

ORIGINAL ARTICLE

ATTENUATION OF HAEMODYNAMIC RESPONSE TO LARYNGOSCOPY AND ORAL ENDOTRACHEAL INTUBATION IN CORONARY ARTERY BYPASS SURGERY PATIENTS: INTRAVENOUS MORPHINE AND LIDOCAINE VERSUS INTRAVENOUS MORPHINE AND LIDOCAINE SPRAY

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Background: Sympathetic response associated with laryngoscopy and endotracheal intubation is recognized as a potential cause for a number of complications especially in coronary bypass surgery patients. Various methods have been used to attenuate these hemodynamic responses, The aim of our study was to compare lidocaine spray in addition to intravenous morphine on attenuating the hemodynamic response to laryngoscopy and endotracheal intubation with intravenous lidocaine and morphine in coronary artery bypass surgery patients. **Method:** Sixty patients, scheduled for elective coronary bypass grafting surgery were included in this randomized controlled trial. The patients randomly divided in group-A (Intravenous Morphine 0.1mg/kg and Intravenous lidocaine 1.5 mg/kg) and group-B (Intravenous Morphine 0.1mg/kg and lidocaine spray 1.5 mg/kg). **Results:** Demographic data was comparable in both groups. There was no statistically significant difference between two groups in the duration of laryngoscopy and intubation. There was statistically insignificant attenuation in heart rate in both groups ($p=0.134$), the trends of attenuation of systolic blood pressure, diastolic blood pressure and mean arterial pressure in group-A compared to group-B ($p=0.933$), ($p=0.768$) and ($p=0.136$) respectively were statistically insignificant. **Conclusions:** Under the present study design, lidocaine spray in addition to intravenous morphine had no better effect on attenuating the hemodynamic response to laryngoscopy and endotracheal intubation as compared to intravenous lidocaine and morphine in coronary artery bypass surgery patients.

Keywords: Lidocaine, Hemodynamic response, laryngoscopy, endotracheal intubation, coronary bypass grafting

J Ayub Med Coll Abbottabad 2014;26(3):275-8

INTRODUCTION

Laryngoscopy and endotracheal intubation stimulates laryngeal and tracheal receptors resulting in release of catecholamines, leading to increase in heart rate and blood pressure.¹

Laryngoscopy and endotracheal intubation is an integral part of general anaesthesia for cardiac surgery. Direct laryngoscopy and passage of endotracheal tube through the larynx is a noxious stimulus, which can provoke untoward response in the cardiovascular, respiratory and other physiological systems.²

Hypertension, tachycardia and arrhythmia caused by endotracheal intubation can be deleterious in patients with poor cardiovascular reserves. Such haemodynamic changes that occur during intubation may alter the delicate balance between myocardial oxygen demand and supply and precipitate myocardial ischemia in patients with coronary artery disease. Methods to attenuate these responses, both pharmacological and otherwise, have also been studied.³⁻⁵

Morphine is a naturally occurring phenanthrene derivative. It is the standard drug against which all other opioids are compared. The onset of action is rapid following IV administration, as the main factor responsible for its latency is low lipid solubility and slow penetration of blood brain barrier.⁶

Lidocaine is an amide local anaesthetic, and is metabolized (N-dealkylation and hydroxylation) by microsomal P-450 enzymes in the liver. Intravenous lidocaine and lidocaine spray (1.5 mg/kg) attenuates the rise in arterial and intracranial pressure that accompanies laryngoscopy and endotracheal intubation.

The objective of this study was to evaluate, whether lidocaine spray in addition to intravenous morphine had a better effect on attenuating the hemodynamic response to laryngoscopy and endotracheal intubation as compared to intravenous lidocaine and morphine in coronary artery bypass surgery patients.

MATERIAL AND METHODS

After obtaining approval from the Hospital Ethics Committee for this randomized control trial and

patient's informed consent, 60 patients scheduled for elective coronary bypass grafting surgery were included in this study and randomly divided into group-A (Intravenous Morphine 0.1 mg/kg and Intravenous lidocaine 1.5 mg/kg) and group-B (Intravenous Morphine 0.1mg/kg and lidocaine spray 1.5 mg/kg). Exclusion criteria included refusal to give consent, emergency cases, history of allergy to lidocaine or morphine, morbidly obese patients (BMI >40), patients with history of asthma, laryngoscopy and intubation taking more than 30 seconds or more than single attempt, rapid sequence induction, renal insufficiency, erection fraction less than 40% and acute/recent myocardial infarction.

The sample size was determined based on power of 80% and the probability of type-I (α) error equal to 0.05. The calculated sample size was sixty subjects.

Patients were randomized for treatment allocation. Sixty slips of paper were taken. Thirty were labelled as group-A and rest of the 30 were labelled as group-B. These slips were placed in an envelope. One slip was raised against each patient by an assistant who were not involved in taking observations.

