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A COMPARATIVE STUDY OF INTRAVENOUS ESMOLOL AND DEXMEDETOMIDINE ON HEMODYNAMIC STREES RESPONSES DURING LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION UNDER GENERAL ANAESTHESIA

Anaesthesiology

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ABSTRACT

Introduction: Laryngoscopy and endotracheal intubation are considered as the most critical events in conducting general anesthesia.[1] They provoke a transient and marked sympathoadrenal response resulting in tachycardia and hypertension.[5,6] Various methods have been used to blunt these responses including inhalational anesthetic agents, lignocaine, opioids, calcium channel blockers, and direct-acting vasodilators.[7,8,9] These methods have got side effects such as bradycardia, hypotension, sedation, and respiratory depression. Dexmedetomidine is a selective alpha 2 agonist that provides multimodal features like sedation, hypnosis, analgesia and sympatholysis, it also decreases level of catecholamines during surgery and maintains intraoperative hemodynamics. Perioperative infusion of dexmedetomidine is effective in attenuating sympathoadrenal response to tracheal intubation. It has significant anaesthetic and opioid sparing effect.[13] Beta blockers have been used for blunting hemodynamic response to laryngoscopy and intubation. However, they blunt the HR response better than blood pressure response. Esmolol is an ultrashort-acting cardioselective beta blocker with rapid onset of action and short elimination half-life; these properties make it a valuable agent to obtund the cardiovascular response.[10] It has been used in doses ranging from 0.5 to 2 mg/kg IV to provide hemodynamic stability during laryngoscopy and intubation in previous studies.[11,12,14] **Methods:** This is a prospective, randomized, single blind, clinical study. The study involves 60 patients Aged 18-60years, ASA physical status I and II, Elective surgery under general anaesthesia. All the patients were randomly allocated by computer generated random number sequence in one of the two groups; Group D: Patient received 1 μg/kg of inj Dexmedetomidine diluted in 10 ml of normal saline given over 10 minutes and Group E: Patient received 0.5mg/kg of inj Esmolol diluted in 10ml normal saline over 10 minutes. After injection HR, SBP, DBP, MAP, SPO2, ETCO2 were recorded at 1,2,5,10,15 minutes after intubation and every 15 minutes till extubation. Sedation score was assessed postoperatively till 8 hours. **Results:** Heart rate decreased after injection of the drug in D and E group. The fall in heart rate was more in group D than in group E. SBP and DBP after injection of drug and after induction were comparable between the groups. There is statistically significant difference ($p<0.05$) between two group for SBP while for DBP $p>0.05$. After laryngoscopy and intubation SBP and DBP decreased in group D and E ($p<0.05$). In group D the pressure response after intubation at 1, 2, 5, 10,15 minutes interval were less than group E. There was no significant difference between oxygen saturation and ETCO2 intraoperatively while there was statistically significant difference in sedation score of dexmedetomidine group and the average sedation score was 1.2, that is all patients were calm and tranquil in Group D. There is no significant difference in Side Effects in both the groups. **Conclusion:** Both dexmedetomidine and esmolol suppressed the hemodynamic response to intubation, but dexmedetomidine is more effective than esmolol in maintaining hemodynamic stability following laryngoscopy and intubation.

KEYWORDS

Esmolol, Dexmedetomidine, Haemodynamic stress response, Laryngoscopy and endotracheal intubation

INTRODUCTION

Direct Laryngoscopy and endotracheal intubation violate the patient's protective airway reflexes, which accelerates release of catecholamines by stimulating sympathetic nervous system results in hemodynamic changes associated with increased heart rate, increased blood pressure and occasional disturbance in cardiac rhythm. These changes are seen maximum immediately after intubation and last for 5 to 10 increases in HR and BP is usually transient and well tolerated by healthy individuals. But in patients with cardiovascular diseases these hemodynamic changes may lead to life threatening complications and compromises myocardial contractility and oxygen supply.This cardiovascular response is a reflex phenomenon, mediated by vagus (X) & Glossopharyngeal (IX) cranial nerves. Vagus & Glossopharyngeal nerves carry the afferent stimulus from epiglottis & infra glottic region & activate the vasomotor centre to cause a peripheral sympathetic adrenal response to release adrenaline & noradrenaline. [4] Various pharmacological(Inhalational anaesthetics, Topical and Intravenous lidocaine, narcotics, ß- blockers, calcium channel blockers, vasodilators [15]) & non – pharmacological methods(smooth & gentle intubation with a shorter duration of laryngoscopy, insertion of LMA in place of endotracheal intubation & blocking Glossopharyngeal & superior laryngeal nerves) have been used to attenuate the haemodynamic response to laryngoscopy & endotracheal intubation.Each has its own advantages, so many times multimodal therapy rather than single intervention has been in practice to attenuate this response.

