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Efficacy of Dexmedetomidine and Esmolol for attenuation of cardiovascular response during laryngoscopy and endotracheal intubation in cases with controlled hypertension

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Abstract

Background: Laryngoscopy and endotracheal intubation evokes tachycardia and hypertension in cases with cardiovascular diseases undergoing anaesthesia. This was successfully reduced by opioids, inhaled anaesthetics, vasodilators and adrenergic blockers. This study was designed to assess the efficacy of 1µg/kg Dexmedetomidine and 1.5 mg / kg Esmolol in attenuation of cardiovascular response during laryngoscopy and endotracheal intubation in cases with controlled hypertension

Materials and Methods: A total 100 controlled hypertensive cases undergoing general anaesthesia were randomly divided in to two groups Group 1 administered with 1µg/kg Dexmedetomidine in 100ml normal saline, 2 minutes before intubation and group 2, with 1.5 mg / kg Esmolol, 2 minutes before intubation. Heart rate, Systolic blood pressure, diastolic blood pressure, mean arterial pressure and SpO₂ were recorded at Baseline, after drug administration, after induction, at 0 min, 1min, 3min, 5min, 10min, 15 minutes after intubation.

Results: The mean difference of age (p=0.722), sex (p=0.358) and history of anti-hypertensive drug usage (p=0.562) between two study groups was statistically not significant. After induction, all raised baseline parameters were normalized after 10 minutes in group 1 and after 15 minutes in group 2.

Conclusion: Dexmedetomidine is efficient in attenuating the rise in mean heart rate, mean systolic blood pressure and mean diastolic blood pressure. Esmolol had longer duration in attenuation of cardiovascular response.

Keywords: 1µg/kg Dexmedetomidine, 1.5 mg / kg Esmolol, Endotracheal intubation, Controlled Hypertension.

Introduction

Laryngoscopy and endotracheal intubation produce marked sympathetic response that evokes hypertension and tachycardia. This leads to the severe haemodynamic disturbances in cases with cardiovascular complication [1, 2]. It required numerous pharmacological interventions to control the haemodynamic response. This was successfully reduced by opioids, inhaled anaesthetics, vasodilators and adrenergic blockers [3, 4].

Dexmedetomidine, an ideal α_2 - adrenergic agonist possess anxiolytic, sedative, analgesic and sympatholytic properties with minimal respiratory depression. It is effective in attenuation of haemodynamic stability and sympathoadrenal responses during laryngoscopy and endotracheal intubation [5, 6]. Esmolol, an ultra-short β -adrenergic blocking drug, rapid onset, water soluble, possesses little sedative effect, but no analgesic activity. It is effective in providing haemodynamic stability during laryngoscopy and endotracheal intubation [7, 8]. The present study was designed to assess the efficacy of 1µg/kg Dexmedetomidine and 1.5 mg / kg Esmolol in attenuation of cardiovascular response during laryngoscopy and endotracheal intubation in cases with controlled hypertension

Materials and Methods

The present Prospective, randomized double blind study was conducted in the Department of Anaesthesia, MNR Medical College, Sangareddy in association with Department of Anaesthesia, Gandhi Medical College, Secunderabad during June 2018 to November 2019. A total 100 controlled hypertensive cases undergoing general anaesthesia for elective non cardiac surgery between 31-60 years were recruited. Case with controlled hypertension,

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with SAP>160 mm of Hg or DAP>90 mm of Hg and ASA grade II were included, cases not willing to participate, with cardio vascular diseases, diabetes, with secondary hypertension and with longer intubation time and attempts were excluded.

Informed consent was obtained from all the study participants and study protocol was approved by Institutional ethics committee. Based on drug administered study participants were randomly divided in to two groups Group 1 administered with 1µg/kg Dexmedetomidine in 100ml normal saline, 2 minutes before intubation and group 2, with 1.5 mg / kg Esmolol, 2 minutes before intubation. Prior to the surgery baseline parameters were noted and recorded. Study drugs were administered as per study protocol to both groups. After 2 min, cases induced with 5 mg/kg thiopentone sodium, 2 µg/kg fentanyl and 0.5mg/kg atracurium. Laryngoscopy and endotracheal intubation was done. Parameters such as Heart rate, Systolic blood pressure, diastolic blood pressure, mean arterial pressure and SpO₂ were recorded at Baseline, after drug administration, after induction, at 0 min, 1min, 3min, 5min, 10min, 15 minutes after intubation. Study data was collected

on to the Microsoft excel sheet and data analysis was conducted by SPSS version 16. Study data was represented as Mean and standard deviation.

