e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2023; 13 (12); 120-130

Original Research Article

Comparison of Dexmedetomidine/ Esmolol for Attenuation of Stress Response to Extubation and Emergence

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Received: 18-09-2023 / Revised: 21-10-2023 / Accepted: 26-11-2023
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Conflict of interest: Nil

Abstract:

Background: endotracheal intubation & extubation are the procedures which cause stress response to airway manipulation which is hazardous for patients with low cardiorespiratory reserve. various pharmacological agents used to control it.

Aims & Objectives: To study the effect of dexmedetomidine (0.5µg/kg)/ Esmolol (0.5µg/kg) on hemodynamic responses during tracheal extubation, to compare the two groups with respect to hemodynamic parameters, time to extubate and quality of extubation & observe and compare sedation score in the two study groups. To study the side effects of drugs if any.

Method:

Group A: Patients received 0.5 µg/kg of Esmolol diluted in 10 ml in normal saline IV over 10 minutes.

Group B: patients received 0.5µg/kg of Dexmedetomidine diluted in 10 ml in normal saline Iv over 10 min.

In all cases, anaesthesia techniques were similar irrespective of group. Study drug was given as described above and administered 15 minutes before estimated time of completion of surgery. Hemodynamic parameters like Heart rate, SBP, DBP, MAP, and SpO2 were monitored in all patients at baseline, after administration of study drug, at 5 and 10 minutes and post extubation at 1st, 3rd, 5th, 10th, 15th ,30th,45th and 60th minute. Time to emergence and extubate were noted. Extubation quality and sedation score were assessed by Extubation quality and five point scale respectively. Incidence of complications like bradycardia, hypotension, respiratory depression, laryngospasm and bronchospasm were noted. In our study following observations were made: Hemodynamic parameters like HR, SBP, DBP and MAP values were comparable at baseline in both groups. Reduction in HR and MAP were found a 5 and 10 minutes after drug administration and there was increase in HR and MAPat post extubation 1 and 3 minutes which were lower when compared to baseline. Thereafter at post extubation 5,10,15 and 30 minutes HR and MAP in group B was statistically significant lower compared to group A($p<0.05$) and at post extubation 45- and 60-minutes values of HR and MAP were comparable. At all measurement point HR and MAP were remained below baseline value which signifies attenuation in hemodynamic parameters to extubation. Emergence time in group A and B were 9.13±1.32 and 10.5±1.66minutes respectively, while extubation time in group A and B were 12.3±1.39 and 14.13±2.11minutes respectively and shows that dexmedetomidine is associated with delaying in both emergence and extubation time and there was statistical significant difference($p<0.001$) among two groups. We found that sedation score at all measurement point was higher in group B and there was statistically significant difference among two groups ($P<0.05$). At post extubation 45- and 60-minutes sedation score was not statistically significant different ($P>0.05$). Group of dexmedetomidine is associated with more sedation without any respiratory depression.

Incidence of bradycardia in group A was 6.66% and In group B 13%, and incidence of hypotension In group A was 3.33% in group A and 10% in group B. No any case of respiratory depression, laryngospasm or bronchospasm was noted.

Keywords: Dexmedetomidine, Esmolol, Postextubation Stress Response, Sedation.

Introduction

Anaesthetic maneuvers like direct laryngoscopy, tracheal intubation and extubation involve severe sympathetic stimulation accompanied by increased plasma catecholamine levels and sympath adrenal activity. This increase in sympathoadrenal activity may result in hypertension, tachycardia, arrhythmias and increased myocardial oxygen consumption which are usually transitory, variable, and unpredictable. However, they may adversely affect the balance between myocardial oxygen supply and demand, causing significant myocardial ischemia and haemodynamic compromise. Thus, modulation of the post-operative sympathetic response may decrease morbidity in high risk surgical patients with hypertension, myocardial insufficiency or cerebrovascular disease. [8,15,17]
Respiratory complications associated with tracheal extubation are coughing and sore throat, laryngospasm, bronchospasm which leads to hypoxemia. Laryngospasm is the commonest cause for post extubation upper airway obstruction.For a smooth extubation, there should be no straining, movement, coughing, breath holding or laryngospasm. Extubation at light levels of anaesthesia or sedation can stimulate reflex responses via tracheal and laryngeal irritation. [6,17,27]

Various techniques, as well as drugs, have been used to attenuate these responses during tracheal extubation. Techniques like extubation in a deeper plane of anaesthesia, laryngeal mask airway and drugs like β_1 blockers like esmolol, [9] combined α-β blocker like labetalol; intravenous lignocaine, low dose iv opioids like fentanyl, remifentanil, central sympatholytics like clonidine, dexmedetomidine have been studied as sole agent or in comparison with each other to control [5,9,14,45] haemodynamic changes and upper airway tract events with variable success rates.

