



## Anaesthesiology

## AN OBSERVATIONAL STUDY OF HAEMODYNAMIC STRESS RESPONSES TO ENDOTRACHEAL INTUBATION AND POST-OPERATIVE SEDATION WITH INTRAVENOUS DEXMEDETOMIDINE: A COMPARISON BETWEEN TWO DOSES.

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**ABSTRACT** **INTRODUCTION:** Dexmedetomidine, blunts sympathetic response to laryngoscopy and tracheal intubation for patients requiring general anaesthesia.

**AIMS AND OBJECTIVES** To study the efficacy of dexmedetomidine in blunting of hemodynamic responses for intubation and post-operative sedation.

**METHODOLOGY** Sixty patients between 18-65 years of age requiring general anaesthesia were selected randomly and divided in 2 groups (30 in each group). Group A was given the dexmedetomidine at the dose of 0.5 mcg/kg and group B was given the dexmedetomidine at the dose of 0.75 mcg/kg in 100 ml NS infused over 10 minutes. The hemodynamic stress response was assessed at 1, 3, 5 minutes after intubation; also post-operative sedation up to 4 hours was noted.

**DISCUSSION** Following intubation the hemodynamic response starts within few seconds, reaches its peak at 1-2 minutes; and returns to its baseline level at 5 minutes. Dexmedetomidine act through  $\alpha$ -2 receptor agonist in locus caeruleus, the predominant noradrenergic nuclei of upper brainstem.

**CONCLUSION:** We conclude that preoperative infusion of dexmedetomidine at the dose of 0.75 mcg/kg shows better response to blunting of stress responses. Also the post-operative sedation was not significant with any group.

**KEYWORDS :** dexmedetomidine, post-operative sedation, stress responses, laryngoscopy & intubation.

### INTRODUCTION

Laryngoscopy and tracheal intubation cause cardiovascular alterations and affect airway reactivity.<sup>(1)</sup> Haemodynamic and hormonal responses to laryngoscopy and intubation can present in very severe forms. These include post intubation cerebral and cardiovascular side effects.<sup>(2)</sup> Endotracheal intubation in patients undergoing general anaesthesia often causes hypertension and tachycardia which may be altered when the efferent sympathetic fiber to the cardiovascular system is interrupted.<sup>(3)</sup> Infusion of dexmedetomidine perioperatively blunts the stress responses to tracheal intubation along with sparing the need for anaesthetic agents and opioid supplementation.<sup>(4)</sup> Dexmedetomidine is a highly selective  $\alpha$ 2-receptor agonist with sedative, analgesic and anxiolytic effects.<sup>(5)</sup> with the unique characteristic to cause less dose dependent respiratory depression. In addition, it possess sympatholytic and antinociceptive effects that allow hemodynamic stability during surgical stimulation.<sup>(6)</sup> In healthy normotensive patients, the use of dexmedetomidine during anaesthetic induction suppresses the decrease in blood pressure. It also blunts the stress responses to laryngoscopy and intubation.<sup>(7)</sup>

In a prospective, randomized controlled study, we try to assess the optimal dose of dexmedetomidine needed for blunting of hemodynamic response to laryngoscopy and endotracheal intubation. We also assess the dose dependent post operative sedation with the study drug.

### MATERIALS AND METHODS

The study included 60 patients of either sex from age group 18-65 years undergoing general anaesthesia for various procedures. Ethical clearance was obtained from our institution (ethical reference no-IEC/cert/56/2018). Vital parameters like pulse, blood pressure were noted. Routine laboratory investigations like haemoglobin, renal function tests, s.bilirubin, x-rays, ECG were done. Patient and relatives were explained about the study in their own language and informed written consent was obtained.

Furthermore, patients were divided randomly in two groups and they were not aware about which group they belonged. Computer generated program was used for randomization and patient allocation to the two

study groups, with the patients not being aware of their individual group. The surgeries of duration lasting one and half hour to two hour only were included in the study.

