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Intravenous dexmedetomidine versus esmolol for attenuation of haemodynamic response to endotracheal extubation: A Randomized double-blind study

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Abstract
Background and Aim: Tracheal extubation is a crucial step of general anaesthesia which is associated with intense airway and hemodynamic responses secondary to activation of mechanoreceptors in larynx. The present study aims to compare the efficacy of intravenously administered dexmedetomidine and esmolol in attenuating the hemodynamic response to endotracheal extubation.
Materials and Method: This prospective, randomized, double-blind study was conducted in 80 ASA I-II patients of 18-60 years undergoing elective surgery under general anaesthesia. They were randomly divided into two groups of forty each. Anticipated ten minutes before the extubation Group D received intravenous dexmedetomidine 0.5 µg/kg diluted in 10 ml normal saline and Group E received 10 ml of normal saline. Two min before extubation Group D received 10 ml normal saline and Group E received esmolol bolus dose 1 mg/kg diluted in 10 ml normal saline. Heart rate, systolic blood pressure, diastolic blood pressure, mean blood pressure, extubation and emergence time, Ramsay sedation score and adverse events were recorded.
Results: Mean heart rate was significantly lower in group D from 5 min of drug administration till 20 min post extubation as compared to group E. Mean systolic blood pressure, diastolic blood pressure and mean blood pressure were significantly lower in group D as compared to group E from 8 min after administration of drug till 20 min of post extubation ($p<0.05$). Emergence time, extubation time and adverse events were comparable in both the groups ($p>0.05$). Delayed emergence was observed in 2 patients in group D. More number of patients in group D were sedated.
Conclusion: IV dexmedetomidine is better in attenuating haemodynamic response to endotracheal extubation than esmolol because of comparatively stable haemodynamics, comparable emergence and extubation time, conscious sedation, less postoperative cough and agitation.

Keywords: Dexmedetomidine, esmolol, extubation, haemodynamic responses

Introduction
Tracheal extubation is associated with intense airway and hemodynamic responses secondary to activation of mechanoreceptors in larynx just like intubation. The peak changes occur during the first few minutes following extubation and may persist till 5-15 min [1, 2]. Increase catecholamine secretion associated with tracheal extubation results in tachycardia, hypertension and increased oxygen consumption. Stimulus is further exaggerated by pain at surgical site, emergence from anaesthesia or tracheobronchial irritation and reflex sympathetic discharge caused by epipharyngeal and laryngopharyngeal stimulation. Such stress may induce postoperative haemorrhage, disruption of wound and hematoma formation after surgery. Thus, it is important to prevent or suppress this hemodynamic response.
Several non-pharmacological and pharmacological strategies have been studied extensively in the literature to blunt these responses like extubation in the deeper plane of anaesthesia and using drugs such as opioids, magnesium sulphate, beta blockers [3], calcium channel blockers [4], vasodilator, gabapentin, clonidine, lidocaine [5], etc but none of the agents proved to be ideal.
Dexmedetomidine, potent and highly selective α-2 adrenoreceptor agonist which reduces norepinephrine turnover, suppresses sympathetic discharge, provides conscious sedation and analgesia without respiratory depression. Esmolol, a selective β-1 antagonist that has very short duration of action, competitively reduces receptor occupancy by catecholamines, blunts hemodynamic responses to perioperative noxious stimuli and decreases need for opioids.

Hence, this prospective, randomized, double-blind study was conceptualized to analyse the effectiveness of iv dexmedetomidine and iv esmolol for attenuating hemodynamic response during endotracheal extubation in terms of change in heart rate (HR) and mean blood pressure (MBP) as primary outcome and emergence time, extubation time, Ramsay sedation score and adverse effects as secondary outcome. Confounding factors were prolonged extubation time, instrumentation during extubation, duration and extent of surgery and type of surgery.

Materials and Method

The present prospective, randomized double-blind study was carried out at Tertiary Care Hospital after approval from Institutional Scientific and Ethics Committee and registration in the Clinical Trials Registry of India (CTRI/2022/05/042940).

Total 80 patients of 18-60 year age belonging to ASA I-II, scheduled for elective surgery under general anaesthesia were included in the study. Any patient who refused to give consent, had known hypersensitivity reaction, surgery lasting for more than two hours, had any systemic comorbidities (hypertension, ischemic heart disease, aortic stenosis, left ventricular failure, atrio-ventricular conduction block, sinus bradycardia, asthma, chronic obstructive pulmonary disease, severe hepatic and renal disease), anticipated difficult airway, novel corona virus positive, pregnant and lactating mother, on antihypertensives and MAO inhibitors were excluded from the study.

