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A Comparative Study between the Efficacy of Different Agents Used to Attenuate the Heamodynamic Response to Laryngoscopy and Intubation in Elderly Controlled Hypertensive Patients

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Abstract

Background: Endotracheal intubation (ETI) and mechanical ventilation control introduced a new era in the history of anaesthesia. This has led to improved airway and breathing management, making anaesthetic delivery safer. Stimulation of the autonomically innervated epipharynx, pharynx, larynx, and trachea as a result of laryngoscopy and intubation (L&I). The purpose of this work was to compare the efficacy of different agents used for attenuating the hemodynamic response to laryngoscopy and ETI in elderly controlled hypertensive patients scheduled for elective surgery.

Methods: This prospective interventional double blinded randomized clinical trial included 120 adult elderly controlled hypertensive (age > 65 years old) scheduled for elective surgery. Patients were randomly allocated into six equal groups. All participants received study medications according to their assigned group., before induction which were fentanyl, lidocaine, diltiazem, nitroglycerine (NTG), and esmolol. Further, all participants were subjected to suitable preoperative, intraoperative, and postoperative preparations in addition to serum cortisol level, and salivary alpha amylase (SAA) assessment.

Results: MAP before intubation, after intubation, 5 and 10 minutes after intubation was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001). Serum cortisol before intubation, after intubation, 5 and 10 minutes after intubation was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

Conclusions: In elderly controlled hypertensive scheduled for elective surgery, MAP, RBS, Serum cortisol, and SAA were lower significantly in Dexmedetomidine and Esmolol groups compared to the other groups, as well in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups before intubation, after intubation, 5 and 10 minutes after intubation.

Keywords: Heamodynamic Response, Laryngoscopy, Intubation, Fentanyl, Lidocaine, NTG, Diltiazem, Esmolol, Dexmedetomidine, Salivary alpha amylase.

1. Introduction

Responses of the hemodynamic system to laryngoscopy and intubation (L&I) has been mitigated by a variety of drugs and procedures like lignocaine is injected laryngotracheally prior to intubation, oropharynx anaesthesia topically (viscous lignocaine), adrenoblocking medications, (either beta or alpha blockers) injected lignocaine, vasodilators, such as hydralazine, nitroglycerine (NTG), inhalational anaesthesia and intravenous opiates etc. These drugs have varying degrees of effect on the L&I response [1].

Fentanyl is a powerful, synthetic analgesic narcotic with a quick onset of effect and a short window of action. It is a synthetic opioid agonist that is widely utilised as an I.V analgesic additive, equilibrium anaesthesia, element of inhalation anaesthesia, and analgesia induced by neurolepts., as well as a solo anaesthetic. As an analgesic, it is 75 to 125 times more powerful compared to morphine. After I.V injection, the start of action occurs within 1 to 2 minutes, and it lasts for one hour [2].

Lidocaine inhibits the flow of sodium ions via sodium selective ion channels in neuronal membrane, hence preventing the transmission of nerve impulses (blocking conduction). As well as lidocaine can control hemodynamic responses during intubation [3].

Despite the fact that NTG has a vasodilatory action in both veins and arteries, its profoundly beneficial impacts are predominantly attributable to venodilation. The benefit of utilising NTG during intubation is due to its ability to produce desired and temporary hypotension while cardiac output is not expected to diminish. Additionally, it possesses cardioprotective properties. So, it can reduce the rise in arterial blood pressure (BP) after intubation [4, 5]. Diltiazem lowers the pressor impact of circulating noradrenaline on resistance arteries by inhibiting the calcium influx that accompanies activation of α2 receptors, hence attenuating the rise in arterial pressure in response to high plasma noradrenaline concentrations [2].

Due to its cardioselectivity and ultra-short duration of action, Additionally, Esmolol is FDA-approved to treat hypertension and tachycardia generated by intubation, although it can only be taken intravenously [6, 7].

Dexmedetomidine is a highly selective agonist for the alpha2 adrenoceptor (α2-AR) which is very versatile drug in anaesthesia practice involving aesthetic impact, sympathetic quality, beneficial for other procedure sedation and cardiovascular stabilisation. Additionally, it has been linked to a lower

incidence of perioperative ventricular and supraventricular tachyarrhythmias [8].

