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A Comparative study of the Effect of Esmolol and Dexmedetomidine in Attenuating Hemodynamic Response to Laryngoscopy and Endotracheal Intubation

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ABSTRACT
To assess the effect of esmolol and dexmedetomidine in attenuating hemodynamic response to laryngoscopy and endotracheal intubation. Ninety adult patients scheduled for elective surgery under general anaesthesia were randomized into three groups of thirty patients each. Parameters such as dose of propofol, HR, SBP, DBP, MAP, RPP, RSS, VAS and duration of laryngoscopy was recorded. The age group 21-30 years had 8 patients in group A, 9 in group B and 7 in group C, age group 31-40 years had 7-6 and 10, 41-50 years had 9-8 and 9 and 51-60 years had 6-7 and 4 patients respectively. In group A-B and C, RSS was 2.6-2.1 and 2.7 respectively. VAS was 4.6-4.2 and 2.8 respectively. The duration of the laryngoscopy was 10.4-10.3 minutes and 10.7 minutes. HR (BPM) was 90.2-91.4 and 89.7, SBP was 132.6-131.3 mm Hg and 125.5 mm Hg, DBP was 82.5-82.4 mm Hg and 83.2 mm Hg, MAP was 98.5-97.3 mm Hg and 98.2 mm Hg respectively. RPP was 116.2-114.6 mm Hg min X 100 and 115.6 mm Hg min X 100. The dose of propofol was 103.6-105.2 and 82.5 respectively. Intraoperative intravenous dexmedetomidine reduces the stress response to laryngoscopy and intubation while maintaining hemodynamic stability. Dexmedetomidine 0.5 mcg kg was more effective in suppressing the hemodynamic response to laryngoscopy and intubation, and intraoperative hemodynamic parameters were maintained more consistently. Dexmedetomidine, endotracheal intubation, hypertension.

INTRODUCTION

When managing the airway prior to surgery, endotracheal intubation is the most effective technique. Nevertheless, tachycardia and hypertension are the obvious consequences of both laryngoscopy and endotracheal intubation, which trigger a sympathetic response. Hemodynamic value changes can elevate the risk of myocardial ischemia and related complications in people with cardiovascular disease[1,2]. To manage the increase in these hemodynamic parameters, a wide range of pharmacological and physiological preventative techniques have been investigated. Nevertheless, there could be some unforeseen repercussions from those acts[3].

Many techniques that target different points along the reflex arc have been proposed to reduce the hemodynamically adverse effects. There are several options for decreasing reflex tachycardia and hypertension as a result[4]. For patients who are at risk, anesthesia must be administered without the patient's assistance, limit the cardiovascular response, avoid impairing cerebral blood flow and prevent the patient from becoming aroused. It shouldn't take too long and it shouldn't change the duration or type of anesthesia administered after that[5]. Considering this, we assessed the effect of esmolol and dexmedetomidine in attenuating haemodynamic response to laryngoscopy and endotracheal intubation.

Method

A sum total of ninety adult patients scheduled for elective surgery under general anaesthesia were enrolled after obtaining valid informed written informed consent from all patients. The institutional ethical and review committee approved the study. Demographic profiles such as name, age, gender etc. was recorded. Patients were randomized into three groups of thirty patients each using a simple random technique. In group A patients, 10 mL normal saline was administered 5 min before laryngoscopy and intubation. In group B patients, 0.5 mg kg esmolol IV diluted to 10 mL with distilled water, 5 min before laryngoscopy and intubation was used. In group C, patients received 0.5 µ kg of dexmedetomidine IV diluted with distilled water to make 10 mL, 5 min before laryngoscopy and intubation. Parameters such as duration of laryngoscopy, HR (BPM) SBP (mmHg) DBP (mm Hg), MAP (mm Hg), RPP (mm Hg min) X 100, RSS, VAS and dose of propofol was recorded. Results thus obtained were statistically analysed. p-value less than 0.05 was considered significant.

