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Effect of Fentanyl in Systolic Blood Pressure and Heart Rate to Laryngoscopy and Endotracheal Intubation.

Nazmoon Nahar[1], A K H Loban[2], Abdur Rahman[3]

1. *Nazmoon Nahar, Assistant Professor, Bangladesh Shishu Hospital and Institute, Dhaka,Bangladesh.*
2. *A K H Loban, Associate Professor, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh.*
3. *Abdur Rahman, Professor, Dhaka Medical College and Hospital, Dhaka, Bangladesh.*

Corresponding author: Nazmoon Nahar

Abstract

Introduction: *Introduction- Laryngoscopy and endotracheal intubation both are associated with a sympathetically mediated increase in systolic blood pressure and heart rate, which are the maximum at 1 minute after intubation and last for 5-10 minutes. This study aimed to assess the effect of fentanyl on systolic blood pressure and heart rate during laryngoscopy and endotracheal intubation.*

Aim of the study: *The aim of the study was to evaluate the effect of fentanyl in preventing hemodynamic responses to laryngoscopy and endotracheal intubation.*

Methods: *This double-blind randomized clinical study was conducted in the anaesthesia, analgesia & intensive care department of Dhaka Medical College Hospital. A total of 80 patients were divided into group I (fentanyl) and group II(lignocaine) using the fixed card sampling method after fulfilling the inclusion and exclusion criteria. After reaching the operation theatre patient's systolic blood pressure and heart rate were measured. This was a baseline record of a patient. After laryngoscopy and endotracheal intubation, the anesthesiologist who was blinded to the study drug recorded the patient's systolic blood pressure and heart rate in prefixed observation points.*

Result: *In this study, the mean systolic pressure and mean heart rate of group I and group Il were compared with baseline data. The mean systolic blood pressure and mean heart rate at the time of intubation, after 1 minute, 3 minutes, 5 minutes, and after 7 minutes were statistically significant (P<0.05) in group I and group 11 compared with baseline.*

Conclusion: *There was an increase in systolic blood pressure and heart rate in group I was less than in group II. The responses to pretreatment with fentanyl and lignocaine were less in both groups. In increasing the SBP and HR the effect of fentanyl was better than lignocaine.*

Keywords: *Systolic blood pressure, Heart rate, laryngoscopy, Intubation*

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I. Introduction

The hemodynamic response to laryngoscopy and endotracheal intubation has been a topic of discussion right since 1940 when Reid and Brace found that stimulation of the upper respiratory tract provoked an increase in vagal activity[1]. After 1 year (Burstein et al.) contradicted Reid's statement, the pressor or response occurring at laryngoscopy and endotracheal intubation was due to augmented sympathetic response, provoked by stimulation of stimulation epipharynx and laryngopharynx. These factors were further confirmed by prays - Roberts et al[2]. Hemodynamic responses are the maximum at 1 minute after intubation and last for 5-10 minutes[3]. Both laryngoscopy and tracheal intubation are associated with sympathetically mediated increases in systolic blood pressure and heart rate which may be deleterious in patients with underlying cardiovascular and cerebrovascular diseases[4]. These changes have little consequences in healthy patients but have led to myocardial ischemia, intracranial hemorrhage and raised intracranial pressure in vulnerable patients[5]. Control of such hemodynamic changes is very important to prevent detrimental effects, and the need for safe and effective therapeutic agents that may attenuate, blunt, suppress or abolish such changes became an important intervention during surgical procedures under general anesthesia. To blunt this pressor response, various methods have been tried. In the early sixties, inhalational agents were used to attenuating laryngoscopy reactions. Other methods include omitting premedication anticholinergic drug, premedication with α-agonist, oral clonidine and midazolam, use of vasodilators β-blocker, ca-channel blocker, various opioid remifentanil sufentanil[6,7]. One of them uses fentanyl. Fentanyl citrate is a synthetic phenylpiperidine opioid and analgesic. It was first synthesized by Dr. Paul Jansen in 1960. It is 100 times more potent than morphine sulphate. Fentanyl is very commonly used for intraoperative analgesia. Fentanyl also seemed to provide a more stable hemodynamic profile before

laryngoscopy and tracheal intubation[8, 9]. This study aimed to evaluate the effect of fentanyl in preventing hemodynamic responses to laryngoscopy and endotracheal intubation.