Dexmedetomidine hydrochloride is a highly selective, specific and potent α2 adrenergic agonist. It decreases sympathetic out flow and noradrenergic activity thereby decreasing blood pressure and heart rate. It also has sedative, analgesic and anaesthetic sparing properties without producing respiratory depression. [5] Hence our study is undertaken to compare the effect of two different intravenous bolus doses of Dexmedetomidine (0.5µg/kg) and Esmolol 0.5µg/kg) before extubation for attenuation of the hemodynamic stress response and airway reflexes to endotracheal extubation.

Materials and Methods

Present Retrospective observational study was carried out in tertiary care hospital by taking 60 patients aged 18-60 years of either Sex, ASA physical status I/II and malampatti grade I/II who were scheduled for various elective surgeries under general anaesthesia. Informed consent was taken from all the patients.

Group Allocation:

Patients were randomly divided into 2 groups of 30 patients randomization was done by odd & even number in seal opaque envelope before extubation.

Group A: patients received inj Esmolol 0.5µg/kg IV bolus (diluted in in 10ml normal saline) over 10 minutes by syringe pump

Group B: patients received inj Dexmedetomidine 0.5 µg/kg IV bolus (diluted in 10ml normal saline) over 10 minutes by syringe pump.

Exclusion Criteria

1. Patient refusal
2. Patients with H/O ischemic heart disease, aortic stenosis, LVF, AV conduction block, H/O cerebrovascular accidents, severe hepatic and renal disease, asthma, COPD and diabetes.
3. 3 Patients with history of drug abuse or psychological disorder.
4. Obese patients, with difficult airway or history of sleep apnea.
5. Patients allergic to drug.
6. Pregnant or lactating mother.

Preoperative Evaluation

All patients were evaluated preoperatively for any past or present medical and surgical illness, any history of previous anaesthesia exposure, drug treatment or drug allergy, any specific family history and drug addiction.

Thorough general and systemic examination of patients was done. Airway was graded according to Modified Malampatti classification, weight of patients were recorded. Investigations like Complete Blood count, blood sugar, renal function test, serum electrolytes, liver function test, chest X-ray and ECG were reviewed. All the patients were kept nill by mouth for 6 hours before surgery. Informed consent was taken from all the patients.

Preoperative Preparation

- Anaesthesia work station was checked. Appropriate size endotracheal Tubes, working laryngoscope with medium and large size blades, stylet and working suction apparatus were kept ready before procedure.
- After shifting patient to the operating room, IV access was obtained on the forearm with 20-G or 18 G cannula and ringer lactate started.
- All patients were monitored with electrocardiogram (ECG), percentage

saturation of oxygen (SpO2), noninvasive pressure (NIBP) end tidal carbon dioxide EtCO2.

Premedication:

- Injection Glycopyrrolate 0.004mg/ kg intravenously
- injection Fentanyl 1µg/ kg intravenously

Induction

- Patients were pre-oxygenated with 100% O2 for 3 minutes and induced with injection Thiopentone 5mg/kg and intubation facilitated with injection Succinylcholine 2mg/kg intravenously
- Patient was intubated with a cuffed endotracheal tube (ETT) of appropriate size. Bilateral air entry checked.
- Anaesthesia was maintained with nitrous oxide, oxygen, sevoflurane and inj. Vecuronium bromide 0.08mg/kg bolus dose and 0.02 mg/kg intermittent dose.
- Fifteen minutes before the estimated time of completion of surgery, bolus dose of study drug was started,

Group A: Patients received Esmolol 0.5µg/kg (diluted in 10ml Normal Saline) iv bolus over 10 minutes

Group B: Patients received Dexmedetomidine 0.5µg/kg (diluted in 10ml Normal Saline) iv bolus over 10 minutes

• Residual neuromuscular blockade was reversed using injection Glycopyrrolate 0.008 mg/ kg iv and injection neostigmine 0.05µg/ kg after return of spontaneous respiration.

