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Original Research Article

# Intravenous Lignocaine versus Intravenous Dexmedetomidine in Attenuation of Haemodynamic Response to Laryngoscopy and Intubation in Adult Patients: A Comparative Study

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**Abstract:**

**Background:** The stress response to Laryngoscopy and endotracheal intubation is a common physiological phenomenon. It can be transient and harmless in healthy normotensive patients, but it may be hazardous in patient with underlying cardiac disease.

**Materials and Methods:** Sixty cases undergoing surgery under general anaesthesia aged between 18 to 50 years of both sexes with ASA grade I with Modified Mallampatti score 1 and 2 were selected randomly and divided two groups of 30 each. All patient were pre-medicated with Inj Ranitidine (i.v) Ketorolac 0.5 mg /kg and paracetamol infusion 15mg/kg before induction. Inj Glycopyrolate 0.004 mg/kg (i.v.), midazolam 0.02 mg/kg and Inj. fentanyl 1 µg/kg were given before induction. After Preoxygenation group L received 1.5 mg/kg Lignocaine intravenous and group D received Dexmedetomidine 0.5 µg/kg diluted in 100 ml of normal saline intravenous. Patients was induced with injection propofol 1% intravenously. until loss of response to verbal stimulus Pulse rate, systolic and diastolic blood pressure was recorded noninvasively before induction, post induction-1, 3, 5 and 10 minutes from the onset of laryngoscopy. Mean, SD and 't' test was used for statistical analysis.

**Results:** A better control of haemodynamic response was observed in patients receiving dexmedetomidine infusion($p < 0.001$). Heart rate, systolic, diastolic and mean blood pressure fell gradually till 10 minutes after post intubation in both the group as compared to basal level.

**Conclusion:** Dexmedetomidine showed better attenuation of haemodynamic response to laryngoscopy and intubation as compared to lignocaine.

**Keywords:** Attenuation; Dexmedetomidine; Lignocaine; Haemodynamic response; Laryngoscopy; Intubation.



## Introduction

Laryngoscopy and endotracheal intubation is mandatory procedures for most of the patients undergoing surgery under general anaesthesia. Endotracheal intubation is perfect gold standard airway device, but its placement may lead to evoke stress response. Although this response is transient in normotensive healthy patients occurring 30 seconds after laryngoscopy and intubation are more marked in patients with underlying cardiac disease [1,2]. Numerous drugs like calcium channel blockers, opioids, magnesium sulphate , lignocaine and other local anaesthetics have been used to blunt it [3,4,5]. Abou-Madi et al [6] observed that lignocaine1.5mg/kg as the optimal dose administered intravenously 3 minutes before laryngoscopy for attenuating the cardiovascular response. However, Miller et al [7] did not find any benefit after using intravenous lignocaine (1.5 mg/kg) at 1, 2 or 3 minutes before laryngoscopy.

Numerous techniques have been tried to attenuate these adverse effects in current safe anaesthesia practices, including deep levels of general anesthesia with variable success rate [8].As none of the approaches proved to be satisfactory and search for an ideal agent still continues. Lignocaine is a long-established, safe and effective agent using to blunt the hemodynamic response. Alpha- 2 adrenergic agonists widely used in the preoperative period due to their analgesic, anxiolytic, sedative/hypnotic, and sympatholytic properties [9].Dexmedetomidine is relatively new alpha-2

adrenergic agonist. Dexmedetomidine has been widely used and more effective to attenuate haemodynamic response to laryngoscopy as compared to other agents like fentanyl, esmolol, and clonidine [10,11].

This study was conducted with an objective to compare the changes in heart rate and blood pressure during laryngoscopy and intubation in intravenous lignocaine and dexmedetomidine infusion and to compare side-effects profile in both groups.

## Material and Methods

This comparative study was done in department of anaesthesia at Fakhruddin Ali Ahmed Medical College& Hospital from September, 2020 to August, 2021, after obtaining institutional ethical committee clearance (No. FAAMC & H/IEC_PG/498/2020/13657).

