Original Research Article

Effect of esmolol & dexmedetomidine in attenuating haemodynamic response to laryngoscopy and endotracheal intubation- A comparative study

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Received: 25-01-2021 / Revised: 04-03-2021 / Accepted: 23-04-2021

Abstract

Background: Endotracheal intubation and laryngoscopy are very essential tools in the hands of anaesthesiologists in maintaining airway. The present study is undertaken to determine the efficacy of IV dexmedetomidine 0.5µg/kg bolus and IV esmolol 0.5mg/kg bolus in attenuating the sympathetic responses to laryngoscopy and tracheal intubation and to compare the effect of esmolol & dexmedetomidine in attenuating haemodynamic response to laryngoscopy and endotracheal intubation.**Materials & Methods:**150 cases undergoing various elective Orthopaedic, Gynecological and General surgical procedures were selected were divided into three groups with 50 cases in each group.Group-I was Control group. In this group 10 ml Normal Saline was administered 5 minutes before laryngoscopy and intubation.Group-II was Esmolol group. Here patients received 0.5 mg/kg esmolol IV diluted to 10 ml with distilled water, 5 minutes before laryngoscopy and intubation.Group-III was Dexmedetomidine group. All the patients in this group received 0.5µ/kg of Dexmedetomidine IV diluted with distilled water to make 10 ml, 5 minutes before laryngoscopy and intubation. **Results:** A non- significant difference in HR, SBP, DBP, MAP, duration of laryngoscopy, RPP, mean dose of propofol RSS and VAS. The difference was non- significant (P> 0.05).After start of trial drug, mean heart rate increased in comparison to baseline in control group after 60seconds of injecting the drug. However, in Gr. Esmolol the HR decreased by 10% of the baseline which was statistically significant (P< 0.05). In dexmedetomidine group the HR decreased by 2.95% from the baseline,which was still comparable to the baseline.The mean baseline heart rates are similar in both the groups, statistical difference being insignificant (P > 0.05). A baseline mean systolic blood pressures of both the groups were comparable (P > 0.05).After start of trial drug, mean systolic blood pressure decreased in control & esmolol groups after 60 seconds from giving the drug by 1.2% & 3.2% (P>0.05) respectively. However, in Gr. Dexmedetomidine the mean SBP. **Conclusion:** Intravenous dexmedetomidine given in a dose 0.5 mcg/kg body weight before induction of anaesthesia attenuates the stress response to laryngoscopy and intubation and maintains haemodynamic stability during the intraoperative period.When dexmedetomidine given in a dose of 0.5 mcg/kg, adverse effects like dryness of mouth hypotension and bradycardia may be observed.

Keywords: dexmedetomidine, Endotracheal intubation, laryngoscopy

Introduction

Endotracheal intubation and laryngoscopy are very essential tools in the hands of anaesthesiologists in maintaining airway. Endotracheal intubation has become an integral part of the anaesthetic management and critical care of the patient and has been practiced following its description by Rowbotham and Magill in 1921[1]. Intubation period is considered as one of the greatest risks in surgical patients with coronary artery diseases and patients with coronary artery diseases and intracranial aneurysm[2]. Although the response may be transient, it is invariably- significant, often persistent, and of great concern.Many strategies have been advocated to minimize the haemodynamic adverse responses and are aimed at different levels of the reflex arc[3].Recommendations for attenuation of reflex hypertension and tachycardia aretherefore many fold[4].Besides minimizing the cardiovascular response, anaesthesia for patients at risk must also satisfy the following requirements;it must be applicable regardless of patient collaboration, prevent impairment of cerebral blood flow avoid arousal of the patient. It should neither be time consuming nor affect the duration or modality of the ensuing anaesthesia[5].The present study is undertaken to determine the efficacy of IV dexmedetomidine 0.5µg/kg bolus and IV esmolol 0.5mg/kg bolus in attenuating the sympathetic responses to laryngoscopy and tracheal intubation and to compare the effect of esmolol & dexmedetomidine in attenuating haemodynamic response to laryngoscopy and endotracheal intubation.