**Group A** = 0.5 mcg/kg Inj Dexmedetomidine diluted in 100 ml 5% normal saline infused over 10 minutes

**Group B** = 0.75 mcg/kg Inj Dexmedetomidine diluted in 100 ml 5% normal saline infused over 10 minutes.

Patients were premedicated with glycopyrrolate 4 microgram/kg, fentanyl 2 microgram/kg and ondansetron 0.15 mg/kg IV prior to induction. Patients were taken on OT table and vital parameters like non-invasive blood pressure (NIBP), heart rate (HR), pulse oximetry, were measured. Thereafter, study drug infusion was given over 10 minutes. After monitoring the hemodynamics for 10 minutes, the anaesthetic procedure was started. General anaesthesia technique were generalised for both the groups. Patients were induced with Inj Thiopentone sodium 4-6mg/kg and Inj. Succinyl Choline 2mg/kg intravenously to facilitate tracheal intubation with proper endotracheal tube size. Recording of HR, BP (Systolic blood pressure, Diastolic blood pressure, Mean arterial pressure), SPO<sub>2</sub> was done after 1, 3 and 5 minutes of intubation. Patients were maintained under controlled ventilation with O<sub>2</sub> sevoflurane and vecuronium/atracurium to maintain normocapnia and to keep BIS values between 40 and 60. After surgery, reversal was achieved after onset of spontaneous respiration with Inj. neostigmine 0.05 mg/kg IV and Inj. glycopyrrolate 8 mcg/kg IV and after satisfying extubation criteria the patients were extubated. After adequate recovery, patients were shifted to post anaesthesia care unit (PACU) for post operative monitoring. The sedation of the patient was observed in the immediate post-operative, 2 hours and 4 hours post-operative period.

### RESULTS

This randomised study done on 60 patients divided equally into 2 groups with equal number of patients in each group (30 each).

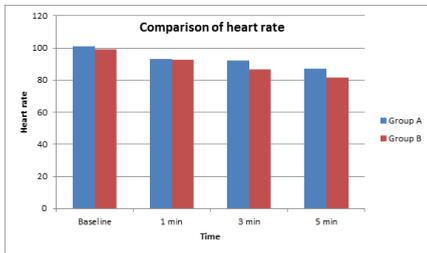
**Group A** = 0.5 mcg/kg inj dexmedetomidine diluted in 100 ml NS infused over 10 minutes

**Group B** = 0.75 mcg/kg inj dexmedetomidine diluted in 100 ml NS infused over 10 minutes.

**Table1: Difference in heart rates within two study groups**

| HR (beats/ min) | Group A    | Group B      | P value | Inference       |
|-----------------|------------|--------------|---------|-----------------|
| Baseline        | 101± 12.98 | 99.27± 12.91 | 0.60    | Not significant |
| 1 min           | 93.3±16.06 | 92.6± 10.5   | 0.84    | Not significant |
| 3 min           | 92± 12.15  | 86.7±8.7     | 0.05    | significant     |
| 5 min           | 87.1± 10.4 | 81.4± 8.96   | 0.02    | significant     |

HR-Heart rate

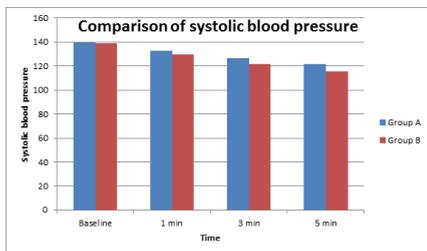


The above diagram shows significant difference in the heart rate at 3 min and 5 min from the baseline.

**Table 2:Systolic blood pressure recorded in the two study groups.**

| SBP (mm of Hg) | Group A       | Group B      | P value | Inference       |
|----------------|---------------|--------------|---------|-----------------|
| Baseline       | 139.47± 10.66 | 139.03±10.19 | 0.87    | Not significant |
| 1 min          | 132.6± 10.15  | 129.4±10.15  | 0.25    | Not significant |
| 3 min          | 126.7± 8.72   | 121.4±8.72   | 0.69    | Not significant |
| 5 min          | 121.67± 7.66  | 115.2± 7.66  | 0.008   | significant     |

SBP-Systolic Blood Pressure

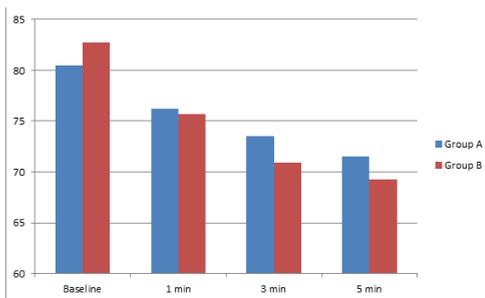


The bar diagram shows the significant differences in systolic blood pressures at 5 minutes from the baseline.

**Table 3:Diastolic blood pressure recorded in the two study groups.**

| DBP(mm of Hg) | Group A    | Group B     | P value | Inference       |
|---------------|------------|-------------|---------|-----------------|
| Baseline      | 80.5± 7.2  | 82.73± 5.93 | 0.19    | Not significant |
| 1 min         | 76.2± 8.21 | 75.73±7.45  | 0.81    | Not significant |
| 3 min         | 73.5± 5.6  | 70.93± 6.12 | 0.09    | significant     |
| 5 min         | 71.53± 7.5 | 69.3±5.63   | 0.19    | Not significant |

DBP-Diastolic Blood Pressure

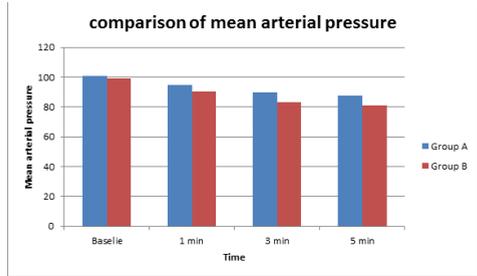


The above diagram shows significant difference at 3 min and 5 min from the baseline.