For sample size calculation, study done by Solanki R K *et al.* [6] was taken into consideration. At 1 min post extubation (T6), mean HR was 76.02±7.16 bpm and 80.67±6.95 bpm and MAP was 90.07±4.78 mmHg and 96.09±6.01 mmHg in dexmedetomidine and esmolol group, respectively. The sample size was calculated by using "R" statistical software and program. With 95% confidence interval and power of 80%, sample size (including both groups) required was 80 (40 in each group).

After thorough preoperative checkup, written and informed consent was taken. Patients were kept nil by mouth for 8 hours prior to the surgery. After confirming patient's identification, consent form, diagnosis on the day of surgery, patients were randomly assigned into two groups (n=40) using sequentially numbered opaque sealed envelope (SNOSE) technique: Group D (dexmedetomidine) and group E (esmolol). (Figure 1) Trained person who was not involved in the study prepared the opaque envelope with code and the drugs as per the allocation group. (Figure 1)

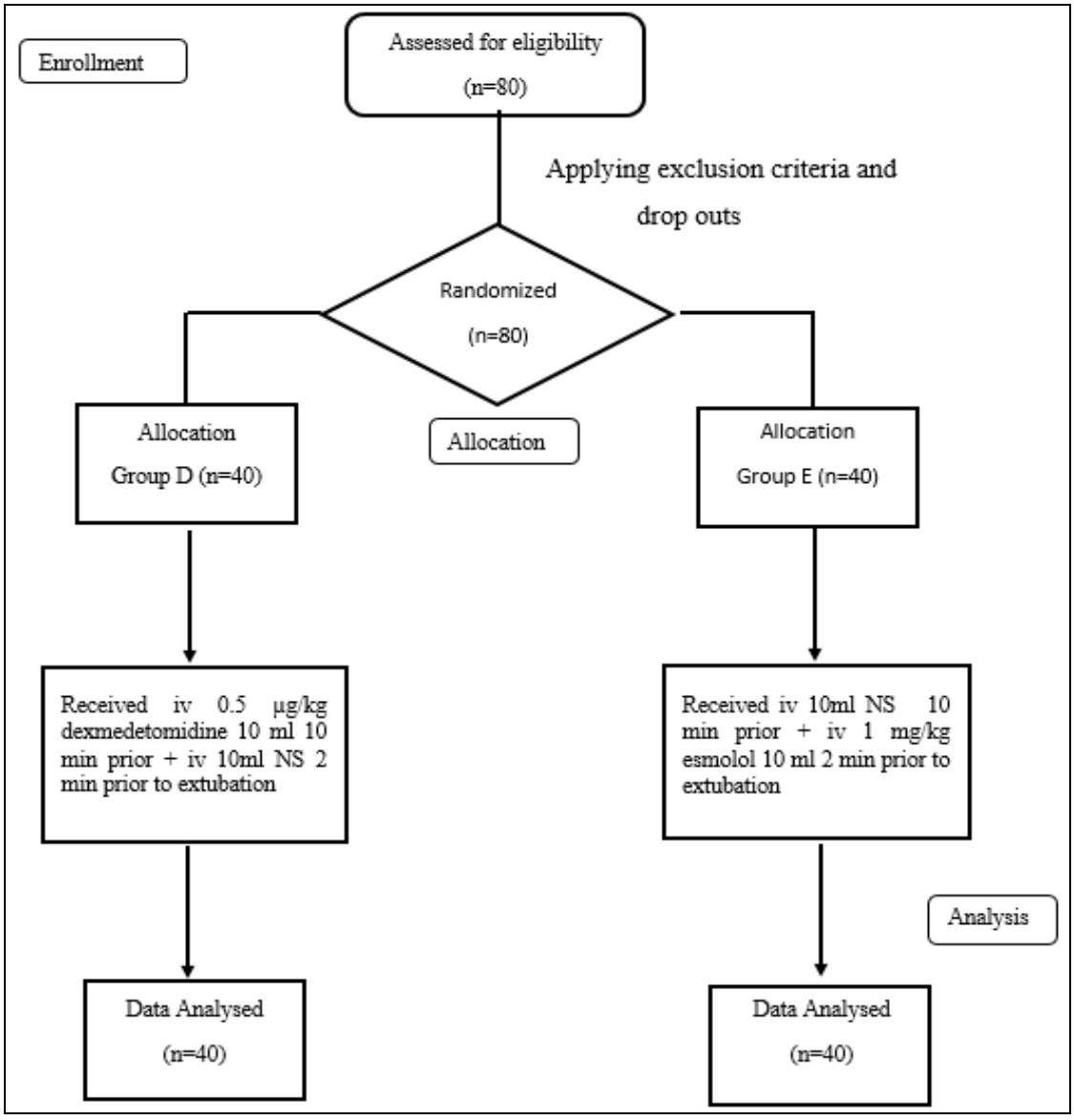

Fig 1: Consort diagram

On arrival in the operation theatre, patients were positioned supine, intravenous line was secured and Ringer's lactate was started. Multipara monitor was attached and heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), respiratory rate (RR), SpO_2 and $EtCO_2$ were recorded every 15 minutes but observed every 5 minutes throughout the study.

