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**Original research article**

# A study to compare the side effects of IV dexmedetomidine and IV esmolol in laparoscopic surgeries

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**Abstract**

Dexmedetomidine could result in cardiovascular depression i.e. bradycardia and hypotension. The incidence of postoperative bradycardia has been reported as high as 40% in healthy surgical patients who received Dexmedetomidine, especially high doses. After obtaining approval and clearance from institutional ethical committee, 132 patients fulfilling the inclusion criteria will be enrolled for the study after obtaining informed consent. The study involves the patients undergoing laparoscopic surgeries of the age group between 15 to 50 years. Informed written consent was taken from the patients of age 18 to 50 years and for those between 15 to 18 years, assent from the patient and informed written consent from the parents/guardian was obtained. There was no significant side effects were noted in our study between group D and group E.

**Keywords:** Laparoscopic surgeries, dexmedetomidine and esmolol

## Introduction

Dexmedetomidine does not appear to have any direct effects on the heart. A biphasic cardiovascular response has been described after the application of dexmedetomidine. The administration of a bolus of 1 μg/kg body weight, initially results in a transient increase of the blood pressure and a reflex decrease in heart rate, especially in young healthy patients. The initial reaction can be explained by the peripheral alpha 2B adrenoceptors stimulation of vascular smooth muscles and "can be attenuated by a slow infusion over 10 or more minutes" [1]. Even at slower infusion rates however the increase in mean arterial pressure over the first 10 minutes was shown to be in the range of 7% with a decrease in heart rate between 16% and 18%. The initial response lasts for 5-10 minutes and is followed by a decrease in blood pressure of approximately 10%-20% below baseline values; both these effects are caused by the inhibition of the central sympathetic outflow overriding the direct stimulant effects. Another possible explanation for the subsequent heart rate decrease is the stimulation of presynaptic alpha-2 adrenoceptors, leading to a decrease in norepinephrine release [2].

The application of a single high dose of Dexmedetomidine reduced norepinephrine release by as much as 92% in young healthy volunteers. The release of epinephrine is also reduced by the same amount. The baroreceptor reflex is well preserved in patients who received dexmedetomidine, and the reflex heart rate response to a pressor stimulus is augmented. These results illustrate that cardiovascular response is evoked mainly by decrease in central sympathetic outflow [3].

Dexmedetomidine could result in cardiovascular depression i.e. bradycardia and hypotension. The incidence of postoperative bradycardia has been reported as high as 40% in healthy surgical patients who received Dexmedetomidine, especially high doses. Usually these temporary effects were successfully treated with atropine or ephedrine and volume infusions [4].

Esmolol Hydrochloride is a beta - selective (cardioselective) adrenergic receptor – blocking agent with rapid onset, short duration of action, and no significant intrinsic sympathomimetic or membrane stabilizing activity at therapeutic dosage. Esmolol inhibits the beta receptors located chiefly in cardiac muscle, but this preferential effect is not absolute and at higher doses it begins to inhibit beta - 2 receptors located chiefly in the bronchial and vascular musculature [5, 6].

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**Methodology**

**Source of data**

American Society of Anaesthesiologists (ASA) I and ASA II patients aged 15- 50 years undergoing elective laparoscopic surgeries under general anesthesia.

**Type of study:** Interventional study.

**Sampling technique:** Simple random sampling by lottery method.

**Sample size:** Sample size was calculated by previous records of all the laparoscopic surgeries in the department of Anaesthesia.
According to last year's data, the average sample size found to be around 60.
Sample size = years of study x 1 year data + 10% drop out rate
= 2 x 60 + 12
Total sample = 132 Group D - 66, Group E– 66

**Inclusion Criteria**

1. Patients of age 15-50 years belonging to ASA I and II.
2. Patient willing to give informed consent.
3. Patients undergoing elective laparoscopic surgeries.
4. Patients of both gender.

**Exclusion Criteria**

1. Patients with Secondary Hypertension.
2. Patients with Co-morbidities like Diabetes mellitus, Coronary artery disease, Cerebrovascular accidents.
3. Pregnancy.

After obtaining approval and clearance from institutional ethical committee, 132 patients fulfilling the inclusion criteria will be enrolled for the study after obtaining informed consent.
The study involves the patients undergoing laparoscopic surgeries of the age group between 15 to 50 years. Informed written consent was taken from the patients of age 18 to 50 years and for those between 15 to 18 years, assent from the patient and informed written consent from the parents/guardian was obtained. All the patients were assessed preoperatively with history, clinical examination and required investigations.

**The patients were randomly allocated into two groups either by lottery method into**

Group D (no.66) received Dexmedetomidine 1 µg/kg in 10 ml normal saline i.v. over 10 min, 5 min before induction of anaesthesia.
Group E (no.66) received Esmolol 1.5 mg/kg in 10 ml normal saline i.v. over 10 min, 5 min before induction of anaesthesia.
The respective drug to be given was prepared by the senior resident who randomly allocates the patients into respective group.
The intra operative monitoring was done by the researcher as per the scale.