**Table 4:Mean arterial blood pressure recorded in the two study groups.**

| MAP(mm of Hg) | Group A      | Group B     | P value | Inference       |
|---------------|--------------|-------------|---------|-----------------|
| Baseline      | 100.8± 10.59 | 98.9± 7.77  | 0.43    | Not significant |
| 1 min         | 94.6± 9.9    | 90.3± 10.45 | 0.10    | Not significant |
| 3 min         | 90.06± 6.95  | 83.17±9.12  | 0.001   | significant     |
| 5 min         | 87.36± 8.86  | 80.93± 7.5  | 0.003   | significant     |

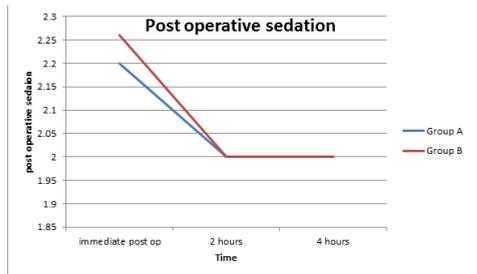
MAP-Mean arterial pressure



The bar diagram shows significant differences in the mean arterial pressure at 3 minutes and 5 minutes from the baseline.

**Table 5:Dose dependent post-operative sedation.**

| Post-operative sedation (hours) | Group A  | Group B   | P value              |
|---------------------------------|----------|-----------|----------------------|
| Immediate Post op               | 2.2±0.40 | 2.26±0.44 | 0.5(Not significant) |
| 2 hours                         | 2        | 2         | -                    |
| 4 hours                         | 2        | 2         | -                    |



The above graph shows that there is no significant difference in post operative sedation in both the groups.

**DISCUSSION**

The most fascinating concept of general anaesthesia is induced unconsciousness, induced by altered arousal or cognition and the state of controlled unconsciousness.<sup>(8,9)</sup> Artificial airway maintenance by endotracheal tube is used to preserve the airway and prevent aspiration in a patient and for proper delivery of inhalational anaesthetic agents. Increased the cardiovascular responses and airway reactivity in form of laryngospasm or bronchospasm are seen with laryngoscopy and intubation.(1)Haemodynamic and hormonal responses to laryngoscopy and intubation can present in very severe forms. These include post intubation cerebral and cardiovascular side effects.<sup>(2)</sup> Endotracheal intubation in patients undergoing general anaesthesia often causes hypertension and tachycardia which may be altered when the efferent sympathetic fiber to the cardiovascular system is interrupted.(3)

Dexmedetomidine is a highly selective central  $\alpha_2$ -receptor agonist with sedative, analgesic and anxiolytic effects <sup>(5)</sup> with the unique characteristic to cause no respiratory depression. Possessing sympatholytic and antinociceptive effects that allow hemodynamic stability during surgical stimulation.(6) Perioperative infusion of dexmedetomidine is effective in attenuating sympathetic and adrenal response to intubation. Along with its significant anaesthetic and opioid sparing effect. <sup>(4)</sup> Dexmedetomidine not only decreased the degree of haemodynamic response to endotracheal intubation, surgery and extubation but also decreased the dose of opioids and isoflurane in achieving adequate analgesia and anaesthesia, respectively.<sup>(10)</sup>

Hypotension following induction of general anaesthesia is a common event.<sup>(11)</sup> dexmedetomidine not only blunts the responses like hypertension and tachycardia to intubation but also suppresses blood pressure changes due to anaesthetic drugs.(7)

In our study intravenous administration of dexmedetomidine 10 mins prior to laryngoscopy and intubation blunts the stress responses to the same. Where the dose of 0.75 mcg/kg shows better response of the drug than 0.5 mcg/kg. Blunting of hemodynamic response is better with 0.75 mcg/kg at the end of 3 min and 5 min. Also the post-operative sedation does not seem to be that evident with any of the groups. Though Group B dose being on higher side does not show any significant post-operative sedation. In our study no other episode as bradycardia or

hypotension was noted.

## CONCLUSION

The three minute assessments revealed a significant variation between two groups statistically group B showing better stability tolerance as opposed to Group A ( $P < 0.06$ ) and similar trend was observed in the five minute assessment wherein Group B again showed a better stability as opposed to group A ( $P < 0.03$ ). Also the drug dose of 0.75 mcg/kg even being in higher side did not show any post-operative sedation.

Thus the study revealed statistically significant and better response among Group patients as compared to Group A.

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