RESULTS

The age group 21-30 years had 8 patients in group A, 9 in group B and 7 in group C, age group 31-40 years had 7-6 and 10, 41-50 years had 9-8 and 9 and 51-60 years had 6-7 and 4 patients respectively (Table 1). In

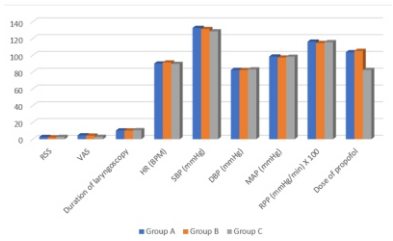

Fig 1: Comparison of parameters in all groups

group A, B and C, RSS was 2.6-2.1 and 2.7 respectively. VAS was 4.6-4.2 and 2.8 respectively. The duration of laryngoscopy was 10.4-10.3 min and 10.7 minutes. HR (BPM) was 90.2-91.4 and 89.7, SBP was 132.6-131.3 mm Hg and 125.5 mm Hg, DBP was 82.5-82.4 mm Hg and 83.2 mm Hg, MAP was 98.5-97.3 mm Hg and 98.2 mm Hg respectively. RPP was 116.2-114.6 mm Hg min X 100 and 115.6 mm Hg min X 100. The dose of propofol was 103.6-105.2 and 82.5 respectively. The difference was non- significant ($p>0.05$).

DISCUSSION

Uncomfortable stimuli such as tracheal intubation and laryngoscopy cause a brief but noticeable sympathetic reaction that increases blood pressure, heart rate (HR) and other symptoms. Physically fit and active individuals can likely tolerate these changes in patients with ASA 1 status. They peak right after intubation and last for five-ten min[6]. Hemodynamic abnormalities in people with cardiovascular disease can cause myocardial ischemia, abrupt heart failure and cerebrovascular accidents, which are serious adverse effects. Numerous therapy methods are available, such as topical lignocaine sprays, deeper planes of anesthetic using narcotics or intravenous (IV) medicines, calcium channel blockers and vasodilators such sodium-nitroprusside and nitroglycerin, or both. Research on laryngoscopy pressor response attenuation and intubation is still ongoing, despite the wide range of techniques[7].

For surgical patients with coronary artery disease and those who have both the condition and an intracranial aneurysm the intubation phase presents one of the biggest dangers. The response is almost always significant, often persistent and highly uncomfortable, even if it may only last for a brief while[8]. Maintaining intraoperative hemodynamic stability is one of the most crucial elements of modern anesthesia. Tachycardia, hypertension and elevated metabolic needs are examples of unfavorable haemodynamic effects of stress brought on by anesthesia, surgery and patient anxiety during the process[9]. Any of these could lead to unfavorable perioperative results. Many medications have been utilized to provide drowsiness, analgesia, perioperative

Table 1: Age-wise distribution

Age group (years)	Group A	Group B	Group C
21-30	8	9	7
31-40	7	6	10
41-50	9	8	9
51-60	6	7	4

Table 2: Comparison of parameters in all groups

Parameters	Group A	Group B	Group C	p-value
RSS	2.6	2.1	2.7	0.52
VAS	4.6	4.2	2.8	0.69
Duration of laryngoscopy	10.4	10.3	10.7	0.74
HR (BPM)	90.2	91.4	89.7	0.88
SBP (mm Hg)	132.6	131.3	128.5	0.16
DBP (mm Hg)	82.5	82.4	83.2	0.24
MAP (mm Hg)	98.5	97.3	98.2	0.82
RPP (mm Hg min) X 100	116.2	114.6	115.6	0.94
Dose of propofol	103.6	105.2	82.5	0.82

anxiolysis and hemodynamic stability. To prevent or minimize the stress response to anesthesia and surgery, preoperative medicine has traditionally included benzodiazepines, opioids, barbiturates, antihistamines and beta-adrenoreceptor antagonists[10]. Considering this, we assessed the effect of esmolol and dexmedetomidine in attenuating haemodynamic response to laryngoscopy and endotracheal intubation.

