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Research Article

Comparison OF IV Dexmedetomidine and IV Esmolol for Suppression of Hemodynamic Response to Laryngoscopy and Endotracheal Intubation

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ABSTRACT

Background: Direct laryngoscopy and endotracheal intubation are almost always associated with hemodynamic changes such as hypertension, tachycardia and arrhythmias[1,8,13].The purpose of our study was to compare intravenous Dexmedetomidine(1mcg/kg) and intravenous Esmolol(1.5 mg/kg) for suppression of hemodynamic
responses secondary to laryngoscopy and endotracheal intubation.

Material and methods: This was a comparative, observational, and prospective study in which total 60 patients undergoing elective surgery under general anaesthesia were divided into two equal groups. Group-D received inj. Dexmedetomidine 1 mcg/kg IV infusion (diluted to 10 ml with normal saline) over 10 minutes before induction

Group E: Patients who received Injection Esmolol 1.5 mg/Kg IV (diluted to 10 ml with normal saline) 2 minutes before induction. Baseline preoperative values of hemodynamic parameters were recorded. Both groups were observed for Changes in HR,SBP,DBP,MAP and Spo2,After study drug, After induction, Immediately after intubation,At 1 min, 3 min, 5 min, 7 min, 10 min after Intubation and Patients were observed for any adverse effects and treated accordingly.

Result:From the observation it was found that Dexmedetomidine had better attenuation of the stress response during laryngoscopy and intubation than Esmolol. However, there was no significant difference in hemodynamic parameters after study drug and after induction,there was highly significant difference between two groups immediately after intubation and 1,3,5,7,10 min after intubation.

Conclusion: Dexmedetomidine 1 mcg/kg IV was more effective in attenuating the hemodynamic stress response to laryngoscopy and intubation, provides more hemodynamic stability as compared Esmolol 1.5 mg/kg IV.

Keywords: *Elective surgery, general anaesthesia, Dexmedetomidine, Esmolol.*

INTRODUCTION

Laryngoscopy and endotracheal intubation are commonly performed procedures in anaesthesia and critical care settings. Direct laryngoscopy and endotracheal intubation are almost always associated with hemodynamic changes such as hypertension, tachycardia and arrhythmias[1,8,13]. In 1940 Reid and Brace [10] studied the reflex effect upon the heart during irritation of the respiratory tract which lead to reflex sympathetic stimulation and described that this reflex is due to provocation of larynx and pharynx. The response is transient and occurs 30 seconds after intubation and last for less than 10 minutes. Hypertension and tachycardia may predispose an individual to development of pulmonary edema[3],myocardial insufficiency and raised intracranial pressure especially in patients with is chaemic heart disease, cerebrovascular disease, hypertension, old age, and diabetes mellitus. Hemodynamic stability is the most essential goal of anaesthetic management plan. There are various methods and drugs[9] used to reduce this pressor response to laryngoscopy and endotracheal intubation.

Perioperative beta-blocker use in cardiac surgery by Blessbergeretal[2]have shown beneficial effects as they reduce rhythm disturbances. Esmolol is a cardio selective,ultra short acting,beta blocking agent with short half life(9min). It blocks the beta adrenergic receptors and also reduces the force of contraction and heart rate[7].This agent has been used to reduce the hemodynamic response to laryngoscopy and intubation.

Dexmedetomidine is an imidazole derivative and selective alpha-2 adrenergic receptor agonist which produces hyperpolarization of noradrenergic neurons and suppression of neuronal firing in the locus ceruleus leading to decreased systemic noradrenaline release and causing attenuation of sympathoadrenal responses and hemodynamic stability during laryngoscopy and tracheal intubation[4] The effects of dexmedetomidine include anxiolysis,sedation, analgesia and sympatholysis with minimal or no respiratory depression[12]The purpose of our study was to compare intravenous Dexmedetomidine(1mcg/kg) and intravenous Esmolol(1.5 mg/kg) for suppression of hemodynamic responses secondary to laryngoscopy and endotracheal intubation.

AIMS AND OBJECTIVE

The aim of the present study was to compare the efficacy of intravenous Dexmedetomidine (1 mcg/kg) and Esmolol (1.5 mg/kg) for suppression of hemodynamic response to laryngoscopy and endotracheal intubation in patients undergoing elective surgery under general anaesthesia.

