

## COMPARISON OF THE EFFECT OF I.V DEXMEDETOMIDINE AND FENTANYL ON HAEMODYNAMIC AND AIRWAY RESPONSES DURING EMERGENCE FROM GENERAL ANAESTHESIA

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### Abstract

**Introduction:** Extubation of the trachea is a process of discontinuing the artificial airway when the necessities for its use like ventilation, protection of the airway, obstruction of the airway and hypoxia are corrected. It is one of the most uncomfortable state during general anaesthesia with the complications occurring during and after extubation being three times more common than that occurring during tracheal intubation and induction of anaesthesia.

**Materials and methods:** After obtaining institutional ethics committee approval, the study was conducted in 100 patients belonging to ASA 1 & 2 undergoing surgeries in GA. Pre-anaesthetic assessment of the patient was done with a complete history, physical examination and routine investigations and informed written consent was taken. Pulse Rate(PR), Systolic Blood Pressure(SBP), Diastolic Blood Pressure(DBP), Mean Arterial Pressure(MAP), Oxygen Saturation(SpO<sub>2</sub>) were recorded post extubation every 2 min for 10 min, thereafter every 10 min for 1 hour and quality of extubation was analyzed on a five point score (Extubation quality score) based on the patient's comfort and response.

**Results:** mean age in group D is 34.04± 7.16 and in group F is 34.54 ± 7.89 and mean weight in group D is 55.86± 8.87 and in group F is 57.34 ± 9.17. Difference between both the groups were statistically insignificant. (**p>0.05**). The baseline mean SBP in the group D was 125.08± 6.95 and in the group F it was 126.64± 6.56. Statistical analysis shows a P value of baseline SBP as 0.125 which is statistically insignificant. The mean SBP just prior to extubation in the group D was 109.32±5.51 and in the group F it was 120.84± 3.94. Statistical analysis shows a P value of SAB before extubation as 0.00003 which is statistically significant.

**Conclusion:** From the observation and results of our study it is concluded that I.V. Dexmedetomidine when given in the dose of 0.5 µg/kg 10 mins prior to extubation effectively attenuates haemodynamic responses, airway reflexes with providing adequate sedation postoperatively thus allowing smoother extubation when compared to Fentanyl 1.0 µg/kg.

**Key Words:** artificial airway, hypoxia, Diastolic Blood Pressure, Mean Arterial Pressure.

## INTRODUCTION

Extubation of the trachea is a process of discontinuing the artificial airway when the necessities for its use like ventilation, protection of the airway, obstruction of the airway and hypoxia are corrected. It is one of the most uncomfortable state during general anaesthesia with the complications occurring during and after extubation being three times more common than that occurring during tracheal intubation and induction of anaesthesia.<sup>1</sup>

It is almost always associated with hemodynamic changes and can stimulate airway reflexes by laryngeal and tracheal irritation. 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  $\alpha$  and  $\beta$  adrenergic receptors.<sup>2</sup>

Extensive research has been done to attenuate hemodynamic responses to intubation, but the same care and precautions are seldom carried out for extubation. A reliable technique for rapid and smooth extubation is still not fully evolved. Recommendations are manifold but the technique besides minimizing the haemodynamic responses must be applicable easily, prevent impairment of CBF and should not affect the duration or modality of ensuing anaesthesia. Trials have been conducted to attenuate the hemodynamic and stressor responses during tracheal extubation by using various drugs like opioids, inhalational agents, local anaesthetics, vasodilators, alpha blockers, betablockers and calcium channel blockers.<sup>3</sup>

Fentanyl, an opioid agonist, may blunt cardiovascular and airway reflexes during emergence without prolonging the recovery. Dexmedetomidine, an  $\alpha_2$ -adrenoreceptor agonist with a distribution half-life of approximately 6 minutes has sedative, analgesic, sympatholytic and anxiolytic effects, mitigates most of the cardiovascular responses in the perioperative period. Currently, dexmedetomidine is indicated for intensive care unit sedation in mechanically ventilated patients and for sedation of non-intubated patients before or during surgical and other procedures. So it might be a useful agent to attenuate the response to extubation as it provides sedation, hemodynamic stability and does not depress respiration.<sup>4</sup>

With this background, this study was conceptualized to analyse & compare the effect of sedation with single-dose dexmedetomidine and fentanyl on the attenuation of circulatory and airway response to endotracheal extubation.

## AIMS AND OBJECTIVES

**Aim of the study:** The purpose of this study is to analyze and compare the properties of dexmedetomidine with that of fentanyl on the hemodynamic changes and variations in the recovery profile that occur during endotracheal extubation.

**Primary objectives:**

- To compare the effects of dexmedetomidine and fentanyl on hemodynamic responses to extubation and emergence from general anaesthesia.

- To compare the effects of dexmedetomidine and fentanyl on airway responses to extubation and emergence from general anaesthesia.

**Secondary objectives:**

- To compare Post-operative sedation with the study drug.
- To study the occurrence of any side effects and complications related dexmedetomidine and fentanyl.

**MATERIALS AND METHODS**

**Source of the Study:** Patients posted for elective surgeries under General anaesthesia in department of Anaesthesia, GMC Bhopal and associated Hamidia Hospital.