Results

A total 100 study participants were randomly divided in to two groups Group 1 administered with 1µg/kg Dexmedetomidine in 100ml normal saline, 2 minutes before intubation and group 2, with 1.5 mg / kg Esmolol, 2 minutes before intubation.

Table 1: Demographic data of study participants.

Parameter	Group 1	Group 2	P-value
Age	43.9±6.8	45.2±7.6	0.722
Sex			
Male	21 (42%)	24 (48%)	0.358
Female	29 (58%)	26 (52%)	
Details of anti-hypertensive drugs			
Beta Blockers	18	15	0.562
ACEI	20	14	
Diuretics	09	06	
No drugs	10	08	

Table 2: Mean heart rate and mean Arterial pressure in both the study groups.

Time interval	Heart rate (HR)			Mean Arterial pressure (MAP)		
	Group 1 (Mean±SD)	Group 2 (Mean±SD)	p-value	Group 1 (Mean±SD)	Group 2 (Mean±SD)	p-value
At beginning	78.34 ± 4.06	78.85 ± 4.22	0.284	91.03 ± 7.27	91.89 ± 6.21	0.391
After drug dose	78.88 ± 4.52	83.26 ± 4.18	0.183	91.52 ± 8.39	92.28 ± 7.45	0.448
after induction	82.30 ± 5.51	89.08 ± 5.45	0.004	93.28 ± 7.81	97.73 ± 7.63	0.089
At 0 min	79.98 ± 5.18	90.65 ± 4.33	0.0032	93.22 ± 7.10	98.59 ± 6.89	0.005
At 1min	84.18 ± 6.24	95.20 ± 6.74	0.0001	97.36 ± 8.98	100.11 ± 8.24	0.002
At 3 min	82.68 ± 6.51	94.98 ± 6.82	0.00	99.14 ± 8.24	102.90 ± 8.05	0.004
At 5 min	82.32 ± 7.28	96.39 ± 5.61	0.0001	99.67 ± 7.33	105.54 ± 7.78	0.0001
At 10 min	80.15 ± 6.22	80.71 ± 7.08	0.436	95.23 ± 9.45	97.62 ± 9.31	0.391
At 15 min	79.24 ± 7.74	78.43 ± 6.17	0.418	93.66 ± 9.17	97.05 ± 8.22	0.446

Table 3: Mean Systolic blood pressure (SBP) and diastolic blood pressure (DBP) in the study participants.

Time interval	Systolic blood pressure (SBP)			Diastolic blood pressure (DBP)		
	Group 1 (Mean±SD)	Group 2 (Mean±SD)	p-value	Group 1 (Mean±SD)	Group 2 (Mean±SD)	p-value
At beginning	121.09 ± 9.28	122.29 ± 10.02	0.202	77.25 ± 6.34	76.28 ± 7.24	0.489
After drug dose	120.50 ± 9.66	124.21 ± 9.56	0.241	77.18 ± 7.69	78.63 ± 7.61	0.650
after induction	121.41 ± 11.08	124.98 ± 9.35	0.287	79.32 ± 8.55	82.95 ± 7.39	0.244
At 0 min	120.33 ± 11.87	125.67 ± 9.10	0.001	78.45 ± 8.41	83.27 ± 7.55	0.004
At 1min	126.22 ± 12.45	129.22 ± 10.84	0.003	81.06 ± 10.88	87.29 ± 8.82	0.001
At 3 min	127.78 ± 11.77	129.6 ± 10.18	0.002	82.11 ± 9.98	86.11 ± 9.23	0.214
At 5 min	129.91 ± 10.29	128.91 ± 9.44	0.002	84.98 ± 10.74	89.68 ± 7.11	0.002
At 10 min	121.87 ± 9.71	128.04 ± 10.09	0.087	81.66 ± 10.02	83.54 ± 9.98	0.489
At 15 min	121.01 ± 9.33	127.30 ± 11.68	0.355	80.48 ± 9.14	81.22 ± 8.56	0.224

Discussion

Direct Laryngoscopy and endotracheal intubation are the key events during surgery under general anaesthesia. They frequently induce cardiovascular stress response due to reflex sympathetic stimulation which is harmful to cases with hypertension, myocardial disease, cardiovascular complications and cerebrovascular disease^[9, 10]. The present study was designed to evaluate the efficacy of Dexmedetomidine and Esmolol in suppressing cardiovascular response during laryngoscopy and endotracheal intubation in cases with controlled hypertension. The study participants were randomly divided in to 2 groups. Group 1 administered with 1µg/kg Dexmedetomidine in 100ml normal saline, 2 minutes before intubation and group 2, with 1.5 mg/kg

Esmolol, 2 minutes before intubation.