## Sample Size

Assuming mean difference of PR or SBP between two groups as 5, at 95% C.I. ($\alpha = 0.05$), population variance as 40 and power of the study ($\beta$) as 80%, the sample size n = 26 was required in each group. Considering 15% loss to follow-up, it was decided to include 30 patients in each group. Results were compiled in SPSS.20 spreadsheet for statistical analysis. Student t-test, Mean and Standard Deviation (SD) were calculated from collected data. $P < 0.05$ was considered as statistically significant.

Sixty cases undergoing surgery under general anaesthesia aged between 18 to 50 years of both sexes with ASA grade I with Modified Mallampattiscore1and 2 were included. Patient were excluded who did not give consent, if their Modified Mallampati Score 3 & 4, having history of Alcoholism, Diabetesmellitus, Hypertension, Bleeding diathesis, hepatic, renal or cardio-pulmonary abnormality, hypersensitivity to dexmedetomidine or lignocaine and significant neurological, psychiatric, or neuromuscular disorders.

The study was done between two groups that is group Lignocaine (L) and Dexmedetomidine (D). The first patient was allocated one of the study drugs randomly, then each subsequent patient was alternately allocated to Lignocaine or Dexmedetomidine group till desired sample achieved. A detailed pre anaesthetic checkup was done prior to day of surgery and preoperative fasting of minimum 6 hour was ensured before operation. All patients were clinically monitored in the preoperative period and the whole procedure was explained to patient along with written informed consent. Skin sensitivity test for both drugs that is lignocaine and dexmedetomidine was done on day of pre-anaesthetic checkup. Only Patients fit for pre-anaesthetic checkup were taken for surgery under study and tab alprazolam 0.25 mg given orally on the evening before surgery.

Before surgery each patient were pre-medicated with Inj Ranitidine (i.v) Ketorolac 0.5 mg /kg and paracetamol infusion 15mg/kg fifteen minutes before induction; Inj Glycopyrolate 0.004 mg/kg (i.v.), midazolam 0.02 mg/kg and Inj. fentanyl 1 µg/kg body weight were given ten minutes before induction of anaesthesia. After Preoxygenation, group L received 1.5 mg/kg of 2% preservative free lignocaine intravenous and group D received dexmedetomidine 0.5 µg/kg diluted in 100 ml of normal saline intravenous over a period of 10 min by syringe pump, and the infusion was completed in 10 min before induction. Patients was induced with injection propofol 1% intravenously until loss of response to verbal stimulus. After that Vecuronium (0.1mg/kg) intravenous was given, after that patient's lungs were manually ventilated for over 3 minutes. After 3 minutes Laryngoscopy and intubation was done by an experienced anaesthesiologist in <15seconds. Muscle relaxation was maintained with intermittent intravenous vecuronium [0.02 mg/kg]. Controlled ventilation was maintained with 33% oxygen in 66% nitrous oxide and isoflurane inhalation. After completion of surgery, inhalation agents of isoflurane and $N_2O$ were discontinued and residual neuromuscular blockade was antagonized with neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg intravenously and the patient extubated. The baseline, pre-laryngoscopy, at the time of laryngoscopy and intubation, 1 minute, 3 minutes and 5 minutes and 10 minutes after intubation values of circulatory variables such as HR, SBP, DBP and MBP were recorded. The incidence of adverse events during operation, i.e. shivering, nausea, vomiting, bradycardia (HR<60 bpm), and hypotension (MAP<65 mm Hg or SBP< 100 mm Hg)was also recorded.