After thorough oropharyngeal suction, patient was extubated when following verbal command and after return of protective reflexes, smooth's respiration and adequate muscle tone and power, during deep inspiration.

Parameters Evaluated:

1. **HR, SBP, DBP, MAP, SpO2** readings before infusion of drug ; 5 and 10 minutes during infusion; post extubation at 1,3,5,10,15,30,45,60 minutes.

Definitions:

Hypotension: defined as reduction in Mean arterial pressure (MAP) of more than 30% below the base line and it was treated with increasing rate of iv fluid.

Bradycardia: defined as heart rate of less than 60 beats per minute and was treated with injection Atropine 0.6mg IV.

Extubation Parameters

1: Emergence time: The time interval between discontinuation of anaesthetic agents and patient following verbal command.

2. Extubation time: The time interval between cessation of anaesthetic agents and tracheal extubation.

3. Quality of extubation was assessed by five point scale:

1-no coughing

2- Smooth extubation, minimal coughing.
3- Moderate coughing (3 or 4 times.)
4- Severe coughing (5 to 10 times) and straining
5- Poor extubation, very uncomfortable (laryngospasm and coughing >10 time)

4. Sedation was evaluated using Ramsay Sedation Scale which was measured after extubation at 1,5, 15, 30,45 and 60 minutes.

1- Anxious and agitated or restless or both
2. Co- operative, oriented, tranquil.
3- Responsive to verbal commands, drowsy
4. Asleep, brisk response to light glabellar tap or auditory stimlus
5- Asleep, slow response to light glabellar tap or auditory stimulus. _
6- No response to stimulation

Statistical analysis:

The results were expressed as mean±SD and percentages. All Recorded data were entered using MS Excel software and analysed using SPSS® computer software .Statistical analysis was done by using descriptive and inferential statistics using Chi-square test, students paired and unpaired t test to find out the significance mean of various study parameters among the two groups.

P-value

>0.05	Not Significant(NS)
<0.05	Significant(S)
<0.001	Highly Significant(HS)

Observation and Results: We conducted a observational study at our institute to evaluate the effect of bolus doses of Dexmedetomidine (0.5µg/kg And 1µg/kg) for attenuation of hemodynamic and airway responses to extubation following surgery under general anaesthesia. Results obtained were tabulated as below.

Table 1: Comparison of Demographic between Two Groups

Demographic Data	Group A	Group B	P Value	inference
	Mean ± SD	Mean ± SD		
Age (in yrs)	36.8±10.28	35.7±10.59	0.62	NS
Weight (in kgs)	64.26±6.68	64.2±9.5	0.66	NS
Gender (Male/Female)	16/14	17/13	-	
ASA Grade (I/II)	22/8	24/6	-	

Table-1 shows Age distribution, weight distribution and sex distribution are comparable in two groups. Patient belonging to ASA I and II gragde incuded in this study.

Table 2: Nomenclature Denoting Various Measurement Points

Before Infusion	Basal(Bi)
5 Min After Infusion	T_5
10 Min After Infusion	T_{10}
Post Extubation 1min	Pe_1
Post Extubation 5 Min	Pe_5
Post Extubation 10 Min	Pe_{10}
Post Extubation 15 Min	Pe_{15}
Post Extubation 30 Min	Pe_{30}
Post Extubation 45 Min	Pe_{45}
Post Extubation 60 Min	Pe_{60}

Table 3: Comparison of Heart Rate (mean) between Two groups.