**Design of The Study:** Comparative observational study.

**Period of the study:** January 2018 – July 2019.

**Sample size:** 100 patients

**Inclusion criteria:**

- Age 18yrs - 60 yrs of either sex.
- ASA grades 1 and 2.
- Mallampati grades 1 and 2.
- Surgeries under GA such as ENT surgeries, laparotomy, Mastectomy, etc.

**Exclusion criteria:**

- Age <18yrs and >60yrs.
- ASA grades 4 and more.
- Mallampati grades 3 and 4.
- History of serious pulmonary, coronary artery or cervical spine disease.
- Patient with h/o bronchial asthma and drug abuse.
- Patients with pheochromocytoma, patients on beta-blockers, antidepressants, anticonvulsants, antipsychotics.
- Any predicted difficult airway.

**Materials**



**Figure 3: DEXEM™ Ampoule - Contains Dexmedetomidine hydrochloride injection with a concentration of 100ug/ml**



**Figure 4: VERFEN™ Ampoule – Contains Fentanyl citrate injection with a concentration of 50ug/ml**

#### **METHODOLOGY**

After obtaining institutional ethics committee approval, the study was conducted in 100 patients belonging to ASA 1 & 2 undergoing surgeries in GA. Pre-anaesthetic assessment of the patient was done with a complete history, physical examination and routine investigations and informed written consent was taken.

In the operation theatre, intravenous line, pulse oximeter, electrocardiograph and a noninvasive blood pressure monitor were attached and baseline values of hemodynamic parameters were recorded following a stabilization period of 3-5 minutes. Patients were premedicated with Inj. ondansetron 0.08 mg/kg, Inj. glycopyrrolate 0.01mg/kg, Inj. midazolam 0.05mg/kg, Inj. Fentanyl 1.5mg/kg. Preoxygenation with 100% oxygen was done for 3 minutes and anaesthesia was induced with Inj. Propofol 2mg/kg and Inj. Succinylcholine 2mg/kg was used for facilitation of intubation and muscle relaxation. Mask ventilation was done for 1 minute after injection of succinylcholine and endotracheal intubation was done, IPPV was started. Patients were maintained on 50% nitrous oxide and 50% oxygen and Isoflurane 0.2% - 1%. Atracurium at the dose of 0.1mg/kg body weight was used for maintenance of muscle paralysis. The concentration of isoflurane was increased or decreased during surgery to maintain BP and HR between 80% and 120% of the preoperative values. Hypotension (a decrease in SBP >25% from baseline or an SBP <90 mm hg) was controlled by increasing the fluid infusion rate and decreasing gas concentrations.

At the beginning of closure of skin incision, Isoflurane was discontinued and dexmedetomidine 0.5mcg/kg body weight diluted to 50 ml in normal saline was infused over 10 minutes in Group D patients. Group F patients received iv fentanyl 1.0mcg/kg diluted up to 50 ml with normal saline as infusion over 10 minutes. Residual neuromuscular block was antagonized with neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg following which oropharyngeal secretions were aspirated before extubation and the endotracheal tube was removed smoothly.

Pulse Rate(PR), Systolic Blood Pressure(SBP), Diastolic Blood Pressure(DBP), Mean Arterial Pressure(MAP), Oxygen Saturation(SpO<sub>2</sub>) were recorded post extubation every 2 min for 10 min, thereafter every 10 min for 1 hour and quality of extubation was analyzed on a five point score (Extubation quality score) based on the patient's comfort and response.

### EXTUBATION QUALITY SCORE

Extubation quality score	Extubation response
1	Patient is having no cough
2	Endotracheal extubation is smooth and the patient is having cough - one or two times (minimal)
3	Patient is having cough - three or four times (moderate)
4	Patient is having cough - five to ten times (severe)
5	Patient is having cough - more than ten times or laryngospasm or breath holding. Extubation is poor and the patient is restless.

Post Operative Sedation was evaluated using Ramsay Sedation Scale.

### RAMSAY SEDATION SCALE

Score	Response
1	Patient anxious and agitated or restless or both
2	Patient cooperative, oriented, and tranquil
3	Patient drowsy but responds to commands
4	Brisk response to light glabellar tap or loud auditory stimulus
5	Sluggish response to light glabellar tap/loud auditory stimulus
6	No response to light glabellar tap or loud auditory stimulus

Adverse events such as bradycardia, hypotension, hypertension, nausea, vomiting, shivering, cough, laryngospasm, bronchospasm or desaturation was noted.

**Statistical Analysis:** All data analysis were compiled in the form of mean and standard deviation and the *t* test was used for between-group comparisons of HR, SBP, DBP, and SpO<sub>2</sub> while the chi square test was used to analyze extubation and sedation scores, sex, and adverse events using computer software SPSS of windows and P value less than 0.05 was considered as statistically significant.

