ORIGINAL RESEARCH PAPER

Volume-7 | Issue-10 | October-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ATTENUATION OF HEMODYNAMIC RESPONSES TO ENDOTRACHEAL INTUBATION WITH INTRAVENOUS DEXMEDETOMIDINE, LIGNOCAINE AND FENTANYL : A RANDOMISED CONTROLLED TRIAL.

Anesthesiology

Dr. Narmada Padhy Associate Professor, Anaesthesiology

Dr. Abhiruchi Patki* Associate Professor, Anaesthesiology *Corresponding Author

Dr. Srilata Moningi Additional Professor, Anaesthesiology.

ABSTRACT

Laryngoscopy and intubation often leads to haemodynamic changes which is detrimental with certain subset of patients.

AIM OF THE STUDY : To compare the effect of intravenous dexmedetomidine, lignocaine and fentanyl for obtundation of the pressor response.

MATERIAL AND METHODS: Seventy eight patients were randomised into three groups to receive intravenous Dexmedetomidine (Group-D) , Lignocaine (Group-L) and Fentanyl (group-F) before intubation. After routine protocol of induction and intubation, haemodynamic parameters were noted during different time points after intubation .The requirement for propofol for induction was also noted. Data was analyzed using Student's t-test and Fisher's exact test.

RESULTS: Overall there was no significant haemodynamic changes in all the three groups except the SBP, DBP, MAP decreased significantly at 5 and 10 mins of intubation than baseline. ($p<0.05$) . Propofol requirement in group D was significantly less than the other groups.($p=0.01$).

CONCLUSION: The effect of dexmedetomidine , lignocaine and fentanyl were comparable for attenuation of pressor response, while the induction agent requirement was less in dexmedetomidine group.

KEYWORDS

Pressor Response, Dexmedetomidine, Lignocaine, Fentanyl

INTRODUCTION:

Laryngoscopy and intubation often incite haemodynamic changes associated with release of catecholamines[1,2].Circulatory response to laryngoscopy and intubation leads to increase in heart rate, blood pressure, intracranial pressure, cardiac dysrrythmia which may lead to asystole, myocardial and cerebral infarction. Haemodynamic changes are acceptable in a normal individual but may lead to serious consequences in patients with compromised circulatory system and cerebrovascular disorders. Several approaches have been tried to attenuate these responses with their own limitations.

Dexmedetomidine is a new alpha-2 adrenergic agonist having more affinity for alpha-2 adrenoceptors. Pretreatment with dexmedetomidine attenuates hemodynamic response to laryngoscopy and intubation.[3]. Intravenous (IV) lignocaine is one of the oldest, cheapest and most easily available drug used for attenuation of hemodynamic response to laryngoscopy and intubation.[4] Fentanyl is a routinely used drug acts at opioid receptor. Haemodynamic stability is achieved by decreasing sympathetic tone and increasing parasympathetic tone.

The present study was undertaken to compare the efficacy of 1µg/kg of dexmedetomidine ,1.5 mg /kg of lignocaine and 1µg/kg of fentanyl IV infusion for attenuating the hemodynamic response to laryngoscopy and intubation in patients posted for surgery under general anesthesia. Requirement of induction agent in different groups were also noted.

MATERIAL AND METHODS:

After obtaining institutional review board approval and informed written consent from the patients, the present prospective randomized study was carried out in a tertiary care teaching hospital. A total of 78 American Society of Anaesthesiologists (ASA) physical status I and II patients aged between 18 and 60 years undergoing elective surgery were enrolled in the study. Patients with uncontrolled hypertension, cardiac, coronary, renal, hepatic, cerebral diseases, and peripheral vascular diseases, bradycardia, obese patients, anticipated difficult airway, pregnant, and nursing women, history suggestive of sensitivity to drugs used during the study and in whom intubation attempts lasted longer than 30 seconds were excluded from the study.

Patients were randomly allocated using MS –excel rand 1,2,3 to receive either dexmedetomidine (group D), lignocaine (Group L) or fentanyl (Group F). Patients were randomly divided into 3 groups with 26 patients in each group. All patients included in the study were premedicated with tablet alprazolam 0.5 mg and tablet ranitidine 150 mg orally at bedtime the night before surgery. They were kept nil orally for 6 hours before surgery. On arrival of the patient in the operating room baseline parameters such as heart rate (HR), mean arterial pressure (MAP), respiratory rate, and oxygen saturation (SpO2) were recorded. After securing the intravenous cannulae patients received the study drug according to randomisation. Bolus dose was given over 10 minutes followed by infusion.

