

# Comparison of Two Different Doses of Dexmedetomidine in Decreasing the Extubation Response

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**Abstract:** **Background:** Laryngoscopy, intubation and extubation is associated with sympathetic stimulation which results in hypertension and tachycardia. Drugs modulating the sympathetic response can be used during extubation to decrease the sympathetic response. **Aim:** To compare of two different doses of dexmedetomidine in decreasing the sympathetic response. **Method:** A hospital based Prospective, randomized, double blind study where a total of 66 patients undergoing surgery under general Anaesthesia in our hospital were randomly divided into 2 groups: Group-D1: Dexmedetomidine (0.25mcg/kg) group - 33 patients; Group-D2: Dexmedetomidine (0.5mcg/kg) group – 33 patients. The hemodynamic parameters, airway reflexes were assessed in different intervals of time and compared. **Result:** heart rate and systolic and diastolic blood pressure were significantly lower in D2 group (0.5 µg/kg) as compared to D1 group (0.2 µg/kg). 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). Mean time for extubation was significantly lower in D2 group (136.7 vs 224.5 sec; p<0.05). **Conclusion:** 0.5 mcg/kg dose of dexmedetomidine prior to extubation is optimum to decrease the extubation response.

**Keywords:** extubation, dexmedetomidine, sympathetic response

## 1. Introduction

Endotracheal intubation is frequently performed in the operating room to secure the airway in patients undergoing a surgical procedure under general anaesthesia. Laryngoscopy and tracheal intubation cause significant haemodynamic changes in a patient [1]. There is catecholamine surge which causes significant tachycardia and hypertension [2]. Extubation is also associated with haemodynamic changes due to reflex sympathetic discharge caused by epipharyngeal and laryngopharyngeal stimulation [3]. 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 [4]. The techniques like use of laryngeal mask airway during emergence, extubation in deep plane of anaesthesia and drugs like lignocaine, opioids, calcium channel blockers, magnesium sulphate, Propofol and Esmolol have been used to attenuate the cardiac and airway responses to extubation [5, 6]. Dexmedetomidine is a selective adrenergic  $\alpha_2$  agonist. It has sedative, analgesic and anaesthetic sparing effects and it decreases heart rate, blood pressure and circulating plasma catecholamines in a dose dependent fashion [7, 8]. Different concentrations of dexmedetomidine ranging from 0.25 µg/kg to 1.0 µg/kg intravenously as a bolus have been studied for attenuation of pressor responses to extubation and intubation [9, 10].

### Objective

The objective of this study is to assess the effect of Dexmedetomidine by intravenous route, on attenuation of

hemodynamic responses and airway reflexes during extubation following surgery under general anaesthesia.

## 2. Materials and Method

A hospital based Prospective, randomized; double blind study was conducted at Father Muller Medical College, Mangaluru. The study was carried out for 6 months. A total of 66 patients undergoing surgery under general Anaesthesia in our hospital was randomly divided into 2 groups: Group-D1: Dexmedetomidine (0.25mcg/kg) group – 33 patients; Group-D2: Dexmedetomidine (0.5mcg/kg) group – 33 patients.

### Inclusion Criteria

- 1) Patients with ASA grade I or II Either gender with age between 18-45 years
- 2) Patients who give informed written consent.

### Exclusion Criteria

Patients with:

- 1) Allergy to adrenergic agonists.
- 2) History of uncontrolled hypertension, Obesity.
- 3) Heart block greater than first degree. History of uncontrolled hypertension.
- 4) History of alcohol or drug abuse.
- 5) Clinically significant neurologic, cardiovascular, renal, hepatic, gastrointestinal diseases.

### 2.1 Methodology

With a minimum Fasting state of 6-8 hours before anaesthesia, IV access was obtained and standard monitoring consisted of Electrocardiography (ECG), pulse Oximetry, Noninvasive Blood pressure (NIBP) and End tidal carbon dioxide monitoring (ETCO<sub>2</sub>). All patients was pre-oxygenated with 100% oxygen for 3 minutes and pre-

medicated injection glycopyrolate 0.2mg and Injection fentanyl 2mcg/kg intravenously. They were induced with injection Propofol 2mg/kg and intubation facilitated with injection vecuronium 0.1mg /kg intravenously. Patients were maintained on 66% nitrous oxide in oxygen and isoflurane 1%-2%. Vecuronium was used for maintenance of muscle paralysis.

In Group-D1 patients, Dexmedetomidine 0.25mcg/kg body weight diluted to 10 ml in normal saline was infused over 10 minutes, approximately 10 minutes prior to reversal.

In Group-D2 patients, Dexmedetomidine 0.5 mcg/kg kg body weight diluted to 10 ml in normal saline was infused over 10 minutes, approximately 10 minutes prior to reversal. Isoflurane was discontinued at the beginning of closure of skin incision or approximately 10 minutes prior to reversal and nitrous oxide were discontinued post procedure and Residual neuromuscular blockade was reversed using injection neostigmine 0.05mg/kg and injection glycopyrrolate 0.01mg/kg intravenously. Patients were extubated when the following extubation criteria were fulfilled.