**RESULTS**

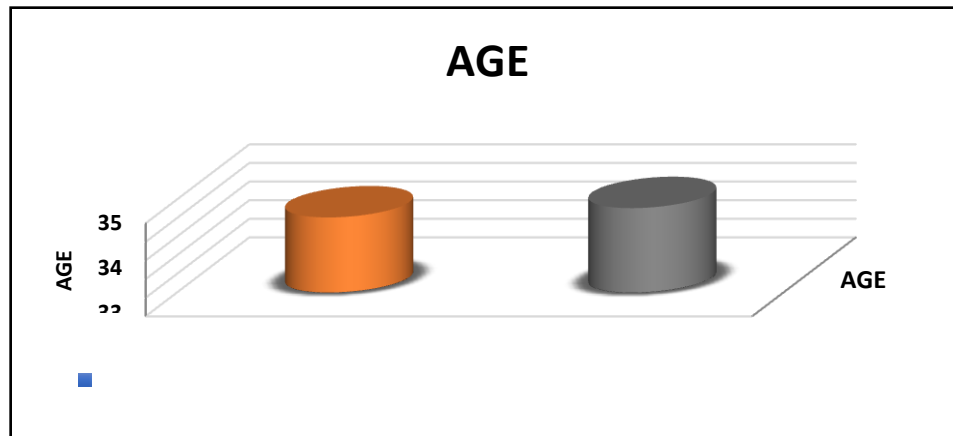
**Table -1: showing group distribution according to study drugs**

<b>GROUPS (NO. OF PATIENTS)</b>	<b>STUDY DRUGS AND ITS DOSE (given as an infusion over 10 minutes)</b>
GROUP D(n=50)	i/v Dexmedetomidine 0.5mcg/kg diluted upto 50ml in normal saline
GROUP F(n=50)	i/v Fentanyl 1.0mcg/kg diluted upto 50 ml in normal saline

**Table -2: demographic data of patients in two study groups**

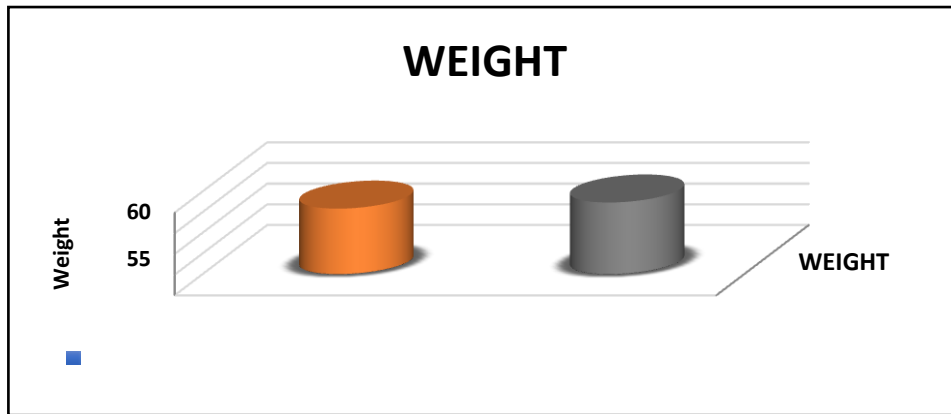
PARAMETER	GROUP D		GROUP F		P VALUE
	MEAN	±SD	MEAN	±SD	
AGE(18-60 yrs)	34.04	7.16	34.54	7.89	0.37
Weight	55.86	8.87	57.34	9.17	0.207

**Graph 1 (a): BAR DIAGRAM SHOWING MEAN AGE OF PATIENTS IN TWO GROUPS**



	<b>Group D</b>	<b>Group F</b>
AGE	34.04	34.54

**GRAPH-1 (b): BAR DIAGRAM SHOWING MEAN WEIGHT OFPATIENTS IN STUDY GROUPS**



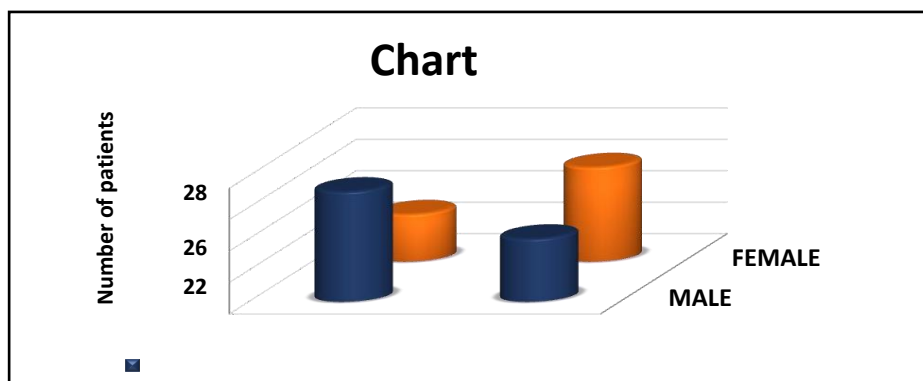
	Group D	Group F
WEIGHT	55.86	57.34

Mean age in group D is  $34.04 \pm 7.16$  and in group F is  $34.54 \pm 7.89$  and mean weight in group D is  $55.86 \pm 8.87$  and in group F is  $57.34 \pm 9.17$ . Difference between both the groups were statistically insignificant. ( $p > 0.05$ )

**Table –3: Sex distribution of patients in group D and group F**

PARAMETER	Group D	Group F	P VALUE
Male	27 (54%)	24 (48%)	0.276
Female	23(46%)	26 (52%)	
Total	50	50	

**Graph-2: Bar diagram showing sex ratio between two groups**



Sex wise distribution of patients in both groups: in group D 54 % of them were males and 46 % were females whereas in group F, 48 % of them were males and 52% were females. Difference between both the groups were statistically insignificant. ( $p>0.05$ )

