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# EVALUATION OF EFFECT OF LOW DOSE DEXMEDETOMIDINE ON INTRAOPERATIVE HEMODYNAMICS IN PATIENTS UNDERGOING LAPAROSCOPIC SURGERIES UNDER GENERAL ANAESTHESIA

**Dr. Preethi. R** Postgraduate Resident Department of Anaesthesiology, Sri Devaraj Urs Academy of Higher Education and Research,R L Jalappa Hospital,Tamaka,Kolar,Karnataka,563103,India.

**Dr. Suresh Kumar. N** Professor and Head Department of Anaesthesiology, Sri Devaraj Urs Academy of Higher Education and Research,R L Jalappa Hospital,Tamaka,Kolar,Karnataka,563103,India.

## ABSTRACT

**Background:** Dexmedetomidine provides adequate intraoperative analgesia and good surgical field, post-operative sedation, and patient comfort with no adverse effects for patients. This study assessed the hemodynamic stability with the two doses of dexmedetomidine (0.25mcg & 0.5mcg) among patients experiencing laparoscopic surgeries under general anaesthesia. **Materials And Methods:** This is a prospective observational study done among 64 Patients admitted under General Anaesthesia for elective laparoscopic surgeries performed at R. L. Jalappa Hospital and Research Centre, Tamaka, Kolar, between January 2020 to May 2021. Group A (Dexmed- 0.25mcg/kg/hr) and Group B (Dexmed -0.5mcg/kg/hr) were classified into two groups, and haemodynamic changes were examined among the two groups. **Results:** Among 64 patients, Group A male was 3 (9.4%), and females were 29 (90.6%). In group B, the male was 2 (6.3%), and the female was 30 (93.7%); there is no significant difference in gender and age (p=0.641) and (p=0.381). The difference in means of the haemodynamic parameters such as Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation between the study groups was not statistically significant except for the systolic blood pressure at 90 min, where the mean SBP is significantly greater among Group A (Dexmed- 0.25mcg). **Conclusion:** From our study, we conclude that there is no difference in hemodynamic stability with two different doses of dexmedetomidine (0.25mcg & 0.5mcg) among patients who underwent laparoscopic surgeries under general anaesthesia.

**KEYWORDS :** Dexmedetomidine, General anaesthesia, Haemodynamic stability, Laparoscopic

## INTRODUCTION

Anaesthetic procedures involved in general anaesthesia, like direct trachea intubation, laryngoscopy, and extubation, usually cause stimulation of the sympathetic system.[1] This leads to increased plasma norepinephrine, adrenaline levels and blood plasma renin activity.[2] Because of its minimal scar, lessened post-operative pain, decreased duration of stay at the hospital and less mortality, Laparoscopic surgeries become the choice wherever possible.[3] Also, the hallmark of laparoscopy is the creation of pneumoperitoneum with carbon dioxide (CO2) insufflation under pressure to separate the organs inside the abdominal cavity.[4] The stimulation of the sympathetic system cause increase in intra-arterial pressure, systemic –pulmonary vascular resistance and changes in heart rate. Sometimes these haemodynamic alterations can produce severe permanent injury to the myocardium or rarely life-threatening complication.[5]

Modern anaesthesia uses various drugs to prevent this sympathetic discharge from providing haemodynamic stability. Most commonly used medications for this purpose include opioid analgesics, calcium channel blockers, beta-blockers, benzodiazepines, and vasodilators □-2 agonists have shown to provide adequate sedation, analgesia, weakening of a response to stress and reduction in dexmedetomidine is a highly selective agonist at the □2-adrenergic receptor falls under the imidazole subclass which is a pharmacologically active Dextro rotatory S-enantiomer of medetomidine. Dexmedetomidine acts through a receptor different from the usual γ-aminobutyric receptor utilised by drugs such as propofol and benzodiazepines.[6]

Numerous studies have demonstrated that intra-operative infusion with dexmedetomidine reduces the requirement for peri-operative analgesics. In addition, dexmedetomidine has also proved to reduce intraoperative blood pressure and provide satisfactory surgical field conditions used in hypotension anaesthesia. Therefore, our study aims to assess the efficacy of dexmedetomidine infusion in lower doses than in previous studies to reduce the systolic blood pressure lower than 30% of the baseline value to achieve the targeted SBP in patients who underwent laparoscopic surgeries.