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Materials & Methods

The present prospective, randomized, double blinded, placebo-controlled study comprised of 150 adult patients scheduled for elective surgery under general anaesthesia in NIIMS hospital, NIU Noida. After obtaining an approval of research and ethics committee of hospital and after having informed consent from each patient. Patients undergoing various elective Orthopaedic, Gynecological and General surgical procedures were selected. Following criteria's were adopted for selecting patients - patients aged between 20-60 years ofboth the sexes, patients with ASA Grade I or II, patients undergoing elective surgical procedures under general anaesthesia. Exclusion criteria were unwilling patients, emergency surgeries and patients with ASA Grade III or higher. 150 cases were divided into three groups with 50 cases in each group.Group-I was Control group. In this group 10 ml Normal Saline was administered 5 minutes before laryngoscopy and intubation.Group-II was Esmolol group. Here patients received 0.5 mg/kg esmolol IV diluted to 10 ml with distilled water,5 minutes before laryngoscopy and intubation.Group-III was Dexmedetomidine group. All the patients in this group

received 0.5µ/kg of Dexmedetomidine IV diluted with distilled water to make 10 ml, 5 minutes before laryngoscopy and intubation. Laryngoscopy was done using rigid laryngoscope with standard Macintosh blade. Intubation was done with appropriate sized disposable, high volume low pressure cuffed endotracheal tube. The patients were then ventilated with 66% nitrous oxide and 33% oxygen with a tidal volume of 8-10ml/kg and a rate of 12 – 15 breaths per minute. For maintenance of relaxation, Inj. atracurium was administered according to body weight.Descriptive data presented as Mean ± SD and in percentage. Intergroup comparison between three groups was done by ANOVA test.Qualitative data was expressed as percentage.

Results

Table 1:Distribution of age

	Control	Esmolol	Dexmedetomidne
20-30	15	15	12
31-40	22	20	24
41-50	13	15	12
51-60	0	0	2
Total	50	50	50

Table 1 shows that majority of patients in all 3 groups belong to age group 31 to 40 years. The no.of patients in age group 20 to 30 is 15,15 ,12 for Control, Esmol, Dexmedetomidine respectively.

Table 2:Comparison of parameters

Parameters	Control	Esmolol	Dexmedetomidine	P value
Duration of laryngoscopy	10.2	10.92	10.68	>0.05
HR(BPM)	86.8	88.4	87.4	>0.05
SBP(mmHg)	130.6	129.3	127.5	>0.05
DBP(mmHg)	77.5	78.2	79.0	>0.05
MAP(mmHg)	94.5	95.3	96.2	>0.05
RPP (mmHg/min) X 100	110	115.3	112.1	>0.05
Mean dose of propofol	102.8	103.2	73.8	>0.05
Mean RSS	2.14	2.22	2.9	>0.05
Mean VAS	4.4	4.08	2.5	>0.05

Table 2 shows non- significant difference in HR, SBP, DBP, MAP, duration of laryngoscopy, RPP, mean dose of propofol RSS and VAS. The difference was non- significant (P> 0.05).