**Table-4: Comparison of mean pulse rate between both groups**

TIME	GROUP D		GROUP F		P Value
	Mean	±SD	Mean	±SD	
Baseline	79.70	6.19	79.10	7.77	0.335
Just prior to Extubation	73.32	3.87	70.72	6.10	0.0032
Immediate after Extubation	73.82	3.71	75.06	5.52	0.0012
2 min.	71.98	3.82	74.78	5.56	0.0003
4 min.	70.10	3.47	74.86	5.66	0.0002
6 min.	68.44	3.33	73.38	5.31	0.00001
8 min.	67.44	3.66	72.08	5.22	0.00003
10 min.	66.54	3.21	72.20	5.23	0.00002
20 min.	65.74	3.11	71.50	5.27	<0.00001
30 min.	64.72	2.55	71.68	5.16	<0.00001
40 min.	63.84	2.68	71.58	4.13	<0.00001
50 min.	62.54	3.13	73.32	3.89	0.00001
60 min.	62.45	2.73	75.52	3.80	0.00001

Comparison of mean pulse rate among both groups D and group F. The mean heart rate was calculated at baseline, just prior to extubation, immediately after extubation and up to 60 mins in both the groups.

The baseline mean heart rate in group D was  $79.7\pm 6.19$  and in group F was  $79.1\pm 7.77$ . Statistical analysis shows a P value of baseline heart rate as 0.335 which is statistically insignificant.

The mean heart rate just prior to extubation in the group D was  $73.32\pm 3.87$  and in the group F it was  $70.72\pm 6.10$ . Statistical analysis shows a P value of heart rate before extubation as 0.0032 which is statistically significant.

The mean heart rate immediately after Extubation in the group D was  $73.82\pm 3.71$  and in the group F it was  $75.06\pm 5.52$ . Statistical analysis shows a P value of heart rate after extubation as 0.0012



which is statistically significant.

The mean heart rate after extubation at 2,4,6,8,10,20,30,40,50, and 60 mins in group D are  $71.98 \pm 3.82$ ,  $70.1 \pm 3.47$ ,  $68.44 \pm 3.33$ ,  $67.44 \pm 3.66$ ,  $66.54 \pm 3.21$ ,  $65.74 \pm 3.11$ ,  $64.72 \pm 2.55$ ,  $63.84 \pm 2.68$ ,  $62.54 \pm 3.13$ ,  $62.45 \pm 2.73$  and in group F are  $74.78 \pm 5.56$ ,  $74.86 \pm 5.66$ ,  $73.38 \pm 5.31$ ,  $72.08 \pm 5.22$ ,  $72.2 \pm 5.23$ ,  $71.5 \pm 5.27$ ,  $71.68 \pm 5.16$ ,  $71.58 \pm 4.13$ ,  $73.32 \pm 3.89$ ,  $75.52 \pm 3.80$  respectively. Statistical analysis reveals a P value of heart rate after extubation at 2,4,6,10,20,30,40,50, and 60 mins are  $<0.001$  which is statistically significant.

**Table -5: Comparison of mean systolic blood pressure between both groups**

TIME	GROUP D		GROUP F		P Value
	Mean	$\pm$ SD	Mean	$\pm$ SD	
Baseline	125.08	6.95	126.64	6.56	0.125
Just prior to Extubation	109.32	5.51	118.52	4.37	0.00003
Immediate after Extubation	110.08	5.05	120.84	3.94	$<0.00001$
2 min.	111.56	4.09	119.52	4.19	$<0.00001$
4 min.	108.60	3.57	116.64	3.86	$<0.00001$
6 min.	107.56	3.38	115.24	4.21	$<0.00001$
8 min.	105.92	4.89	114.08	4.26	$<0.00001$
10 min.	105.80	2.53	112.08	4.46	$<0.00001$
20 min.	105.08	2.15	110.41	3.92	$<0.00001$
30 min.	107.48	2.54	110.84	3.54	$<0.00001$
40 min.	109.08	2.59	110.28	3.21	0.002
50 min.	110.72	3.15	113.24	3.23	0.007
60 min.	112.40	2.55	115.28	3.81	0.0001

Comparison of **mean systolic blood pressure** among group D and group F. The mean SBP at baseline, just prior to extubation, immediately after extubation and up to 60 mins was calculated in both the groups.

The baseline mean SBP in the group D was  $125.08 \pm 6.95$  and in the group F it was  $126.64 \pm 6.56$ . Statistical analysis shows a P value of baseline SBP as 0.125 which is statistically insignificant.

The mean SBP just prior to extubation in the group D was  $109.32 \pm 5.51$  and in the group F it was  $120.84 \pm 3.94$ . Statistical analysis shows a P value of SAB before extubation as 0.00003 which is statistically significant.

The mean SBP Immediately after Extubation in the group D was  $110.08 \pm 5.05$  and in the group F it was  $120.84 \pm 3.94$ . Statistical analysis shows a P value of SBP after extubation as  $<0.00001$  which is statistically significant.