## AIM:

This study assessed the hemodynamic stability with the two doses of dexmedetomidine (0.25mcg & 0.5mcg) among patients underwent laparoscopic surgeries under general anaesthesia.

## MATERIAL AND METHODS:

This was a Prospective observational study performed on 64 patients admitted for elective laparoscopic surgeries with General Anaesthesia at R. L.Jalappa Hospital & Research Centre, Tamaka, Kolar, Karnataka, during the period from January 2020 to May 2021.

Inclusion Criteria: Patients belonging to ASA Grade I and II, both genders, age group between 18 years to 60years, weighing more than 45 kgs, and scheduled for elective laparoscopic surgeries. Exclusion criteria: Patients suffering from chronic hypertension, severe ventricular dysfunction, Hypovolemia, and Bradycardia.

Based on the Computerised randomisation, the patients will be allocated to either of the two groups. Group A (Dexmed-0.25mcg): received dexmedetomidine 0.25mcg/kg/hr as continuous iv infusion at an infusion rate of 0.05ml/kg/hr from a prepared dexmedetomidine diluted in saline to a concentration of 5mcg/ml. Group B (Dexmed -0.5mcg): received dexmedetomidine 0.5mcg/kg/hr as continuous iv infusion at an infusion rate of 0.05ml/kg/hr from a prepared dexmedetomidine diluted in saline to a concentration of 10mcg/ml.

Baseline HR, NIBP, ECG, and SPO2 were recorded on arrival at the operation room. All patients were given intravenous injections of 0.005 mg/kg of glycopyrrolate, two mcg/kg of fentanyl citrate, and 4 mg of ondansetron 10 minutes before anaesthesia was induced.

After preoxygenation for 3 minutes, anaesthesia was induced

with the Inj. Propofol 2 mg/kg till loss of verbal command and tracheal intubation with appropriate size Oral Endo Tracheal Tube was facilitated with Inj. Succinyl Choline 2 mg/kg.

Anaesthesia was maintained with 60% Nitrous Oxide in O2, Isoflurane and Inj. Vecuronium 0.1mg/kg as muscle relaxant. Patients were mechanically ventilated to keep ETCO 2 between 30 – 35 mmHg.

Intraoperatively, HR, ETCO 2, ECG, NIBP, and SPO 2 were monitored and recorded at 15 min intervals till the finishing of surgery. In cases of hypotension, the dial concentration of isoflurane or the infusion rate of intravenous fluids was lowered, and in cases of bradycardia, intravenous atropine was administered. After the conclusion of surgery, the residual neuro-muscular blockade was withdrawn with Inj. Neostigmine 0.05mg/kg and Inj.Glycopyrrolate 0.008 mg/kg. After the patient had made a sufficient motor recovery and was breathing on their own, extubation was performed.

After the neuromuscular blockade was reversed, the moment of waking was noted. Next, patients were transported to the post-anaesthesia care unit (PACU) to monitor any drug-induced side effects or problems, including but not limited to respiratory depression, sedation score, VAS score, haemodynamic abnormalities, nausea, vomiting, and so on.

Mean, median, mode, and standard deviation are measures of central tendency used to summarise numerical data. Estimates of frequency and percentages are used to characterise categorical variables such as gender and age. Bar graphs and pie charts are employed as necessary.

When a mean difference of a Numerical variable is compared among groups A and B, an independent t-test is used. Tables and bar graphs show the differences and similarities between the two categorical variables. The chi-square test is used to determine statistical significance. Fisher's exact test is employed when the predicted cell value is less than 5, more than 20% of the cell values. To analyse the data, we used Microsoft Excel and SPSS 26.