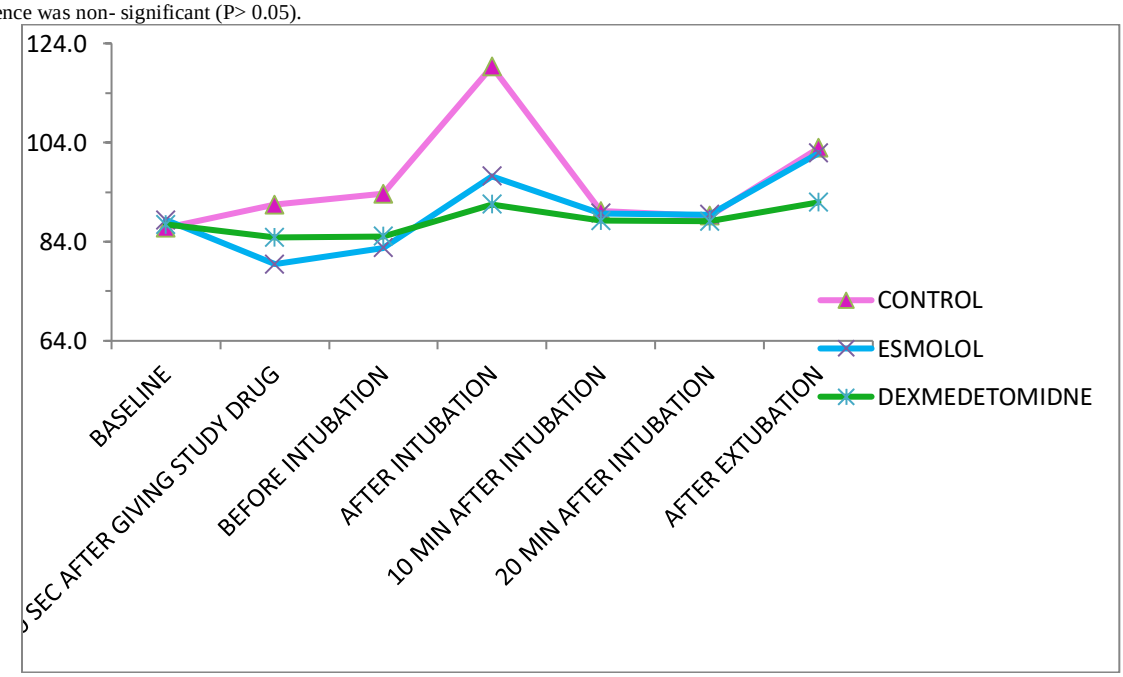

Fig 1:Comparison of HR at different intervals

Fig 1 shows that after start of trial drug, mean heart rate increased in comparison to baseline in control group after 60seconds of injecting the drug. However, in Gr. Esmolol the HR decreased by 10% of the baseline which was statistically significant (P< 0.05). In dexmedetomidine group the HR decreased by 2.95% from the baseline,which was still comparable to the baseline.The mean baseline heart rates are similar in both the groups, statistical difference being insignificant (P > 0.05).

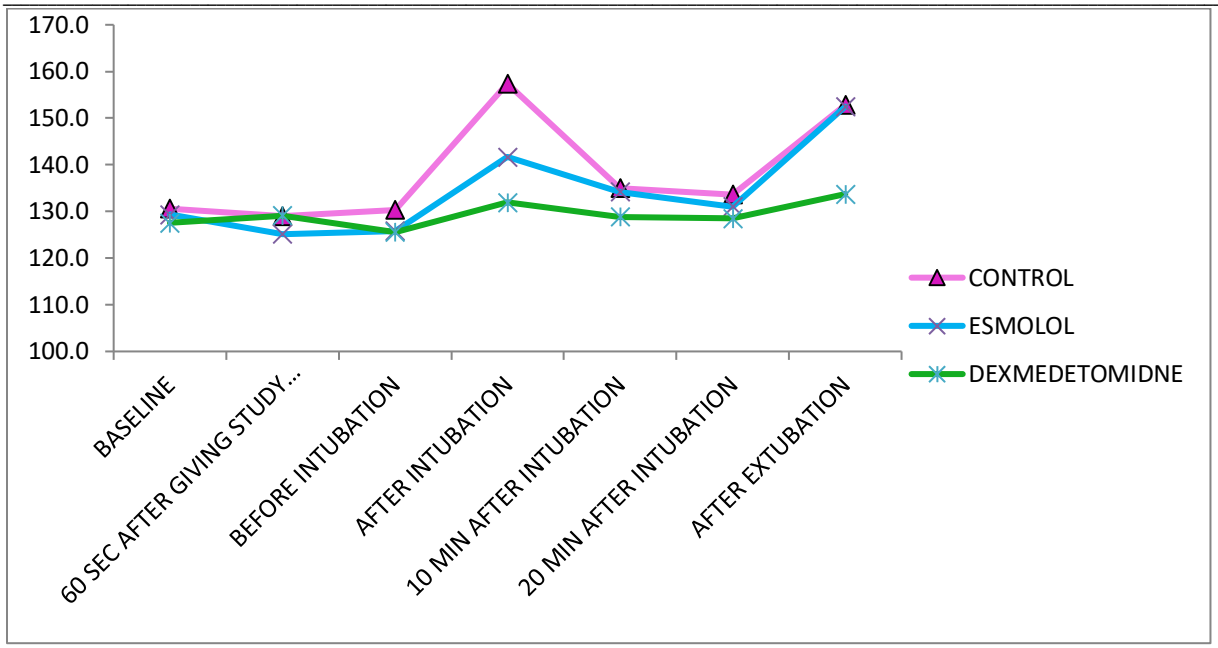

Fig 2:Intergroup comparison of mean SBP (mm Hg)

Fig 2 shows that baseline mean systolic blood pressures of both the groups were comparable (P > 0.05).After start of trial drug, mean systolic blood pressure decreased in control & esmolol groups after 60 seconds from giving the drug by 1.2% & 3.2% (P>0.05) respectively. However, in Gr. Dexmedetomidine the mean SBP.

