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# Effects of Dexmedetomidine on Hemodynamic Responses to Tracheal Intubation: A Comparison with Esmolol

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**Abstract:** Pressure response to laryngoscopy and endotracheal intubation have been long known to be a deleterious phenomenon. Various methods and various drugs to attenuate these changes have been studied. The most recent being dexmedetomidine. It has been shown to be effective.This study was hence conducted to compare esmolol and this new drug to conclude which is better for the same purpose.The study was a randomised controlled trial done on 50 patients who were randomly allocated to two groups. Group I(n=25) received dexmedetomidine 1mcg/kg body weight iv slowly over 10min while Group II received esmolol 100mg iv bolus slow over 30sec. Intubation responses in form of HR and BP were observed.Though none of the drugs were successful in preventing the hemodynamic responses to tracheal intubation dexmedetomidine was found to be better than esmolol.
**Key words:** Hemodynamic response; Intubation; Dexmedetomidine; Esmolol.

## INTRODUCTION

Laryngoscopy and endotracheal intubation is an invasive anaesthetic procedure that involves hemodynamic responses in the patient that are potentially deleterious. Various techniques and a few drugs have been used to alleviate these responses. Esmolol due to its cardioselective nature and short duration of action has been used successfully in this condition. A 100 mg IV bolus of esmolol slowly over 30 seconds has been found to be quite effective in alleviating hemodynamic responses to endotracheal intubation.

It has also been observed that IV infusion (1 mcg/Kg body wt over 10 minutes) of dexmedetomidine combined with inhalation anaesthetics provided satisfactory intraoperative conditions without adverse hemodynamic effects [7].

Esmolol is a second generation beta adrenoceptor antagonist. Being selective antagonist of the β-1 receptors, it is highly cardioselective and has β-2 antagonist activities only at very high doses. The t-1/2 of esmolol is around 6-9 minutes which makes it a very rapid and short acting agent hence very useful in procedures that require short duration blockade.

Dexmedetomidine the pharmacologically active d-isomer of medetomidine [4-(1-(2,3-Dimethylphenyl)ethyl)-1H-imidazole] is a highly specific and selective alpha-2 adrenoceptor agonist[1,2]. The α2:α1 binding selectivity ratio of dexmedetomidine is 1600:1 compared to 220:1for clonidine [2]. Animal experiments have indicated that it has prominent anaesthetic effect[3]. Studies in human volunteers have demonstrated clonidine like analgesic, sedative, sympatholytic and cardiovascular effects [4,5]. In recent studies, dexmedetomidine has been shown to have clinically significant effects on anaesthetic requirements, hemodynamic responses induced by anaesthesia and surgery in patients [6] for which esmolol has long been used.

This study was undertaken to compare two very good drugs esmolol and dexmedetomidine for prevention of hemodynamic responses to tracheal intubation.

## MATERIALS AND METHODS

The study was a double-blind randomized comparative study. It was performed in the department of anaesthesiology of Patna Medical College & Hospital on patients undergoing surgery under general anesthesia. 50 patients were selected according to the selection criteria. The inclusion criteria included ASA grade I-II, age between 20-60 years and not having any systemic illness or taking any cardiac drugs. Group I patients received dexmedetomidine 1mcg/kg body weight iv slowly over 10 min. Group II patients will

receive esmolol 100 mg iv bolus slowly over 30 sec. After proper anaesthetic premedications the two groups received their study drugs. 3 min after giving study drugs, induction was started with propofol 2 mg/kg and suxamethonium 1.5 mg/kg. Intubation was done within 15seconds and inhalation agents along with oxygen and nitrous oxide were used for maintenance. At the end of surgery proper reversal (neostigmine+glycopyrrolate) in appropriate doses were given and patient was extubated. Heart rate (HR) and Mean Arterial Pressure (MAP) were observed in the baseline (T1), after the induction (T2), just after intubation (T3), and 5min after intubation (T4) in both the groups. The mean value of HR and MAP were recorded and compared in the different phases and across the two groups. The effect of the drugs on the change in the hemodynamic parameters were noted and also compared with each other by the use of simple statistical tools.

## RESULTS

Demographic profile of both the groups was almost similar. Average age distribution in group I was 44.6±10.2 yrs while in group II was 44.3±10.5 yrs, average weight distribution in group.