Principal salivary protein is salivary alpha amylase (SAA), which is mostly released via the parotid glands. The autonomic nervous system has a significant role in the secretion of SAAs. Correlations between alterations in SAA and heart rate variability (HR) index blood or norepinephrine in response to a stressful event suggest that SA may serve as a reliable predictor of sympathetic nervous system activity, according to emerging research [9].

The aim of this work was to compare the efficacy of different agents used for attenuating the hemodynamic response to laryngoscopy and endotracheal intubation (ETI) in elderly controlled hypertensive patients scheduled for elective surgery.

2. Patients and Methods:

This prospective interventional double blinded randomized clinical trial was conducted on 120 adult elderly controlled hypertensive (age > 65 years old), American society of Anaesthesiologists (ASA) physical status II or III intended for elective surgery. Patients were assigned randomly to six equal groups. All participants were administered research medicines according to their assigned group, before induction which were fentanyl, lidocaine, diltiazem, NTG, and esmolol.

The patient's informed written consent was acquired. The research was conducted after the approval of the Benha University Faculty of Medicine's Ethical Committee.

Exclusion criteria were age < 65 years and uncontrolled hypertensive patients.

Randomization and blinding

The 120 enrolled Patients were randomised into six equal treatment groups fentanyl (fen), lidocaine (lid), diltiazem (dil), NTG (nit), esmolol (esm), dexmedetomidine (dex) respectively by using random allocation software computer-generated and stored in sealed envelopes. The sealed envelopes were unsealed on the day of surgery, when the case was in the Operating theatre, and participants were given the study medication as specified on the envelopes. The postoperative anesthesiologist observer was blinded to the patient's group. The outcome assessor did not know which group each patient was in.

All participants were subjected to:

Preoperative planning (physical examinations, histories, and investigations [CBC and blood glucose content, hepatic function tests, serum creatinine and urea, coagulation diagram, chest X ray, ECG].

Intraoperative preparation (IV access was established with an 18-gauge IV cannula in the upper extremity). All patients received Midazolam 0.03 mg/kg IV, ondansetron 4mg mg IV, Ranitidine 50 mg IV as premedication and morphine 0.1mg/kg. Monitors (electrocardiography, pulse oximeter, non-invasive BP and capnography) were adapted. All participants received study drugs according to allocated group. All patients received 3 minutes of 100% O2 pre-oxygenation. Propofol 1.5-2 mg/kg was utilized to produce anaesthesia, and atracurium 0.5 mg/kg was provided to enable ETI. Controlled breathing with % oxygen and isoflurane at a ratio of 1:1.5 MAC was used to maintain anaesthesia. Once the patient regained consciousness and met the extubation requirements, anaesthesia was removed and tracheal extubation was performed.

postoperative preparations (mean arterial blood pressure was recorded at different occasions. Arterial line was inserted for frequent blood samples and then blood samples (blood glucose level, serum cortisol) were collected and measured. The blood cortisol concentration was determined using a calibrated Elecsys competitive electro-chemiluminescent enzyme immunoassay, 2010 analyzer (Roche Diagnostic GmbH, Mannheim, Germany). Salivary alpha amylase was measured in all patients via SARSTEDT Salivette® system).

Statistical examination

Statistical analysis was executed utilizing the SPSS (Package of Statistics for the Social Sciences) version 25 (IBM Inc., Chicago, IL, USA). Using the Shapiro-Wilks normality test and histograms, the distribution of quantitative data was examined in order to choose the proper type of statistical testing: whether it is parametric or nonparametric. Parametric variables (such as age) were expressed in terms of mean and standard deviation and compared using an ANOVA test across the three groups, followed by a post hoc (Bonferroni) test between each pair of groups. Categorical variables (such as gender) were reported in terms of frequency and percentage and statistically examined using the Chi-square test. A two-tailed P value of less than or equal to 0.05 was considered statistically significant.

