their study (1µg/kg).

Systolic BP was lower in group D as compare to control group throughout study period. Our results were different from the result given by Reddy et al in which mean BP levels in Dexmedetomidine group were significantly lower than control group immediately after intubation and until the end of surgery. The possible explanation could be the use of low dose dexmedetomidine (0.5µg/kg) compared to the study performed by Reddy et al in which the dose of dexmedetomidine was 1 µg/kg.

Determination of RPP is very handy non invasive method of knowing myocardial oxygen demand and it is simple, reliable and reproducible process serving the same purpose as that of invasive method, it is also important indicator of ventricular functional status. RPP (HR x SBP product) is index which best correlates with myocardial oxygen consumption[14].

Pre induction values of RPP were comparable between the groups at base levels with no significant difference. RPP values were lower in the group D compared with control group at all times except at 10 min post intubation.

No significant side effects as hypotension, sedation, bradycardia or arrhythmias were observed perioperatively.

Conclusion

Dexmedetomidine significantly attenuated the effects of laryngoscopy and intubation. This study concludes that dexmedetomidine at dose of 0.5µg/kg is ideal agent in attenuating the stress response to laryngoscopy and intubation and provide better haemodynamic safety profile without high dose related side effects.

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