All patients were premedicated with intravenous (iv) midazolam 0.2 mg/kg, iv glycopyrrolate 0.1 mg/kg followed by iv fentanyl 1 µg/kg and preoxygenated with 100% oxygen for 3 minutes. Induction was carried out with iv propofol 2 mg/kg in titrated dose till the loss of verbal response and iv succinylcholine 2 mg/kg was given to facilitate tracheal intubation. After tracheal intubation, general anaesthesia was maintained 66% nitrous oxide in oxygen, sevoflurane 1-2% and iv atracurium 0.6 mg/kg.

Anticipated ten minutes before the extubation, Group D received intravenous dexmedetomidine 0.5 µg/kg diluted in 10 ml normal saline (NS) and Group E received 10 ml of NS. Two min before extubation Group D received 10 ml NS and Group E received intravenous esmolol 1mg/kg diluted in 10 ml NS. At the end of the surgery sevoflurane and N_2O were stopped and patients were reversed with iv glycopyrrolate 0.01 mg/kg and iv neostigmine 0.05 mg/kg. Extubation was done when patients had adequate respiratory efforts and were able to obey commands.

The observation was taken by the anaesthesiologist who was not involved in the study. HR, SBP, DBP, MBP, SpO_2, RR, $EtCO_2$ were recorded intraoperatively every 15 min till the time of drug administration, during the time of I drug administration (considered as baseline value), then 1 min, 2 min, 3 min, 5 min, II drug administration (8 min), 10 min of drug administration, at the time of extubation then 1 min, 2 min, 3 min, 4 min, 5 min, and 7 min, 10 min, 15 min, 20 min post extubation.

Emergence time (time interval from discontinuation of anaesthetic agent to patient following verbal commands) and extubation time (time interval from discontinuation of anaesthetic agents to tracheal extubation) were assessed. Sedation score was recorded at 15 minutes postextubation using Ramsay sedation score (1: anxious, agitated, restless, 2: cooperative, oriented, tranquil, 3: drowsy but responds to commands, 4: asleep, brisk response to light glabellar tap or loud auditory stimulus, 5: asleep, sluggish response to light glabellar tap or loud auditory stimulus, 6: asleep and unarousable). Any adverse events (e.g., delayed emergence, laryngospasm, bronchospasm, desaturation, respiratory depression, nausea, vomiting, hypotension, bradycardia, dry mouth, cough, agitation) within 20 min of extubation were documented.

MBP<55 mmHg was considered as hypotension and was managed with rapid administration of IV fluids and iv mephenteramine 5-10 mg. Any sinus bradycardia (HR<55/min), was managed with rescue dose of iv atropine 0.6 mg.

Data was entered in Microsoft Excel and analysed using SPSS (Statistical Package for Social Sciences), version 25 and expressed as number, percentage, mean and standard deviation. Student unpaired t test was used to compare the mean values of different parameters and intra-group comparison was done by paired t-test. p value<0.05 was considered as statistically significant.

Results

Demographic variables like age, sex, BMI and ASA physical status, type and duration of surgery were statistically comparable between the two groups. (Table 1)

Table 1: Demographic profile and Duration of surgery

	Group D (n=40)	Group E (n=40)	p value
Age (years) mean±SD	36.93±10.47	40.18±9.43	0.15
Sex (male: female)	20:20	19:21	0.80
BMI (kg/m^2) mean±SD	22.17±1.62	22.59±1.24	0.18
ASA physical status (I/II)	19/21	22/18	0.34
Duration of surgery (min) mean±SD	91.87±19.63	94.25±18.52	0.58

Our study included various procedures like cholecystectomy, appendicectomy, modified radical mastectomy, hernioplasty, excision, parotidectomy, FESS (functional endoscopic sinus surgery)**,** excision of rhino mass with wide base cauterization, tympanoplasty, antero-choanal polypectomy and hemithyroidectomy. Majority of the cases were ENT surgeries.