The mean SBP after extubation at 2,4,6,8,10,20,30,40,50, and 60 mins in group D are  $111.56 \pm 4.09$ ,  $108.60 \pm 3.57$ ,  $107.56 \pm 3.38$ ,  $105.92 \pm 4.89$ ,  $105.80 \pm 2.53$ ,  $105.08 \pm 2.15$ ,  $107.48 \pm 2.54$ ,  $109.08 \pm 2.59$ ,  $110.72 \pm 3.15$ ,  $112.4 \pm 2.55$  and in group F are  $119.52 \pm 4.19$ ,  $116.64 \pm 3.86$ ,  $115.24 \pm 4.21$ ,  $114.08 \pm 4.26$ ,  $112.08 \pm 4.46$ ,  $110.41 \pm 3.92$ ,  $110.84 \pm 3.54$ ,  $110.28 \pm 3.21$ ,  $113.24 \pm 3.23$ ,  $115.28 \pm 3.81$  respectively. Statistical analysis reveals a P value of SBP after extubation at 2,4,6,10,20,30,40,50, and 60 mins are  $<0.001$  which is statistically significant.

**Table-6: Comparison of mean diastolic blood pressure between both groups**

TIME	GROUP D		GROUP F		P Value
	Mean	$\pm$ SD	Mean	$\pm$ SD	
Baseline	78.64	2.50	79.40	3.03	0.087
Just prior to Extubation	70.32	3.51	73.60	2.49	0.00001
Immediate after Extubation	70.78	2.76	76.28	2.41	$<0.00001$
2 min.	68.58	2.44	75.32	2.23	$<0.00001$
4 min.	66.44	1.68	74.96	2.60	$<0.00001$
6 min.	64.32	2.40	73.32	2.98	$<0.00001$
8 min.	62.84	2.32	73.36	2.66	$<0.00001$
10 min.	62.12	2.66	72.48	2.28	$<0.00001$
20 min.	63.92	2.06	71.36	2.70	$<0.00001$
30 min.	63.01	1.94	70.56	3.48	$<0.00001$
40 min.	65.52	1.97	69.96	2.87	0.0032
50 min.	66.48	2.04	70.01	3.12	0.0027
60 min.	67.21	2.52	70.80	2.91	0.0043

Comparison of **Mean Diastolic Blood Pressure** among groups D and group F. The mean DBP at baseline, just prior to extubation, immediately after extubation and up to 60 mins was calculated in both the groups.

The baseline mean DBP in the group D was  $78.64 \pm 2.50$  and in the group F it was  $79.4 \pm 3.03$ . Statistical analysis shows a P value of baseline DBP as 0.087 which is statistically insignificant.

The mean DBP just prior to extubation in the group D was  $70.32 \pm 3.51$  and in the group F it was  $73.6 \pm 2.49$ . Statistical analysis shows a P value of DBP before extubation as 0.00001 which is statistically significant.

The mean DBP Immediately after Extubation in the group D was  $70.78 \pm 2.76$  and in the group F it was  $76.28 \pm 2.41$ . Statistical analysis shows a P value of DBP after extubation as  $<0.00001$  which is statistically significant.

The mean DBP after extubation at 2,4,6,8,10,20,30,40,50, and 60 mins in group D are  $68.58 \pm 2.44$ ,  $66.44 \pm 1.68$ ,  $64.32 \pm 2.40$ ,  $62.84 \pm 2.32$ ,  $62.12 \pm 2.66$ ,  $63.92 \pm 2.06$ ,  $63.01 \pm 1.94$ ,  $65.52 \pm 1.97$ ,  $66.48 \pm 2.04$ ,  $67.21 \pm 2.52$  and in group F are  $75.32 \pm 2.23$ ,  $74.96 \pm 2.60$ ,  $73.32 \pm 2.98$ ,  $73.36 \pm 2.66$ ,  $72.48 \pm 2.28$ ,  $71.36 \pm 2.70$ ,  $70.56 \pm 3.48$ ,  $69.96 \pm 2.87$ ,  $0.01 \pm 3.12$ ,  $70.80 \pm 2.91$  respectively. Statistical analysis reveals a P value of DBP after extubation at 2,4,6,10,20,30,40,50, and 60 mins are  $<0.001$  which is statistically significant.

**Table-7: Comparison of mean arterial pressure between both groups**

TIME	GROUP D		GROUP F		P Value
	Mean	$\pm$ SD	Mean	$\pm$ SD	
Baseline	94.12	2.44	95.70	2.11	0.1033
Just prior to Extubation	90.34	2.19	92.98	1.54	0.00172
Immediate after Extubation	90.78	2.57	93.98	1.56	0.0002
2 min.	88.92	1.21	91.40	1.23	$<0.00001$
4 min.	86.32	1.25	89.31	1.29	$<0.00001$
6 min.	85.06	1.61	87.08	1.31	$<0.00001$
8 min.	83.58	1.82	85.42	1.26	0.00001
10 min.	80.56	2.21	83.12	1.46	$<0.00001$
20 min.	80.94	1.87	83.76	1.54	0.00001
30 min.	81.42	1.92	83.84	1.60	0.00001
40 min.	82.76	1.74	85.52	1.19	0.00001
50 min.	82.78	1.51	87.58	1.58	0.00001
60 min.	84.26	1.48	89.18	3.14	0.00032

Comparison of **mean arterial pressure** among both groups D and group F. The mean MAP at baseline, just prior to extubation, immediately after extubation and up to 60 mins was calculated in both the groups. The baseline mean MAP in the group D was  $94.12 \pm 2.44$  and in the group F it was  $95.7 \pm 2.11$ . Statistical analysis shows a P value of baseline MAP as 0.1033 which is statistically insignificant. The mean MAP just prior to extubation in the group D was  $90.34 \pm 2.19$  and in the group F it was  $92.98 \pm 1.54$ . Statistical analysis shows a P value of MAP before extubation as 0.00172 which is statistically significant. The mean MAP Immediately after Extubation in the group D was  $90.78 \pm 2.57$  and in the group F it was  $93.98 \pm 1.56$ . Statistical analysis shows a P value of MAP after extubation as 0.0002 which is statistically significant.