Time	Group A	Group B	P-VALUE	Inference
	Mean±SD	Mean±SD		
BASAL(BI)	85.2±7.03	84.66±8.14	0.78	NS
T5	82.7±9.85	81.3±12.20	0.62	NS
T10	80.73±11.8	75.76±9.9	0.08	NS
PE1	82.1±9.2	79.86±12.02	0.40	NS
PE3	81.86±10.63	77.03±9.4	0.06	NS
PE5	79.13±11.2	73±11.6	0.04	S
PE10	75.4±10.72	70.06±5.93	0.02	S
PE15	73.96±11.23	68.06±6.1	0.01	S
PE30	72.63±10.71	67.03±9.9	0.04	S
PE45	73.1±10.53	70±6.1	0.168	NS
PE60	80.167±7.4	78.7±6	0.40	NS

Table-3 shows that heart rate at baseline is comparable between two groups ($p>0.05$). No significant difference was observed between two groups from starting of the drug till 3 minutes after extubation. But a statistical significant difference thereafter till 30 minutes of extubation ($p<0.05$).

Table 4: Comparison of SBP, DBP and MAP (mean) between the Two Study Groups.

Time	Group A			Group B			p	inference
	SBP	DBP	MAP	SBP	DBP	MAP		
BASAL	127.4±10.9	82.23±7.98	97.14±7.98	128.67±11.05	83.23±6.54	98.22±6.9	0.5	NS
T5	126.4±8.10	80.5±10.9	95.64±7.77	125±12.37	80.1±11.59	94.91±6.3	0.6	NS
T10	123.8±10.4	77.4±10.5	92.72±10.7	119.03±10.12	73.40±10.7	88.45±6.9	0.07	NS
PE1	125.9±12.6	80.2±7.16	95.29±9.5	122.8±12.73	79.03±8.9	93.47±6.5	0.39	NS
PE3	123.60±7.6	78.76±10.14	93.55±13.3	119.47±10.12	73.2±12.14	88.46±6.9	0.06	NS
PE5	121.07±9.9	76.43±6.2	91.16±10.2	116.63±7.60	71.56±6.3	86.43±7.1	0.04	S
PE10	119.4±5.68	75.4±9.5	89.92±11.2	115.77±6.43	69.1±5.3	84.50±6.6	0.02	S
PE15	116.83±9.8	71.93±5.8	86.74±9.50	111.23±7.5	67.03±5.5	81.61±6.4	0.01	S
PE30	114.23±6.7	70.1±6.7	84.66±8.9	109.5±5.65	65.5±6.8	80.02±8.6	0.0	S

							4	
PE45	118.43±9.0	73.2±12.14	88.12±10.1	116.2±6.39	70.9±5.8	85.849±8.6	0.35	NS
PE_{60}	121.57±8.18	76.03±10.06	91.05±9.90	119.47±7.2	74.83±9.7	89.56±8.3	0.5	NS

Table-4 shows that SBP, DBP and MAP at baseline is comparable between two groups (p>0.05). No significant difference was observed between two groups from starting of drug infusion till 3 minutes after extubation. But a statistical significant difference thereafter till 30 minutes of extubation (p<0.05).

Table 5: Comparison of Emergence and Extubation time between two groups

Extubation Parameters	Group A	Group B	P Value	Inference
Time To Emergence	9.13±1.32	10.5±1.66	<0.001	Hs
Time To Extubation	12.3±1.39	14.133±2.11	<0.001	Hs

Table-5, The average time of emergence was 9.13±1.32 and 10.5±1.66 minutes in groups A and B respectively and the average time to extubate was 12.3±1.39 and 14.13±2.11 in groups A and B respectively showing statistically highly difference(p Value<0.001).

Table 6: Comparison of Extubation Quality Five-Point Scale

Extubation Quality	Group A		Group B	
	No	%	No	%
1	27	90	28	93.34
2	3	10	2	6.66
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
Total	30	100	30	100

Table-6 shows that in group A, 90% of the patients had smooth extubation (Score 1) , only 10.0% had minimal cough (score 2). In group B, 93.3% of the patients had a smooth extubation (score 1),only 6.6% had minimal cough(score 2).

Table 7: Comparison of Ramsay Sedation Score Between two study groups

Ramsay Sedation Score	Group A	Group B	P Value	Inference
	Mean ± SD	Mean ± SD		
PE_1	2.5 ± 0.77	2.9±0.4	0.015	S
PE_5	2.43±0.67	2.76±0.43	0.02	S
PE_{15}	2.33±0.60	2.66±0.47	0.02	S
PE30	2.2±0.6	2.5±0.5	0.04	S
PE45	1.8±0.48	2±0.37	0.07	NS
PE_{60}	1.6±0.67	1.8±0.4	0.1	NS

Table-7 shows that patients were more sedated in group B compared to group A. Sedation score was statistically significant after extubation till 30 minutes post extubation(P<0.05) but thereafter at 45 and 60 minutes post extubation sedation score observed were statistically not significant(P>0.05).