Group D - Dexmedetomidine 1mcg/kg followed by 0.1mcg/kg/hr
Group L - Lignocaine 1.5mg/kg followed by 2mg/min
Group F- Fentanyl 1mcg/kg followed by 0.1mcg/kg/hr .

All the patients were premedicated with injection glycopyrrolate 0.004 mg/kg IV, injection ondansetron 0.08 mg/kg IV, before preoxygenation. After preoxygenation, all patients were induced with titrated dosage of injection propofol as 1% solution IV till loss of verbal response and the reqirement of propofol was noted.. Endotracheal intubation was facilitated with 0.5mg/kg of atracurium besylate given IV 3 min prior to laryngoscopy and intubation. Laryngoscopy was performed using Macintosh laryngoscope, trachea intubated with appropriate size endotracheal tube, and connected to closed circuit. After confirmation of bilateral equal air entry, endotracheal tube was fixed.

No surgical or any other stimulus was applied during 10 min of study period . Anesthesia was maintained using 50% oxygen and air with isoflurane and atracurium . At the end of the procedure, patients were reversed with inj. neostigmine 0.05 mg/kg IV and inj. glycopyrolate 0.08 mg/kg IV. Patients were extubated when they regained reflexes and consciousness.

Hemodynamic parameters were recorded during the basal period(T0), after study drug bolus(T1), before intubation(T2), 1 min(T3), 2min(T4), 3 min(T5), 5 min(T6), and 10 min (T7)after intubation. If MAP increased more than 20% of baseline 20mg of propofol was supplemented and dosage required was noted. Any adverse effects of drugs were noted.

STATISTICAL ANALYSIS :

Data were analyzed using NCSS version 9 statistical software .Quantitative data was analyzed using Student's t-test and qualitative data were analyzed using Fisher's exact test. $P < 0.05$ was considered as statistically significant .

RESULTS:

Data was collected from January 2017 to July 2017. None of the patients were excluded from the study. All the data was expressed as mean and standard deviation for continuous data and number and percent for categorical data.

Demographic data: All the data were found to be normally distributed without any variance. All the groups were comparable regarding age, gender, body mass index, and baseline heart rate and mean arterial pressure.(Table 1)

Table 1. Demographic data

Demographic data					
Group	**Sex (male:female)**	**Age (years)**	**BMI(kg/m2)**	**Baseline HR(b/m)**	**Baseline MAP(mm hg)**
Group D	19:11	41.4(6.2)	24.6(3.2)	76.0(12.5)	103.2(12.4)
Group L	18:12	39.0(8.4)	24.9(3.4)	73.5(11.0)	102.5(9.6)
Group F	22:8	35.2 (10.4)	24.5(3.4)	71.5(13.4)	103.3(9.8)

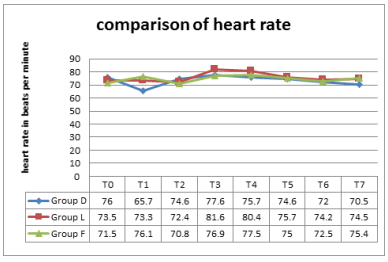

FIG.1: comparison of heart rate

In Dexmedetomidine group baseline heart rate was 76.0 which decreased to 65.7 though it was not statistically significant. There was no significant difference in the heart rate within and in between the group.(P>0.05)

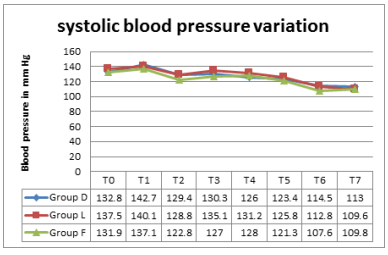

Fig 2 : comparison of systolic blood pressure

In dexmedetomidine group systolic blood pressure increased from 132.8 to 142.7 after bolus(p>0.05) , but gradually decreased to 113.0. The change in SBP were significant in all the groups at 5 and 10 minutes after intubation within the group. (p=0.00)

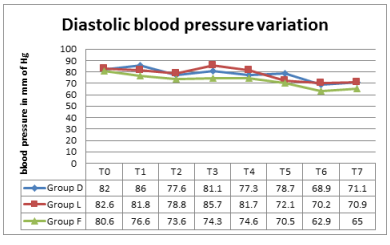

Fig 3: comparison of diastolic blood pressure

The diastolic blood pressure gradually decreased over time until 5 and 10 mins after intubation (p=0.01)

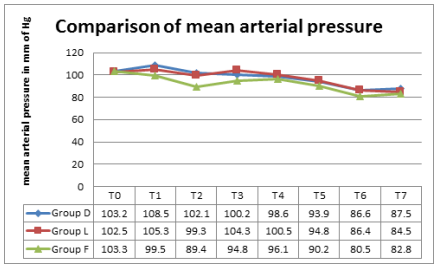

Fig 4 : comparison of mean arterial pressure

The change in MAP were not significant when compared among all the groups, while MAP decreased in all the groups at 5 and 10 mins of intubation (p=0.00).'