Mean HR was comparable in both the groups at preinduction, throughout the surgery and before the first study drug administration (p>0.05). In group D, there was statistically significant decrease in mean HR as compared to baseline (I drug administration) value from 3 min after I drug administration till 20 min post extubation (p<0.05). Similarly in group E there was statistically significant decrease in mean HR as compared to baseline (I drug administration) during extubation and till 4 min post extubation (p<0.05). In both the groups, HR was statistically comparable from preinduction value till 3 min after administration of drugs. Thereafter, mean HR was significantly lower in group D from 5min after administration of drug, till 20 min post extubation) as compared to group E (p<0.05). (Table 2)

Table 2: Mean heart rate

	Mean Heart Rate (beats per minute)				p value
Time interval	**Group D**	**p value**	**Group E**	**p value**	**Group D vs Group E**
Preinduction	85.15±4.23	-	86.00±4.45	-	0.38
15 min	84.85±4.32	0.32	85.93±4.05	0.81	0.25
30 min	85.00±4.14	0.68	85.54±4.05	0.89	0.56
45 min	85.18±3.91	0.95	86.13±4.45	0.79	0.32
60 min	85.40±3.83	0.84	86.23±4.16	0.67	0.36
75 min	85.03±3.52	0.89	86.62±3.96	0.52	0.06
90 min	85.52±3.60	0.71	86.40±3.77	0.66	0.28
I Drug administration (Baseline)	86.55±3.71	0.12	85.28±3.99	0.78	0.14
1 min	86.33±3.92	0.79	86.05±3.40	0.648	0.73
2 min	85.55±4.41	0.033	85.70±3.84	0.392	0.87
3 min	84.88±4.71	0.006	85.78±3.81	0.443	0.35
5 min	83.08±4.70	<0.001	85.40±3.69	0.213	0.02
II Drug administration (8 min)	81.85±5.89	<0.001	85.23±4.00	0.162	<0.001
10 min	80.73±6.32	<0.001	84.63±4.48	0.056	<0.001
At the time of extubation	82.45±7.05	<0.001	84.08±4.78	0.030	<0.001
1 min	78.50±6.30	<0.001	81.58±5.54	<0.001	0.02
2 min	77.83±5.95	<0.001	80.68±5.88	<0.001	0.03
3 min	77.23±5.60	<0.001	80.08±6.33	<0.001	0.04
4 min	76.63±5.72	<0.001	79.38±6.08	<0.001	0.04
5 min	75.78±4.79	<0.001	83.28±5.93	0.064	<0.001
7 min	75.63±5.34	<0.001	84.85±3.89	0.062	<0.001
10 min	75.48±5.91	<0.001	84.93±3.74	0.07	<0.001
15 min	75.05±5.84	<0.001	84.85±3.95	0.064	<0.001
20 min	74.43±5.84	<0.001	84.95±4.08	0.089	<0.001

In both the groups, mean SBP, DBP and MBP were comparable throughout the surgery until I drug administration with preinduction value (p>0.05). In group D, there was progressive decrease in SBP, DBP, and MBP starting from 5min after I drug administration till 20 min post extubation compared to baseline which was statistically significant (p<0.05). In group E, there was significant decrease in mean SBP, DBP and MBP from extubation till 4 min post extubation compared to baseline (p<0.05). Between the groups, mean SBP, DBP, and MBP were significantly lower in group D as compared to group E from 8 min after administration of drug till 20 min of post extubation (p<0.05). [Table 3, 4, and 5].