Awakening time: Discontinuation of nitrous oxide to eye opening.

Extubation time: Completions of reversal to extubation were noted. Values for HR, SBP, DBP and MAP was recorded just before (A0) and 1, 3, 5, 10 (A1, A3, A5, A10) min after the study drug administration and at extubation (E0) and 1, 3, 5, 10, 15 min after extubation (E1, E3, E5, E10, E15).

Respiratory rate, SpO<sub>2</sub> and airway responses like coughing, breath holding, laryngospasm or bronchospasm was recorded at extubation (E) and 1, 3, 5, 10 and 15 min after extubation (E1, E3, E5, E10, E15).

At the end of extubation, quality of extubation was recorded with five point scale [<sup>15</sup>]

- Grade 1: No Coughing ;
- Grade 2: Smooth extubation, Minimal Coughing [once or twice];
- Grade 3: Moderate coughing [3-4 times];
- Grade 4: Severe coughing [5-10 times].
- Grade 5: Poor extubation, very uncomfortable [laryngospasm/ coughing > 10 times].

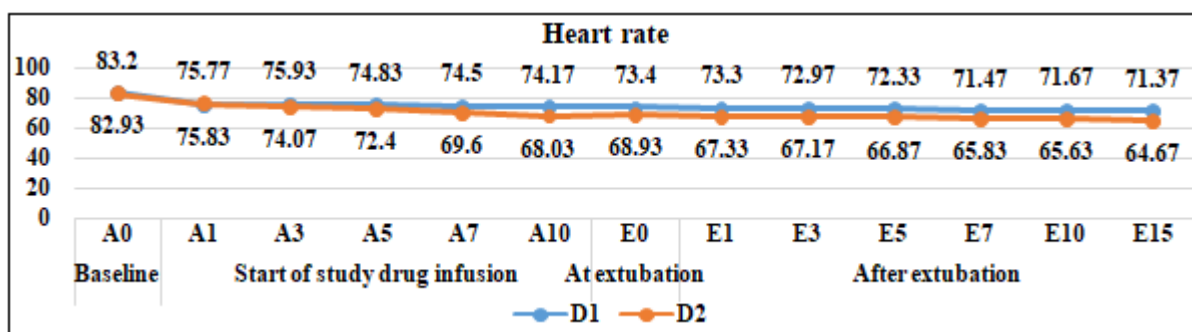
After extubation, all these patients were observed for sedation by Modified Ramsey sedation score

Time taken for eye opening after Nitrous oxide is discontinued was recorded. Time taken for extubation, after completion of injection of neuromuscular reversal was recorded. Any change in Heart rate (HR) and blood pressure (BP) ( $\pm 20\%$  of pre drug administration value), if occurred was recorded and treated with appropriate drugs, if required. Any other side-effect of study drugs if occurs, will also be recorded.

### 3. Results

Among the 66 patients who were studied in the study we found that the mean age of the study groups was 34.56 and 36.79 years in D1 and D2 group respectively with p-0.31. Out of 66 cases, there were 56.1% males and 43.9% females (p-1.0) and 51 (77.3%) belonged to ASA grade I and 15 (22.7%) belonged to ASA grade II (p-1.0). The mean duration of surgery was 120.57 minutes and 130.17 minutes in D1 and D2 group (p-0.14).

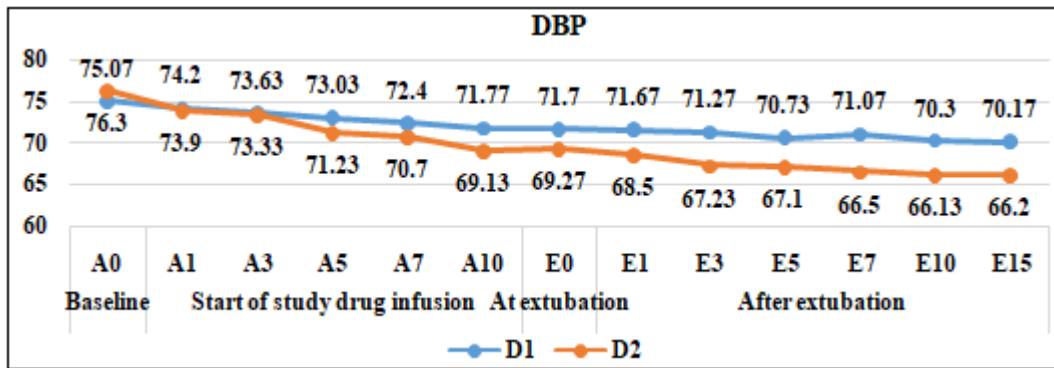
The mean heart rate was comparable between study groups at the time of induction (p-0.5). The heart rate was significantly lower in D2 group at 10 minutes after injection of the drug, during reversal and till 15 minutes after extubation (p<0.05).