3. Results:

Demographic data (age, gender and ASA physical status) were insignificantly different among the six groups. **Table 1**

Table (1) Demographic data of the studied patients

		Fentanyl	Lidocaine	Diltiazem	Nitroglycerin	Esmolol	Dexmedetomidine	*p*-value
Age (years)		69.8±3.82	70.7±4.28	69.95±3.8	69.2±3.81	72±4.47	70.5±4.33	0.360
Gender	**Male**	11(55%)	10(50%)	11(55%)	9(45%)	7(35%)	9(45%)	0.805
	Female	9(45%)	10(50%)	9(45%)	11(55%)	13(65%)	11(55%)	
ASA physical status	**ASA II**	14 (70%)	15 (75%)	15 (75%)	13 (65%)	16 (80%)	14 (70%)	0.927
	ASA III	6 (30%)	5 (25%)	5 (25%)	7 (35%)	4 (20%)	6 (30%)	

Data are presented as mean ± SD or frequency (%). ASA: American Society of Anesthesiologists

MAP before induction was insignificantly different among the six groups. MAP before intubation, after intubation, 5 and 10 minutes after intubation was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

MAP before intubation, after intubation, 5 and 10 minutes after intubation were insignificantly different between Dexmedetomidine and Esmolol groups, between NTG and Diltiazem groups and between Fentanyl and Lidocaine groups. **Table 2**

Data are presented as mean ± SD, MAP: Mean arterial blood pressure, *: significant as p value ≤ 0.05, P1: P values compared to Dexmedetomidine group, P2: P values compared to Esmolol group, P3: P values compared to Nitroglycerin group, P4: P values compared to Diltiazem group, P5: P values compared to Lidocaine group.

RBS before induction was insignificantly different among the six groups.

RBS before intubation, after intubation, 5 and 10 minutes after intubation was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

RBS before intubation, after intubation, 5 and 10 minutes after intubation was insignificantly different between Dexmedetomidine and Esmolol groups, between NTG and Diltiazem groups and between Fentanyl and Lidocaine groups. **Table 3**

Data are presented as mean ± SD, RBS: Random blood sugar, *: significant as p value ≤ 0.05, P1: P values compared to Dexmedetomidine group, P2: P values compared to Esmolol group, P3: P values compared to Nitroglycerin group, P4: P values compared to Diltiazem group, P5: P values compared to Lidocaine group.

Serum cortisol before induction was insignificantly different among the six groups.

Serum cortisol before intubation, after intubation, 5 and 10 minutes after intubation was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

Serum cortisol before intubation, after intubation, 5 and 10 minutes after intubation was insignificantly different between Dexmedetomidine and Esmolol groups, between NTG and Diltiazem groups and between Fentanyl and Lidocaine groups. **Table 4**

Table (2) Mean arterial blood pressure (mmHg) among the six group.

MAP (mmHg)	Fentanyl	Lidocaine	Diltiazem	Nitroglycerin	Esmolol	Dexmedetomidine	*p*-value
Before induction	95±4.46	95.25±3.99	96.9±2.67	96.7±3.08	95.6±2.3	95.25±2.47	0.289
Before intubation	90.20 ± 4.21	91.8±4.41	84.35±2.8	86.65±3.73	75.65±3.25	72.95 ±3.02	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**<0.001***	0.180	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	0.029*	**<0.001***	0.343		P3		
	<0.001*	**<0.001***			P4		
	0.728				P5		
After intubation	116.8 ±8.41	111.85±4.53	106.9±2.9	103.75±3.04	85.6±2.85	81±1.75	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**<0.001***	0.446	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**<0.001***	0.234		P3		
	<0.001*	**0.009***			P4		
	0.74				P5		
5 min after intubation	103.9±5.78	101.85±3.66	94.45±2.46	92.2±3.25	82.35±2.01	80.15 ± 2.39	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**<0.001***	0.353	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**<0.001***	0.328		P3		
	<0.001*	**<0.001***			P4		
	0.434				P5		
10 min after intubation	92.95 ± 4.26	94.4±3.14	89.15±2.62	88.45±3.2	77.05±2.61	76.10 ± 3.39	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**0.004***	0.939	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**<0.001***	0.984		P3		
	0.004*	**<0.001***			P4		
	0.72				P5		

Table (3) Random blood sugar (mg/dL) among the six groups.