In this study, the mean difference of age (p=0.722), sex (p=0.358) and history of anti-hypertensive drug usage (p=0.562) between two study groups was statistically not significant (Table 1). Study by Amutharani *et al.*, found that demographic profile and antihypertensive drug type were statistically not significant among two study groups^[11].

In this study, the mean heart rate in group 1 was 78.34 beats/minute at the beginning, which was raised to 84.18 beats/minute after induction and was returned to the normal basal value 80.15 beats/minute at 10 minutes. In group 2, the mean heart rate was 78.85 beats/minute and reached a maximum of 95.20 beats/minute and was returned to the normal basal value 78.43 at 15 minutes (Table 2). The

findings of Amutharani *et al.*, stated that, in group Dexmedetomidine, the mean heart rate was 79.97 at the beginning, which was raised to 87 after intubation and came down to 78.6 at 10 minutes. Whereas in Esmolol group, mean heart rate was 78.47 at the beginning, which was raised to 98.6 after intubation and came down to 78.37 at 15 minutes^[11].

The mean arterial pressure in group 1 was 91.03 mm of Hg at the beginning, which was raised to 99.67 mm of Hg after induction and was returned to the normal basal value 95.23 mm of Hg at 10 minutes. In group 2, the mean arterial pressure was 91.89 mm of Hg and reached a maximum of 105.54 mm of Hg and was returned to the normal basal value 97.05 mm of Hg at 15 minutes (Table 2). The findings of Amutharani *et al.*, stated that, in group Dexmedetomidine, the mean arterial pressure was 90.93 mm of Hg at the beginning, which was raised to 100.61 mm of Hg after intubation and came down to 95.67 mm of Hg at 15 minutes. Whereas in Esmolol group, mean arterial pressure was 92.6 mm of Hg at the beginning, which was raised to 114.8 mm of Hg after intubation and came down to 98.80 mm of Hg at 15 minutes^[11].

In group 1, the mean systolic blood pressure was 121.09 mm of Hg at the beginning and was raised to 129.91 mm of Hg and was returned to 121.87 mm of Hg at 10 minutes. In group 2, the mean systolic blood pressure at the beginning was 122.29 mm of Hg and 128.04 mm of Hg at 15 min after induction. Study by Amutharani *et al.*, found that, in Dexmedetomidine group, the mean systolic blood pressure was 122.2 mm of Hg at the beginning and was reached to normal level at 10 minutes. In Esmolol group the mean systolic blood pressure was 124.57 mm of Hg at the beginning and was reached to basal level at 15 minutes after intubation^[11].

In the present study, raise in mean heart rate, mean systolic blood pressure and diastolic blood pressure was effectively reduced by Dexmedetomidine than Esmolol after laryngoscopy and endotracheal intubation. After induction, all raised baseline parameters were normalized after 10 minutes in group 1 and after 15 minutes in group 2. Study by Sharma *et al.*, stated that 100mg Esmolol is effective in attenuating haemodynamic response to laryngoscopy and endotracheal intubation in treated hypertensive cases^[12]. Study by Hale Yarkan Uysal *et al.*, found that Esmolol was not effective in attenuating the BP to tracheal intubation, but it is effective in attenuating heart rate to tracheal intubation in hypertensive cases^[13]. Study by Kindler *et al.*, stated that 1-2mg/kg Esmolol is effective in attenuating HR response to trachea intubation^[14].

Conclusion

The study results concludes that, Dexmedetomidine is efficient in attenuating the rise in mean heart rate, mean systolic blood pressure and mean diastolic blood pressure. Whereas Esmolol took longer duration in attenuation of mean heart rate, mean arterial pressure, mean systolic blood pressure and mean diastolic blood pressure after laryngoscopy and endotracheal intubation.

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