## Results

Demographic characteristics of both Lignocaine (L) and Dexmedetomidine (D) group shown in table 1. Both groups were comparable with respect to their age, height, weight and BMI status. Basal haemodynamic status of both groups were also comparable ($p < 0.05$) as shown in (Table 1)

**Table 1: Demographic Characteristics.**

| Group ► | Lignocaine (L) (N = 30) | | Dexmedetomidine (D) (N = 30) | | p– value |
|---|---|---|---|---|---|
| Variable ▼ | Mean | S.D. | Mean | S.D. | |
| Age (Years) | 34.53 | ± 8.25 | 30.67 | ± 8.82 | 0.085 |
| Weight (kg) | 66.17 | ± 7.66 | 69.17 | ± 4.22 | 0.065 |
| Height (cm) | 166.80 | ± 6.55 | 168.80 | ± 5.24 | 0.196 |
| Body Mass Index | 23.73 | ± 1.83 | 24.28 | ± 1.16 | 0.172 |

The mean heart rate reached peak during laryngoscopy and intubation in Lignocaine group followed by gradual decline to 5 minutes post-intubation. However, in Dexmedetomidine group there was gradual decline of heart rate till 5 minutes post intubation as compared to basal heart rate. This decline of mean heart rate during laryngoscopy and intubation to 10 minutes after intubation in Dexmedetomidine group was significantly ($p < 0.001$) lower as compared to Lignocaine group(Table: 2).

**Table 2: Comparison of Mean Heart Rates.**

| Variable ► | Mean Heart Rate | | | | t-test |
|---|---|---|---|---|---|
| | Lignocaine (L) (N = 30) | | Dexmedetomidine (D) (N = 30) | | |
| Time ▼ | Mean | SD | Mean | SD | L – E |
| Basal Heart Rate | 88.90 | ± 10.86 | 90.80 | ± 9.40 | 0.472 |
| Pre-Laryngoscopy Heart Rate | 86.77 | ± 10.88 | 80.87 | ± 8.59 | 0.023 |
| During laryngoscopy and Intubation | 90.57 | ± 11.22 | 76.53 | ± 7.51 | 0.001 |
| 1 Min | 86.67 | ± 9.45 | 71.17 | ± 6.20 | 0.001 |
| 3 Min | 85.30 | ± 8.53 | 67.27 | ±5.32 | 0.001 |
| 5 Min | 83.73 | ±7.69 | 61.97 | ± 4.15 | 0.001 |
| 10 Min | 84.73 | ± 7.69 | 62.97 | ± 4.15 | 0.001 |

It was observed that systolic blood pressure fell gradually till 10 minutes after post intubation in both groups as compared to basal systolic blood pressure. However, this fall was more in Dexmedetomidine group. There was highly significant difference ($p<0.001$) noticed in both the groups during laryngoscopy and intubation to 10 minutes post intubation. (Table: 3)

**Table 3: Comparison of Systolic Blood Pressure.**

| Variable ► | Systolic Blood Pressure | | | | t-test |
|---|---|---|---|---|---|
| | Lignocaine (L) (N = 30) | | Dexmedetomidine (D) (N = 30) | | |
| Time ▼ | Mean | SD | Mean | SD | L – E |
| Basal Systolic Blood Pressure | 121.80 | ± 13.00 | 123.67 | ± 11.12 | 0.552 |
| Pre-Laryngoscopy Systolic Blood Pressure | 112.57 | ± 11.66 | 107.03 | ± 5.22 | 0.021 |
| During laryngoscopy and Intubation | 117.23 | ± 7.34 | 106.23 | ± 3.98 | 0.001 |
| 1 Min | 109.87 | ± 6.83 | 101.20 | ± 3.54 | 0.001 |
| 3 Min | 103.77 | ± 6.53 | 97.37 | ± 3.25 | 0.001 |
| 5 Min | 100.97 | ± 6.57 | 94.57 | ± 3.22 | 0.001 |
| 10 Min | 101.97 | ± 6.57 | 95.57 | ± 3.22 | 0.001 |

In both study group gradual fall of diastolic blood pressure was noticed till 10 minutes after post intubation as compared to basal diastolic pressure. Attenuation of diastolic blood pressure by Dexmedetomidine group as compared to lignocaine group was highly significant ($p < 0.001$)during the whole procedure. This response was more favourable to Dexmedetomidine group (Table: 4)