Table 8: Comparison of Complications among the Two study groups

Complications	Group A		Group B	
	No. of Patients	%	No. of Patients	%
Hypotension	1	3.33	3	10
Bradycardia	2	6.66	4	13
Respiratory Depression	0	0	0	0
Bronchospasm	0	0	0	0
Laryngospasm	0	0	0	0

Table-8 1shows that one patient (3.33%) in group A and three (10%) patients and in group B had hypotension that was managed with IV bolus normal saline. In Group A two (6.66%) patients and In group B four (13%) patients developed Bradycardia which was responded to inj Atropine 0.6mg IV. There was no incidence of respiratory depression, laryngospasm or bronchospasm in any of the groups.

Discussion

Laryngoscopy and endotracheal intubation is considered to be the most crucial event while conducting general anesthesia. Likewise emergence from general anesthesia and tracheal extubation is often associated with sympathoadrenal response which is seen during tracheal intubation and is of equal concern.

Complications that occur during and after extubation are three times more common than that occurring during tracheal intubation and induction of anaesthesia. Hypertension and tachycardia are well documented events during extubation. These haemodynamic reflexes reflect sympatho-adrenal reflex stimulation (epipharyngeal and laryngopharyngeal stimulation) with concomitant increase in plasma levels of catecholamines and activation of α and β adrenergic receptors. These increases in blood pressure and heart rate are transitory, variable and unpredictable. This development of postoperative hypertension warrants immediate assessment and treatment to reduce the risks of myocardial infarction, arrhythmias, congestive heart failure, cerebrovascular accidents, bleeding and other end organ damage [5,19,30**]**

The present study was designed to assess the degree of hemodynamic responses and airway reflexes to extubation of trachea by administration of two different doses of dexmedetomidine (0.5µg/kg and 1µg/kg) as a bolus over 10 minute before 15 minute of extubation. Technique of anaesthesia was similar in two study groups. Parameters observed include HR, SBP, DBP, MAP, SpO2 readings before drug infusion (basal); 5 and 10 minutes during infusion, post extubation 1, 3,5,10,15,30,45 and 60 minutes. Extubation quality, sedation, time to emergence and extubation and any associated complications were noted.

In 1971 Braunwald [8] concluded that myocardial oxygen consumption was increased in response to untreated blood pressure and heart rate during extubation. He concluded that in patients with CAD, myocardial ischemia can occur at extubation Dexmedetomidine, a potent α2-adrenergic receptor agonist with sedative, analgesic and sympatholytic properties, has been widely used in clinical practice28. Activation of postsynaptic α2 receptors by dexmedetomidine leads to sympatholysis and results in decreases in blood pressure and heart rate, which helps to attenuate the stress response [6]. Alpha2 agonist activity of dexmedetomidine is known to reduce secretions of mucus glands of oral and tracheobronchial tree in particular. Reduction in secretions may result in decreased incidence of coughing and other complications such as laryngospasm and bronchospasm. Dexmedetomidine has been found to be superior to fentanyl and lignocaine in blunting hemodynamic changes to extubation which was demonstrated by Aksu et al [2], P Rani et al33 And Amrita Rath et al [3].

Guler et al in 200513 reported that a single dose of dexmedetomidine given before extubation facilitated tolerance of the endotracheal tube and attenuated the airway and cardiovascular response to extubation.

Demographic Data:

In our study the two groups were comparable with respect to age, sex, weight and ASA grade.

Antony D et [4] al had comparable demographic data.

Premedication and Induction:

In our study, all the patients were premedicated with Injection Glycopyrrolate 0.004 mg/kg IV and Injection Fentanyl 1 µg/kg 5 minutes before induction of anaesthesia.