Dexmedetomidine is a selective alpha 2 agonist that provides multimodal features like sedation, hypnosis, analgesia and sympatholisis, it also decreases level of catecholamines during surgery and maintains intraoperative hemodynamics. Perioperative infusion of dexmedetomidine is effective in attenuating sympathoadrenal response to tracheal intubation. It has significant anaesthetic and opioid sparing effect [13]. Esmolol is a parenteral antihypertensive adrenergic antagonist that has an effect on selective β1. It has a rapid onset of action, it reaches its peak effect at 5 min after i.v injection, it rapidly redistributes (9-min redistribution half-life)[3], and it lowers BP by decreasing (β1-blockade).

MATERIALS AND METHODS:

This randomized, prospective, control study was conducted following approval by institutional ethical committee and 60 patients who were selected for elective surgeries under general anaesthesia in civil hospital, Ahmedabad attached to B J Medical College were included in study. Patients aged 18-60 years, having ASA Grade |/|| were included in the study while Patient refusing consent, having H/o cardiac, respiratory, renal or hepatic dysfunction or failure, Pregnant females, those having Coagulation disorders, Allergy to study medications, on Adrenoreceptors agonists or antagonists. And with difficult intubation and in whom intubation was attempted for more than 30 seconds were excluded from the study. All patients were examined thoroughly pre-operatively and history was taken in detailed. All necessary routine investigations were done. Written and informed consent was taken. All patients were randomly divided in two groups using a computer-generated program for group allocation. The drug administrator and who record parameter was same person. Patient was taken on OT table and after securing iv-line, baseline parameters like heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), oxygen saturation (spo2), ETCO2 were recorded. Patients were pre medicated with inj glycopyrrolate 4 microgram/kg, fentanyl 1 microgram/kg, and ondanestron 0.15 mg/kg iv.Group D received inj dexmedetomidine 1 microgram/kg diluted in 10 ml normal saline IV over 10 minutes while Group E received inj esmolol 0.5 mg/kg diluted in 10 ml normal saline IV over 10 minutes. After injection of study drug parameters like HR,

SBP, DBP, Spo2, and Etco2 were monitored immediately and after 1, 2, 5, 10 and 15 minutes. All patients were pre oxygenated for 5 minutes with 100% oxygen. Any hypotension if occurred (SBP < 20%of baseline) or bradycardia (HR< 50 beats per minute) was treated with injection Mephentermine 6mg i.v and injection Atropin 0.6 mg i.v respectively. After 5 minutes of giving study drug conventional GA was given to all patients. HR, SBP, DBP, MAP, Spo2, ETCO2 were recorded during surgery 1, 2, 5, 10 and 15 minutes after intubation. Intraoperatively, hemodynamic parameters were recorded every 15 minutes till extubation. Complications were recorded. After extubation and complete recovery patient was shifted to PACU and monitored. Ramsay sedation score(1 = agitated, restless; 2 = cooperative, tranquil; 3 = responds to verbal command while sleeping; 4 = brisk response to glabellar tap or loud voice while sleeping; 5 = sluggish response to glabellar tap or loud voice; 6 = no response to glabellar tap or loud voice) was assessed post operatively till 8 hours.

DATA ANALYSIS:

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. The variables were assessed for normality using the Kolmogorov Smirnov test. Descriptive statistics included computation of percentages, means and standard deviations. Both Paired and un-paired t-test (student t-test) were used for quantitative data comparison. Chi-square test used for the analysis of qualitative data. Level of significance was set at $p \leq 0.05$.

OBSERVATION AND RESULTS:

Sixty patients were recruited. All of them underwent planned surgical procedure and received their allocated study drug. The patients were categorized into 2 groups.