In our results, the age group 21-30 years had 8 patients in group A, 9 in group B and 7 in group C, age group 31-40 years had 7-6 and 10, 41-50 years had 9-8 and 9 and 51-60 years had 6, 7 and 4 patients respectively. Scheinin *et al.*[11] studied the effects of the new, highly selective alpha 2-adrenergic agonist, dexmedetomidine, in 24 ASA I patients. Dexmedetomidine 0.6 micrograms kg^{-1} or saline was given i.v. 10 min before induction of anaesthesia. The required dose of thiopentone was significantly smaller in the dexmedetomidine group (mean 4.4 mg kg^{-1}) than in the control group (6.9 mg kg^{-1}) and the drug attenuated the cardiovascular responses to laryngoscopy and tracheal intubation. The concentration of noradrenaline in mixed venous plasma was smaller in the dexmedetomidine group during all phases of induction. During surgery, fentanyl was required in a dose of 0.5 mg kg^{-1} and 2.8 mg kg^{-1} in the dexmedetomidine and control groups, respectively. During 2 h postoperative follow-up, oxycodone 0.06 mg kg^{-1} and 0.16 mg kg^{-1} was given to the two groups respectively.

In our results, in group A-B and C, RSS was 2.6-2.1 and 2.7 respectively. VAS was 4.6-4.2 and 2.8 respectively. The duration of laryngoscopy was 10.4-10.3 minutes and 10.7 minutes. HR (BPM) was 90.2-91.4 and 89.7, SBP was 132.6-131.3 mm Hg and 125.5 mm Hg, DBP was 82.5-82.4 mm Hg and 83.2 mm Hg, MAP was 98.5-97.3 mm Hg and 98.2 mm Hg respectively. RPP was 116.2-114.6 mm Hg min X 100 and 115.6 mm Hg min X 100. The dose of propofol was 103.6-105.2 and 82.5 respectively. But *et al.*[12] studied the impact of pre-operative dexmedetomidine infusion on hemodynamics in patients with pulmonary hypertension after mitral valve replacement surgery. Patients were randomly assigned to either dexmedetomidine or a placebo. Ten min before to the onset of anesthesia, Group D was given a bolus dose of dexmedetomidine at a rate of 1 g kg. In comparison to the values in the placebo group D showed significantly lower mean arterial pressure (MAP) mean pulmonary arterial pressure (MPAP) and pulmonary capillary wedge pressure (PCWP) as well as a post-sternotomy increase in the systemic vascular resistance index (SVRI) and pulmonary vascular resistance index (PVRI). Talke *et al.*[13] in their study from one hour before to the induction of anesthesia until 48 hrs after the procedure, twenty four patients undergoing vascular surgery were continuously infused with either a placebo or one of three doses of dexmedetomidine, to achieve plasma concentrations of 0.15 ng mL (low dosage, 0.30 ng mL (medium dose) or 0.45 ng mL (high dose). Before surgery, patients on dexmedetomidine had lower systolic blood pressure (low dosage 3%, medium dose 12%, high dose 20%) and heart rates (low dose 11%, medium dose 5%, high dose 20%). More vasoactive drugs were needed intraoperatively in the dexmedetomidine groups to keep hemodynamics within predefined ranges. Following surgery, tachycardia (measured in min/monitored hrs) was lower in the dexmedetomidine groups than in the place bo group (placebo 23 min h low dosage 9 min h $p = 0.006$ medium dose 0.5 min h, $p = 0.004$ high dose 2.3 min h $p = 0.004$) at all doses.

CONCLUSION

Intraoperative intravenous dexmedetomidine reduces the stress response to laryngoscopy and intubation while maintaining hemodynamic stability. Dexmedetomidine 0.5 mcg kg was more effective in suppressing the hemodynamic response to laryngoscopy and intubation and intraoperative hemodynamic parameters were maintained more consistently.

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