## RESULTS:

**Table 1. Distribution Of Patient's Characteristics**

| Variable | | Frequency (%) | | P value |
|---|---|---|---|---|
| | | Group A | Group B | |
| Gender | Male | 3 (9.4%) | 2 (6.3%) | 0.641 |
| | Female | 29 (90.6%) | 30 (93.7%) | |
| Age (Years) | 18-20 | 1 (3.1%) | 0 | 0.381 |
| | 21-30 | 2 (6.3%) | 5 (15.6%) | |
| | 31-40 | 13 (40.6%) | 8 (25%) | |
| | 41-50 | 12 (37.5%) | 16 (50%) | |
| | 51-60 | 4 (12.5%) | 3 (9.4%) | |

Among 64 patients, Group A male was 3 (9.4%), and females were 29 (90.6%). In group B, the male was 2 (6.3%), and the female was 30 (93.7%); there is no significant difference in gender and age (p=0.641) and (p=0.381). There is no statistical significant difference in ASA.

**Table 2. Distribution Of Procedure Among The Study Participants**

| Procedure | Mean and Std Deviation | | P value |
|---|---|---|---|
| | Group A | Group B | |
| Laparoscopic Cholecystectomy | 28 (87.5%) | 26 (81.2%) | 0.783 |
| Laparoscopic Appendectomy | 2 (6.3%) | 2 (6.3%) | |
| Lap Assisted Vaginal Hysterectomy | 1 (3.1%) | 3 (9.4%) | |
| Diagnostic Laparoscopy | 1 (3.1%) | 1 (3.1%) | |

There is no significant difference in procedure between the groups (p=0.783) (Table 2).

**Table 3. Heart Rate Changes Among The Study Participants**

| Heart rate | Mean and Std Deviation | | P value |
|---|---|---|---|
| | Group A | Group B | |
| Baseline | 78.41 ± 8.07 | 77.63 ± 6.67 | 0.636 |
| After infusion | 75.31 ± 8.77 | 77.16 ± 9.68 | 0.371 |
| 0 min | 77.72 ± 9.10 | 76.72 ± 9.99 | 0.798 |
| 15 min | 78.47 ± 8.39 | 77.56 ± 8.69 | 0.652 |
| 30 min | 75.09 ± 9.27 | 72.31 ± 9.10 | 0.216 |
| 45 min | 75.56 ± 9.108 | 75.03 ± 9.94 | 0.867 |
| 60 min | 77.19 ± 9.00 | 75.41 ± 11.03 | 0.554 |
| 75 min | 74.13 ± 8.16 | 74.75 ± 9.33 | 0.804 |
| 90 min | 75.59 ± 9.97 | 73.28 ± 9.17 | 0.405 |

The differences between the groups in maintaining the heart rate were not statistically significant (Table 3).

**Table 4. Mean Arterial Pressure Changes Among The Study Participants**

| Mean Arterial pressure | Mean and Std Deviation | | P value |
|---|---|---|---|
| | Group A | Group B | |
| Baseline | 89.59 ± 7.81 | 91.59 ± 7.35 | 0.310 |
| After infusion | 92.83 ± 6.47 | 92.16 ± 6.22 | 0.825 |
| 0 min | 96.29 ± 6.34 | 95.16 ± 5.65 | 0.401 |
| 15 min | 90.22 ± 6.41 | 91.35 ± 6.44 | 0.409 |
| 30 min | 90.14 ± 6.28 | 90.71 ± 5.78 | 0.672 |
| 45 min | 90.45 ± 5.09 | 91.20 ± 5.22 | 0.610 |
| 60 min | 88.86 ± 5.67 | 90.39 ± 5.50 | 0.351 |
| 75 min | 91.49 ± 5.93 | 90.15 ± 5.45 | 0.307 |
| 90 min | 91.72 ± 5.50 | 91.23 ± 5.63 | 0.893 |

There was no statistical difference between the groups in maintaining the mean arterial pressure (Table 4).