Table 3: Mean systolic blood pressure

	Mean SBP (mmHg)				p value
Time interval	**Group D**	**p value**	**Group E**	**p value**	**Group D vs Group E**
Preinduction	121.20±3.53		119.80±3.33		0.07
15 min	121.40±4.08	0.82	119.70±3.82	0.90	0.06
30 min	120.18±4.00	0.23	118.73±3.07	0.14	0.08
45 min	119.73±3.86	0.08	118.53±2.76	0.07	0.11
60 min	119.63±4.51	0.08	118.48±3.18	0.07	0.11
75 min	120.16±4.07	0.23	119.23±3.72	0.48	0.28
90 min	121.79±3.76	0.51	120.81±2.99	0.15	0.20
I Drug administration (Baseline)	122.00±3.59	0.39	120.48±3.82	0.40	0.07
1 min	122.68±3.55	0.40	121.05±4.27	0.530	0.08
2 min	122.13±3.57	0.87	120.45±4.58	0.975	0.07
3 min	120.98±3.74	0.22	119.65±4.13	0.354	0.14
5 min	119.50±3.78	<0.001	119.43±4.40	0.258	0.94
II Drug administration (8 min)	118.20±4.30	<0.001	121.88±3.94	0.111	<0.001
10 min	116.93±4.61	<0.001	118.78±3.00	0.03	0.03
At the time of extubation	118.53±5.39	<0.001	117.38±4.41	<0.001	0.01
1 min	114.73±5.65	<0.001	117.13±4.35	<0.001	0.001
2 min	113.53±5.94	<0.001	115.90±4.16	<0.001	0.001
3 min	112.30±5.89	<0.001	114.65±4.32	<0.001	0.001
4 min	112.20±5.12	<0.001	116.70±3.74	<0.001	0.001
5 min	111.68±4.82	<0.001	118.80±4.41	0.072	<0.001
7 min	111.65±4.41	<0.001	119.10±5.09	0.120	<0.001
10 min	111.63±3.96	<0.001	119.30±4.14	0.190	<0.001
15 min	111.60±3.62	<0.001	120.23±3.98	0.775	<0.001
20 min	111.58±3.45	<0.001	120.78±3.93	0.730	<0.001

Table 4: Mean diastolic blood pressure

	Mean DBP (mmHg)				p value
Time interval	**Group D**	**p value**	**Group E**	**p value**	**Group D vs Group E**
Preinduction	82.30±4.10	-	80.48±4.67	-	0.06
15 min	82.48±3.60	0.64	80.88±4.22	0.68	0.07
30 min	82.03±2.97	0.73	80.78±3.58	0.75	0.09
45 min	82.03±3.07	0.74	81.25±3.70	0.42	0.31
60 min	82.13±3.01	0.83	80.73±4.21	0.81	0.10
75 min	82.19±3.19	0.89	80.95±4.32	0.64	0.15
90 min	82.90±3.94	0.51	81.13±4.43	0.52	0.07
I Drug administration (Baseline)	83.95±4.56	0.56	82.23±4.90	0.11	0.11
1 min	83.85±4.09	0.727	82.40±4.78	0.074	0.15
2 min	83.40±4.31	0.890	81.53±4.65	0.514	0.07
3 min	82.10±4.53	0.142	80.85±5.06	0.221	0.25
5 min	81.23±4.43	0.018	79.70±4.77	0.022	0.14
II Drug administration (8 min)	80.33±4.86	0.001	78.18±3.66	<0.001	0.03
10 min	78.98±4.10	<0.001	76.85±3.83	<0.001	0.02
At the time of extubation	78.20±4.32	<0.001	76.10±4.43	<0.001	0.03
1 min	77.58±4.16	<0.001	75.50±4.84	<0.001	0.04
2 min	76.58±4.14	<0.001	74.55±4.60	<0.001	0.04
3 min	75.50±4.44	<0.001	73.35±4.68	<0.001	0.04
4 min	74.53±4.32	<0.001	81.68±5.66	0.643	<0.001
5 min	73.83±4.30	<0.001	81.45±5.40	0.503	<0.001
7 min	73.25±4.25	<0.001	81.30±5.61	0.435	<0.001
10 min	73.13±4.48	<0.001	81.60±5.64	0.598	<0.001
15 min	73.55±4.50	<0.001	81.63±5.57	0.611	<0.001
20 min	83.08±6.33	0.48	81.88±5.39	0.762	0.36

Table 5: Mean blood pressure

	MBP (mmHg)				p value
Time interval	**Group D**	**p value**	**Group E**	**p value**	**Group D vs Group E**
Preinduction	95.12±2.76	-	94.34±3.50	-	0.2
15 min	95.00±2.50	0.83	94.18±2.91	0.82	0.18
30 min	94.32±2.17	0.15	94.01±2.89	0.64	0.58
45 min	94.59±2.01	0.32	93.01±2.79	0.06	0.62
60 min	94.52±2.45	0.30	93.14±3.02	0.10	0.63
75 min	94.90±2.16	0.69	94.03±2.65	0.65	0.11
90 min	95.71±2.46	0.52	94.73±3.02	0.60	0.11
I Drug administration (Baseline)	96.90±3.39	0.91	95.96±3.33	0.50	0.24
1 min	96.79±2.69	0.99	95.91±3.24	0.47	0.23
2 min	96.30±3.01	0.554	95.60±3.26	0.38	0.19
3 min	95.67±3.40	0.51	95.42±3.41	0.31	0.74
5 min	94.06±3.43	0.001	95.30±3.36	0.24	0.55
II Drug administration (8 min)	92.83±3.61	<0.001	94.79±2.66	0.10	0.007
10 min	92.80±3.72	<0.001	94.33±3.00	0.09	0.05
At the time of extubation	94.70±4.32	<0.001	93.00±3.01	<0.001	0.04
1 min	91.25±4.49	<0.001	92.98±3.00	<0.001	0.04
2 min	89.17±4.58	<0.001	91.78±3.51	<0.001	0.005
3 min	87.29±4.53	<0.001	90.15±3.45	<0.001	0.003
4 min	87.08±4.12	<0.001	91.52±3.39	<0.001	0.001
5 min	86.44±3.73	<0.001	90.70±4.02	0.103	0.001
7 min	86.05±3.12	<0.001	94.67±4.15	0.101	0.001
10 min	85.95±3.60	<0.001	95.16±3.84	0.266	<0.001
15 min	85.38±3.84	<0.001	95.23±3.79	0.301	<0.001
20 min	85.23±3.80	<0.001	95.42±3.70	0.418	<0.001