The mean MAP after extubation at 2,4,6,8,10,20,30,40,50, and 60 mins in group D are  $88.92 \pm 1.21$ ,  $86.32 \pm 1.25$ ,  $85.06 \pm 1.61$ ,  $83.58 \pm 1.82$ ,  $80.56 \pm 2.21$ ,  $80.94 \pm 1.87$ ,  $81.42 \pm 1.92$ ,  $82.76 \pm 1.74$ ,  $82.78 \pm 1.51$ ,  $84.26 \pm 1.48$  and in group F are  $91.40 \pm 1.23$ ,  $89.31 \pm 1.29$ ,  $87.08 \pm 1.31$ ,  $85.42 \pm 1.26$ ,  $83.12 \pm 1.46$ ,  $83.76 \pm 1.54$ ,  $83.84 \pm 1.60$ ,  $85.52 \pm 1.19$ ,  $87.58 \pm 1.58$ ,  $89.18 \pm 3.14$  respectively. Statistical analysis reveals a P value of MAP after extubation at 2,4,6,10,20,30,40,50, and 60 mins are  $<0.001$  which is statistically significant.

**Table- 8: Comparison of mean respiratory rate between both groups**

TIME	GROUP D		GROUP F		P Value
	Mean	$\pm$ SD	Mean	$\pm$ SD	
Baseline	12.90	1.44	12.90	1.62	0.413
Just prior to Extubation	12.70	1.19	12.80	1.30	0.390
Immediate after Extubation	12.70	0.94	12.40	1.03	0.072
2 min.	12.70	1.11	12.90	1.10	0.182
4 min.	12.90	1.14	13.10	1.16	0.219
6 min.	12.90	1.34	12.70	1.09	0.233
8 min.	13.60	1.43	13.60	1.38	0.118
10 min.	13.00	1.15	13.20	1.15	0.167
20 min.	13.10	1.15	13.10	1.17	0.424
30 min.	13.60	1.43	13.60	1.38	0.218
40 min.	13.20	1.15	13.40	1.14	0.267
50 min.	13.40	1.16	13.60	1.17	0.434
60 min.	13.50	1.12	13.20	1.27	0.237

Comparison of mean respiratory rate among groups D and group F. Base line value of mean respiratory rate in group D was  $12.9 \pm 1.44$  and in group F was  $12.9 \pm 1.62$  with a P value of 0.413 showed a statistically insignificant difference among both the groups. Changes in respiratory rate at different time interval were showing P value  $> 0.05$  which was statistically insignificant among the groups.

**TABLE-9: Comparison of mean spo2 between both groups**

TIME	GROUP D		GROUP F		P Value
	Mean	$\pm$ SD	Mean	$\pm$ SD	

Baseline	99.50	0.43	99.40	0.53	0.431
Just prior to Extubation	99.40	0.54	99.40	0.57	0.428
Immediate after Extubation	99.30	0.65	99.20	0.45	0.437
2 min.	99.10	0.87	99.10	0.87	0.441
4 min.	98.50	0.70	98.40	0.73	0.438
6 min.	98.30	0.68	98.30	0.62	0.432
8 min.	98.30	0.51	98.30	0.50	0.254
10 min.	98.20	0.55	98.30	0.58	0.164
20 min.	98.20	0.67	98.20	0.70	0.258
30 min.	98.20	0.62	98.20	0.56	0.425
40 min.	98.20	0.64	98.20	0.75	0.375
50 min.	98.20	0.62	98.10	0.72	0.309
60 min.	98.20	0.58	98.10	0.65	0.358

comparison of **mean SpO<sub>2</sub>** among groups D and group F. Base line value of mean SpO<sub>2</sub> in group D was  $99.5 \pm 0.43$  and in group F was  $99.4 \pm 0.53$  with a P value of 0.431, showing statistically insignificant difference between the groups. Changes in SpO<sub>2</sub> at different time interval were showing P value > 0.05 which was statistically insignificant among both groups.

