Section: Anaesthesiology

Original Research Article

ATTENUATION OF HEMODYNAMIC RESPONSE TO LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION - A COMPARATIVE STUDY BETWEEN INTRAVENOUS DEXMEDETOMIDINE AND ESMOLOL

K. Kiran Sai Prasanna[1], Rajasri Kunche[2], Pushpalatha Vantepaka[3], Canchi Dhanraj Kushal Raj[4], A. Kiran Kumar[5]

[1]Assistant Professor, Department of Anaesthesiology, Gandhi Medical College/Hospital, Secunderabad, Telangana, India.
[2]Assistant Professor, Department of Anaesthesiology, Gandhi Medical College/Hospital, Secunderabad, Telangana, India
[3]Assistant Professor, Department of Anaesthesiology, Gandhi Medical College/Hospital, Secunderabad, Telangana, India
[4]Junior Resident, Sri Siddhartha Academy of Higher Education
[5]Associate Professor, Department of Anaesthesiology, Gandhi Medical College/Hospital, Secunderabad, Telangana, India

Received : 10/01/2025
Received in revised form : 12/03/2025
Accepted : 28/03/2025

Keywords:
Dexmedetomidine; Esmolol; Systolic blood Pressure (SBP); Diastolic blood pressure (DBP); Mean arterial pressure (MAP).

Corresponding Author:
Dr. A. Kiran Kumar,
Email: mailkranthi777@gmail.com

DOI: 10.47009/jamp.2025.7.2.120

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 585-590

Abstract

Background: Laryngoscopy and endotracheal intubation produces a transient, but marked sympathetic response leading to hypertension and tachycardia. No single anaesthetic technique has been accepted to be completely effective in abolishing this sympathetic response. Dexmedetomidine, a highly selective alpha-2 agonist, has shown to partially attenuate the hemodynamic response to laryngoscopy and intubation. **Aim of the Study:** To compare the effect of dexmedetomidine and esmolol for the attenuation of hemodynamic response to direct laryngoscopy and endotracheal intubation. **Materials and Methods:** Total No. of 60 patients of either sex, American Society of Anesthesiologist (ASA) I & II, admitted for sample procedure under general anaesthesia were randomized into two groups. Thirty patients received Dexmedetomidine 1mcg/kg diluted in 20mI NS over 10 min before induction and the remaining 30 patients received 1.5mg/kg esmolol diluted in 20mI NS over 10min before induction. Patients were induced with propofol 2.5mg/kg and vecuronium 0.1mg/kg. Systolic, diastolic and mean blood pressure, aIong with heart rate, were measured in all the patients at baseline, before induction and intubation, and at 1,2,3 and 5 minutes post intubation. **Result:** Both dexmedetomidine and esmolol attenuated the rise in systolic, diastolic and mean arterial pressure, as well as the rise in heart rate. The rise in systolic pressure and heart rate was significantly lower in the dexmedetomidine group at 1 to 5 minutes post intubation) when compared to esmolol. **Conclusion:** Dexmedetomidine is more effective than esmolol in attenuating the rise in systolic pressure and heart rate after laryngoscopy and intubation.

INTRODUCTION

Laryngoscopy and endotracheal intubation (ETI) are essential components of general anesthesia, commonly performed during surgical procedures to secure the airway. These procedures, however, provoke significant hemodynamic responses, including increases in heart rate (HR), blood pressure (BP), and plasma catecholamine levels. The stress response can be especially concerning in patients with cardiovascular co-morbidities, where such surges may lead to arrhythmias, myocardial ischemia, or even complications like stroke. Therefore, it is important to attenuate these hemodynamic changes for safer perioperative management.[1]

To attenuate the hemodynamic response to laryngoscopy and intubation, various pharmacological agents have been employed. Among them, dexmedetomidine and esmolol are two commonly used drugs. Dexmedetomidine, an α2-adrenoceptor agonist, has sedative, anxiolytic, and analgesic properties. It effectively blunts the sympathetic response by inhibiting norepinephrine release, thus providing a stable hemodynamic profile during surgical procedures. Esmolol, a short-acting β-blocker, specifically inhibits the β1-adrenoreceptors, leading to a decrease in heart rate