THE OBJECTIVES OF THE STUDY ARE

To compare haemodynamic response in terms of Heart rate,Systolic blood pressure,Diastolic blood pressure,Mean arterial pressure,Oxygensaturation,To observe for any adverse effect

MATERIALS AND METHODS

Study design: This was a comparative, observational, and prospective study conducted in SVP Hospital, NHL Municipal Medical College, Ahmedabad, India. After receiving an approval letter from ethical committee of the institute, 60 patients planned for the elective surgery under general anaesthesia were enlisted in the study.

The sample size was obtained based on previous studies.

Inclusion Criteria

Patients between 20 to 50 years age group both gender, ASA grade of I / II posted for elective surgeries under general anaesthesia

Exclusion criteria

This study excluded patients less than 20 years and more than 50 years of age,Patientsrefusal,Patient with ASA(American society of anaesthesiologist) class above II Patients known to have drug allergies ,Predicted difficult intubation Intubation time more than 30sec or intubation in more than 1 attempt Patients on treatment with beta blocker or calcium channel blocker drugs Patients with comorbidities like uncontrolled diabetes mellitus, coronary artery disease, cardiovascular disease,Pregnant women.

INFORMED CONSENT: written and informed consent will be obtained.

STUDY PROCEDURE :

Patients fulfilling the inclusion criteria The nature of study and procedure will be explained to the patient and written informed consent was taken, Each patient was assessed preoperatively by General andsystemic examination.All the patients in this study received general anaesthesia as per routine protocol of the institute by the consultant anaesthesiologist of the hospital and all the parameters were observed and noted.All the patients will go for routine pre-anesthetic checkup with necessary investigations.

Preoperative preparation: Anesthetictrolly and emergency drug tray checked.Pre operative pulse, blood pressure, spo2 will be recorded.After establishing intravenous access, an infusion of intravenous fluids will be started.All patients will be receiving inj. Glycopyrrolate(0.004mg/kg) iv and injondansetron(0.15mg/kg)iv as premedication.

GROUP D Receive I.V Dexmedetomidine 1 mcg/kg over 10 minutes before intubation.

GROUP E Receive I.V Esmolol 1.5 mg/kg over 2 minutes before intubation.

Preoxygenation will be done with 100% oxygen for 3 minutes.
Induction will be done by Inj. Thiopentone(6 mg/kg) iv followed by inj. succinylcholine(2 mg/kg) iv.
Endotracheal intubation will be done by appropriate size oral,portex,cuffed,endotrachealtube.bilateral air entry checked,present,equal,tube fixed. Maintenance of anesthesia will be carried out with 50% O2 and 50% N2O + sevoflurane + inj.atracurium 0.5mg/kg iv loading dose and 0.1mg/kg iv in maintenance doses.

At the end of surgery residual neuromuscular blockade will be reversed by appropriate doses of Inj. glycopyrrolate(0.008 mg/kg) and neostigmine (0.05 mg/kg)

Extubation will be carried out after returns of smooth respiration,good muscle tone and power,eye opening and all protective reflexes.

Observations

THE FOLLOWING PARAMETERS WILL BE COMPARED BETWEEN 2 GROUPS: The blood pressure, heart rate,spo2 will be recorded at baseline,after study drug,after induction ,immediately after intubation,1,3,5,7,10 minutes after intubation

Statistical analysis

Statistical analysis was done by using descriptive and inferential statistics using Chi-square test and students unpaired t test to find out the significance of various study parameters among the two groups with a significance threshold set at 'p' value <0.05.

Observations and RESULTS Total sixty patients who fulfilled inclusion criteria were selected for the study and according the given study drugs,they were allocated to groups. Changes in HR,SBP,DBP,MAP and Spo2 were recorded at baseline,after study drug,afterinduction,immediately after intubation and 1,3,5,7,10 minutes after intubation.

(1) DEMOGRAPHIC DATA

TABLE:1

Demographic data					
Patient Data		**GROUP E**	**GROUP D**	**P value**	**Inference**
Number Of Patients		30	30	-	
Age(years)		36.03 ±8.80	36.3 ±7.82	0.90	NS
Male:Female		14:16	16:14	-	-
Weight (kgs)		57.7 ±5.98	57.6 ±6.61	0.92	NS
ASA Grade	I	14	15	-	-
	II	16	15		

Table-1 Compares the demographic characteristics of all the patients which were clinically comparable among both the groups(P Value>0.05).Patients belonging to ASA grade I and II were included in this study.

