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Original Research Article

Effect of intravenous fentanyl versus intravenous fentanyl and paracetamol in attenuating the hemodynamic response to laryngoscopy and endotracheal intubation

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ABSTRACT

Background: Laryngoscopy and endotracheal intubation are potent stimuli causing increased sympathoadrenal activity. The objective of this study is to assess and compare the effects of intravenous fentanyl versus a combination of intravenous fentanyl and paracetamol in blunting the hemodynamic responses to laryngoscopy and endotracheal intubation.

Materials and Methods: Sixty patients of ASA status I and II, aged 18-60 years of either sex posted for surgeries under general anaesthesia were selected. Patients in group A received intravenous fentanyl 2mcg/kg. Patients in group B received intravenous fentanyl 2mcg/kg and paracetamol 15mg/kg. After intubation vital parameters were recorded at 1, 2, 4 and 6^{th} minute and later once every 10minutes.

Results: After intubation, there was an initial increase in heart rate in both groups. However, this was significantly higher (p=0.004) with group A as compared to group B and remained significantly high for another 6 minutes(p=0.03).

There was an increase of mean arterial pressure after intubation in both the groups, however, this was significantly higher in group A and remained significantly high for 6 minutes as compared to group B[p=0.003]. Mean SpO2 was similar in both the groups, and there were no complications during the study.

Conclusion: Intravenous fentanyl and paracetamol is more effective in blunting the hemodynamic responses due to laryngoscopy and endotracheal intubation when compared to intravenous fentanyl alone.

1. Introduction

Laryngoscopy and intubation are essential steps in general anaesthesia. They are potent stimuli causing hemodynamic responses like tachycardia and hypertension due to increased sympathetic and sympathoadrenal activity by means of increased catecholamines.[1] An average of 20% increase in heart rate and 40-50% increase in blood pressure is noted after laryngoscopy and intubation[2] which may lead to myocardial ischemia, ventricular arrhythmias, ventricular failures, cerebral hemorrhage if preventive measures are not taken. Many techniques have been used to attenuate these adverse stress responses like increasing the depth of anaesthesia, use of opioids such as fentanyl,[3] beta blockers, alpha 2 agonists, etc.[4]

Fentanyl is a short acting synthetic opioid agonist, around 100 times more potent than morphine. It acts on the mu-opioid receptors in the central nervous system and alters the body's response to pain. Fentanyl alters the release of certain neurotransmitters such as β-endorphins, sensitive to pain. It has various advantages over older opioids such as rapid onset, short duration of action, cardio stability without histamine release or bronchospasm.[5,6]

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Paracetamol is a non-opioid analgesic without potential adverse effects of opioids such as respiratory depression, nausea and vomiting. Its analgesic effect is mediated by activation descending serotonergic pathways, though its exact mechanism of action is unknown. Paracetamol has a well-established safety and analgesic profile.[7] It has been successfully used for management of postoperative pain.[8,9]

The present study was undertaken with an objective to compare the attenuation of the hemodynamic responses during laryngoscopy and intubation. In this study, we compared fentanyl 2mcg/kg versus a combination of fentanyl 2mcg/kg and Paracetamol 15mg/kg to assess maximum effectiveness and safety to prevent stress response during laryngoscopy and intubation.

2. Materials and Methods

After institute ethics committee approval, 60 patients of ASA physical status I and II, aged 18-60 years of either sex with Mallampatti class I and II posted for surgeries under general anaesthesia requiring intubation were included in the study. Patients with predicted difficult intubation such as short neck, weight >90kg, pregnant women and lactating mothers were excluded from the study.

Each patient was visited preoperatively, the procedure was explained, and a written informed consent was taken. All routine investigations required for preoperative evaluation and the proposed surgery were done. All patients were kept nil per oral overnight. In the operation theatre, all standard ASA monitors were connected, and all the basal parameters recorded. Patients were randomized to two groups of 30 each by simple randomization sampling and the allocation concealment was done using sealed envelope technique. Patients were pre medicated with inj glycopyrrolate 0.02mg/kg, then given intravenous fentanyl 2mcg/kg (90 seconds prior to intubation) (Group A) or fentanyl 2mcg/kg (90 seconds prior) + paracetamol 15mg/kg (10 minutes prior to intubation) (Group B), by the concerned anesthesiologist, who was blinded to the study.