ISSN (O): 2687-5365; ISSN (P): 2753-6556

and contractility, thereby preventing excessive tachycardia and hypertension associated with laryngoscopy and intubation.[2]

Dexmedetomidine exerts its effect by stimulating presynaptic alpha-2 receptors in the central nervous system, which results in reduced sympathetic outflow, sedation, and analgesia. Its sedative and analgesic properties are beneficial during the peri-intubation period, not only helping control the hemodynamic response but also improving overall patient comfort. Esmolol, on the other hand, works by inhibiting beta-adrenergic receptors in the heart, leading to a reduction in heart rate and contractility, thereby attenuating the cardiovascular response to stress.[3]

Both agents have demonstrated effectiveness in attenuating the hemodynamic response to laryngoscopy and intubation, but they differ in their onset, duration, and side effect profiles. While dexmedetomidine may provide more comprehensive control of the stress response. Esmolol, being shorter-acting, offers rapid onset and termination of effect, but its use is generally limited to controlling heart rate and blood pressure without providing sedation.[4]

There is increasing evidence that the control of the heart rate and blood pressure response to endotracheal intubation is essential in preventing adverse cardiovascular outcomes, as increase in heart rate and blood pressure acts as an indicator of oxygen demand by the heart at the onset of ischemia.[5]

This study aims to compare the effectiveness of intravenous dexmedetomidine and esmolol in attenuating the hemodynamic response to laryngoscopy and endotracheal intubation. By assessing the degree of attenuation in heart rate, blood pressure, and other relevant outcomes, we hope to provide insights into the optimal choice for managing hemodynamic stability during intubation, ultimately improving patient safety and comfort during anesthesia.

Aim of the Study

- To evaluate the comparative efficacy of dexmedetomidine and esmolol in attenuating the hemodynamic response to laryngoscopy and intubation.
- To compare the difference in the hemodynamic parameters and document the extent of the difference between dexmedetomidine and esmolol.
- To compare the incidence of side effects, if any between dexmedetomidine and Esmolol, when used to attenuate hemodynamic response to laryngoscopy and intubation.

MATERIALS AND METHODS

The experimental design, inclusion and exclusion criteria, interventions, and methodologies used in the study. This part is crucial as it ensures the study's reproducibility, validity, and reliability of the findings. The methodology must be clearly defined to allow for proper interpretation of results and comparison between the two treatments.

Total No. of 60 patients of this study selected in Government Tertiary Care Hospital, Telangana, for sample procedures under General Anaesthesia from January 2022 to June 2023.

Study Design: This is a prospective, randomized, controlled, double-blind study aimed at comparing the effectiveness of intravenous dexmedetomidine and esmolol in attenuating the hemodynamic response to laryngoscopy and endotracheal intubation in adult patients undergoing elective surgeries under general anesthesia.

Inclusion Criteria

- Adult patients aged 18-60 years.
- American Society of Anesthesiologists (ASA) physical status I and II.
- Elective surgeries requiring general anesthesia with endotracheal intubation
- Mallampati grade I or II.

Exclusion Criteria

- Patients with known allergies to dexmedetomidine or esmolol.
- Patients with significant cardiovascular diseases such as severe arrhythmias, heart block, or decompensated heart failure.
- Patients with renal or hepatic insufficiency.
- Pregnant or lactating women.
- Patients with a history of obstructive airway disease.
- Patients requiring emergency surgery or who have contraindications for general anesthesia.

Sampling Procedure

Power analysis from similar studies suggested that a sample size of 30 patients per group was required to get the power of study to 80%, with 0.05 level of significance.

Using a sample size of 60, patients of either sex, ASA I & II, admitted for elective procedure under general anaesthesia were selected for this study.