TABLE 2 shows the distribution of the patients according to the type of surgeries in both the groups.

DISTRIBUTION ACCORDING TO TYPE OF SURGERY				
TYPE OF SURGERY	**GROUP E**		**GROUP D**	
	No. of Patients	**%**	**No. of Patients**	**%**
General Surgery	14	46.66%	15	50%
ENT Surgery	5	16.66%	4	13.33%
Gynaecological Surgery	5	16.66%	6	20%
Orthopaedic Surgery	6	20%	5	16.66%

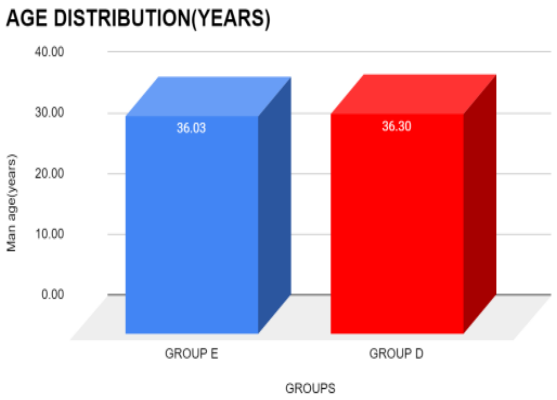
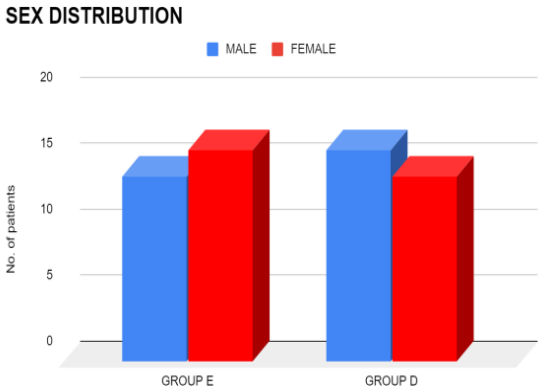
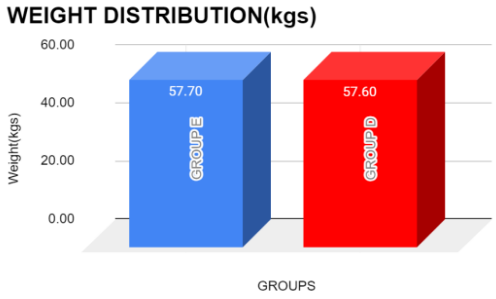


Table 2: Table shows the distribution of the patients according to the type of surgeries in both the groups.

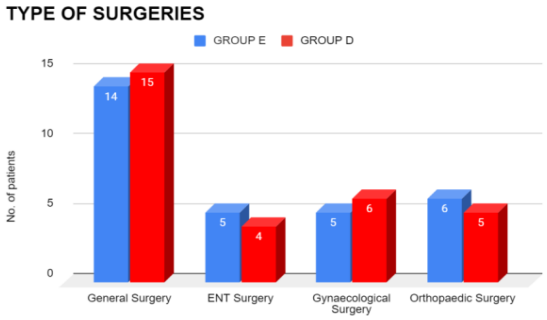
Graph 1 : Shows the age distribution amongst both the groups.



Graph 2 : Shows the sex distribution amongst both the groups.



Graph 3 : Shows the weight distribution amongst both the groups.



Graph 4: Shows the distribution according to the types of surgeries amongst both the groups.

In This study of 60 patients,29 patients were posted for general surgery,9 patients were posted for ent surgery,11 were posted for gynaecological surgery and 11 patients were posted for orthopedic surgery.

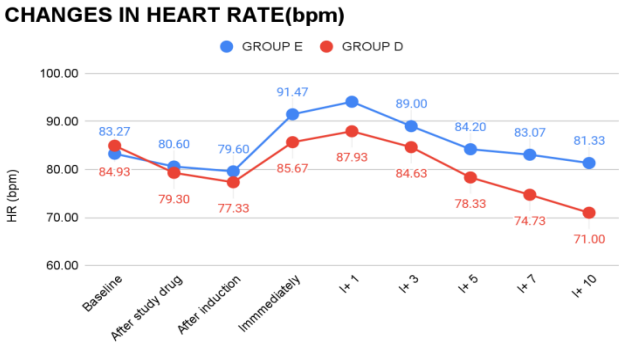
(2) HEART RATE

The heart rate is measured at baseline,after study drug,afterinduction,immediately after intubation, 1,3,5,7,10 minutes after intubation (Table 3, Graph 5).**TABLE-3: CHANGES IN HEART RATE**

