

Comparative Evaluation of Dexmedetomidine and Esmolol for Attenuation of Intubation Stress Response in well Controlled Hypertensive Patients – A Double-Blind Randomized Control Study

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ABSTRACT

Introduction: Laryngoscopy and tracheal intubation provokes a transient and marked sympathetic response that manifests as an increase in BP and HR, with the potential for development of arrhythmias. Study aimed to compare the efficacy of intravenous Dexmedetomidine and Esmolol in attenuating the cardiovascular stress responses accompanying laryngoscopy and endotracheal intubation in well-controlled hypertensive patients.

Material and Methods: 60 hypertensive patients undergoing elective non cardiac surgery were included in the study. Patients were divided into 2 groups, Group D received Dexmedetomidine 1µg/kg and Group E received esmolol 1.5 mg/kg. HR, SAP, DAP, MAP were recorded.

Results: There is statistical significant lower HR, SAP, DAP and MAP in group D compared to group E at T4 to T7. Intragroup analysis showed there is no statistically significant change of HR, SAP, DAP and MAP compared to baseline in Group D and returns to baseline at 10 minutes. Intragroup analysis showed there is statistically significant (Higher) change of HR, SAP, DAP and MAP compared to baseline in Group E at T5 to T8 and returns to baseline at 15 minutes.

Conclusion: In controlled hypertensive patients, administration of dexmedetomidine infusion before induction of anaesthesia blunts the haemodynamic response to laryngoscopy and endotracheal intubation.

Keywords: Hypertension, Laryngoscopy, Tracheal intubation, Dexmedetomidine, Esmolol, Anaesthesia.

INTRODUCTION

Laryngoscopy and endotracheal intubation are mandatory for many patients who undergo an operation under general anaesthesia.¹ However, there may be several unwanted haemodynamic responses, such as changes in blood pressure and heart rate (HR) and even arrhythmias during these procedures.² These haemodynamic responses are mostly temporary and do not cause any significant clinical effects. However, they may increase morbidity and mortality in patients with coronary artery disease, hypertension, pre-eclampsia, intracranial tumours, increased intracranial pressure or increased intraorbital pressure, and in patients with previous myocardial infarction. Hypertension and tachycardia are two dynamic predictors of perioperative cardiac morbidity.^{3,4} Reflex tachycardia and hypertension during laryngoscopy and intubation are old problems encountered by anaesthetists.⁵ The responses are exaggerated in both treated and untreated hypertensive patients.⁵ Therefore, anaesthetists have been trying to obtund these

untoward reflexes by the use of various agents.⁶ Esmolol, a water soluble selective beta adrenoceptor antagonist is one such drug. It has a rapid onset and ultra-short duration of action with a half life of nine minutes.⁷ The pharmacological properties of rapid onset and offset of action of this drug are particularly advantageous during anaesthesia in obtunding the haemodynamic stress response.⁸ Prevention of haemodynamic responses to laryngoscopy and tracheal intubation remains an important issue. Predicting the haemodynamic changes that may result in myocardial ischaemia for any patient will help to avoid events that trigger ischaemia and allow immediate treatment.

Study aimed to compare the efficacy of intravenous Dexmedetomidine and Esmolol in attenuating the cardiovascular stress responses accompanying laryngoscopy and endotracheal intubation in well-controlled hypertensive patients.

MATERIAL AND METHODS

A Single-centre, Prospective, Randomized, Double-blind study was conducted in the Department of Anaesthesiology at Tirunelveli Medical College Hospital during December 2015 to April 2017. Total of 60 controlled hypertensive patients (Diagnosis of SHT according to WHO criteria SAP≥160 mm of Hg or DAP≥90 mm of Hg) undergoing general anaesthesia for elective noncardiac surgery were included.

Inclusion Criteria: ASA Physical status II, Well controlled Hypertensive Patients, Age 30 - 60 years, Both Gender.