Patients were preoxygenated with 100% O2 for 3 minutes and induced with injection thiopentone 5 mg/kg and intubation facilitated with injection succinylcholine 2 mg/kg intravenously. Patient was intubated with cuffed endotracheal tube of appropriate sized. Anesthesia was maintained with 50% nitrous oxide in 50% oxygen and sevoflurane. Muscle relaxation was achieved with injection, vecuronium 0.08 mg/kg (initial dose) and 0.02 mg/kg (repeat doses) later intravenously.

Shrirang Rao et al [37] premedicated patient with glycopyrrolate and fentanyl and induced patients inj Thiopentone sodium and succinylcholine and anesthesia was maintained with 66% nitrous oxide in 33% oxygen and isoflurane. Muscle relaxation was achieved with injection, vecuronium 0.1 mg/kg (initial dose) and 0.02 mg/kg (repeat doses) later intravenously

Hemodynamic Parameters

1. Heart Rate:

The results in our study are as following:

HR in both 0.5µg/kg and 1.0µg/kg groups at baseline was comparable in both the groups and there was no statistical significant difference between them ($p>0.05$).

HR values were significantly lower in both group compared to baseline value from the time of drug infusion to post extubation 60 minutes. Following administration of study drug, In both groups fall in heart rate was observed at 5 and 10 minutes. There was increase in HR at post extubation 1 and 3 minutes which remained below the baseline value. This is indicative of attenuation of rise in HR after extubation by dexmedetomidine. Statistically significant difference in heart rate reduction between two study groups was found from post extubation 5 minutes till 30 minutes(P value<0.05). Aksu R et al [2] concluded that in the dexmedetomidine group, HR did not significantly increase after extubation; however, in the fentanyl group, HR significantly increased compared to preextubation values (all, P = 0.007). HR was significantly higher in the fentanyl group compared with the dexmedetomidine group at 1, 5, and 10

minutes after extubation (all, P = 0.003).Antony D et al 2016 [4] in their study observed significant reduction in HR from 5minutes after starting infusion in both 0.5µg/kg and 1.0µg/kg groups; with attenuation of rise in HR during extubation. Both doses effectively controlled responses in HR to extubation but the mean HR was significantly lower in 1µg/kg group from 5minutes after extubation till 30 minutes when compared with 0.5µg/kg group.

MD Kashif Jamal et al 201825 concluded that the heart rate remained below baseline in the post-extubation period among all three group but in group A(0.5µg/kg) fluctuation were less as compared to group B(0.75µg/kg) and group C(1.0µg/kg).

Roshni Sebastian et al 2019 [34] observed that mean heart rate readings were comparable between study groups before injection of study drug. However the heart rate was significantly lower in D2 group (0.5 µg/kg) as compared to D1 group (0.25 µg/kg) at 10 minutes after starting of injection, during reversal and till 15 minutes after extubation ($p<0.05$). Shrirang Rao et al 2015 [37] in their study observed that basal HR was comparable in both groups. But it was statistically lower in study group from 2nd minute of drug infusion till the end of infusion, at reversal, extubation and post extubation at 5, 10, 15, 30 minutes compared to basal value. Suvankar Pramanick et al 2016 [39] observed that heart rate of patients allotted in Group –I(0.5µg/kg) and Group- II(1.0µg/kg) were significantly lower than GroupIII(control) from 5 minutes after starting administration of the study drug till 10 minutes after extubation. No significant difference of heart rate was found between Group –I and Group- II.

Blood Pressure:

In our study SBP, DBP and MAP values were significantly lower in both groups compared to baseline values from the time of drug infusion to post extubation 60 minutes.

Reduction in MAP values at 5 and 10 minutes after starting infusion of study drug in both groups A and B, but reduction is more with group B as compared to group A but not statistically significant.

Thereafter at post extubation 5 minutes till 30 minutes MAP values were statistically significant among two groups($p<0.05$).

MD Kashif Jamal et al [25] observed that there was no significant difference between Group A (0.5µg/kg), Group B (0.75µg/kg) and Group C (1µg/kg) for the means of MAP from the preextubation values. MAP was significantly lower in Group C(1µg/kg) at 3 min and most probably at 15 minutes in Group B(0.75µg/kg) and Group C(1µg/kg) differed from Group A(0.5µg/kg)

Meitei et al [26] in their study of dexmedetomidine(0.5µg/kg) and control group were observed that SBP,DBP and MAP values during infusion 1,2,7 and 10 minutes then at reversal and extubation followed by post extubation 15 min. A statistically significant difference was observed in SBP, DBP, and MAP ($p < 0.05$) from 10 minute of drug infusion till the end of observation.