CHANGES IN HEART RATE (bpm)						
TIME	**GROUP E**		**GROUP D**		**P VALUE**	**Inference**
	MEAN	**SD**	**MEAN**	**SD**		
Baseline	83.27	4.71	84.93	5.42	0.21	NS
After study drug	80.60	5.31	79.30	7.98	0.46	NS
After induction	79.60	5.10	77.33	4.01	0.08	NS
Immediately after intubation	91.47	3.36	85.67	4.79	<0.001	HS
I+ 1	94.07	3.50	87.93	4.65	<0.001	HS
I+ 3	89.00	4.03	84.63	4.48	<0.001	HS
I+ 5	84.20	4.05	78.33	4.30	<0.001	HS
I+ 7	83.07	4.89	74.73	4.78	<0.001	HS
I+ 10	81.33	5.29	71.00	4.54	<0.001	HS

The HR at baseline ,after study drug and after induction was comparable in both the group and there was no significant difference between the two groups (P Value >0.05)

At Immediately after intubation and 1,3,5,7 and 10 minutes after intubation ,HR difference was statistically highly significant between the two groups (P Value<0.001).



GRAPH 5:HEART RATE IN BOTH GROUPS AT VARIOUS TIME INTERVALS

(3) SYSTOLIC BLOOD PRESSURE

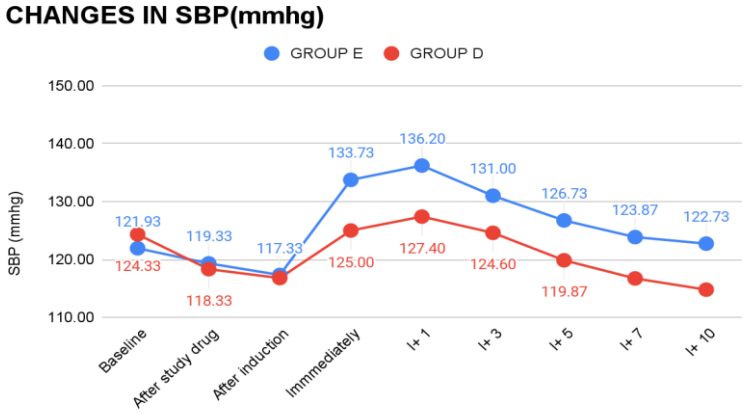
The systolic blood pressure was measured at baseline,after study drug,afterinduction,immediately after intubation, 1,3,5,7,10 min after intubation(Table 4, Graph 6).

TABLE 4: CHANGES IN SYSTOLIC BLOOD PRESSURE

CHANGES IN SYSTOLIC BLOOD PRESSURE(mmhg)						
TIME	**GROUP E**		**GROUP D**		**P VALUE**	**Inference**
	MEAN	**SD**	**MEAN**	**SD**		
Baseline	121.93	6.78	124.33	4.27	0.11	NS
After study drug	119.33	5.76	118.33	5.44	0.49	NS
After induction	117.33	5.47	116.80	5.60	0.71	NS
Immediately after intubation	133.73	3.43	125.00	5.32	<0.001	HS
I+ 1	136.20	3.17	127.40	5.38	<0.001	HS
I+ 3	131.00	4.09	124.60	5.41	<0.001	HS
I+ 5	126.73	4.77	119.87	4.41	<0.001	HS
I+ 7	123.87	4.78	116.73	3.98	<0.001	HS
I+ 10	122.73	4.22	114.80	4.16	<0.001	HS

The SBP at baseline,after study drug and after induction was comparable in both the groups and there was statistically no significant difference between the two groups (P Value >0.05).

At Immediately after intubation and 1,3,5,7 and 10 minutes after intubation ,SBP difference was statistically highly significant between the two groups (P Value<0.001).