Exclusion Criteria: Patient's refusal, Secondary Hypertension, Co-morbidities like DM, CAD, CVA,

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Pregnancy, Predicted Difficult Intubation, Intubation time >30Secs, Intubation in more than one attempt. 60 Patients are randomly divided into 2 groups of 30 patients each by using a sealed envelope technique.

Group D (Dexmedetomidine): consisting of 30 patients who received Dexmedetomidine 1µg/kg in 100ml normal saline, 2 minutes prior to intubation.

Group E (Esmolol): consisting of 30 patients who received 1.5 mg / kg Esmolol, 2 minutes prior to intubation. All patients were premedicated with injection Midazolam 0.05 mg/kg and Injection glycopyrrolate 0.2 mg intramuscularly 45 minutes before surgery. In the operating room, an IV line was established. Patients were monitored by NIBP, ECG, SpO₂ and 0.9% NaCl was started at the rate of volume based on the fluid deficit and maintenance fluid according to patients body weight. Baseline Parameters (HR, SAP, DAP, MAP and SpO₂) were recorded. Group D received 1µg/kg of Dexmedetomidine in 100 ml 0.9%NaCl over 10 minutes. Group E received 1.5mg/kg of Esmolol over 1 min. An anaesthesiologist who is not involved in the study

administered the study drug. After 2 min, Patient induced with thiopentone sodium 5 mg/kg, fentanyl 2 µg/kg and atracurium 0.5mg/kg. All patients were ventilated via face mask. Laryngoscopy and endotracheal intubation are done by appropriate size cuffed endotracheal tube. Anaesthesia was maintained with controlled ventilation with nitrous oxide 66% and oxygen 33%. HR, SAP, DAP, MAP and SpO₂ were recorded Baseline(T1), after drug administration(T2), after induction(T3), 0, 1, 3, 5, 10, 15 min after intubation(T4-T9). No surgical intervention was allowed throughout the study period.

STATISTICAL ANALYSIS

Data analysis was done by using statistical package for social sciences version 16. All data were expressed as mean ± 2 SD. Student 't' test and Pearson chi-square were used to analyzing the nominal data. Paired 't' test was used to compare intra group variation. A 'p' value less than 0.05 is taken to denote significant relationship.

RESULTS

60 patients under this study were categorized into 2 groups (Group D and Group E). The mean age of the patients is 44.4 in Group D and E. They comprised both sexes with age ranging from 30-60 years. Demographic profile, type of antihypertensive medications and baseline parameters between two groups were comparable and were not statistically significant (P>0.05). (Figure 1)

There is no statistical difference in baseline parameters of mean HR, SAP, DAP, MAP and SPO₂ between the two groups. (Figure 2)

There is statistical significant (Higher) change of HR, SAP, DAP, MAP compared to baseline in Group E. Group D has no statistical significance.