**Results**

**Table 1:** Gender

| Gender | Group D | Group E | Total |
|---|---|---|---|
| Female | 21(31.8%) | 36(54.5%) | 57(43.2%) |
| Male | 45(68.2%) | 30(45.5%) | 75(56.8%) |
| Total | 66(100%) | 66(100%) | 132(100%) |

P=0.013*, Significant, Chi-Square Test

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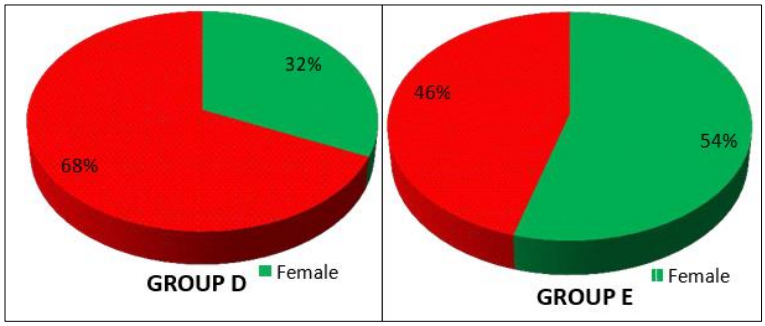


**Fig 1:** Showing the sex distribution

There was no significant difference in the gender of the patients between group D and group E.

**Table 2:** Side Effects

| Side Effects | Group D | Group E | Total |
|---|---|---|---|
| Nil | 66(100%) | 66(100%) | 132(100%) |
| Yes | 0(0%) | 0(0%) | 0(0%) |
| Total | 66(100%) | 66(100%) | 132(100%) |

P=1.000, Not Significant, Fisher Exact Test

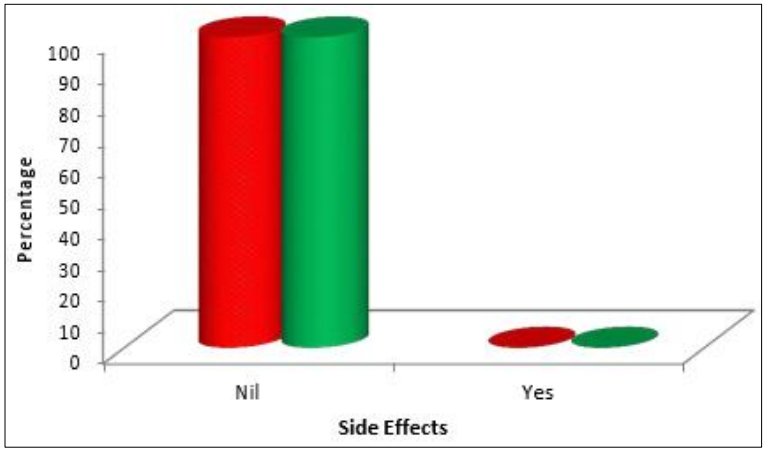


**Fig 2:** Side effects

There was no significant side effects were noted in my study between group D and group E.

**Discussion**

No significant side effects like bradycardia or hypotension were noted in my study for both the groups. This was similar to the study conducted by R. Amutharani *et al*., [7] and Bhavana R Soni *et al*., [8] who also did not observe any adverse effects in both the groups.

Dexmedetomidine is α2-adrenergic agonist which produces its action by decreasing the catecholamine release from locus cereleus in the brain. It decreases the cerebral blood flow (CBF) while preserving the CBF-cerebral metabolic rate coupling, decrease ICP, attenuation of hypoxic injury to brain as well as decrease the vasodilation produced by use of inhalational agents. Hence it is a potentially attractive adjunct for neuro-anaesthesia to attenuate hemodynamic response. It has also been found to influence the catecholamine surge associated with endotracheal intubation.

Rapid administration of Dexmedetomidine might produce tachycardia and hypertension followed by bradycardia and hypotension. We administered Dexmedetomidine at 1.0 μg/kg as IV infusion over 10 min in our study and no bradycardia or hypotension was noticed [9].

Among the β-adrenergic blocking drugs, Esmolol seems to be an appropriate selection for attenuating the haemodynamic response to laryngoscopy and endotracheal intubation, because of its cardio selectivity, rapid onset of action and short elimination half-life.

Esmolol decreases the force of contraction and HR by blocking beta-adrenergic receptors of the sympathetic nervous system which are found in the heart, blood vessels and other organs of the body [10]. Esmolol prevents the action of two naturally occurring neurotransmitters epinephrine and nor-epinephrine, thereby attenuates tachycardia and hypertensive responses to laryngoscopy and tracheal intubation [4].

This study was conducted to compare the effectiveness of intravenous Dexmedetomidine (1 mcg/kg), an

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alpha 2-adrenegic receptor agonist with Esmolol (1.5 mg/kg), an ultra-short acting beta blocker in attenuation of haemodynamic response to laryngoscopy and endotracheal intubation in adult patients undergoing elective laparoscopic surgeries under general anaesthesia.

**Conclusion**

No significant side effects like bradycardia or hypotension were noted in my study for both the groups.

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