Table 3: Comparison of MAP

Time	Control	Esmolol	Dexmedetomidne	P-value
Baseline	94.5	95.3	96.2	>0.05
60 sec after giving drug	92.3	91.6	99.1	HS
Before intubation	93.9	92.7	97.2	>0.05
After intubation	113.0	104.0	100.2	ES
10 min after intubation	98.9	98.9	98.9	>0.05
20 min after intubation	98.9	96.4	99.0	S
After extubation	113.1	111.5	103.1	ES

Table 5 shows that it is evident that baseline mean MAP of the two groups are comparable (P > 0.05).

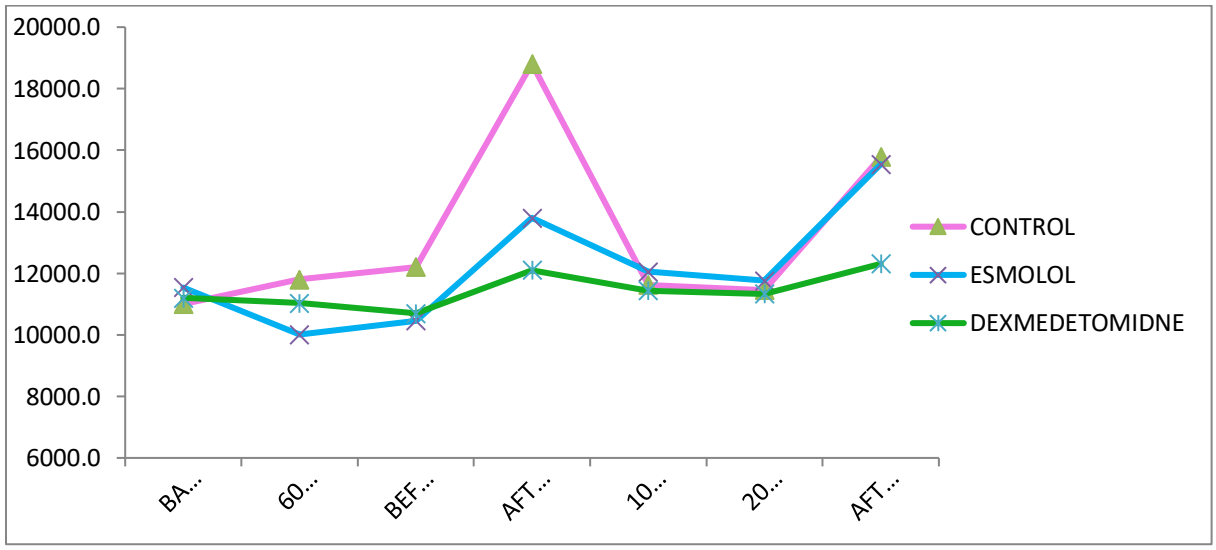

Fig 3: Intergroup comparison of RPP

Fig 3 shows that intergroup comparison shows mean RPP to be significantly higher in control group after 60 sec of giving the drug than groups dexmedetomidine & esmolol (P<0.01).

Discussion

Maintaining intraoperative haemodynamic stability is an integral part of modern anaesthesia. Stress produced by anaesthesia and surgery and also perioperative anxiety of the patients produce undesirable haemodynamic effects in the form of tachycardia, hypertension, and increased metabolic demands[6]. All these contribute to adverse perioperative outcomes. Different agents have been used to achieve perioperative anxiolysis, sedation, and analgesia and haemodynamic stability[7].Benzodiazepines, opioids, barbiturates, antihistamines and beta-adrenoreceptor antagonists have traditionally been used as preoperative medication to eliminate or suppress stress reaction to anaesthesia and surgery[8]. Dexmedetomidine is more alpha-2 selective with alpha-2: alpha-1 activity of 1600:1. It was introduced in USA in clinical practice in 1999 and has been approved by FDA. Dexmedetomidine is also claimed to have properties like decreasing salivary secretion, anaesthetic sparing property, decreasing oxygen consumption etc[9]. In various studies. Dexmedetomidine, in a single pre-anaestheticintravenous dose of upto 0.6 mcg/kg has been shown to reduce the anaesthetic requirement and blunt the haemodynamic response to stressful intraoperative events.In the present study the effects of pre-anaesthetic single dose intravenous dexmedetomidine versus esmolol on intraoperative haemodynamic parameters was compared.We found that the no.of patients in age group 20 to 30 is 15,15,12 for control, esmol, dexmedetomidine respectively.