Mean RR, SpO_2, and $EtCO_2$ were comparable throughout the study period at all measured time interval (p>0.05) in both the groups.

Mean emergence and extubation time were 5.05±3.03 min and 5.70±3.08 min in group D whereas 4.48±0.88 min and 5.18±0.90 min in group E; respectively which was statistically not significant (p>0.05).

Thirty-two (80%) patients in group D had Ramsay sedation score 3 whereas none of the patients had score 3 in group E. The mean score at 15 min post extubation in group D and group E was 2.825±0.118 and 1.925±0.08; respectively which was statistically significant (p<0.05). (Table 6)

Table 6: Ramsay sedation score

Ramsay Sedation Score	Group D	Group E
	n (%)	n (%)
1	0	3 (7.5%)
2	8 (20%)	37 (92.5%)
3	32 (80%)	0
4	0	0
5	0	0
6	0	0
15 min (mean±SD)	2.65±0.142	1.925±0.082

The incidence of adverse events are depicted in figure 2.

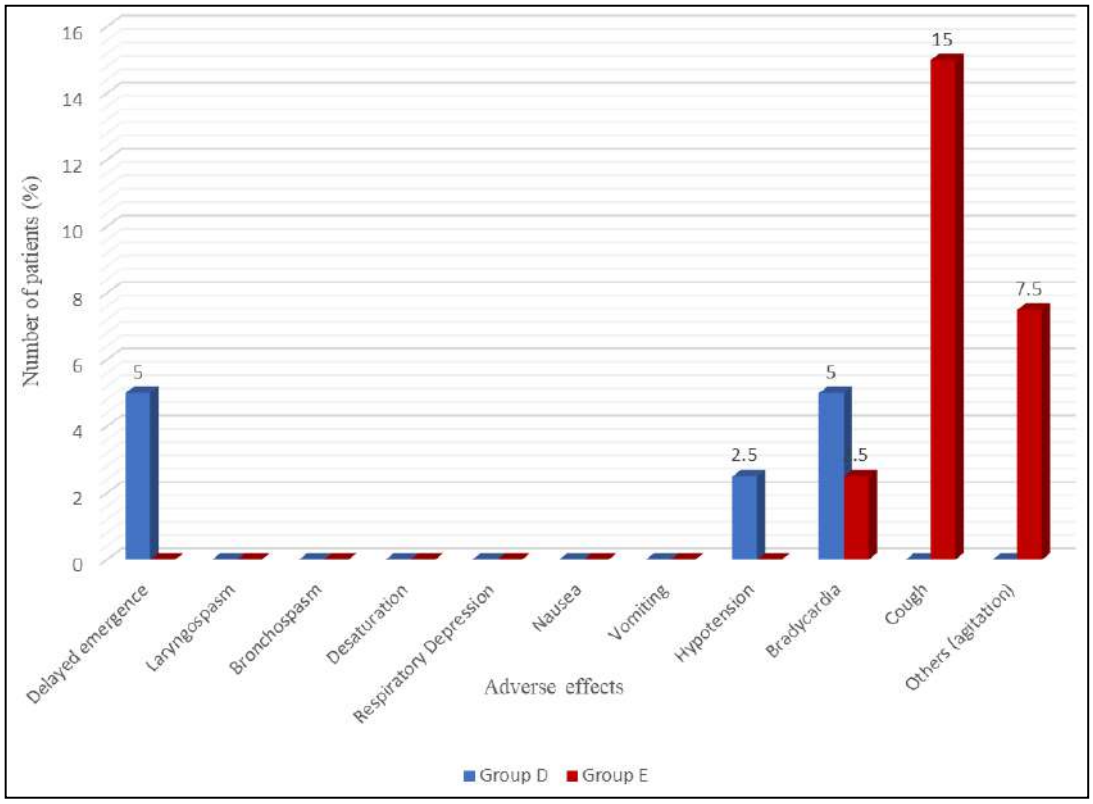

Fig 2: Adverse events

Discussion

Haemodynamic and airway changes during extubation can be detrimental to the patient. There is 10-30% increase in blood pressure and heart rate which are acute, transient, significant and unpredictable [7]. Respiratory complications are three times more common during extubation than during intubation and induction of anaesthesia (4.6% vs 12.6%) [7]. These changes may lead to arrythmias, left ventricular failure, myocardial infarction, upper airway obstruction, laryngospasm, bronchospasm, vocal cord palsy leading to hypoventilation, pulmonary aspiration, negative pressure pulmonary oedema[8]. Thus, present study was undertaken to circumvent these haemodynamic responses to tracheal extubation.

In our study, intragroup comparison showed significant decrease in mean HR from baseline till 20 min in group D and 4 min in group E. The intergroup comparison revealed statistically significant reduction in mean HR which was significantly more in group D from 5 min after administration of drug till 20 min post extubation as compared to group E (p<0.05). Kotak N *et al.* [9], Solanki R K *et al.* [6], Amarappa G *et al.* [10] and Mamde R *et al.* [11] also observed decreasing trend in mean HR till 20 min post extubation which was similar to our study. This might be due to the similar drug doses (dexmedetomidine 0.5 µg/kg and esmolol 1 mg/kg) and timing of administration (dexmedetomidine - anticipated 10 min before the end of the surgery and esmolol - 2 min before the end of surgery). In both the groups, Solanki R K *et al.* [6] observed similar decreasing trend in mean HR but for longer duration and was slightly lower than our finding which might be due to usage of higher dose of dexmedetomidine 0.75 µg/kg and esmolol 1.5 mg/kg compared to our study.