GRAPH 6: SBP IN BOTH GROUPS AT VARIOUS TIME INTERVALS

(4) DIASTOLIC BLOOD PRESSURE

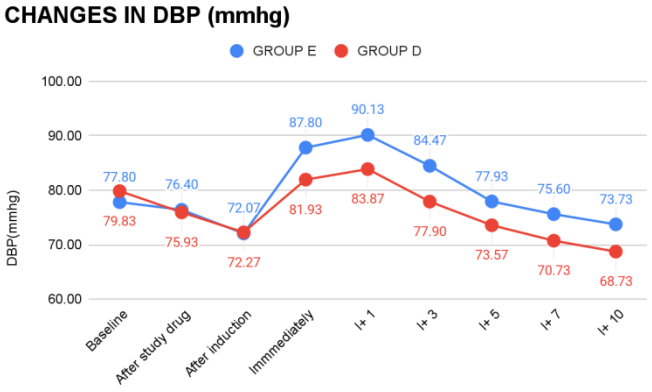
The Diastolic Blood Pressure was measured at baseline, After Study Drug,After induction, After intubation, at 1,3,5,7,10 min after intubation (Table 5, Graph 7).

TABLE 5: CHANGES IN DIASTOLIC BLOOD PRESSURE

CHANGES IN DIASTOLIC BLOOD PRESSURE (mmhg)						
TIME	**GROUP E**		**GROUP D**		**P VALUE**	**Inference**
	MEAN	**SD**	**MEAN**	**SD**		
Baseline	77.80	5.95	79.83	4.70	0.14	NS
After study drug	76.40	4.83	75.93	4.43	0.69	NS
After induction	72.07	4.94	72.27	5.11	0.88	NS
Immediately after intubation	87.80	3.50	81.93	4.53	<0.001	HS
I+ 1	90.13	3.48	83.87	4.55	<0.001	HS
I+ 3	84.47	3.59	77.90	4.47	<0.001	HS
I+ 5	77.93	3.88	73.57	4.06	<0.001	HS
I+ 7	75.60	3.54	70.73	3.89	<0.001	HS
I+ 10	73.73	3.55	68.73	3.58	<0.001	HS

The DBP at baseline,after study drug and after induction was comparable in both the groups and there was statistically no significant difference between the two groups (P Value >0.05)

At Immediately after intubation and 1,3, 5 ,7, 10 minutes after intubation ,DBP difference was statistically highly significant between the two groups(P Value <0.001).



GRAPH 7: DBP IN BOTH GROUPS AT VARIOUS TIME INTERVALS

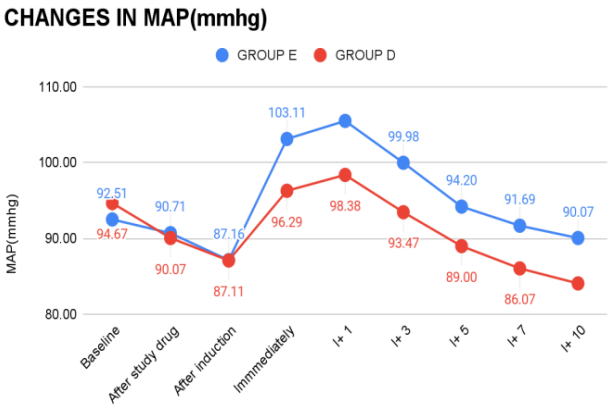
(5) MEAN ARTERIAL PRESSURE

The Mean Arterial Pressure was measured at baseline, before induction, at intubation, at 1,3,5,7,10 min after intubation (Table 6, Graph 8).

TABLE 6: CHANGES IN MEAN ARTERIAL PRESSURE

CHANGES IN MEAN ARTERIAL BLOOD PRESSURE (mmhg)						
TIME	**GROUP E**		**GROUP D**		**P VALUE**	**Inference**
	MEAN	**SD**	**MEAN**	**SD**		
Baseline	92.51	4.90	94.67	3.79	0.06	NS
After study drug	90.71	4.10	90.07	3.98	0.54	NS
After induction	87.16	4.25	87.11	4.48	0.97	NS
Immediately after intubation	103.11	2.80	96.29	3.87	<0.001	HS
I+ 1	105.49	2.80	98.38	3.95	<0.001	HS
I+ 3	99.98	2.98	93.47	4.10	<0.001	HS
I+ 5	94.20	2.79	89.00	3.64	<0.001	HS
I+ 7	91.69	3.02	86.07	3.51	<0.001	HS
I+ 10	90.07	3.10	84.09	3.21	<0.001	HS

The MAP at baseline,after study drug and after induction was comparable in both the groups and there was statistically no significant difference between the two groups (P Value >0.05) At Immediately after intubation and 1,3, 5 ,7, 10 minutes after intubation ,MAP difference was statistically highly significant between the two groups(P Value <0.001).