II. Methodology & Materials

This double-blind randomized clinical trial study was conducted in the anesthesia, analgesia & intensive care of Dhaka Medical College Hospital. Before the commencement of this study, the research protocol was approved by the hospital ethical committee. Study populations were the patients of either sex, aged between 20-60 years, ASA grade I, and grade II patients undergoing elective surgery under general anaesthesia. Patients were excluded from the study, if they had medical co-morbidities (significant cardiovascular cerebrovascular and coronary artery disease), were on drugs affecting blood pressure and heart rate (Beta-blocker, ca channel blocker), and had an allergy to any of the study medications and had emergency surgery. The day before the operation patients were visited, and after fulfilling the inclusions and exclusion criteria patient was selected for the study. No premedication was given and advised for fasting from midnight. On the day of surgery in a preoperative suit, randomization was done using a fixed card sampling method. 40 cards were for fentanyl (Group I) and another 40 cards were for lignocaine (Group 11). After reaching the operation theatre, the patient's systolic blood pressure and heart rate were measured. These were the baseline records of the patient. For induction patient received either iv fentanyl 2 µg/kg body weight diluted up to 5 ml (group I) or i/v lignocaine 1.5 mg/kg body weight diluted up to 5ml (group 11), followed by thiopental sodium 5 mg/kg body weight, long-acting muscle relaxant vecuronium 0.1mg/kg was given as an intravenous bolus to facilitate tracheal intubation. By this time patient's lungs were manually ventilated with 100% O_2 with 0.5% halothane. Direct laryngoscopy was carried out using a macintosh blade. Anaesthesia was maintained with 0.5% halothane and 60% nitrous oxide in oxygen. The anesthesiologist who was blinded to the study drug recorded the patient's systolic blood pressure and heart rate in prefixed observation points. Data were processed and analyzed using SPSS (statistical package for social sciences) for windows, version 19.0. Student t-test was used for continuous variables when comparing the between the groups. The Chi-square test was used to analyze the categorical variables. P values <0.05 were considered statistically significant.

III. Results

The difference in the mean of two demographic variables between the two groups was not statistically significant (P>0.05) (table-1). Distributions of patients by ASA class (Table–Il) show that the majority of patients had ASA class in both the groups, which was 25 (62.5%) in group I and 23 (57.5%) in group II. This difference was not statistically significant (P>0.05). Table III shows that mean systolic blood pressure at the time of intubation after I minute, 3 minutes, 5. minutes and after 7 minutes were statistically significant. (P<0.05) in the group, I and group II compared with baseline. Table IV shows heart rate at baseline and different follow up of the patients, it was observed that mean heart rate baseline, at the time of intubation, after 1, 3,5 and 7 minutes were not statistically significant between the two groups. But mean heart rates were statistically significant in group I and group 11 compared with baseline.

Table-I: Comparison of basic parameters between two groups.

variable	Group I	Group II	p-value
Age (years)	40.50± 15.00	38.50±14.30	0.357
Weight (kg)	60.72±12.23	59.31±13.67	0.225

Table-II: Comparison of two groups according to ASA grading.

ASA Grading	Group I	Group II	p-value
I	25 (62.5%)	23 (57.5%)	0.648
II	15 (37.5)	17 (42.5%)	
Total	40 (100.0%)	40 (100.0%)	

Table-III: Distribution of the patients by systolic blood pressure.