**Table 10: Comparison of extubation quality score between both groups**

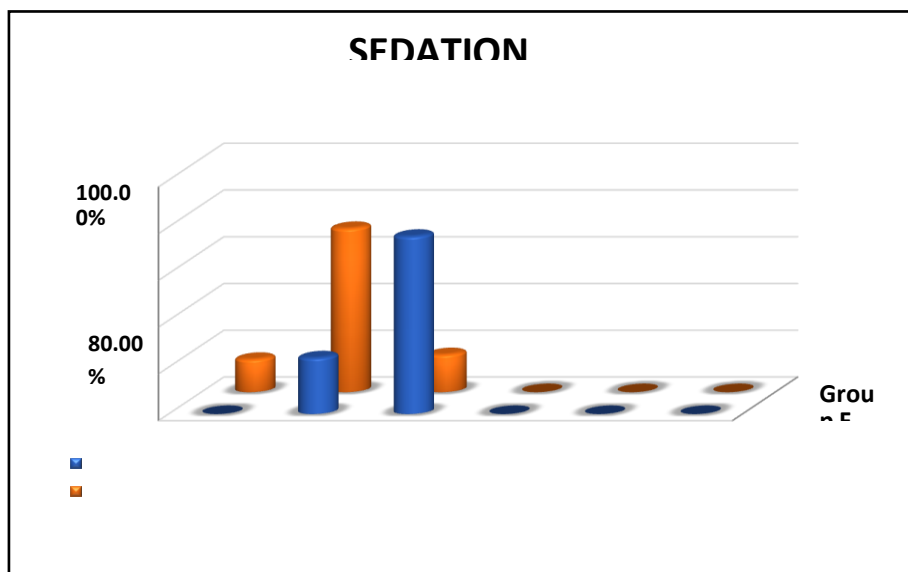
Quality score	Dexmedetomidine	Fentanyl	Total	P Value
1	15 (30 %)	4 (8%)	19	<0.00001
2	32 (64 %)	6 (12%)	38	
3	3 (6 %)	38 (76 %)	41	
4	0 (0 %)	2 (4%)	2	
5	0 (0 %)	0 (0 %)	0	
Total	50	50	100	

In the Dexmedetomidine group, 30 % of the patients had no cough during extubation whereas 64 % of the patients were extubated smoothly with minimal cough and 6 % of them had moderate cough. In the Fentanyl group, 8% of the patients had no cough, 12% of the patients had minimal cough and 76 % patients had moderate cough whereas 4% of the patients had severe cough during extubation. Statistical analysis of the Extubation Quality score shows a P value of <0.00001 which is statistically significant.

**Table– 11: comparison of sedation score between both groups**

SEDATION SCORE	Group D [n=50]		Group F [n=50]		P Value
	N	%	N	%	
1	0	0.00%	7	14%	<0.00001
2	12	24%	35	70%	
3	38	76%	8	16%	
4	0	0.00%	0	0.00%	
5	0	0.00%	0	0.00%	
6	0	0.00%	0	0.00%	

Graph -4: comparison of sedation score between both groups



Comparison of **sedation score** among both groups D and group F. Table shows in the dexmedetomidine group, 24% of the patients were calm, oriented and co-operative (grade 2) and 76% of the patients were drowsy (grade 3), but responded to commands. In the Fentanyl group, 70% of the patients were calm, oriented and co-operative (grade 2) and 16% of the patients were drowsy and responded to commands (grade 3) and 14% of the patients were apprehensive and restless (grade 1). There were statistically significant difference among both groups. ( $p < 0.00001$ )

Table -12: comparison of side effects between both groups

SIDE EFFECTS	GROUP D [n=50]	GROUP F [n=50]	P Value
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Vomiting	1	3	0.156
Respiratory Depression	0	0	NA
Laryngospasm	0	0	NA
Bronchospasm	0	0	NA
Bradycardia (HR<60/min)	4	1	0.086
Hypotension (MAP < 60 mm Hg)	0	0	NA
Pruritis	0	1	0.227

	Vomiting	Respiratory depression	Laryngospasm	Bronchospasm	Bradycardia	Hypotension	Pruritis
Group D	1	0	0	0	4	0	0
Group F	3	0	0	0	1	0	1

Comparison of **side effects** among both groups D and group F as; One patient in the dexmedetomidine group had vomiting whereas 3 patients in the Fentanyl group had vomiting. None of the patient had respiratory depression, laryngospasm or bronchospasm. 4 patients had bradycardia (heart rate < 60 / min) in the dexmedetomidine group whereas, one patient had bradycardia in the Fentanyl group but none of them required intervention. The incidence of hypotension (MAP < 60 mm Hg) was not observed in any of the patients in both the groups. 1 patient showed Pruritis in fentanyl group. There were statistically insignificant difference in occurrence of side effects among both groups. ( $p \geq 0.001$ )

### DISCUSSION

Extubation of the trachea is associated with wide fluctuations in the hemodynamics that can lead to tachycardia, hypertension and arrhythmias. It is also associated with reflex increases in airway reactivity leading to stress responses and airway irritation.<sup>5</sup>

After an ideal extubation, patients should exhibit adequate ventilatory drive, a normal breathing pattern, a patent airway with intact protective reflexes, normal pulmonary function, and the absence of any mechanical perturbation (eg, coughing).<sup>6</sup>

Dexmedetomidine and Fentanyl both are associated with control of these hemodynamic changes and stressful airway responses. This study was undertaken to compare the effects of dexmedetomidine versus fentanyl for variations in hemodynamics and recovery responses during tracheal extubation. This study was conducted in 100 patients belonging to ASA I AND II, between the age group of 18 to 60 years of age who were posted for surgeries to be conducted under General Anaesthesia.

**DOSE SELECTION:** Different doses of IV dexmedetomidine and iv fentanyl employed by various authors were:

**Fan Q et al** conducted a study to compare the effectiveness of dexmedetomidine or remifentanyl infusion for producing smooth tracheal extubation and concluded that **dexmedetomidine 0.7 ug/kg** and remifentanyl provided similar rates for smooth tracheal extubation with Dexmedetomidine exhibited opioid-sparing effects postoperatively and was associated with less PONV than remifentanyl.

**D Jain et al** found out that a bolus dose of **Dexmedetomidine 1µg/kg** over 10 minutes, prior to administration of reversal provided hemodynamic stability associated with extubation.