GRAPH 8: MAP IN BOTH GROUPS AT VARIOUS TIME INTERVAL

(6) SPO2

SPO2 was measured at baseline, After Study Drug,After induction, After intubation, at 1,3,5,7,10 min after intubation (Table 7, Graph 9).**TABLE 7: CHANGES IN SPO2**

SPO2	GROUP E		GROUP D		P Value
	MEAN	SD	MEAN	SD	
Baseline	99.27	0.64	99.5	0.51	>0.05
After study drug	99.03	0.76	98.8	0.61	>0.05
After induction	99.27	0.69	99.53	0.51	>0.05
Immediately after intubation	99.4	0.62	99.63	0.49	>0.05
I+ 1	99.07	0.64	98.97	0.76	>0.05
I+ 3	99.13	0.68	98.87	0.68	>0.05
I+ 5	99.43	0.63	99.63	0.49	>0.05
I+ 7	99.33	0.76	99.57	0.50	>0.05
I+ 10	99.2	0.48	99.17	0.83	>0.05

SPO2 In both Group at baseline, After Study Drug,After induction, After intubation, at 1,3,5,7,10 min after intubation was comparable to each other as there is no statistically significant difference between them P value(>0.05)

TABLE OF ADVERSE EFFECTS

Perioperative complications	Group E (n=30) No.ofpatients(%)	Group D (n=30) No.ofpatients(%)
Bradycardia	———	1(3.33%)
Tachycardia	———	———
Arrhythmia	———	———
Hypertension	———	———
Hypotension	———	———
Sedation	———	———
Vomiting	———	———

In our study, one patient in Group D has bradycardia and treated with injection atropine 0.6 mg IV.

DISCUSSION

Laryngoscopy and endotracheal intubation have become an integral part of anaesthetic management and critical care since their description in 1921 by Rowbotham and Magill[10].Circulatory response to laryngeal and tracheal stimulation in the form of tachycardia, hypertension and dysrhythmia was known since 1940[10,11]. The principal behind the hypertension and tachycardia is the exaggerated sympathetic action due to increased catecholamine release[5].The increase in HR and blood pressure is usually transient,variable and unpredictable.It may not be of much significant in healthy individuals,but can be hazardous in those with hypertension,cardiacdysfunction,coronary artery disease or cerebrovascular disease[3]

Esmolol is a cardioselective beta-1 antagonist,without any intrinsic sympathomimetic effect or membrane stabilising property. And onset of action within a minute produces hemodynamic stability soon after its administration.its action is similar to other b-blockers,decreasing cardiac output by reducing heart rate and force of contraction,cardiac work and oxygen consumption are reduced.IN 1990 PARNASS SM,KERCHBERGER JP et al[6] demonstrated that single bolus dose of esmolol blunted tachycardia and hypertensive response to laryngoscopy and endotracheal intubation.

Dexmedetomidine is a newer alpha-2 agonist having 8-times more affinity for alpha-2 adrenoceptors as compared with Clonidine. It acts by inhibition of sympathetic outflow as well as stimulation of pre synaptic alpha 2 receptors , causing a decrease in norepinephrine release, resulting in fall in blood pressure and heart rate. Dexmedetomidine offers a unique pharmacological profile with sedation, sympatholysis, analgesia, opioid and anaesthetic sparing effect, cardiovascular stability and with great advantage to avoid respiratory depression.

The present study was conducted to evaluate and compare the efficacy of intravenous Esmolol and Dexmedetomidine in attenuation of hemodynamic response to laryngoscopy and endotracheal intubation. Sixty patients aged 20-50 years of either sex belonging to ASA grade I or II undergoing elective surgery under general anaesthesia were selected and divided in two groups of 30 patients each.
Group D: Patients received Injection Dexmedetomidine 1 mcg/kg IV infusion (diluted to 10 ml with normal saline) over 10 minutes before induction.
Group E: Patients received Injection Esmolol Hydrochloride 1.5 mg/Kg IV (diluted to 10 ml with normal saline) 2 minutes before induction.

CONCLUSION

The findings of present study suggest that Dexmedetomidine 1 mcg/kg IV was more effective in attenuating the hemodynamic stress response to laryngoscopy and intubation,provides more hemodynamic stability as compared to Esmolol 1.5 mg/kg IV.

Source of Support: Nil
Conflict of Interest: None Declared

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