In Dexmedetomidine group (Group D), the mean basal heart

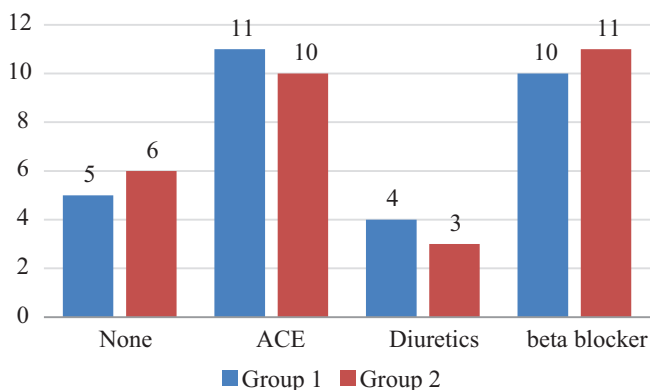


Figure-1: Anti hypertensive medication

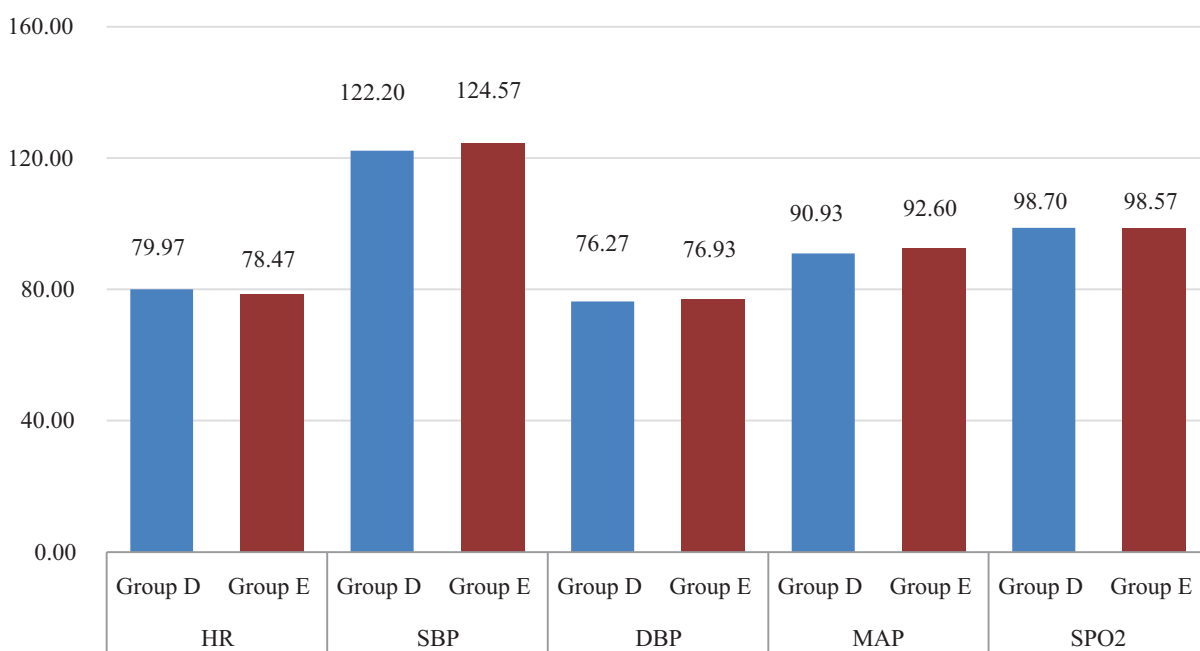


Figure-2: Baseline parameters

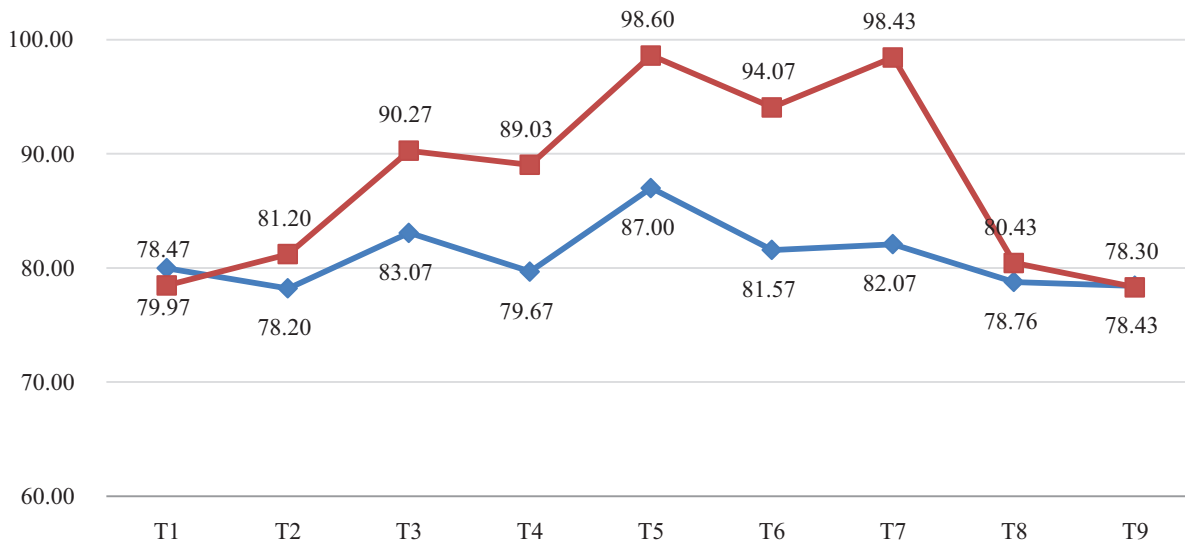


Figure-3: Comparison of Heart rate

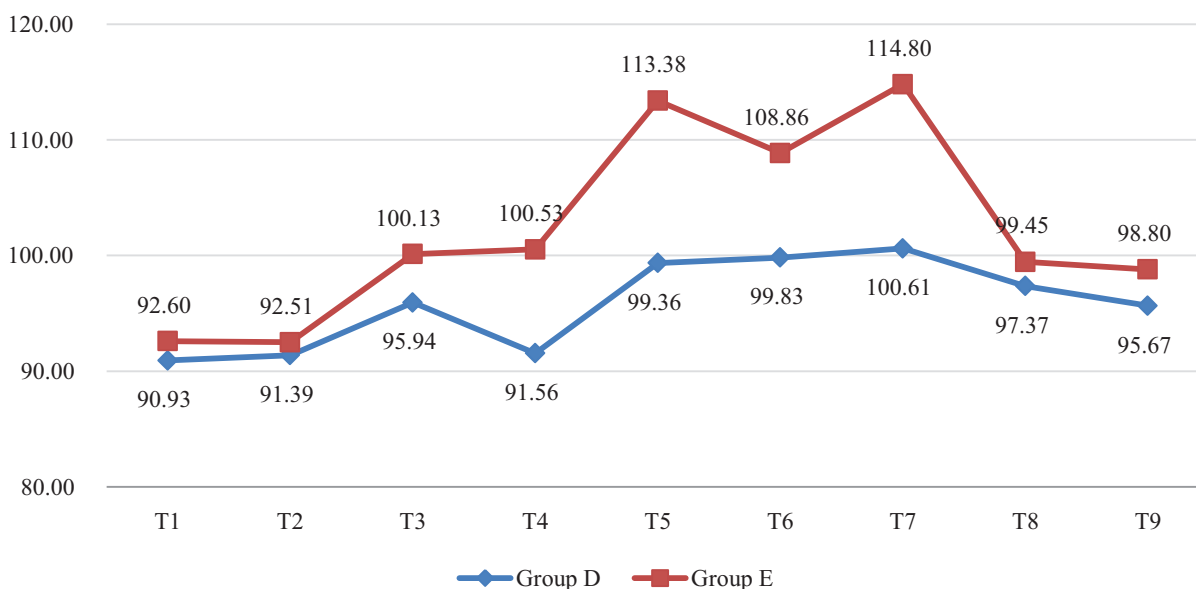


Figure-4: Comparison of MAP

rate was 79.97 beats / minute and reached a maximum of 87 beats / minute at 1 min after laryngoscopy and endotracheal intubation and came back to the basal value of 78.6 beats/minute at 10 minutes. In Esmolol group (Group E), the mean basal heart rate was 78.47 beats / minute which reached a maximum of 98.6 beats / minute following laryngoscopy and endotracheal intubation and came back to the basal value of 78.37 beats/minute at 15 minutes following laryngoscopy and intubation. There is a statistical significant lower heart rate in group D compared to group E at T3 to T7 (figure-3). In Dexmedetomidine group (Group D), the mean basal systolic blood pressure 122.2 mm of Hg and reached a maximum of 129.43 mm of Hg at 1 minute following laryngoscopy and endotracheal intubation and came back to the basal value at 10 minutes. In Esmolol group (Group E), the mean basal systolic blood pressure was 124.57 mm of Hg and reached a maximum of 144.40 mm of Hg at 1 minute following laryngoscopy and endotracheal intubation