Mean SBP was comparable till 5 min of administration of drugs in our study. In both the groups mean SBP was significantly lower in group D as compared to group E from 8 min after administration of drug till 20 min of post extubation. (p<0.05). Solanki R K *et al.* [6] and Mamde R *et al.* [11] observed decreasing trend in mean SBP in group D compared to group E for longer time post extubation. Their study was in accordance with our study as similar trend was seen as in our study. Fall in mean SBP was more in study done by Solanki R K *et al.* [6] as higher dose of dexmedetomidine 0.7 µg/kg and esmolol 1.5 mg/kg was used in their study compared to our study.

In both the groups, mean DBP was comparable till 5 min of administration of drugs in our study. Thereafter mean DBP was significantly lower in group D as compared to group E from 8 min of drug administration till 15 min post extubation (p<0.05). Decreasing trend in mean DBP in group D compared to group E for 15 min post extubation observed in the study by Mamde R *et al.* [11] was in accordance with our study. This might be due to same drug doses (dexmedetomidine 0.5µg/kg and esmolol 1 mg/kg) and timing of administration (dexmedetomidine - anticipated 10 min before the end of the surgery and esmolol - 2 min before the end of surgery) in both the studies.

In present study, intragroup MBP was significantly lower when compared to baseline value till 20 min postextubation in group D and 4 min post extubation in group E (p<0.05). MBP was significantly lower in group D as compared to group E from 8 min after administration of drug till 20 min of post extubation (p<0.05). Rao S G *et al.* [12] and Mamde R *et al.* [11] observed similar decreasing trend in MBP in group D compared to group E till 20 min post extubation. Their study was in accordance with our study as same dosages of dexmedetomidine (0.5 µg/kg iv) and esmolol (1 mg/kg iv) were used and the timing of administration were also same.

Bindu B *et al.* [13] observed a decreasing trend in mean HR, SBP, DBP and MAP in dexmedetomidine group from 1 min post extubation till 15 min post extubation which was in

accordance with our study. The decrease in all four parameters was more in their study. This might be due to the higher dose of dexmedetomidine (0.75 µg/kg) used in their study compared to 0.5 µg/kg in our study.

Mean extubation time was 5.70±3.08 min in group D in our study and it was statistically comparable to group E. Rao S G *et al*. [12] observed prolonged extubation time in dexmedetomidine group which might be due to the use of iv pentothal sodium and patients were extubated as per subjective and objective criteria. Solanki R K *et al*. [6] also observed prolonged extubation time in dexmedetomidine group as higher dose of dexmedetomidine 0.7 µg/kg was used. To the best of my knowledge, none of existing literature had mentioned about the extubation time following iv esmolol.