**Table-1: Demographic profile of the patients in both groups**

| | Group I | Group II | P value |
|---|---|---|---|
| Mean Age (in years) | 44.6±10.2 | 44.3±10.5 | 0.46 |
| Mean Weight (in kg) | 56.9±8.1 | 57.4±7.6 | 0.42 |
| Mean Height (in cm) | 166.8±7.5 | 166.3±7.8 | 0.41 |

**Table-2: Average MAP in both groups at different stages**

| | Average MAP (in mmHg) | | | |
|---|---|---|---|---|
| | at T1 | at T2 | at T3 | at T4 |
| Group I | 92.92±4.63 | 86.96±3.37 | 88.36±3.48 | 92.24±3.17 |
| Group II | 92.08±4.49 | 85.16±3.98 | 91.16±5.21 | 91.52±2.57 |

I was 56.9±8.1 kg while in group II was 57.4±7.6 kg. The average height distribution in group I was 166.8±7.5 cm while in group II was 166.3±7.8 cm. The difference between both groups in all the parameters was statistically non-significant as shown in table 1.

The MAP in the two groups was comparable at the baseline (92.92±4.64 mmHg in group I vs 92.08±4.49 mmHg in group II, p value: 0.26). There was a statistical significant decline in the average MAP after the induction in both groups (6.4% and 7.5% respectively). The average MAP increased after intubation in both the groups however the change was statistically significant in the group II when compared to group I. After 5 minutes of intubation the MAP almost reached the baseline level as shown in table 2.

The mean HR in the two groups was comparable at the baseline (84.96±9.45 in group I vs 83.08±8.83 in group II, p value: 0.47). There was a statistically significant decline in the average HR after the induction in both groups (7.7% and 7.2% respectively). The average HR increased after intubation in both the groups however the change was statistically significant only in group II. After 5 minutes of intubation the HR almost reached the baseline level as shown in table 3.

## DISCUSSION

Several anaesthetic procedures have varied effects on the normal physiology of human beings and they affect the vital parameters of the patients varyingly. Laryngoscopy and endotracheal intubation have been shown to have significant effects on the hemodynamic parameters of the patients. Several drugs have been used to circumvent or minimise these effects. Esmolol and dexmedetomidine are two important drugs of different classes used for this reason.

The study finally concluded that dexmedetomidine, though not very effective in preventing hemodynamic responses to tracheal intubation, is superior to esmolol in the same. The baseline HR and MAP decreased in both the groups after induction and the decline was statistically significant in both the groups. This showed that both the drugs were largely ineffective in preventing the decrease in HR and MAP which usually occurs after induction of anesthesia.

After intubation was done, there was a rise in MAP in both the groups but this rise was statistically significant in patients receiving esmolol (p value:<0.01) as compared to those receiving dexmedetomidine (p value: 0.15). The MAP reached the baseline levels after 5 minutes of induction. This showed that patients who received dexmedetomidine had a mores table MAP at the time of intubation when compared to esmolol.

**Table-3: Mean HR in both groups at different stages**

| | Mean HR | | | |
|---|---|---|---|---|
| | at T1 | at T2 | at T3 | at T4 |
| Group I | 84.96±9.45 | 78.44±7.61 | 80.68±6.50 | 82.04±5.90 |
| Group II | 83.08±8.83 | 77.08±6.89 | 84.16±7.52 | 84.48±5.96 |

As far as the HR was concerned, similar effect was seen here also. There was a rise in mean HR in both groups which was statistically significant (p value: <0.01) in patients receiving esmolol when compared to the patients receiving dexmedetomidine (p value: 0.27). The mean HR reached the baseline levels after 5 minutes if intubation. This also showed that the HR was more stable in patients who were given dexmedetomidine before induction than those receiving esmolol.

Srivastava *et al*. [8] in 2015 also found similar results.Shrestha *et al*. [9] in 2011 noted that higher doses of esmolol 1.5mg/kg do not completely prevent response to intubation in accordance with our study. Samaha *et al*. [10] in 1996 also found the same. Our results are opposite to Alagol *et al*. [11], however, where esmolol was found to be better. However majority studies support the use of dexmedetomidine over esmolol.

## CONCLUSION

Dexmedetomidine and Esmolol both are effective drugs in maintaining the hemodynamic parameters after induction and endotracheal intubation but the parameters are more stable in patients receiving dexmedetomidine when compared to those receiving esmolol.

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