Systolic Blood Pressure	Group-I (n=40)	Group-II (n=40)	P-Value
Baseline data	127.62±35.61	125.11±37.12	0.785
At the time of intubation	135.88±35.12	134.90±36.23	0.902
After 1 Minute	136.25±34.75	135.50±35.27	0.788
After 3 Minute	135.11±34.33	134.27±34.50	0.902
After 5 Minute	133.27±33.77	133.21±34.12	0.933
After 7 Minute	132.36±32.12	130±32.05	0.758

Table-IV: Distribution of the patients by heart rate

Heart Rate	Group I (n=40)	Group-II (n=40)	P-Value
Baseline data	76.91±18.32	78.20±20.120	0.765
At the time of intubation	85.10±19.71	86.57±18.43	0.731
After 1 minute	84.47±20.08	86.39±19.75	0.667
After 3 Minute	84.22±19.11	85.20+18.91	0.813
After 5 Minute	83.17±17.23	84.72+17.34	0.689
After 7 Minute	82.33±17.10	83.92±17.62	0.683

IV. Discussion

This double-blind randomized clinical trial study was carried out to assess the efficacy of fentanyl in the attenuation of the hemodynamic response to laryngoscopy and endotracheal intubation as compared to lignocaine, to assess the effect of fentanyl on systolic blood pressure and heart rate to laryngoscopy and endotracheal intubation, to assess the effect of lignocaine in systolic blood pressure and heart rate to laryngoscopy and endotracheal intubation to find the difference between the effect of fentanyl and lignocaine in systolic blood pressure and heart rate to laryngoscopy and endotracheal intubation. The hemodynamic response to the stress of laryngoscopy and endotracheal intubation does not present a problem for most patients[10]. However, patients with the cardiovascular or cerebral disease may be at increased risk of morbidity and mortality from tachycardia and hypertension resulting from this stress[11]. These hemodynamic effects gained notice after the introduction and use of muscle relaxants, such as curare and succinylcholine, for endotracheal intubation at the time of anesthesia induction. A variety of anesthetic techniques and drugs are available to control the hemodynamic response to laryngoscopy and intubation. The method or drug of choice depends on many factors, including the urgency and length of surgery, choice of anesthetic technique, route of administration, medical condition of the patient, and individual preference. The possible solutions number as many as the medications and techniques available and depend on the individual patient and anesthesia care provider. In this current study mean systolic blood pressure baseline, at the time of intubation, after 1 minute, 3 minutes, 5 minutes and after 7 minutes were almost similar between the two groups. Mean systolic blood pressure at the time of intubation, after I minute, 3 minutes, 5 minutes and after 7 minutes were statistically significant ($P<0.05$) in group I and group II compared with baseline. Chaudhary et. al observed the mean SBP of 132 mmHg in baseline, 125 mmHg in production, 130 mmHg immediately after induction, 124 mmHg after 1 minute, 120 mmHg after 3 minutes, 118 mmHg after 5minutes and 110 mmHg after 10 minutes who received in fentanyl 2 microgram/kg[12]. Malde and Sarode mentioned in their study that after giving midazolam, SBP decreased from baseline in all the groups[13]. SBP further decreased, after giving lignocaine and fentanyl by 7.6% and 8.8% respectively from baseline. This fall from baseline in the fentanyl group was not significantly different when compared with lignocaine ($P = 0.611$). It was observed in this series that mean heart rate - at the time of intubation, after 1 minute, after 3 minutes, after 5 minutes, and after 7 minutes were statistically significant ($P<0.05$) in group I and group II compared with baseline. Another study by Wilson et al showed that irrespective of the timing of administration of injection 2, 3 on 4 minutes before tracheal intubation, there was a significant increase in heart rate of 21-26% in all groups[14]. Feng et al found 75% and 45% incidence of tachycardia and 70%, and 40% incidence of hypertension with lignocaine (2 mg/kg) and fentany1 (3µg/kg) respectively[15]. Fentanyl was found to be more effective than remifentanil in preventing increases in cerebral blood flow velocity during intubation in children undergoing sevoflurane anesthesia[16]. Fentanyl also seemed to provide a more stable systolic blood pressure and heart rate before laryngoscopy when compared to remifentanil.

Limitations of the study:
The study was conducted in a single hospital with small sample size. So, the results may not represent the whole community.

V. Conclusion And Recommendations

Hemodynamic response as defined >10% increase in systolic blood pressure, and heart rate was not significantly different two groups. The increase in systolic blood pressure and heart rate in group I was less than in group II. In increasing the systolic blood pressure and heart rate the effect of fentanyl was better than lignocaine.

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