#### Comparison of study groups based on change in heart rate before and after extubation

The mean systolic blood pressure was comparable between study groups at the time of induction (p-0.6). The SBP was significantly lower in D2 group during reversal and till 15 minutes after extubation (p<0.05). Mean diastolic blood

pressure was comparable between study groups at the time of induction (p-0.57). The DBP was significantly lower in D2 group during reversal and till 15 minutes after extubation (p<0.05). Mean arterial pressure was comparable between study groups at the time of induction (p-0.57).



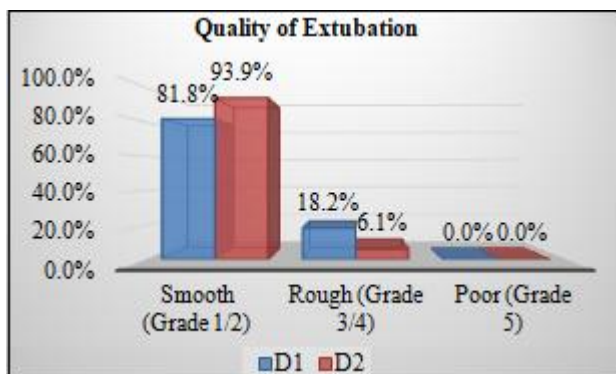
**Comparison of study groups based on change in diastolic blood pressure before and after extubation**

The MAP was significantly lower in D2 group during reversal and till 15 minutes after extubation (p<0.05). No difference was observed between the study groups with respect to partial pressure of oxygen during induction, reversal and post-extubation. 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.

**Comparison of study groups based on quality of extubation**

Quality of Extubation	Group		Total
	D1	D2	
Smooth (Grade 1/2)	27	31	58
	81.8%	93.9%	87.9%
Rough (Grade 3/4)	6	2	8
	18.2%	6.1%	12.1%
Poor (Grade 5)	0	0	0
	0.0%	0.0%	0.0%
Total	33	33	66
	100.0%	100.0%	100.0%

p-value - 0.25



The difference was statistically non-significant (p=0.25). Post-extubation, mean sedation scores were observed to be comparable in both the groups till 15 mins.

**Comparison of study groups as per sedation score after extubation**

Ramsey Sedation Score	D1		D2		p-value
	Mean	SD	Mean	SD	
0 min	2.90	0.43	2.77	0.31	0.17
15 min	2.57	0.51	2.47	0.5	0.84
30 min	2.47	0.51	2.37	0.5	0.61

Post-extubation, mean sedation score were observed to be comparable in both the groups till 30 mins.

The mean time to awaken was significantly higher in D2 group (310.2 sec vs 179.7 sec; p<0.05) while time for extubation was significantly lower (136.7 vs 224.5 sec; p<0.05).

**Mean comparison of study groups as per time for awakening and extubation**

Variables	D1		D2		p-value
	Mean	SD	Mean	SD	
Time to awaken (sec)	179.7	47.6	310.2	59.2	<0.05
Time for Extubation (sec)	224.5	56.7	136.7	43.4	<0.05

Incidence of adverse reactions like bradycardia and nausea was comparable between both groups with 4 and 6 cases of bradycardia and 2 and 3 cases of vomiting being observed in group D1 and D2 respectively (p=0.73; 1.0).

**4. Discussion**

A total of 66 patients undergoing surgery under general Anaesthesia in our hospital fulfilling the criteria were included in the study. Both the groups were comparable with respect to baseline parameters like age, gender and ASA grade. In our study we observed that mean heart rate and blood pressure readings was 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 (0.2 µg/kg) at 10 minutes after starting of injection, during reversal and till 15 minutes after extubation (p<0.05). The systolic and diastolic blood pressure were also significantly lower in D2 (0.5 µg/kg) group before extubation and till 15 minutes after extubation (p<0.05) which was in accordance with study done by Antony et al [5]. 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). Mean time for extubation was significantly lower in D2 group (136.7 vs 224.5 sec; p<0.05) As awakening time is more in D2, reversal was started little late i.e. an eye opening which gave some more time for recovery from neuromuscular blocking agents :this leads to early extubation after reversal of neuromuscular blocking agent. Similar findings have been made by Aksu R et al [10]. Central stimulation of parasympathetic outflow along with inhibition of sympathetic outflow from locus coeruleus in the brain stem plays a major role in the sedative and anxiolytic properties

of dexmedetomidine. However the patients were not excessively sedated in any of the group and the median score was 2 after 30 minutes of drug infusion in both groups but Guler G et al. [52] also observed that time to emergence was prolonged significantly in dexmed group when compared to control group [11]. 3 cases had D2 group had vomiting in our study.

## 5. Conclusion

In present study, we observed that higher dose dexmedetomidine group i.e. 0.5 mcg/kg, there was significant fall of blood pressure and heart rate during the procedure as compared to the low dose dexmedetomidine group (0.25 mcg/kg) with no difference in the incidence of adverse reactions. The extubation was relatively smoother and time for extubation was less in the higher dose group (0.5mcg/kg) as there was better post-operative arousable sedation. We thus conclude that 0.5 mcg/kg dose of dexmedetomidine is optimum to attenuate the extubation response as compared to low dose i.e. 0.25 mcg/kg.

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