M.T. Taittonen et al[10]studied the effects of clonidine and dexmedetomidine premedication on perioperative oxygen consumption and haemodynamic state. They compared they included 30 patients of ASA I status undergoing plastic surgery under general anaesthesia.Patients were premedicated with clonidine 4mcg/kg (n=10), dexmedetomidine 2.5 mcg/kg (n=10), or saline (n=10) i.m. Perioperative oxygen consumption, systolic and diastolic blood pressure and heart rate were lower in the clonidine and dexmedetomidine groups compared to the saline group.We found that after start of trial drug, mean heart rate increased in comparison to baseline in control group after 60seconds of injecting the drug. However, in Gr. Esmolol the HR decreased by 10% of the baseline which was statistically significant (P < 0.05). In dexmedetomidine group the HR decreased by 2.95% from the baseline,which was still comparable to the baseline.Fernandez-Galinski et al[11] found that none of the study drugs blocked the increase in mean arterial pressure induced by endotracheal intubation, but esmolol provided better overall haemodynamic stability. All groups had an adequate level of hypnosis.We found that baseline mean systolic blood pressures of both the groups were comparable (P > 0.05).After start of trial drug, mean systolic blood pressure decreased in control & esmolol groups after 60 seconds from giving the drug by 1.2% & 3.2% (P>0.05) respectively.We found that baseline mean systolic blood pressures of both the groups were comparable (P > 0.05).After start of trial drug, mean systolic blood pressure decreased in control & esmolol groups after 60 seconds from giving the drug by 1.2% & 3.2% (P>0.05) respectively. However, in Gr. Dexmedetomidine the mean SBP. But et al evaluated the effects of pre-operative dexmedetomidine infusion on haemodynamics in patients with pulmonary hypertension undergoing mitral valve replacement surgery[11].Patients were randomly divided into placebo (group P, n= 16) and dexmedetomidine (group D, n= 16) groups. In group D, a 1 μg/kg bolus dose of dexmedetomidine was administered 10 min before the induction of anesthesia, followed by a 0.4 μg/kg/h infusion until the surgical incision. Anesthesia was induced with lidocaine (1 mg/kg),midazolam (0.2 mg/kg) and fentanyl (5 μg/kg) in both groups.In group D, the mean arterial pressure (MAP), mean pulmonary arterial pressure (MPAP) and pulmonary capillary wedge pressure (PCWP) were decreased effectively in comparison with the values in the placebo group (P < 0.05), and there was an attenuation in the increase in the systemic vascular resistance index (SVRI) and pulmonary vascular resistance index (PVRI) at the post-sternotomy period. Hence the authors concluded that pre-operative administration of the α2-agonist dexmedetomidine decreases the fentanyl requirement and attenuates the increase in SVRI and PVRI at the post-sternotomy period relative to the baseline levels, and decreases effectively MAP, MPAP and PCWP in comparison with the values in the placebo group, in patients with pulmonary hypertension undergoing mitral valve replacement surgery.

Conclusion

Intravenous dexmedetomidine given in a dose 0.5 mcg/kg body weight before induction of anaesthesia attenuates the stress response to laryngoscopy and intubation and maintains haemodynamic stability during the intraoperative period.When dexmedetomidine given in a dose of 0.5 mcg/kg, adverse effects like dryness of mouth hypotension and bradycardia may be observed.Intravenous esmolol 0.5mg/kg given as bolus also attenuates the haemodynamis stress response to laryngoscopy & intubation.When compared with 0.5 mg/kg body weight of intravenous esmolol given in a similar fashion, dexmedetomidine 0.5 mcg/kg attenuates the haemodynamic response to laryngoscopy and intubation more effectively and maintains intraoperative haemodynamic parameters more stable

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Conflict of Interest: Nil Source of support:Nil