The patients were pre oxygenated with 100% oxygen for 3 minutes, induced with propofol 2mg/kg and intubated with appropriately sized endotracheal tube after giving inj atracurium 0.5mg/kg. If intubation time was >15sec and unanticipated difficult intubation was seen then the patient was excluded from the study. Systolic and diastolic blood pressures, mean arterial pressure, heart rate, spo2 were recorded just before intubation and taken as basal reading. After intubation vital parameters were recorded at 1^{st}minute, 2^{nd} minute, 4^{th} minute, 6^{th} minute and later once in 10min till the end of surgery. After 6min of intubation the surgeon was allowed to paint and proceed with the surgery. After the surgery patient was reversed with injection (inj) neostigmine 0.05mg/kg and injection glycopyrrolate 0.01mg/kg. Post-operative vitals were monitored and complications if any were recorded and treated accordingly.

Sample size was calculated considering the effect size of 0.65 for the heart rate at the end of 1 minute of intubation measured at 80% of power for two tailed hypothesis and the alpha error at 5%, the sample size needed is 60 with 30 in each group.

Statistical Package for Social Sciences [SPSS] for Windows Version 22.0 Released 2013. Armonk, NY: IBM Corp., was used to perform statistical analyses. Descriptive analysis of all the explanatory and outcome parameters was done using frequency and proportions for categorical variables, whereas in Mean & SD for continuous variables. Mann Whitney Test was used to compare the mean age and weight of the patients between 2 groups. Independent Student t Test was used to compare the mean heart rate & MAP values between 2 groups at different time intervals. The same test was also used to compare the mean height and SPO2 levels between 2 groups. Chi Square Test was used to compare the occurrence of complications between 2 groups. The level of significance was set at $P<0.05$.

3. Results

There was no significant group difference in the distribution of the age; (Mean ± SD; 43.87 ± 13.03years v/s 41.07 ±11.46 years, p=0.36); weight (Mean 63.67 v/s 63.43), gender ratio and ASA classification.

After intubation, there was an initial increase of heart rate in both groups. However, this was significantly higher (p=0.004) with group A as compared to group B where heart rate remained near baseline [Group A v/s Group B at 1^{st} minute; Mean±SD ; 90.87±8.40 v/s 85.53±5.03; p= 0.004], [Group A v/s Group B at 4th minute; Mean±SD ; 88.00±7.86 v/s 83.13±5.27; p= 0.007]; and remained significantly high for another 6 minutes(p=0.03).

There was an increase of mean arterial pressure after intubation in both groups, however, this was significantly higher in the group A [Group A v/s Group B at 1^{st} minute; Mean±SD; 126.97±15.73 v/s 114.93±14.80; p= 0.003], [Group A v/s Group B at 4th minute; Mean±SD; 124.87±15.76 v/s 112.23±14.86; p= 0.002], and remained significantly high for 6 minutes as compared to group B [p=0.003].

Mean spO2 was similar in both the study groups, and there were no complications during the study.

4. Discussion

Laryngoscopy and tracheal intubation are potent stimuli which cause increased sympathoadrenal activity. It presents in the form of increased blood pressure and tachycardia, which may lead to deleterious effects. In our study we have compared the effects of intravenous fentanyl versus a combination of intravenous fentanyl and paracetamol in

Table 1: The comparison of baseline clinico-demographic factors and study objectives between the groups

Variable	Group A: fentanyl Mean ± SD	Group B: fentanyl and paracetamol Mean ± SD	P value
Age	43.87 ± 13.03years	41.07 ±11.46 years	0.36
Mean Arterial pressure			
Basal	99.30±9.71	100.50±7.60	0.6
1st minute	126.97±15.73	114.93±14.80	0.03
2nd minute	127.67±15.80	114.70±14.95	0.002
4th minute	124.87±15.76	112.23±14.86	0.002
6th minute	122.50±16.13	110.07±14.83	0.003
Heart rate			
Basal	75.5±11.8	78.53±6.32	0.2
1st minute	90.87 ± 8.40	85.5±5.03	0.004
2nd minute	90.53±7.63	85.60±4.94	0.004
4th minute	88.0 ±7.86	83.1.3 ± 5.27	0.007
6th minute	83.53±7.20	80.13±4.84	0.03
Nausea/Vomiting in the first 12 hours of the post-operative period	Nil	Nil	