**Barkha Bindu et al** evaluated the effect of **dexmedetomidine 0.75 micrograms/kg** on hemodynamic and recovery responses during tracheal extubation found that use of dexmedetomidine prior to extubation attenuated the hemodynamic response to extubation. It also enables smooth extubation of the trachea and provides adequate sedation postoperatively.

**Vivek Bharti Sharma et al** compared the effects of the  $\alpha$ -2 agonist Dexmedetomidine and Lignocaine given at the end of the procedure on attenuation of airway and pressor responses following tracheal extubation and came to a conclusion that without interfering in emergence and extubation times, attenuation of pressor response is comparable between **dexmedetomidine 0.5 µg/kg** and lignocaine 1.5 mg/kg. However, airway response was better controlled with use of dexmedetomidine allowing a smooth easy tracheal extubation, thereby providing a more comfortable recovery and early neurological examination.

## HEART RATE

Mean heart rate just prior to extubation in the group D was  $73.32 \pm 3.87$  and in the group F it was  $70.72 \pm 6.10$  which increases immediately after extubation to mean heart rate of  $73.82 \pm 3.71$  in the group D and  $75.06 \pm 5.52$  in group F respectively. Then later on no significant increase in HR after extubation was observed when compared with preextubation values in the dexmedetomidine group. HR in the fentanyl group was significantly higher at 2, 4, and 6 minutes after extubation compared with preextubation.

## BLOOD PRESSURE

The mean SBP just prior to extubation in the group D was  $109.32 \pm 5.51$  and in the group F it was  $120.84 \pm 3.94$  which increases immediately after extubation to mean SBP of  $110.08 \pm 5.05$  in the group D and  $120.84 \pm 3.94$  in group F respectively. SBP was significantly increased at 2 min after extubation in the dexmedetomidine group and at 2 and 4 mins after extubation in the fentanyl group compared with preextubation values.

The mean DBP just prior to extubation in the group D was  $70.32 \pm 3.51$  and in the group F it was  $73.6 \pm 2.49$  which increases immediately after extubation to mean DBP of  $70.78 \pm 2.76$  in the group D



and  $76.28 \pm 2.41$  in group F respectively. Then later on as trend shows it was better controlled in the group D than group F.<sup>7</sup>

### EXTUBATION QUALITY

30 % of the patients were extubated smoothly in the dexmedetomidine group with no cough and 64% had minimal cough whereas only 8 % of the patients were extubated smoothly with no cough and 12% with minimal cough in the Fentanyl group. Moreover, in the dexmedetomidine group, only 6 % of the patients had moderate cough whereas, in the Fentanyl group, 76% of the patients had moderate cough during extubation. This was in accordance with the study conducted by **Kim and Bishop** reported a 76% prevalence of cough in a study of the effects of smoking history and albuterol 200 µg (2 puffs) treatment on the severity and frequency of cough during emergence from anesthesia. In the present study, the fentanyl group had a similar prevalence of cough (76%), 4% of which was severe. Also **Guler et al** reported that cough scores were significantly lower in the dexmedetomidine group than in the placebo group ( $P < 0.05$ ), but there were no between-group differences in the prevalence's of breath holding and desaturation. The time from tracheal extubation to emergence from anesthesia was not significantly different between the 2 groups. **Fan Q et al** did a similar study comparing remifentanyl with two doses of dexmedetomidine 0.5 & 0.7µg/kg and observed that higher percent of patients in dexmedetomidine group had smooth extubation with respect to the absence of bucking & coughing with head movement during surgical dressing.<sup>8</sup>

**SEDATION:** 24% of the patients were calm, oriented and co-operative (grade 2) and 76% of the patients were drowsy, but responded to commands (grade 3) in the dexmedetomidine group and in the Fentanyl group, 70% of the patients were calm, oriented and co-operative (grade 2) and 16% of the patients were drowsy and responded to commands (grade 3) and 14% of the patients were apprehensive and restless (grade 1). There was a statistically significant difference among both groups which was in accordance with the study conducted by Barkha Bindu et al. on the effect of dexmedetomidine on hemodynamic and recovery responses during tracheal extubation, also observed that 84% of the patients in the dexmedetomidine group were drowsy, but responded to commands; whereas, in the placebo group, 80 % of the patients were oriented, cooperative and tranquil. Koroglu A et al studied the sedative, haemodynamic and respiratory effects of dexmedetomidine in children undergoing magnetic resonance imaging examination also observed that the quality of sedation is better and the need for rescue sedation is less with dexmedetomidine use as compared with midazolam and there is no significant adverse effect on hemodynamic or respiratory function.<sup>9</sup>

**ADVERSE EFFECTS:** The potential risks of extubation at a deep level of anesthesia include aspiration, airway obstruction, desaturation, and loss of airway control. In present study, as shown in Table & Graph-8 & Table & Graph-9 changes in respiratory rate and in SpO<sub>2</sub> at different time interval were statistically insignificant among both groups. None of the patients in either of the

group developed respiratory depression, laryngospasm, bronchospasm, undue sedation or desaturation.<sup>10</sup>

### CONCLUSION

From the observation and results of our study it is concluded that I.V. Dexmedetomidine when given in the dose of 0.5 µg/kg 10 mins prior to extubation effectively attenuates haemodynamic responses, airway reflexes with providing adequate sedation postoperatively thus allowing smoother extubation when compared to Fentanyl 1.0 µg/kg.

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