RBS (mg/dL)	Fentanyl	Lidocaine	Diltiazem	Nitroglycerin	Esmolol	Dexmedetomidine	p-value
Before induction	93.25 ± 7.43	93.55 ± 5.33	93.6 ± 8.71	94.35 ± 9.85	91.55 ± 7.54	91.1 ± 5.57	0.722
Before intubation	121.75 ± 7.43	117.15 ± 5.42	106.1 ± 8.71	109.55 ± 10.58	93.6 ± 8.61	88.85 ± 5.26	**<0.001***
	<0.001*	**<0.001***	**0.001***	**<0.001***	0.406	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	0.001*	**0.034***	0.738			P3	
	<0.001*	**<0.001***			P4		
	0. 443				P5		
After intubation	160.75 ± 7.25	156.15 ± 5.47	121.4 ± 8.94	124.95 ± 10.96	102.6 ± 8.85	98.65 ± 5.24	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**<0.001***	0.631	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**<0.001***	0.73			P3	
	<0.001*	**<0.001***			P4		
	0.465				P5		
5 min after intubation	151.50 ± 7.25	147.4 ± 5.3	118.4 ± 9.21	121.7 ± 11.07	99.5 ± 9.19	95.7 ± 5.52	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**<0.001***	0.686	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**<0.001***	0.799			P3	
	<0.001*	**<0.001***			P4		
	0.612				P5		
10 min after intubation	143.30 ± 7.49	139.55 ± 5.58	114.65 ± 8.91	117.8 ± 10.83	94.8 ± 9.32	90.85 ± 5.83	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**<0.001***	0.652	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**<0.001***	0.83			P3	
	<0.001*	**<0.001***			P4		
	0.7				P5		

Table (4) Serum cortisol level (nmol/L) among the six groups.

Cortisol (nmol/L)	Fentanyl	Lidocaine	Diltiazem	Nitroglycerin	Esmolol	Dexmedetomidine	*p*-value
Before induction	310.35 ± 24.46	315.6 ± 18.09	311.6 ± 22.8	313.9 ± 23.85	303.85 ± 18.2	312.15 ± 19.3	0.604
Before intubation	392.85 ± 24.62	373.85 ± 24.62	352.45 ± 22.64	347.15 ± 23.58	322.1 ± 19.4	313.95 ± 19.36	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**<0.001***	0. 861	P1	
	<0.001*	**<0.001***	**0.001***	**0.008***		P2	
	<0.001*	**0.004***	0.976			P3	
	<0.001*	**0.037***			P4		
	0.089				P5		
After intubation	491.7 ± 24.6	472.7 ± 24.6	432.15 ± 22.89	427.05 ± 23.94	391.15 ± 19.18	383.20 ± 19.23	**<0.001***
	<0.001*	**<0.001***	**0.001***	**<0.001***	0. 874	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	0.001*	**<0.001***	0.98			P3	
	<0.001*	**<0.001***			P4		
	0.09				P5		
5 min after intubation	526.7 ± 24.72	518.7 ± 24.72	482.1 ± 22.65	477.5 ± 23.69	431.9 ± 19.39	422.45 ± 18.88	**<0.001***
	<0.001*	**<0.001***	**<0.001***	**<0.001***	0.768	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**<0.001***	0.987			P3	

	<0.001*	**<0.001***			P4		
	0.87				P5		
	575.85 ± 24.65	567.85 ± 24.65	526.8 ± 22.98	522.8 ± 23.55	471 ± 19.25	461.3 ± 19.1	**<0.001***
10 min after intubation	**<0.001***	**<0.001***	**<0.001***	**<0.001***	0.748	P1	
	<0.001*	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**<0.001***	0.993			P3	
	<0.001*	**<0.001***			P4		
	0.870				P5		

Data are presented as mean ± SD, *: significant as p value ≤ 0.05, P1: P values compared to Dexmedetomidine group, P2: P values compared to Esmolol group, P3: P values compared to Nitroglycerin group, P4: P values compared to Diltiazem group, P5: P values compared to Lidocaine group.

SAA before induction was insignificantly different among the six groups.

SAA 5 minutes after intubation was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

SAA 5 minutes after intubation was insignificantly different between Dexmedetomidine and Esmolol groups, between NTG and Diltiazem groups and between Fentanyl and Lidocaine groups. **Table (5)**

Table (5) Salivary alpha amylase (U/mL) among the six groups.