R.K Solanki at el [32] concluded that systolic blood pressure, diastolic blood pressure and mean arterial pressure, from starting of study drugs infusion(T1) till 5 minutes of study drugs infusion (T3) showed no significant differences between the three groups($P>0.05$),but their values during T4(completion of study drugs infusion),T5(at extubation),post extubation at T6(1min), T7(5min), T8(10mins), T9(30mins) showed significant decrease in the dexmedetomidine group in comparison to the esmolol and control group.

Roshni sebastian et al [34] observed that mean arterial pressure readings were comparable between study groups before injection of study drug. The Mean arterial pressure was also significantly lower in D2 (0.5 µg/kg) group before extubation and till 15 minutes after extubation.

Shrirang Rao et al [37] observed that SBP, DBP, MAP values were statistically and clinically significantly lower in Group D during study drug infusion; at reversal administration; extubation and post extubation 5, 10, 15, 30, 60 and 90 minutes compared to basal values.

Spo2 values were comparable in both the groups at all measurement point.

Extubation Parameters:

1). Extubation Quality

Extubation quality was assessed by Scoring Five Point Scale and we observed that in both our study group extubation quality was excellent.

In Group A 90% and in Group B 93.34% patients had smooth extubation (score 1) and only 10% in Group A and 6.66% in group B patients had minimal coughing (score 2)

In study done by Antony D et al [4] Most of the patients who received dexmedetomidine could be extubated with an extubation quality score of 1 or 2; whereas the in the placebo group, 50% had moderate cough, 26.7% had severe cough and 6.7% had a poor extubation with laryngospasm.

Roshni Sebastian et al [34] Smooth extubation was reported in 93.9% cases of D2 group as compared to 81.8% in D1 group. Rough experience was seen

in 18.2% cases of D1 group as compared to 6.1% in D2 group (p-0.25).

Shrirang Rao et al [37] in their study extubation quality rated using extubation quality 5-point scale, 71 = no coughing, 2 = smooth extubation, minimal coughing, 3 = moderate coughing (3 or 4 times), 4 = severe coughing (5 to 10 times) and straining, 5 = poor extubation, very uncomfortable (laryngospasm and coughing >10 times). Number of coughs per patient was monitored for 15 minute post extubation and Incidence of coughing was significantly higher in control group than study group (33% vs. 7% respectively)

Suvankar pramanick et al [39] observed that likert scores of patients allocated to Group – I (0.5µg/kg) and Group- II(1µg/kg) were significantly lower than those in group- III(control). In their study, most patients in group- I and group- II showed smooth extubation with minimal coughing (Likert scale score 1 and 2 respectively) which were much lower than control group- III, where most patients experienced moderate cough (Likert scale score 3)

2). Emergence and extubation time:

In our study we observed that ,mean emergence time and extubation time In group B was 10.5 and 14.13minutes respectively and was significantly higer($P<0.001$) compared to Group A which was 9.13 and 12.3minutes respectively so group B patients took longer time to extubate than group A.

In study By Antony D et al 2016 [4] also reported that the time to extubate was found to be significantly prolonged in patients who received dexmedetomidine at 1µg/kg (extubation time ≥ 13minutes in 73.3% of patients); whereas 40% of patients who received 0.5µg/kg and only16.7% in placebo group had extubation time ≥ 13 minutes.

Guler G et al [13] suggested that 0.5µg/kg of dexmedetomidine 5 minutes before the end of surgery significantly prolonged time to extubate, which correlate with present study

Md Kashif Jamal et al 2018 [25] showed similar findings that time from extubation to orientation with time, place and person were significantly prolonged among group C (Dexmedetomidine 1µg/kg IV bolus).

R.K Solanki et [32] al in their study demonstared that regarding the extubation time, time to orientation, time to awakening, Group Dexmedetomidine took a longer time on comparison to Esmolol and Control group.

suvankar pramanick et al39 that appearance of first verbal response and the time of succecful extubation was increased in patients treated with dexmedetomidine 1µg/kg.