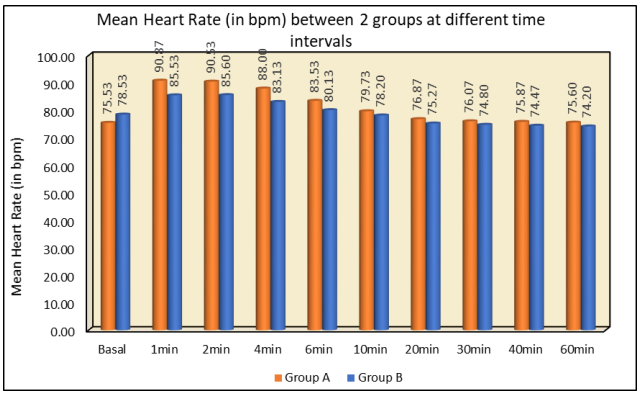

Fig. 1:

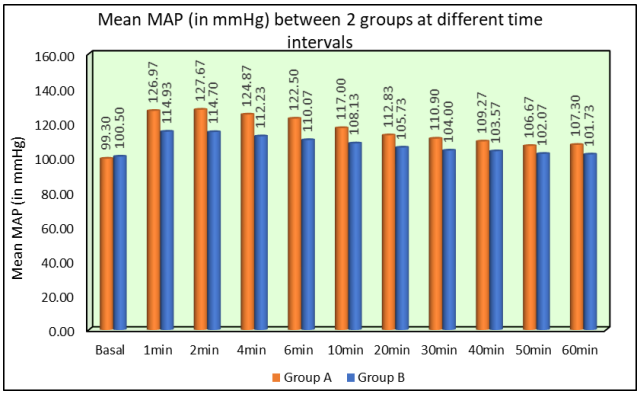

Fig. 2:

attenuating the hemodynamic response to laryngoscopy and endotracheal intubation.

The findings of this study suggest that a combination of intravenous fentanyl and paracetamol is more effective in attenuating the hemodynamic responses to laryngoscopy and endotracheal intubation when compared to intravenous fentanyl alone.

Various methods are employed to attenuate these adverse stress responses such as use of drugs like opioids, beta blockers or by increasing the depth of anaesthesia, etc.[4] A study comparing the effects of lignocaine and fentanyl in attenuation of response to laryngoscopy and tracheal intubation concluded that fentanyl was more effective in attenuating the pressor response to laryngoscopy and endotracheal intubation.[10] In 2015, Karuppiah S et al. studied the blunting of hemodynamic response to laryngoscopy and intubation using intravenous fentanyl and esmolol and concluded that Fentanyl 2 μg/kg bolus or esmolol 0.2 mg/kg bolus significantly attenuates the hemodynamic response to laryngoscopy and intubation better than control group.[11]

A previous study done by Khanday SB et al. in 2019 studied fentanyl and nalbuphine for attenuation of hemodynamic response to laryngoscopy and endotracheal intubation 100 patients and concluded that fentanyl is better than nalbuphine in blunting the hemodynamic response to laryngoscopy and endotracheal intubation.[12] Thus we have chosen fentanyl for our study.

Studies conducted to assess hemodynamic presser response of paracetamol found it to be efficacious.[13–15] In 2015, Soltani G, Molkizadeh A et al. studied the effect of Intravenous Acetaminophen on intubation response and postoperative pain following caesarian Section and concluded that intravenous Paracetamol reduced the heart rate changes due to intubation and reduce Intraoperative and

postoperative analgesic requirement. However, it was not effective in reducing mean arterial blood pressure due to endotracheal intubation.[16]

Almost all the studies available in literature compared either one of the commonly used opioid, or analgesic with a placebo like normal saline or the different concentrations of same drug with each other.

In this study, we compared the hemodynamic response to laryngoscopy and intubation in two groups, where group A (30 patients) received intravenous fentanyl 90 seconds before intubation, and group B (30 patients) received both intravenous paracetamol(10 minutes prior) and intravenous fentanyl (90 seconds before intubation).

We found that there was an initial increase of heart rate after intubation in both groups as compared to heart rate taken at time of induction. However, this was significantly higher(p=0.004) with group A and remained significantly high for another 6 minutes as compared to those who received group B where heart rate remained near baseline.

There was also an increase of mean arterial pressure after intubation in both groups, and this was significantly higher in the group A (p= 0.003). It remained significantly high for 6 minutes as compared to group B (p=0.003).

Mean SpO2 was similar in both the study groups, and there were no complications during the study. However, there are certain limitations to the current study considering the smaller sample size. Further randomized trials with a larger sample size would be able to confirm the findings of our study.

5. Conclusion

Intravenous fentanyl and paracetamol is more effective in attenuating the hemodynamic responses to laryngoscopy and endotracheal intubation when compared to intravenous fentanyl alone.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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