Group D – Dexmedetomidine
Group E – Esmolol

The groups were matched for demographic data, and there was no statistically significant difference found between the groups in age and sex. Baseline parameters are comparable between groups. There is no statistically significant difference between the groups except for SBP (p = 0.02). Results were summarised in tabulated and graphical form.

Table 1: Distribution Of Gender In Both The Groups

	Group D	Group E
Male	17(57%)	16(53%)
Female	13(47%)	14(47%)
Total	30(100%)	30(100%)

Table 2: Distribution Of Age In Both The Groups

Group D		Group E		P value
Mean	SD	Mean	SD	
37.93	8.18	38.3	8.99	0.87

Table 3: Baseline Parameters

BASELINE	Group D		Group E		P value
	Mean	SD	Mean	SD	
HR	82.8	4.41	83.67	4.15	0.43(NS)
SBP	122.70	5.07	126.27	6.56	0.02(Sig.)
DBP	81.33	4.96	82.70	5.17	0.30(NS)
MAP	95.12	3.59	97.22	4.73	0.06(NS)
SPO2	98.50	0.63	98.60	0.50	0.50(NS)

Table 4: Intergroup Comparison Of Heart Rate

HR (Time:mins)	Group D		Group E		P value
	Mean	SD	Mean	SD	
0	82.8	4.41	83.67	4.15	0.43(NS)
1(after intubation)	74.77	4.71	78.73	4.28	0.001(Sig.)
2	69.43	3.00	77.73	4.51	<0.0001(Sig.)
5	66.50	2.81	78.63	5.75	<0.0001(Sig.)
10	72.73	2.72	77.87	5.70	<0.0001(Sig.)
15	74.03	5.44	78.57	4.26	0.0007(Sig.)
30(intraoperative)	74.50	4.24	78.97	6.05	0.001(Sig.)
45	73.57	4.53	79.47	5.99	<0.0001(Sig.)
60	72.43	4.52	79.57	5.36	<0.0001(Sig.)
75	73.87	3.79	79.83	5.55	<0.0001(Sig.)
90	73.27	3.12	80.03	3.62	<0.0001(Sig.)
105	74.40	3.24	80.37	2.76	<0.0001(Sig.)
120	72.60	2.79	79.27	5.70	<0.0001(Sig.)
135	73.00	2.59	79.87	5.35	<0.0001(Sig.)
150	72.80	2.27	79.43	4.78	<0.0001(Sig.)
165	73.33	2.23	79.00	6.05	<0.0001(Sig.)
180	73.40	1.50	79.07	4.03	<0.0001(Sig.)

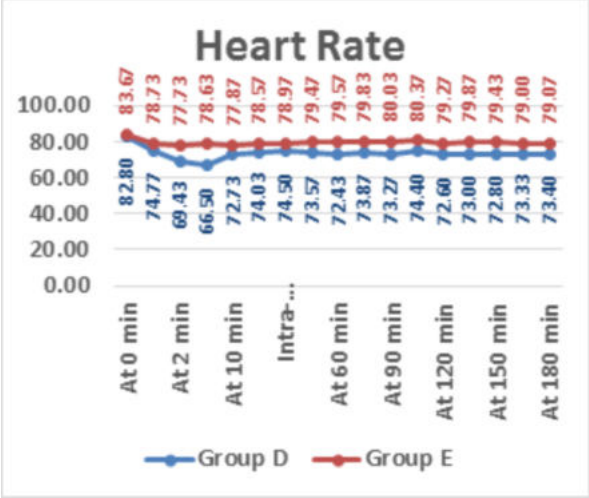

Fig 1: Comparison Of Heart Rate

Table 5: Intergroup Comparison Of SBP

SBP Time(mins)	Group D		Group E		P value
	Mean	SD	Mean	SD	
0	122.70	5.07	126.27	6.56	0.02(Sig.)
1	117.80	6.79	121.30	6.06	0.04(Sig.)
2	114.00	4.07	119.53	6.50	0.0002(Sig.)
5	114.47	4.22	119.17	6.26	0.001(Sig.)
10	113.87	3.82	118.97	6.74	0.0006(Sig.)
15	113.27	4.46	118.97	6.73	0.0003(Sig.)
30	111.13	3.66	117.80	11.31	0.003(Sig.)
45	112.70	2.31	117.87	11.20	0.02(Sig.)
60	111.97	3.70	118.40	11.73	0.006(Sig.)
75	112.60	2.30	116.60	11.28	0.06(Sig.)
90	112.03	2.08	116.90	6.27	0.0002(Sig.)
105	112.73	2.18	115.00	4.94	0.02(Sig.)
120	112.27	2.30	114.87	6.61	0.04(Sig.)
135	112.00	2.77	116.40	5.04	0.001(Sig.)
150	112.83	2.31	117.87	9.08	0.005(Sig.)
165	113.43	2.73	119.60	5.06	<0.0001(Sig.)
180	114.23	3.42	120.97	5.12	<0.0001(Sig.)