## DISCUSSION

The primary objective of our study is to investigate the hemodynamic stability with two separate doses of dexmedetomidine (0.25mcg/ml & 0.5mcg/ml) among patients who underwent laparoscopic surgeries with general anaesthesia. It is a prospective observational study done among 64 Patients who underwent elective laparoscopic surgeries performed with General Anaesthesia. They were classified into two separate groups, Group A (Dexmed- 0.25mcg/ml) and Group B (Dexmed - 0.5mcg/ml). Haemodynamic alterations were studied between the two groups.

Laparoscopic surgeries necessitate intraperitoneal insufflations with carbon dioxide, which is linked with significant hemodynamic changes, including reduced stroke volume, increased blood pressure and a rise in pulmonary and systemic vascular resistance.[7,8] Many hemodynamic and ventilatory changes occur during laparoscopic procedures due to the combined impact of pneumoperitoneum with CO2 insufflation and the placement of the patient.[9,10]

Systemic hypertension can develop when venous return is reduced, and systemic vascular resistance is elevated. For this reason, it becomes more important to use a deeper level of anaesthesia and to provide vasodilators to prevent increased blood pressure. When carbon dioxide is insufflated into the peritoneal cavity, it causes an increase in intra-abdominal pressure (IAP) above 10 mm Hg. This causes significant changes in hemodynamics, including a decrease in venous return, an increase in arterial pressure, and an increase in systemic and pulmonary vascular resistance. The rate of a heartbeat does not alter or moderately rises. The beginning of peritoneal insufflation is particularly prone to these hemodynamic disturbances.[11,12]

The use of alpha two agonists during the peri-operative period has been related to decreased anaesthetic requirements and

diminished heart rate and blood pressure to the stress responses. Furthermore, because they are located in the spinal cord, α-2 receptors help to moderate pain pathways and provide a measure of analgesia.[13,14]

Anaesthesia during these laparoscopic surgeries has emphasised the usage of many pharmaceutical agents which can counteract these hemodynamic changes. Studies using a variety of pharmacological therapies have shown that they can minimise the occurrence of tachycardia and hypertension during laparoscopic procedures while maintaining a stable hemodynamic state with few adverse effects. α2-adrenergic agonists may aid the role of ideal pharmacological adjuvant for laparoscopic surgeries, as they provide analgesia, anxiolysis, hypnosis, sedation, and sympatholysis.[15,16]

Dexmedetomidine is a highly selective alpha-2-adrenoceptor agonist with anxiolytic, sedative, and analgesic properties. It is more selective for α-2 receptors with 1600 times greater affinity than $\alpha_1$ receptor. By inhibiting the production of norepinephrine, its sympatholytic action lowers both MAP and heart rate. Dexmedetomidine can also lessen the need for peri-operative anaesthetics and narcotic pain relievers. Moreover, dexmedetomidine is short-acting and has an antidote for its sedative effect called Atipamezole.[17,18]

The properties mentioned above render dexmedetomidine suitable for sedation and analgesia in the peri-operative period as a premedication, an anaesthetic adjunct, and a post-operative analgesic and sedative. It was observed that dexmedetomidine used in premedication attenuates sympathetic activation.[19]

## CONCLUSION

Hence our study concludes that there is no difference in hemodynamic stability with two separate doses of dexmedetomidine (0.25mcg/kg/hr & 0.5mcg/kg/hr) among patients undergoing surgeries with laparoscopy with general anaesthesia. Furthermore, we did not witness any majorly adverse side effects in the groups.

## LIMITATIONS

The study was conducted with a relatively smaller sample size to measure the differences in the hemodynamic parameters. Also, the desired sample size was achieved despite the Covid pandemic threat mandating a halt in elective surgeries during the majority of the study duration.

The role of Confounding factors cannot be ruled out, even though the factors such as baseline attributes were comparable in both the groups and randomisation was followed to allocate the groups.

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