SAA (U/mL)	**Fentanyl**	**Lidocaine**	**Diltiazem**	**Nitroglycerin**	**Esmolol**	**Dexmedetomidine**	***p*-value**
Before induction	52.18 ± 10.71	47.9 ± 10.81	50.2 ± 9.81	51.57 ± 9.23	50.68 ± 9.99	51.85 ± 11.40	0.805
	80.18 ± 11.50	76.15 ± 11.21	64.40 ± 10.92	62.47 ± 8.94	52.10 ± 11.34	45.13 ± 9.94	**<0.001***
	<0.001*	**<0.001***	**0.005***	**0.031***	0.314	P1	
5 min after intubation	**<0.001***	**<0.001***	**<0.001***	**<0.001***		P2	
	<0.001*	**0.001***	0.993			P3	
	<0.001*	**0.009***			P4		
	0.84				P5		

Data are presented as mean ± SD, SAA: Salivary alpha amylase, *: significant as p value ≤ 0.05, P1: P values compared to Dexmedetomidine group, P2: P values compared to Esmolol group, P3: P values compared to Nitroglycerin group, P4: P values compared to Diltiazem group, P5: P values compared to Lidocaine group.

4. Discussion

Dexmedetomidine is an extremely selective α2-AR agonist that induces drowsiness and analgesia without compromising respiratory condition [10]. The influence of dexmedetomidine on airway responses and hemodynamics during tracheal extubation following GA has been of interest [11, 12].

Lidocaine is an aminoethyl amide that belongs to the category of amide-type local anaesthetics. Three minutes before to intubation, a single I.V dosage of lidocaine (1.5 mg/kg) was provided to reduce the hemodynamic reactions to L&I, with favourable outcomes [13].

Fentanyl works at opioid receptors and mostly on μ receptors, and its impact on the cardiovascular system and autonomic regulatory regions contributes to perioperative hemodynamic stability [14].

Diltiazem has a quick beginning of action as a CCB. It successfully reduces blood pressure increase yet not the rise in connected with the stress reaction [15].

NTG induces smooth muscle relaxation, with venous dilatation dominating arterial dilation [16].

Esmolol is an ultrashort-acting beta-adrenergic receptor antagonist with shown effectiveness in maintaining hemodynamic stability during laryngoscopy and EIT in the absence of serious adverse effects [17].

In our study, MAP before intubation, after intubation, 5 and 10 minutes after intubation was significantly lower in Dexmedetomidine and Esmolol groups on comparison with the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

Our findings agreed with Mahjoubifard et al. [18] conducted a clinical trial on 90 participants of age (30 to 70) who underwent cardiac surgery. Patients were divided into three categories. Group D got 1 μg /kg of I.V dexmedetomidine over the course of 10 minutes, group L administered 1.5 mg/kg lidocaine (1%) 90 seconds prior to intubation, and group F administered 2 μg/kg fentanyl. Vital signs (SBP, HR, DBP, and MAP) were recorded prior intubation and one, three, five, and ten minutes following. It was observed that Dexmedetomidine caused a greater reduction than lidocaine and fentanyl regarding MAP in the 1st (P= 0.048), 5th (P= 0.0001), and 10th (P= 0.0001) minutes.

This is not line with Mashiwar et al. [11] who were recruited one hundred patients undergoing regular surgical operations under GA in this randomised, double-blind, controlled trial. Random assignment of patients to two groups: Group F got fentanyl injections 2 g.kg-1 and Group D received a dexmedetomidine injection 0.5 g.kg-1 intravenously diluted to 5 mL with normal saline over 60 seconds. Five minutes later, following the administration of propofol and vecuronium and three minutes of mask breathing, tracheal intubation was performed. Hemodynamic parameters were monitored at 2-minute intervals prior to tracheal intubation and at 1-minute intervals for five minutes following tracheal tube cuff inflation. They documented that the difference MAP of patients in two groups after L&I never reached a statistically significant level at any time. Using higher dose of both dexmedetomidine and fentanyl and relatively small sample size compared to ours could confer a reasonable justification for this difference.

Therefore, in the current study, RBS was assessed to as a stress response parameter before intubation, after intubation, 5 and 10 minutes after intubation and was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

As evidenced by steady blood glucose levels, dexmedetomidine as a premedication and intraoperative infusion proved successful at reducing the metabolic stress response to major procedures [19].