Patients in both groups received standard premedication tablet midazolam 7.5 mg, 60 minutes before surgery.

Standard monitoring, consisting of inspired oxygen concentration, ECG, pulse oximetry, capnography and invasive blood pressure, central venous catheter, urine output was used.

General anaesthesia with oral endotracheal intubation and controlled mechanical ventilation were given to all patients.

In the operating room baseline vitals (blood pressure, heart rate and oxygen saturation) were recorded. Patients were pre oxygenated for 3 minutes with oxygen flow rate of 6 L/min on circle breathing system.

Anaesthesia was induced in all patients with morphine I/V 0.1 mg/kg, etomidate 0.2 mg/kg I/V and pancuronium I/V 0.1 mg/kg to facilitate the tracheal intubation and controlled ventilation.

Larngoscopy and intubation was done by the primary anaesthetist and PVC endotracheal tube, size 7.5 mm for females and 8.0 mm for males was used.

Baseline blood pressures were recorded before start of induction, then before intubation, immediately after intubation and every minute for 5 minutes.

Twenty five percent changes in blood pressure and heart rate was taken as significant.

Repeated measures ANOVA were used to analyse hemodynamic responses, i.e., heart rate, systolic blood pressure, diastolic blood pressure and

mean arterial pressure. The Chi-squared test was used for categorical data, value of $p < 0.05$ was considered significant.

The continuous response variables like age, weight, height, BMI, duration of laryngoscopy, heart rate, SBP, DBP and mean arterial pressure were presented by Mean \pm SD. Student's *t*-test was applied to compare age, weight, height, BMI and duration of laryngoscopy.

Repeated Measured Analysis of Variance was performed for comparison of heart rate, SBP, DBP and mean arterial pressure taken before and on subsequent periods of times after intubation, between groups and within subjects difference in significance was compiled in this way. Data was analysed using SPSS-16.

RESULTS

The patients included in the study 36 (60.0%) were male and 24 (40%) were female. Mean age of 60 patients was 55.30 \pm 8.786 (ranging from 30–72) years. In the two groups, mean age of patients in the Intravenous group (56.2 \pm 8.4) was found to be slightly higher than Spray group (54.4 \pm 9.2), however, the difference between both groups was statistically insignificant. Similarly the difference between weight, height, BMI and duration of laryngoscopy was statistically insignificant between the two groups as shown in table-1.

Baseline heart rate in Intravenous group was 75.1 \pm 13.6 per minute and 81.6 \pm 16.2 per minute in Spray group, this difference was statistically insignificant ($p=0.097$). The same pattern of insignificance was found in both groups from 2–5 minutes after intubation; there was no statistically significant difference between the two groups as shown in table-2. The trend of attenuation in HR in both groups was statistically insignificant ($F=0.396$, $p=0.134$).

There was no significant difference in the mean baseline SBP of the patients in both groups. A continuous fall in SBP till 5 minutes after intubation was observed in both groups. The difference of mean SBP between both groups was also insignificant ($p=0.933$). However, trend of attenuation in SBP was revealed statistically insignificant in Intravenous ($F=2.255$, $p=0.121$).

The mean baseline DBP in Intravenous was 87.6 \pm 11.7 and of Spray was 86.7 \pm 12.7 and after continuous attenuation these readings were 54.7 \pm 12.5 and 57.8 \pm 10.1 respectively and this difference between the groups was insignificant ($p=0.768$). The trend of DBP was different from that of SBP as in spite of significantly consistent attenuation in DBP as compared with baseline data except immediately after intubation in both groups ($F=733$, $p=0.295$).

The mean baseline mean arterial pressure (MAP) in Intravenous was 110.8±12.8 and of Spray was 110.7±14.1. This difference between two groups was statistically not significant ($p=0.977$). Almost same figures were observed at the time of immediately after intubation but insignificant decline in MAP was observed after 2, 3, 4 and 5 minutes of intubation. The difference between the groups was also insignificant while the mean MAP taken at 5 minutes after intubation ($p=0.136$).

Table-1: Comparison of demographic and procedural features in two groups

| Variables | Groups | | p-value |
|------------------------------------|--------------------|--------------|---------|
| | Intravenous (n=30) | Spray (n=30) | |
| Age (years) | 56.2±8.4 | 54.4±9.2 | 0.450 |
| Weight (kg) | 73.5±10.2 | 71.2±15.0 | 0.483 |
| Height (cm) | 165.2±8.8 | 160.7±10.0 | 0.067 |
| BMI (kg/ m2) | 26.8±3.6 | 27.3±4.8 | 0.645 |
| Duration of laryngoscopy (seconds) | 12.9±4.4 | 13.6±4.5 | 0.543 |

The mean (Mean±SD) difference is insignificant at the 0.05 level.