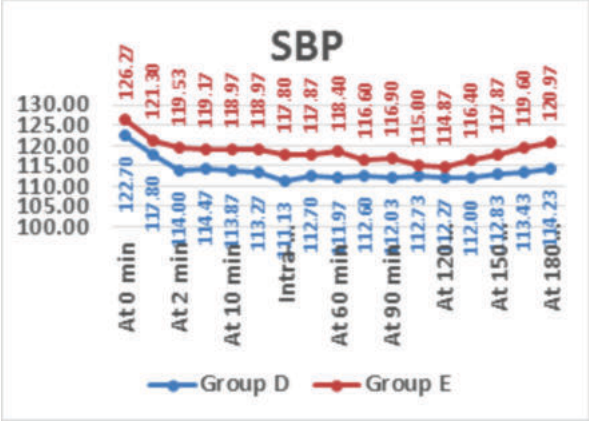

Fig 2: Intergroup Comparison Of DBP

DBP Time(mins)	Group D		Group E		P value
	Mean	SD	Mean	SD	
0	81.33	4.96	82.70	5.17	0.3(NS)
1	75.87	5.26	76.33	5.71	0.75(NS)
2	73.27	4.14	76.23	5.30	0.02(Sig.)
5	73.60	4.05	74.33	3.96	0.48(NS)
10	73.97	3.66	77.73	4.62	0.0009(Sig.)
15	73.83	3.44	78.67	4.49	<0.0001(Sig.)

30	72.17	4.14	78.37	2.72	<0.0001(Sig.)
45	72.80	2.30	79.23	4.08	<0.0001(Sig.)
60	71.37	2.98	79.40	4.50	<0.0001(Sig.)
75	70.43	2.76	76.23	5.30	<0.0001(Sig.)
90	71.10	2.60	78.60	2.31	<0.0001(Sig.)
105	72.17	1.60	80.77	3.33	<0.0001(Sig.)
120	72.03	1.87	80.83	4.89	<0.0001(Sig.)
135	72.07	1.51	81.03	4.67	<0.0001(Sig.)
150	71.73	1.31	81.53	3.17	<0.0001(Sig.)
165	72.53	1.83	81.87	4.59	<0.0001(Sig.)
180	72.77	1.43	80.80	5.49	<0.0001(Sig.)

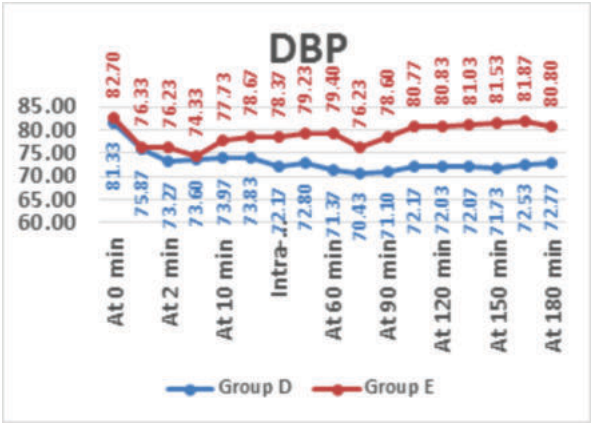

Fig 3: Intergroup Comparison Of DBP

DISCUSSION

We compared the effect of dexmedetomidine 1 µg/kg IV and esmolol 0.5 mg/kg IV given as infusion over 10 min and observed the changes in HR, SBP, DBP, MAP, and SpO2,ETCO2 at 1, 2, 5, 10, and 15 min after intubation and at 30, 45, 60, 75, 90, 105, 120, 135, 150, 165 and 180 min intra-operative in these groups. Both groups were comparable with regard to the demographic profile (age, weight, sex, etc.). Both groups were also comparable (P > 0.05) regarding the time to laryngoscopy and intubation and baseline HR, SBP, DBP and MAP values.