Study Procedure

Patients were kept NPO from midnight and premedicated with alprazolam 0.25 mg on the previous day of surgery.

On the day of the surgery, after arrival to the operation theatre, 18G cannula was secured and an IV fluid (Ringer lactate) was started.

Standard monitor with electrocardiogram, non-invasive blood pressure, and pulse oximeter was connected.

Base line blood pressure, pulse rate and SpO2 were recorded. The study drug either Dexmedetomidine 1 mcg/kg or esmolol 1.5 mg/kg diluted to 20cc with normal saline was injected over 10 minutes.

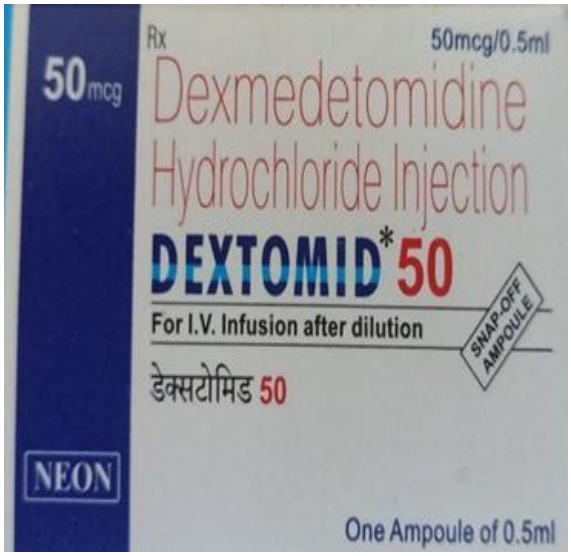
Patients were then preoxygenated for three minutes. Anaesthesia was induced using propolol 2.5mg/kg intravenously along with Vecuronium 0.1 mg/kg to facilitate tracheal intubation. Ventilation was assisted following the injection of Vecuronium, and

ISSN (O): 2687-5365; ISSN (P): 2753-6556

after three minutes direct laryngoscopy was attempted. Intubation was done under direct vision using a Macintosh blade. Positioning of tube was confirmed by bilateral equal air entry on auscultation and capnography.

Heart rate, systolic and diastolic pressures, mean arterial pressure and SpO2 were documented by an independent observer who was blinded to the nature of the study. Intubation response was graded and recorded.

Surgical stimulus was allowed only after 5 minutes following intubation. Any episode of bradycardia (heart rate less than 50) was recorded.



Dexmedetomidine

Esmolol

RESULTS

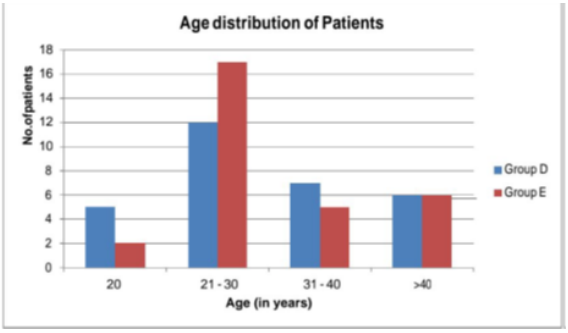


Figure 1: Age Distribution of the patient

Table 1: ASA Distribution.

Gender	Group D (%)	Group E (%)
ASA1	86.7	90.0
ASA2	13.3	10.0
Total	100	100

Table 2: Changes to systolic Blood Pressure

	Group	Mean + SD (mmHg)	P Value
Baseline readings	Group – D	130.40 + 9.17	0.797
	Group – E	130.97 + 7.74	
Just before injection of study drug	Group – D	132.07 + 9.52	0.316
	Group – E	129.67 + 8.86	
Just before induction	Group – D	124.53 + 23.23	0.893
	Group – E	123.93 + 7.56	
Just before intubation	Group – D	114.94 + 10.08	0.008
	Group – E	121.30 + 7.47	
1 minute after intubation	Group – D	134.43 + 10.16	0.007
	Group – E	143.27 + 11.41	
2 minutes after intubation	Group – D	129.73 + 9.35	<0.001
	Group – E	142.30 + 12.97	
3 minutes after intubation	Group – D	124.67 + 10.38	0.001
	Group – E	134.13 + 10.23	
5 minutes post intubation	Group – D	114.37 + 7.57	<0.001
	Group – E	125.60 + 9.81	