Table-2: Comparison of haemodynamic attenuation in groups (n=30 each):

| Groups | Baseline | Before Intubation | After Intubation | After 2min | After 3min | After 4min | After 5min |
|---------------------------------------|------------|-------------------|------------------|------------|------------|------------|------------|
| HR (Heart rate) | | | | | | | |
| Group A | 75.1±13.6 | 70.3±16.6 | 72.3±17.4 | 68.0±16.5 | 65.6±15.4 | 67.4±16.2 | 62.7±13.7 |
| Group B | 81.6±16.2 | 71.4±16.3 | 72.9±17.9 | 69.8±16.8 | 68.7±15.5 | 69.2±15.8 | 68.4±15.3 |
| SBP (Systolic blood pressure) | | | | | | | |
| Group A | 158.4±20.4 | 111.3±29.4 | 110.1±27.7 | 106.8±26.6 | 102.5±26.3 | 99.4±21.6 | 95.3±20.7 |
| Group B | 158.9±27.7 | 107.1±26.6 | 105.9±26.1 | 105.7±26.7 | 106.0±17.9 | 109.3±20.6 | 102.5±13.9 |
| DBP (Diastolic blood pressure) | | | | | | | |
| Group A | 87.6±11.7 | 58.5±13.2 | 64.1±19.7 | 58.2±11.9 | 57.6±13.7 | 55.6±9.5 | 54.7±12.5 |
| Group B | 86.7±12.7 | 56.0±15.4 | 59.2±17.8 | 57.2±13.5 | 59.4±12.5 | 62.1±14.9 | 57.8±10.1 |
| MAP (Mean arterial pressure) | | | | | | | |
| Group A | 110.8±12.8 | 76.1±17.5 | 78.9±21.7 | 74.4±16.2 | 72.3±17.1 | 70.1±12.7 | 68.0±13.7 |
| Group B | 110.7±14.1 | 73.1±18.1 | 74.9±19.8 | 73.4±17.0 | 74.9±13.2 | 77.9±16.0 | 72.7±10.4 |

The mean (Mean±SD) difference is insignificant at $p \leq 0.05$ level.

DISCUSSION

Several studies have looked at the efficacy of intravenous and topical oropharyngeal lidocaine as an agent to blunt the hypertensive and tachycardic response to laryngoscopy and intubation. Our results showed that haemodynamic responses to laryngoscopy and intubation in coronary artery bypass patients were significantly lower in both the groups. However, there was no statistically significant difference in both groups regarding attenuation of hemodynamic response to laryngoscopy and intubation.

The cardiovascular responses to laryngoscopy and tracheal intubation are well known^{7,8} and linked with increases in catecholamine blood levels⁹ found that laryngoscopy alone or followed by tracheal intubation increases arterial pressure and catecholamine levels while intubation significantly increases HR.

To attenuate this hemodynamic response to laryngoscopy and endotracheal intubation different methods have been used to varying success, including opioids (fentanyl, 2.5–5 µg/kg; or alfentanil, 15–25 microgram/kg; or sufentanil, 0.25–0.5µg/kg; or remifentanyl 0.5–1 microgram/kg), beta adrenergic blockers (esmolol, 0.3–1.5mg/kg; propranolol, 1–3 mg; or labetalol, 5–20mg), nitroprusside or nitroglycerin, Calcium channel blockers, intravenous xylocaine 1.5 mg/kg, topical airway anaesthesia and MAC bar (inhalational anaesthetics).^{10,11}

Charles E *et al* in their study examined the hemodynamic responses of unpremedicated healthy patients subjected to prolonged laryngoscopy, a condition expected to evoke a maximum hemodynamic change. They found no advantage to the use of lidocaine (aerosolized, IV, or both) compared to placebo. In each groups the stimulus of laryngoscopy and tracheal intubation significantly increased heart rate and blood pressure, yet they found no differences in the absolute or relative extent of these elevations between the various treatment and control groups. Their results suggest that the administration of lidocaine before laryngoscopy in healthy adult patients affords no protection to the cardiovascular system.¹²

In the light of results of this study we conclude that lidocaine spray in addition to intravenous morphine had no better effect on attenuating the hemodynamic response to laryngoscopy and endotracheal intubation as compared to intravenous lidocaine and morphine in coronary artery bypass surgery patients.

We did not measure serum lidocaine levels in our study which we think should have been checked.

CONCLUSION

Under the present study design, lidocaine spray in addition to intravenous morphine had no better effect on attenuating the hemodynamic response to laryngoscopy and endotracheal intubation as

compared with intravenous lidocaine and morphine in coronary artery bypass surgery patients.

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