Demographic Data:

The mean age of patient participated in Group D were 37.93 with a standard deviation of ± 8.18 and Group E were 38.30 with a standard deviation of ± 8.99. There was no significant difference in age and gender between two groups.[16]

Hemodynamic Parameters:

The pre operative values of heart rate were comparable between two groups with group D 82.80±4.41 and group E 83.67±4.15 with no significant difference. While intra operatively heart rate significantly lower in comparison to group E (<0.0001).Intra operative SBP,DBP were significantly decreased in group D than group E. There was no significant difference between oxygen saturation and ETCO2 intraoperatively. In our study there was statistically significant difference in sedation score of dexmedetomidine group at and it was maximum 0.07 + 0.25 after 4 hours of administrating the drug. In our study side effects were found in Dexmedetomidine were nausea (7%), vomiting and local irritation (3%), while in Esmolol group nausea (10%), vomiting and local irritation in (7%), hypertension and bradycardia in (3%).

CONCLUSION

Both dexmedetomidine and esmolol suppressed the hemodynamic response to intubation, but dexmedetomidine is more effective than esmolol in maintaining hemodynamic stability following laryngoscopy and intubation.

REFERENCES:

1. Ahlquist RP. A study of adrenotropic receptors. American Journal Of Physiology,1948;153:586-589.
2. Forbes AM, Dally FG. Acute hypertension during induction of anaesthesia and endotracheal intubation in normotensive man. Br J Anaesth. 1970;42:618–24.
3. Kanto J, Allonen H, Kleimola T. Pharmacokinetics of labetalol in healthy volunteers. Int J Clin Pharmacol Ther Toxicol 1981; 19:41–44.
4. Derbyshire DR, Chmielewski A, Fell D, Vaters M, Achola K, Smith G. Plasma catecholamine response to tracheal intubation. Br J Anaesth 1983; 55: 855-9.
5. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without tracheal intubation. Br J Anaesth. 1987;59:295–9.
6. Miller DR, Martinaeu RJ. Esmolol for control of haemodynamic responses during anaesthetic induction. Can J Anaesth. 1989;36:S164–5.
7. Ebert JP, Pearson JD, Gelman S, Harris C, Bradley EL. Circulatory responses to laryngoscopy: The comparative effects of placebo, fentanyl, and esmolol. Can J Anaesth. 1989;36:301–6.
8. Oxorn D, Knox JW, Hill J. Bolus doses of esmolol for the prevention of perioperative hypertension and tachycardia. Can J Anaesth. 1990;37:206–9.
9. Steven M et al. Which drug prevents tachycardia or hypotension associated with tracheal intubation. Lidocaine, fentanyl or esmolol. Anaesthesia Analgesia 1991; 72(4): 482-86.
10. Sharma S, Mitra S, Grover VK, Kalra R. Esmolol blunts the haemodynamic responses to tracheal intubation in treated hypertensive patients. Can J Anaesth. 1996;43:778–82.
11. Kindler CH, Schumacher PG, Schneider MC, Urwyler A. Effects of intravenous lidocaine and/or esmolol on hemodynamic responses to laryngoscopy and intubation: A double-blind, controlled clinical trial. J Clin Anesth. 1996;8:491–6.
12. Ghause MS et al. A study of cardiovascular response during laryngoscopy and intubation their attenuation by ultra short acting beta blocker esmolol. IJA 2002;46:104-6
13. Keniya V M, Ladi S, Naphade R. Dexmedetomidine attenuates sympathoadrenal response to tracheal intubation and reduces perioperative anaesthetic requirement. Indian J Anaesth.2011;55:352-7.
14. Moon YE, Lee SH, Lee J. The optimal dose of esmolol and nicardipine for maintaining cardiovascular stability during rapid-sequence induction. J Clin Anesth. 2012;24:8–13.
15. Bostan H,Eroglu A. Comparison of the clinical efficacies of fentanyl, esmolol and lidocaine in preventing the hemodynamic responses to Endotrecheal intubation and extubation. J Curr Surg.2012;2(1):24-8
16. Maskuri sonjanya et al. A study to compare efficacy of dexmedetomidine with esmolol on haemodynamic response during laproscopic cholecystectomy. IAIM, 2018;5(8):17-29