Table 3: Diastolic Blood Pressure change

	Group	Mean + SD (mmHg)	P Value
Baseline readings	Group – D	80.67 + 6.25	0.051
	Group – E	77.23 + 7.06	
Just before injection of study drug	Group – D	81.43 + 6.25	0.046
	Group – E	77.77 + 7.60	
Just before induction	Group – D	80.60 + 6.06	< 0.001

ISSN (O): 2687-5365; ISSN (P): 2753-6556

	Group – E	73.50 + 7.45	
Just before intubation	Group – D	73.07 + 7.77	0.236
	Group – E	70.67 + 7.76	
1 minute after intubation	Group – D	86.27 + 9.28	0.116
	Group – E	89.73 + 7.46	
2 minutes after intubation	Group – D	84.90 + 10.51	0.088
	Group – E	89.03 + 7.75	
3 minutes after intubation	Group – D	84.00 + 10.17	0.978
	Group – E	83.93 + 8.01	
5 minutes post intubation	Group – D	74.67 + 7.73	0.008
	Group – E	79.97 + 7.32	

Table 4: Changes in Mean Arterial Pressure

	Group	Mean + SD (mmHg)	P Value
Baseline readings	Group – D	97.76 + 7.44	0.454
	Group – E	96.33 + 7.29	
Just before injection of study drug	Group – D	98.87 + 8.03	0.153
	Group – E	95.87 + 8.02	
Just before induction	Group – D	97.67 + 9.13	0.013
	Group – E	92.03 + 7.83	
Just before intubation	Group – D	88.27 + 8.69	0.611
	Group – E	89.37 + 7.94	
1 minute after intubation	Group – D	102.73 + 9.38	0.06
	Group – E	107.30 + 9.02	
2 minutes after intubation	Group – D	100.40 + 9.69	0.006
	Group – E	107.27 + 9.91	
3 minutes after intubation	Group – D	96.50 + 10. 79	0.122
	Group – E	100.53 + 9.04	
5 minutes post intubation	Group – D	88.40 + 8.39	0.001
	Group – E	96.53 + 10.36	

Table 5: Changes in Heart Rate

	Group	Mean + SD (mmHg)	P Value
Baseline readings	Group – D	79.87 + 12.09	0.381
	Group – E	82.83 + 13.89	
Just before injection of study drug	Group – D	79.37 +10.45	0.991
	Group – E	79.33 + 11.22	
Just before induction	Group – D	68.57+ 8.22	0.008
	Group – E	75.17 + 10.26	
Just before intubation	Group – D	64.87 + 6.29	0.001
	Group – E	72.20 + 9.18	
1 minute after intubation	Group – D	78.97 + 10.68	0.001
	Group – E	88.37 + 11.06	
2 minutes after intubation	Group – D	76.60 + 10.39	<0.001
	Group – E	89.17 + 12.37	
3 minutes after intubation	Group – D	76.13 + 10. 76	0.01
	Group – E	83.63 + 11.10	
5 minutes post intubation	Group – D	73.03 + 12.03	0.028
	Group – E	79.57 + 10.38	

Table 6: Complications

Bradycardia	Group D		Group E		P value
	Number	(%)	Number	(%)	
Yes	1	3.3%	0.	0	0.33
No	29	97.7	30	100	
Total	30	100	30	100	

DISCUSSION

Laryngoscopy and endotracheal intubation provoke a transient, but marked sympathetic response leading to hypertension and tachycardia. Various drugs have been used to attenuate this post intubation hemodynamic response such as opioids, beta blockers, calcium channel blockers, Lidocaine, magnesium sulphate etc.