Higher sedation scores were observed in group D as compared to group E in our study (p<0.05) which was similar to findings observed by Solanki R K *et al*. [6]. Jamal M K *et al*. [14] conducted a study on three different doses of dexmedetomidine A (0.5 µg/kg), B (0.75 µg/kg), and C (1 µg/kg) and observed the mean sedation score of group A (2.6±0.72) to be similar to our study as same dose was used and of group C (3.5±0.57) was higher than our study (2.825±0.118) due to higher dose used in their study.

Hypotension and bradycardia were observed in 3 and 1 patient in group D and E; respectively. None of the patients required any intervention. Studies done by Kotak N *et al.* [9] and Mamde R *et al*. [11] were in accordance with our study (i.e., similar incidence of hypotension and bradycardia). This might be due to as same dosages of drugs were used and timing of administration was also same. Six (15%) patients reported cough in group E while none in group D. Agitation was seen in 3 (7.5%) in group E whereas nil in group D.

There were some limitations in our study; only ASA grade I and II patients were included, high risk patients were not included in whom even a small difference in haemodynamics might have greater impact on the outcome. Emergency surgeries were not included. Other critical dimensions for pain threshold including ethnic or cultural background, educational level, fear or sleep deprivation were also left out of the evaluation.

Conclusion

From the results, it is observed that though the HR and MBP decreased for a longer time but not to extent that required treatment after dexmedetomidine injection. Emergence and extubation time were comparable and postoperative complications like cough and agitation was almost nil following dexmedetomidine injection might be because of conscious sedation. Hence, we can conclude that iv dexmedetomidine is better in attenuating haemodynamic response to tracheal extubation than esmolol because of comparatively stable haemodynamics, comparable emergence and extubation time, conscious sedation, less postoperative cough and agitation.

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References

1. Karmarkar S, Varshney S. Tracheal extubation. Continuing Education in Anaesthesia Critical Care and Pain. 2008;8(6):214-20.
2. Miller KA, Harkin CP, Bailey PL. Postoperative tracheal extubation. Anesthesia and analgesia. 1995;80(1):149-172.
3. Prajwal patel HS, Shashank MR, Shivaramu BT. Attenuation of haemodynamic response to tracheal extubation: A comparative study between esmolol and labetalol. Anaesthesia, Essays and Researches. 2018;12(1):180-119, 185.
4. Kovac AL, Masiongale A. Comparison of nicardipine versus esmolol in attenuating the haemodynamic responses to anaesthesia emergence and extubation. J Cardiothorac Vasc Anesth 2007;21:45-50.
5. Jee D, Park SY. Lidocaine sprayed down the endotracheal tube attenuates the airway-circulatory reflexes by local anesthesia during emergence and extubation. Anesth Analg. 2003;96:293-297.
6. Solanki RK, *et al*., Sch. J. App. Med. Sci., Jan. 2018;6(IE):310-316.
7. Karmarkar S, Varshney S. Tracheal extubation. Continuing Education in Anaesthesia Critical Care and Pain. 2008;8(6):214-20.
8. Hartley M, Vaughan RS. Problems associated with tracheal extubation. British journal of anaesthesia. 1993;71(4):561-568.
9. Desai P, Kotak N, Mamde R. Prospective randomized comparative trial of dexmedetomidine versus esmolol for attenuation of extubation response. Med J DY Patil Vidyapeeth. 2019;12(2):131.
10. Amarappa G, Thayappa CB, B RS, *et al*. Dexmedetomidine versus Esmolol to attenuate the extubation response following surgeries under general anaesthesia - A comparative study. MIJOANS. 2019;10(2):83-89.
11. Mamde R, Chhallani VP, Jaiswal AV. Attenuation of Extubation Response in Patients Undergoing Abdominal and Lower Limb Surgeries under General Anesthesia – A Comparative Study between Dexmedetomidine and Esmolol. Int J Sci Stud 2019;7(6):22-27.
12. Rao SG, Sudarshan MB, Srinivas VY. Effect of dexmedetomidine and esmolol on extubation. JEBMH. 2017 2;4(79):4650-4655.
13. Bindu B, Pasupuleti S, Gowd U, *et al*. A double blind, randomized, controlled trial to study the effect of dexmedetomidine on hemodynamic and recovery responses during tracheal extubation. J Anaesthesiol Clin Pharmacol. 2013;29(2):162.
14. Jamal MK. A Comparative Study of Effects of Three Different Doses of Dexmedetomidine on Extubation. JMSCR. 2018 3, 6(3).

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