**Table 4: Comparison of Diastolic Blood Pressure.**

| Variable ► | Diastolic Blood Pressure | | | | t-test |
|---|---|---|---|---|---|
| | Lignocaine (L) (N = 30) | | Dexmedetomidine (D) (N = 30) | | |
| Time ▼ | Mean | SD | Mean | SD | L – E |
| Basal Diastolic Blood Pressure | 76.70 | ± 8.49 | 77.83 | ± 7.28 | 0.581 |
| Pre-Laryngoscopy Diastolic Blood Pressure | 70.53 | ± 6.19 | 66.03 | ± 3.81 | 0.001 |
| During laryngoscopy and Intubation | 71.70 | ± 4.63 | 65.53 | ± 2.73 | 0.001 |
| 1 Min | 67.30 | ± 5.92 | 59.43 | ± 2.83 | 0.001 |
| 3 Min | 63.00 | ± 5.65 | 54.00 | ± 1.58 | 0.001 |
| 5 Min | 59.27 | ± 4.29 | 51.27 | ± 1.11 | 0.001 |
| 10 Min | 60.27 | ± 4.29 | 52.27 | ± 1.11 | 0.001 |

Mean blood pressure showed steady decline in both groups as compare to basal recordings. Significant differences were seen in both groups during laryngoscopy and intubation to 10 minutes after post intubation($p<0.001$). Among the study groups, Dexmedetomidine showed better attenuation in controlling mean blood pressure response compared to lignocaine. (Table: 5)

**Table 5: Comparison of Mean Blood Pressure.**

| Variable ► | Mean Blood Pressure | | | | t-test |
|---|---|---|---|---|---|
| | Lignocaine (L) (N = 30) | | Dexmedetomidine (D) (N = 30) | | |
| Time ▼ | Mean | SD | Mean | SD | L – E |
| Basal Mean Blood Pressure | 91.77 | ± 9.96 | 93.10 | ± 8.48 | 0.579 |
| Pre-Laryngoscopy Mean Blood Pressure | 84.60 | ± 7.77 | 79.67 | ± 4.25 | 0.003 |
| During laryngoscopy and Intubation | 86.93 | ± 5.36 | 79.17 | ± 2.91 | 0.001 |
| 1 Min | 81.47 | ± 6.05 | 73.40 | ± 2.79 | 0.001 |
| 3 Min | 76.53 | ± 5.70 | 68.47 | ± 1.83 | 0.001 |
| 5 Min | 73.13 | ± 4.39 | 65.77 | ± 1.07 | 0.001 |
| 10 Min | 74.13 | ± 4.39 | 66.77 | ± 1.07 | 0.001 |

Mean value of $SPO_2$ in lignocaine group was 99.70 ± 0.47 and in dexmedetomidine group was 99.60 ± 0.49 with p value > 0.05, which is statistically insignificant that proves both drugs have no effect on $SPO_2$.(Fig 1).

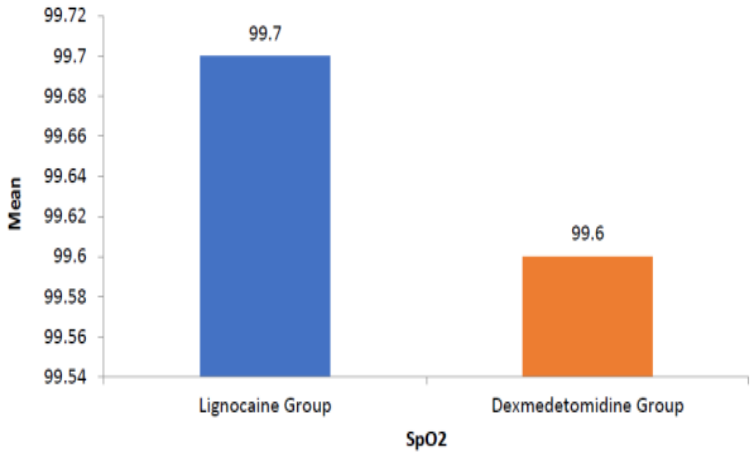


**Figure 1: Comparison of $SPO_2$.**

We did not observe any adverse event following administration of both the drug during laryngoscopy and 10 minutes after post intubation.