This randomized, double-blind study was done to compare the efficacy of dexmedetomidine and Esmolol for the attenuation of hemodynamic response to direct laryngoscopy and endotracheal intubation.

There was significant difference in the distribution of age, sex, weight or ASA physical status between the two groups. Systolic, diastolic and mean blood pressures, along with the heart rate, were measured in all the patients at baseline, before induction and intubation, and at 1, 2, 3 and 5 minutes post intubation.

A fall in SBP was recorded in both the groups, after the injection of Dexmedetomidine 1mcg/kg and Esmolol 1.5 mg/kg, respectively. Systolic blood

ISSN (O): 2687-5365; ISSN (P): 2753-6556

pressure just before intubation was 149.7+10.08mmHg (Dexmed group) and 121.30+ 7.47mmHg (Esmolol group).

Koh V, Ali S, Hassan MH, Mokhtar AM, Yaacob MNM, MazIa MZ (2021)6 in their study observed the efficacy of Esmolol and Dexmedetomidine Infusion in comparison with placebo group in Attenuating Haemodynamic and Blood Glucose Response to Laryngoscopy and Intubation. 60 patients were randomly divided into three groups.

In their study heart rate was significantly higher in control group, both Esmolol 50 mcg/kg/min infusion and Dexmedetomidine 1mcg/kg loading and maintenance with 0.4mcg/kg/hr, are equally elective in preventing increase in heart rate.

In our study both esmolol 1.5mg/kg and dexmedetomidine 1mcg/kg given before intubation, similar results found with our study, but dexmedetomidine is more effective in preventing increase in SBP, MAP, HR when compared to esmolol.

S. Sharma 2018 et al,[7] in their study observed the effects of dexmedetomidine 1mcg/kg and esmolol 1.5mg/kg in comparison with placebo in 90 patients. Mean HR at baseline was comparable in all the three groups (P= 0.8250). After completion of study drug infusion and just before intubation, there was a fall in mean HR with dexmedetomidine (16.72%) and esmolol (7.31O/o), but there was a rise in HR in placebo (2.530/o). After intubation, mean HR remained significantly lower (P<0.001) in dexmedetomidine compared to esmolol and placebo group. Mean systolic blood pressure, diastolic blood pressure, mean arterial pressure after intubation are significantly lower in dexmedetomidine group. We observed similar results in our study.

Dexmedetomidine 1mcg/kg and esmolol 1.5mg/kg, were diluted to 20cc and injected over ten minutes in the present study. The diastolic blood pressure before induction was 6mmHg higher in the dexmedetomidine group as compared to the DBP in the esmolol group (p>0.001). Similar finding was seen in the mean arterial pressures. The MAP in both the groups dropped following injection of dexmedetomidine and esmolol, but when compared to the esmolol group, the mean arterial pressure just before induction was 5mmHg higher in the dexmedetomidine group.

The observations made by Bloor et aI,[8] in 1992 on the effects of intravenous dexmedetomidine on the hemodynamic parameters of a healthy individual, shown initial rise in the blood pressure, beginning 3 minutes from the start of the dexmedetomidine infusion. This was followed by a gradual fall in the blood pressure.

This biphasic response could explain the initial higher diastolic and mean arterial pressures in the dexmedetomidine group.

Yildiz et al,[9] in 2006 studied the effect of intravenous dexmedetomidine on the cardiovascular response to laryngoscopy and endotracheal intubation in fifty adult surgical patients. Dexmedetomidine 1mcg/kg was given over 5 minutes, 20 minutes prior to intubation. One minute after intubation the raise in SBP by 5mmHg from the baseline in the dexmedetomidine group, as compared to the 20mmHg in the control.

We noted similar findings in this study where the patients who received 1mcg/kg dexmedetomidine 5 minutes before intubation showed a maximum rise in systolic pressure 1 minute following intubation. The rise from the baseline at 1 minute was 4mmHg in the dexmedetomidine group which was also comparable.