None of the patients in our study had respiratory depression, bradycardia and oxygen desaturation.

TABLE 2. Propfol requirement for induction in different groups

Group	Dose in mg(mean)	SD	P value
Group D	75.8	14.2	0.01(significant)
Group L	94.6	18.4	0.62
Group F	96.8	12.4	0.54

The propofol requirement in Dexmedetomidine group was 75.8±14.2mg while it is 94.6 and 96.8 in lignocaine and fentanyl group respectively. The difference in requirement of propofol for induction was statistically significant.(p<0.05)

DISCUSSION:

The pressor response to laryngoscopy and endotracheal intubation occurs in the form of tachycardia, hypertension and arrhythmia, which may be detrimental to the patient. The haemodynamic change is due to reflex sympathetic discharge caused by epipharyngeal and laryngopharyngeal stimulation. The pressor response to laryngoscopy is associated with marked increase in noradrenaline concentration in blood. The search for ideal technique for attenuation of haemodynamic response still continues.

In the present study dexmedetomidine was given as IV infusion at the dose of 1 µg/kg diluted in normal saline over 10 mins followed by maintainance infusion. Rapid administration of bolus dose results in initial transient increase in blood pressure and reflex decrease in heart rate because of peripheral α2 adrenoceptor stimulation of vascular smooth muscle. So, in our study we administered the bolus dose over 10 mins followed by maintainance infusion for all 3 groups. Lignocaine is used in several studies for attenuation of stress response.[5,6] Blunting of sympathetic response by fentanyl is dose dependent. Fentanyl at 6 µg/kg completely abolishes, whereas at 2 µg/kg significantly attenuates the haemodynamic response due to laryngoscopy and intubation .[7] In this study we have given 2 µg/kg additional fentanyl for all the groups as premedication according to the protocol.

Though there are many studies showing significant obtundation of haemodynamic response by individual drugs but most of the study shows dexmedetomidine is superior to other drugs. [8] It is established that each of our study drug like dexmedetomidine , lignocaine and fentanyl as premedication obtunds the pressor response. Hence , we designed this study to compare these 3 drugs for attenuation of pressor response to laryngoscopy and endotracheal intubation.

Haemodynamic changes:

In group D baseline heart rate decreased to 65.7 from 76 bpm after giving bolus drug. No difference in heart rate change within or in between the group was found. This finding is in accordance with previous studies and can be explained on the basis of decreased central nervous system sympathetic activity.[9,10,11,12] In the contrary few studies shows a significant fall in HR.[13,14,15] In group D SBP increased from 132.8 to 142.7 after bolus but gradually decreased to less than baseline at 10 mins of intubation. The increase in SBP can be explained by peripheral α2 adrenoceptor stimulation. The baseline SBP further decreased at 5 and 10 mins in all the groups .(p=0.00) The DBP and MAP also has shown the same trend as SBP. Overall there was no significant haemodynamic changes in all the three groups except the SBP, DBP, MAP decreased significantly at 5 and 10 mins of intubation than baseline. (p<0.05) The comparable attenuation may be due to the induction agent propofol we used in our study as compared to other studies where they used thiopentone as induction agent. According to the study by virendra et al a single dose of propofol

attenuates the pressor response .[16]

Propofol requirement in group D was significantly less than the other groups.(75.8 Vs 94.6 and 96.8 mg) in group L and group F respectively. Keniya et al ,[17] Scheinin et al [18] and Bajwa et al [11] reported decreased thiopentone requirement for induction in group D. Our finding is similar to another study published where they found propofol requirement for induction is significantly less(57.5±9.1 mg).when compared to our study it is 75.8±14.2mg. The difference may be due to the dosage of dexmedetomidine they have used as premedication. They have used 2 µg/kg dexmedetomidine while we have used 1 µg/kg as premedication.[19]

CONCLUSION:

The effect of dexmedetomidine, lignocaine and fentanyl were comparable for attenuation of pressor response due to laryngoscopy and intubation without any side effects, while the induction agent requirement was less in dexmedetomidine group.

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