and came back to the basal value at 15 minutes following intubation. There is statistical significant lower SAP in group D compared to group E at T4 to T7.

In Dexmedetomidine group (Group D), the mean MAP was 90.93 mm of Hg and reached a maximum of 100.61 mm of Hg at 1 minute following laryngoscopy and endotracheal intubation and came back to the basal value at 10 minutes following intubation. In Esmolol group (Group E), the mean MAP was 92.6 mm of Hg and reached a maximum of 114.8 mm of Hg at 1 minute following laryngoscopy and endotracheal intubation and came back to the basal value at 15 minutes following intubation. There is a statistical significant lower MAP in group D compared to group E at T4 to T7 (figure-4).

DISCUSSION

In this study, Dexmedetomidine (1mcg/kg) infusion 2 minutes prior to induction of anaesthesia attenuated the rise in heart rate and blood pressure following laryngoscopy

and tracheal intubation in hypertensive patients, whereas Esmolol (1.5mg/kg) bolus injection 2 minutes prior to induction of anaesthesia, failed to protect the cardiovascular response following laryngoscopy and tracheal intubation in hypertensive patients.

Miller et al. concluded bolus administration of esmolol is practical and can be effective for the treatment of intraoperative myocardial ischaemia in a Canadian multicentre trial.⁹ Sharma et al. concluded that use of esmolol in a dose of 100 mg is a safe and convenient method for attenuating the haemodynamic response to laryngoscopy and tracheal intubation in treated hypertensive patients.¹⁰

Oxorn et al. reported bolus doses of 100 mg and 200 mg of esmolol were used to ameliorate the tachycardic response to tracheal intubation. Both doses were equally effective. Esmolol also decreased the incidence of post-intubation ventricular arrhythmias. Neither dose of esmolol prevented the hypertensive response to intubation. No side-effects attributable to esmolol were seen.¹¹ Kindler et al. concluded that esmolol 1 to 2 mg/kg is reliably effective in attenuating HR response to tracheal intubation. Neither of the two doses of esmolol tested nor that of lidocaine affected the BP response. Only the combination of lidocaine and esmolol attenuated both HR and BP responses to tracheal intubation.¹² Hale YarkanUysal et al. reported that in hypertensive patients, esmolol was not effectively attenuating the blood pressure response, but it attenuates the heart rate response to tracheal intubation.¹³

Scheinin et al. concluded that in healthy individuals dexmedetomidine 0.6 µg/kg decreased, but not totally abolished, the cardiovascular response to laryngoscopy and tracheal intubation.¹⁴

Menda et al. reported that dexmedetomidine when combined with fentanyl effectively attenuated the cardiovascular response to endotracheal intubation in patients undergoing myocardial revascularization.¹⁵

Hale YarkanUysal et al.¹³ did not observe any bradycardia or hypotension contrast to the previously mentioned studies. We also did not observe any adverse effect in our study. No control group is the limitation of our study. However, we decided that withdrawing any medication would cause a detrimental effect in hypertensive patients.

CONCLUSION

Dexmedetomidine (1mcg/kg) infusion 2 minutes prior to induction of anaesthesia attenuated the rise in heart rate and blood pressure following laryngoscopy and tracheal intubation in hypertensive patients, whereas, Esmolol (1.5mg/kg) bolus injection 2 minutes prior to induction of anaesthesia, failed to protect the cardiovascular response following laryngoscopy and tracheal intubation.

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