Lawrence et al,[10] in 1997 investigated the effects of 2mcg/kg dexmedetomidine on perioperative hemodynamics. They gave dexmedetomidine as a single dose preoperatively, 20 minutes before intubation, in 25 patients. They found that absence of hypertensive response after intubation in the above study was probably due to the higher dose of dexmedetomidine used in the study. This suggests that 1mcg/kg dexmedetomidine significantly attenuated the systolic pressure increases during laryngoscopy and intubation, but dexmedetomidine 2mcg/kg completely abolished these response.

Miller et al,[11] 54 (1989) concluded that the cardiovascular response to tracheal intubation was effectively attenuated by administration of 100 mg bolus of esmolol in a Canadian multi centre trial.

Sharma et al,[12] (1996) concluded that in hypertensive patients, the cardiovascular response to tracheal intubation was suppressed by 100 mg esmolol.

Oxorn D et al,[13] Bolus doses (1990) reported that esmolol 100 mg and 200 mg in bolus doses significantly affects heart rate response to tracheal intubation.

Kindler CH, Schumacher PG, Schneider MC, Urwyler A,[14] evaluated the efficacy of intravenous lignocaine 1.5mg/kg and two doses of esmolol 1mg/kg and 2mg/kg for attenuating the cardiovascular responses to laryngoscopy and intubation in ninety ASA I and II status normotensive women scheduled for elective gynaecological procedures with general anaesthesia. Systolic blood pressure and heart rate were recorded before infusion, immediately before laryngoscopy and 1,2 and 5 minutes following intubation. They found that esmolol 1 to 2 mg/kg was reliably elective in attenuating the hemodynamic response.

In Feng ck, Chan kh, Liu kn, or ch, Lee TYA study et al,[15] randomly selected eighty ASAI or II patients undergoing non cardiac surgeries. Single blinded study was conducted using lignocaine 2mg/kg, fentanyl 3yg/kg and esmolol 2mg/kg in different groups for attenuating cardiovascular responses. Fentanyl proved superiority over lignocaine. Esmolol provided consistent and reliable protection against increase in heart rate and blood pressure accompanying and intubation.

In our study, esmolol 1.5mg/kg was not completely effective in attenuating cardiovascular response to laryngscopy and tracheal intubation.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Both dexmedetomidine and esmolol failed to completely block the rise in the MAP following laryngoscopy and intubation, in the present study. There was a rise of 5mm Hg from the baseline, 1 minute post intubation in the dexmedetomidine group. In the esmolol group, there was a rise of 7mmHg from the baseline.

Dexmedetomidine was more useful in reducing the rise in systolic pressure, than esmolol. Both dexmedetomidine and esmolol equally blunted the rise in diastolic and mean arterial pressure. Neither 1mcg/kg of Dexmedetomidine nor Esmolol was sufficient to completely block the rise of arterial pressures due to laryngoscopy and endotracheal intubation. A higher dose of these drugs or a combination would be required to achieve the same.

In the study done by Yildiz et al, only one out of the 25 patients in the dexmedetomidine group developed bradycardia during induction, which responded promptly to atropine.

Similarly, Menda et al,[16] in their study also reported no incidence of bradycardia with dose of 1mcg/kg of dexmedetomidine when given to 30 patients on beta blockers posted for CABG.

CONCLUSION

It can be concluded that both Dexmedetomidine at 1mcg/kg and Esmolol at 1.5mg/kg, given 5 minutes before intubation, partially attenuate the hemodynamic response to laryngoscopy and intubation, but neither drug can completely blunt this response.

Dexmedetomidine is more effective than Esmolol, in attenuating the rise in systolic pressure and heart rate that follows laryngoscopy and intubation.