## Discussion

Stress response occurred during laryngoscopy and intubation lead to potentially harmful side effect in anaesthesia technique. Laryngoscopy and intubation alter cardiovascular and respiratory physiology by reflex response and due to presence of endotracheal tube. The common circulatory responses are tachycardia and rise in pressor response [12,13,14,15]. Sudden tachycardia and hypertension lead to increased load in the heart and disrupts oxygen demand and supply ratio. Cardiac rhythm abnormalities, end organ dysfunction, intracranial haemorrhage are especially common in compromised patient i.e. hypertensive, coronary artery disease, diabetic patients, cerebrovascular disease and in renal disease.

Intravenous lignocaine prevents haemodynamic response to endotracheal stimulation during laryngoscopy and intubation by peripheral vasodilatation, direct cardiac depression and increasing depth of Anesthesia. Lignocaine has short duration of action, antiarrhythmic effects and used for blunting pressor response to intubation [16,17].

Dexmedetomidine increases haemodynamic stability during laryngoscopy and intubation by sympatholytic effects [18,19]. It has substantial opioid and anaesthetic agent sparing properties and also decreases anaesthetic requirement.

In this present study demographic profile of both groups were comparable. However, Cole CP. et. al and Liu PL. et. al in their study found that demographic parameters has no significant role in haemodynamic parameter changes [20,21].

In this study, we observed peak during laryngoscopy and intubation in Lignocaine group (1.5 mg/kg) followed by gradual decline of heart rate till 5 minutes post intubation as compared to basal heart rate. But, in Dexmedetomidine (0.5 µg/kg) group there was gradual decline of mean heart rate till 10 minutes after post intubation. This decline of mean heart rate in Dexmedetomidine group was significantly ($p < 0.001$) lower as compared to Lignocaine group. Similarly, Gulabani M et al [22] showed dexmedetomidine brought upon a greater decline in HR when individually compared with lignocaine. Although author find dexmedetomidine at dose of 1µg/kg was better in attenuating heart rate than 0.5 µg/kg. In another study by Prasad SR et al [23] the effect of lignocaine (1.5mg/kg) and dexmedetomidine (1µg/kg) found Increase in heart immediately after laryngoscopy and intubation in both the groups when compared to baseline. Maximum increase in HR was around 38% in group L and 10% in group D compared to baseline ($P = 0.000$). In our study we also found a slight increase of HR of 1.87% from base line at time of laryngoscopy and intubation in group L, but the increase was small as compare to their study. We also found a decrease in heart by 15.72% in group D. The difference may be due to use of different induction and analgesic by them, i.e. thiopentone sodium as induction agent and tramadol as analgesic whereas we used propofol as induction agent and fentanyl as analgesic.

In this study we found that systolic blood pressure, diastolic blood pressure and mean blood pressure fell gradually till 10 minutes after post intubation in both the group as compared to basal level. Dexmedetomidine showed better attenuation as compared to lignocaine ($p < 0.001$). Our study concurs with the study done by Sulaiman et al [24], Gangappa RC et al [25] and K. Kumari et al [26] in their study found that before administration of the study drugs blood pressure values between the two groups L and D did not differ. They observed heart rate, SBP, DBP and MBP values were statistically significantly lower in the Dexmedetomidine group at time of induction, intubation, 1, 3, 5 and 10 mins after intubation when compared to lignocaine group.

In current study we also noted at dose of 0.5 µg / kg significant attenuation of HR, SBP, DBP and MBP without any side effects with no change in spo2 in both groups. Our study concurs with the study done by,Sharma N et al [27], Prasad et al [23] and K. Kumari et al [26] where did not find any differences in the mean values of SpO2 and EtCO2.

## Conclusion

To conclude, Dexmedetomidine 0.5 µg/kgwas significantly better than Lignocaine 1.5mg/kg IV in attenuating haemodynamic response to laryngoscopy and endotracheal intubation by reducing heart rate, systolic and diastolic blood pressure and mean blood pressure.

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