3). Sedation:

After extubation Sedation in our study was assessed using Ramsay Sedation Score which was observed at post extubation 1,5,15,30,45 and 60 minutes.

In our study highest sedation score were observed at post extubation 1 minute.

After extubation till 30 minutes sedation score was significantly high in Group B as compared to Group A($p<0.05$), but at 45 and 60minutes post extubation sedation scores observed were not statistically significant($p>0.05$). Aksu et al [4] reported higher sedation scores in patients receiving 0.5µg/kg dexmedetomidine at the end of surgery without respiratory depression in patients who underwent rhinoplasty; in a comparative study with fentanyl. Antony D et al [4] in their study assessed sedation by ramsay Scale and observed higher sedation scores in patients who received dexmedetomidine. Majority of patients (73.3% and 66.7%) who received dexmedetomidine 0.5µg/kg and 1µg/kg respectively were drowsy but responding to commands. None of the patients had respiratory depression. MD Kashif jamal et al [25] found that patients were more sedated in group C (1.0µg/kg) as compared to group A(0.5µg/kg) and group B(0.75µg/kg),but least sedation was found among the group A. Sedation score was statistically significant at 15 and 30 minutes Ute post extubation among the study groups. But at 60 minutes postextubation sedation scores observed were not statistically significant ($P>0.05$).

P Rani et al [33] demonstrated that patients in dexmedetomidine group showed greater degree of sedation during suctioning of airway and extubation when compared to fentanyl. In dexmedetomidine group, the patients were arousable but not awake, whereas in fentanyl group, the patients were awake and this could be the reason for significant increase in HR in fentanyl group after extubation.

Shrirang rao et [37] al in their study sedation assessed using Ramsay Sedation Scale. Significant number of patients in study group (46%) were drowsy but responded to oral commands (score of 3) following extubation as against 80% of patients in control group were co-operative and oriented (score of 2).

In study of Suvankar Pramanick et al [39**]** patients treated with dexmedetomidine0.5µg kg-1 were found to be cooperative, orientated, tranquil (Ramsay Sedation Scale 2) in comparison to higher doses of dexmedetomidine(1µg kg-1) where patients were drowsy but responding to verbal commands (Ramsay Sedation Scale 3) after extubation. Some patients were found restless (Ramsay Sedation Scale 1) in the control group.

Complications:

In our study we observed anticipated complications like bradycardia, hypotension, respiratory depression, bronchospasm and laryngospasm in each group.

Bradycardia was observed in 2 patients (6.66%) in Group A and 4 patients(13%) in group B and it was not associated with hemodynamic instability and was responded to injection atropine 0.6mg iv. 1 patient in(3.33%) group A and 3 patient(10%) in Group B had hypotension.

Antony D et al [4] reported significant bradycardia in patients who received dexmedetomidine, the incidence being higher with 1µg/kg dose. None of the cases were hemodynamically unstable and required no treatment. The incidence of hypotension was 10% and 13.3% in patients who received dexmedetomidine 1µg/kg and 0.5µg/kg respectively; without anyone in the placebo group developing hypotension.

None of the patients in any group developed respiratory depression, laryngospasm or bronchospasm as also described by Guler G et al [13].

MD Kashif Jamal et al [25] noted the incidence of bradycardia was higher, when a higher dose of dexmedetomidine was used, also the incidence of bradycardia, hypotension was 3.33% and 6.66% respectively among the group C (1.0µg/kg) patient but none of the patient in group A(0.5µg/kg) and group B(0.75µg/kg) suffered hypotension and bradycardia and decreased incidence of coughing and other complications such as laryngospasm and bronchospasm.

Suvankar pramanick et al [39] in their study observed that incidence of bradycardia and hypotension was found little higher in patients treated with dexmedetomidine 1.0µg/kg and none of the patients in any group developed respiratory depression, laryngospasm, bronchospasm, undue sedation or desaturation.

Conclusion

The conclusion a dose of 0.5µg/kg of dexmedetomidine administered as a bolus dose before extubation attenuates the stress response to extubation as effectively as inj. Esmolol 0.5µg/kg. Both doses maintain hemodynamic stability; enabling smooth extubation.

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