REFERENCES

1. Kraemer, T, & Reichi, H. (2015) "Attenuation of hemodynamic response to laryngoscopy and intubation: “A comparative study of intravenous Dexmedetomidine and Esmolol." Journal of Clinical Anesthesia, 27 (2), 138-144.
2. Wang.J.,& Li,M. (2016)."Efficacy of Dexmedetomidine and Esmolol in controlling the hemodynamic response to laryngoscopy and intubation."Anesthesia & Analgesia”, 122 (5), 1256-1262.
3. Ghazali, M.A., & Vengatachalam, V. (2019). "A review of pharmacological interventions for attenuating hemodynamic responses during laryngoscopy and intubation." Journal of Anaesthesiology Clinical Pharmacology, 35(2), 187-195.
4. Bhardwaj, A., & Singh, P. (2017). "Esmolol versus Dexmedetomidine for attenuation of hemodynamic responses to laryngoscopy and intubation." Indian Journal of Anesthesia, 61(8), 653-658.
5. Varshney S, Shahi V, Bhardwaj M. To compare the efficacy of Dexmedetomidine and Esmolol in attenuation of press or response to laryngoscopy and intubation in patients undergoing general anaesthesia for elective laparoscopic cholecystectomy. Indian J. Clin Anaesth 2019;6(4) : 576-580.
6. Koh V, Ali S, Hassan MH, Mokhtar AM, Yaacob MNM, MazIa MZ. Comparison of Esmolol and Dexmedetomidine Infusion in a Jenuating Haemodynamic and Blood Glucose Response to Laryngoscopy and Intubation: A Single Blinded Study. Malays J Med Sci. 2021;28(3):46-55.
7. Sharma, S., Suthar, O.P, Tak, M.L., Thanvi, A., Paliwal, N., & Karnawat, R. (2018). Comparison of Esmolol and Dexmedetomidine for Suppression of Hemodynamic Response to Laryngoscopy and Endotracheal Intubation in Adult Patients Undergoing Elective General Surgery: A Prospective, Randomized Controlled Double-blinded Study. Anesthesia, essays and researches, 12 (1), 262—266.
8. BIoor BC, Denham SW, Bellewille JP. Effects of intravenous Dexmedetomidine in humans. II: hemodynamic changes. Anaesthesia 1992: 77: 1134-42.
9. Yildiz M, Tavlan A, Tuncer S, Reisli R, Yosunkaya A, Otelcioglu S. Effect of Dexmedetomidine on haemodynamic responses to laryngoscopy and intubation: perioperative Haemodynamics and Anaesthetic requirements. Drugs R D.2006;7(1):43-52.
10. Lawrence CJ, Lange S. Effects of single pre-operative Dexmedetomidine dose on isoflurane requirements and perioperative haemodynamic stability. Anaesthesia 1997; 52:736-44.
11. Miller D.R.Martinean R.J. (1991) Esmolol for control of haemodynamic responses to tracheal intubation, The Canadian multicentre trial Canadian Journal of Anaesthesia 1991:38 (7):849-58
12. Sharma S, Mitra S, Grover VK, Kalra R. Esmolol blunts the haemodynamic responses to tracheal intubation in treated hypertnensive patients. Can J Anaesth.1996; 43 (8): 778-82.
13. Oxorn D, Knox JW, Hi I J. Bolus doses of Esmolol for the prevention of perioperative hypertensive and tachycardia. Can J Anaesth.1990; 37 (2) : 206-9.
14. 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.CIin Anesth.1996:8 (6) : 491.
15. Feng Chan KH, Liu KN, Or CH, Lee TYA Comparison of lidocaine, fentanyl, and Esmolol for a Jenuation of cardiovascular response to Laryngoscopy and tracheal intubation. Acta Anaesthesiol Sin.1996 Jun;34 (2):61-7
16. Menda F, Köner 0, Sayin M, Türe H, Imer P, Aykaç B. Dexmedetomidine as an adjunct to anesthetic induction to attenuate hemodynamic response to endotracheal intubation in patients undergoing fast-track CABG. Ann Card Anaesth. 2010 Jan-Apr;13 (1):16-21.

ISSN (O): 2687-5365; ISSN (P): 2753-6556