Additionally, in their study, Koh et al. [20] investigated Sixty patients between the ages of 18 and 70 who underwent elective ETI procedures were randomised equally into three groups: (control, dexmedetomidine and esmolol). HR was recorded at baseline (T0), following introduction of medicine (T1), during anaesthetic induction (T2), directly following intubation (T3), and 3 minutes, 5 minutes, and 10 minutes after intubation (T4, T5 and T6). BG was determined before to surgery and 30 minutes after intubation.

Their findings displayed that the average BG rose from 5.93 to 7.01 mg/dL (MD = 1.08; 95% CI: 0.45, 1.71; P < 0.001) in the group containing dexmedetomidine and in the esmolol group, blood glucose levels rose from 5.98 mg/dL to 6.56 mg/dL (MD = 0.58; 95% CI: 0.20, 0.97; P = 0.005). Likewise, the interaction between intervention group and time on mean BG levels was statistically insignificant [F (2, 57) = 1.30, P = 0.739], showing that there was insignificant change in BG level between the three groups pre-operatively and 30 minutes after intubation. The assessment of BG 30 minutes post-intubation while our assessments were recorded 5 and 10 minutes after intubation might provide an explanation for this difference.

Two basic neuroendocrine systems govern the stress response: the hypothalamus pituitary adrenocortical HPA and SAM systems. SAA content may be used as an indicator of SAM activity, while cortisol level can be used as an indicator of HPA activity [21].

Hence, we assessed serum cortisol before intubation, after intubation, 5 and 10 minutes after intubation and it was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

Comparable to our findings, Renganathan, [22] studied forty patients and split equally between two groups. Group DEX obtained an injection of 1 mcg/kg Dexmedetomidine beyond 10 minutes before to administration of anaesthesia. Group NS receives the same quantity of normal saline. Preoperative assessments were recorded. Two peripheral IV lines with 18 G IV cannulas were established, one for IV infusion and the other for the medication under study. 10 ml/kg of balanced salt solutions were used for preloading. It was recorded that as regard cortisol, base line value showed insignificant difference between two groups (P=0.416) while levels measured after insertion of a pin were considerably lower in the Dexmedetomidine group than in the NS group (P= 0.049).

The witnessed lower lidocaine efficacy in the current study could be attributed to low dose used in our study, as Narayanan et al. [23] on comparing low dose group receiving Lidocaine 1.5 mg/kg and high dose group receiving Lidocaine 2.5 mg/kg.

The increment in SAA level following laryngoscopy and ETI was reported by Iakushenko et al. [24] who aimed to investigate the diagnostic significance of the SAA as an indication of adrenergic activity in reaction to laryngoscopy and ETI. The trial group comprised 52 patients (ASA 1-2) with a median age of 52 +/- 16 who were scheduled to undergo elective orotracheal intubation with routine I.V. induction of anaesthesia. SAA and cortisol levels in saliva, as well as norepinephrine and cortisol levels in plasma, were measured at two points: immediately before to laryngoscopy (point A) and one minute following intubation (point B). Their results showed a considerable SAA elevation in point B correlated with the MAP-shown rise in the same time point (r (s) = 0.328, p < 0.05). Their study confirmed the elevated level of SAA as an adrenergic response to laryngoscopy and ETI and demonstrated its similarity to changes in MAP.

As Dexmedetomidine and Esmolol displayed the superiority in attenuating stress response in our study, a similar pattern was reflected as regards SAA which was significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups (P value <0.001) 5 minutes after intubation and in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups (P value <0.001).

Limitations: It was single-center research; thus, outcomes may vary in other locations. Due of ethical

concerns, a placebo group was omitted. Measuring plasma catecholamine levels would have provided a more accurate evaluation of the pharmacologic agents' hemodynamic stability.

5. Conclusions

In elderly controlled hypertensive scheduled for elective surgery, MAP, RBS, Serum cortisol, and SAA were significantly lower in Dexmedetomidine and Esmolol groups compared to the other groups, as well in NTG and Diltiazem groups compared to Fentanyl and Lidocaine groups before intubation, after intubation, 5 and 10 minutes after intubation.

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