Original Research Article

Comparison of the effect of I.V nalbuphine and fentanyl as premedicant in general anaesthesia for laparoscopic surgeries

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Abstract

Introduction: Laparoscopic surgeries are minimally invasive surgeries with reduced mortality and morbidity, minimal postoperative analgesic requirement and early mobilisation. To prevent hemodynamic response to laryngoscopy, intubation and pneumoperitoneum various drugs are used. Opioids are commonly used in premedication, being a good analgesic, to support analgesia during surgery and to provide pain relief in immediate postoperative period. Among opioids, Fentanyl and Nalbuphine effectively control the hemodynamic stress response associated with laparoscopic surgeries, especially after laryngoscopy, intubation and pneumoperitoneum. In our study, we observed and compared the potency of opioids- Fentanyl & Nalbuphine used as premedicant for attenuation of hemodynamic response in laparoscopic surgeries and postoperative complications if any. **Objectives:** The present study was designed to compare the effect of intravenous Nalbuphine and Fentanyl as premedicant in general anaesthesia for laparoscopic surgeries**. Material and Methods:** After institutional ethics committee approval, the study in 60 patients belonging to ASA 1 & 2 undergoing laparoscopic surgeries like appendectomy, cholecystectomyetc. whose duration was assumed to be <90 min under general anaesthesia was conducted. Pre-anaesthetic assessment of the patient was done with a complete history, physical examination and routine investigations and informed written consent was obtained. Eligible patients who gave consent were kept nil orally for at least 6 hours before surgery. Pulse Rate(PR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure(DBP), Mean Arterial Pressure (MAP), Oxygen Saturation (SpO_2) was recorded at baseline, after giving study drug, immediately after laryngoscopy and tracheal intubation, thereafter at 10 minutes interval intraoperatively, post extubation at 1,3 and 5 minutes. Preoperative and postoperative sedation scoring was done using RASS. **Results:** The mean heart rate increased post extubation in both the groups. At 1min, 3 min and 5mins post extubation heart rate is better controlled in group N than group F and is statistically significant (P value < 0.05). Both groups showed a rise in SBP immediately after intubation. Group N showed a significantly lower SBP in comparison to group F ($p<0.005$). The DBP showed a similar trend. At one, three, and five minutes after intubation, HR, SBP, DBP, and MAP were similar between the groups. Post-extubation sedation score was significantly higher in group N ($p < 0.005$). **Conclusions:** From the findings of our study it is concluded that I.V. Nalbuphine when given in the dose of 0.2 mg/kg as a premedicant is significantly effective in attenuating the haemodynamic responses during intubation, laryngoscopy and pneumoperitoneum in laparoscopic surgery when compared to Fentanyl 2.0 µg/kg. It also provides better hemodynamic stability without major side effects during laparoscopic surgery.

Keywords*:* Nalbuphine, Fentanyl, Laproscopic sugeries

Introduction

Laparoscopic surgeries are the modern methods for better visualisation of internal anatomy of abdomen with advantages of minimal invasiveness, small surgical incision, reduced post-operative pain and discomfort, early recovery, reduced mortality and morbidity, minimal postoperative analgesic requirement and early mobilization[1]. The implications for the anaesthesiologists are to use techniques that not only allows for optimal surgical conditions, but intraoperative patient comfort & safety, and a rapid anaesthetic recovery[2]. General anaesthesia is most commonly employed for laparoscopic surgeries that involves laryngoscopy and intubation i.e., introduction of an artificial airway device-endotracheal tube for providing ventilation, prevention of aspiration and hypoxia[3]. Direct laryngoscopy and tracheal intubation is an invasive procedure which leads to stress response resulting from increase in sympathetic and sympathoadrenal activity, as evidenced by increased plasma catecholamine concentrations and activation of α and β adrenoreceptors leading to tachycardia and hypertension. This increase in blood pressure and heart rate are transitory, variable and unpredictable[4]. Although most patients can tolerate these transient effects without any significant consequences, but this could be detrimental in susceptible individuals causing arrhythmias, left ventricular failure, myocardial ischemia, increased bleeding, raised intracranial and intraocular pressure and cerebrovascular haemorrhage in them[4]. Various methods have been adopted to attenuate the hemodynamic and stress responses during laryngoscopy, intubation and laparoscopic surgeries by using various non-pharmacological techniques & drugs. The non-pharmacological techniques for laryngoscopy and intubation include smooth intubation with single attempt within 15 sec, use of McCoy laryngoscopy blade[5,6], use of supraglottic airway device instead of tracheal intubation[7], use of fibre-optic bronchoscopic intubation with triple nerve block[8].

Opioid in adequate doses have been commonly used to prevent hemodynamic response at laryngoscopy and intubation. Fentanyl and Nalbuphine effectively control the hemodynamic stress response associated with laparoscopic surgeries. In our study, we determined to observe and compare the potency of opioids- Fentanyl & Nalbuphine administered as premedication for attenuation of hemodynamic

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response perioperatively and postoperative complications and sedation in laparoscopic surgeries

Objectives

The present study was designed to compare the effect of intravenous Nalbuphine and Fentanyl as premedicant in general anaesthesia for laparoscopic surgeries.

Material and Methods

Source of the study

Patients posted for elective laparoscopic surgeries under General anaesthesia in department of Anaesthesia, GMC Bhopal and associated Hamidia Hospital.

Design of the study

Comparative observational study

Period of the study

January 2019 – July 2020

After obtaining institutional ethics committee approval, the study was conducted in 60 patients belonging to ASA 1 & 2 undergoing laparoscopic surgeries like appendectomy, cholecystectomy etc. whose duration was assumed to be <90 min under general anaesthesia. Pre-anaesthetic assessment of the patient was done with a complete history, physical examination and routine investigations and informed written consent was obtained. Patients were kept nil orally for 6 hours before surgery. In the operation theatre, intravenous line, pulse oximeter, electrocardiograph and a non-invasive blood pressure monitor were attached and baseline hemodynamic parameters recorded following a stabilization period of 3-5 minutes. All patients were administered IV Ondansetron 4mg, IV Glycopyrrolate 0.2mg, IV Midazolam 1 mg; group N received IV Nalbuphine 0.2 mg/kg and group F received IV Fentanyl 2 mcg/kg five minutes prior to induction of anesthesia. Vital parameters were noted and patients sedation level was assessed using RSS at the end of five minutes. Side-effects like nausea, vomiting, desaturation, respiratory depression, sedation, pruritis were recorded. Post-Operative Sedation was evaluated using Ramsay Sedation Scale. Data analysis were compiled in the form of mean and standard deviation and the student *t* test was used for between-group comparisons of HR, SBP, DBP and SpO2 while the chi square test was used to analyse sedation scores, sex, and adverse events using computer software SPSS of windows and P value less than 0.05 was considered as statistically significant.

RSS- Ramsay Sedation Scale[9]

Score	Response
1	Patient anxious and agitated or restless or both
2	Patient cooperative, oriented, and tranquil
3	Patient drowsy but responds to commands
4	Brisk response to light glabellar tap or loud auditory stimulus
5	Sluggish response to light glabellar tap/loud auditory stimulus
6	No response to light glabellar tap or loud auditory stimulus

Observation and Results

Table 1: The demographic characteristics comparable between the two groups.

Parameters	Group N		Group F		P Value
	Mean	SD			
Age (Yrs)	35	11.84	38.6	12.35	0.44
Weight (Kg)	62.73	5.21	63.03	4.62	0.93
Sex	M (14)	M (16)	M (13)	F (17)	
Duration of surgery	83.47	7.67	79.53	9.89	0.127

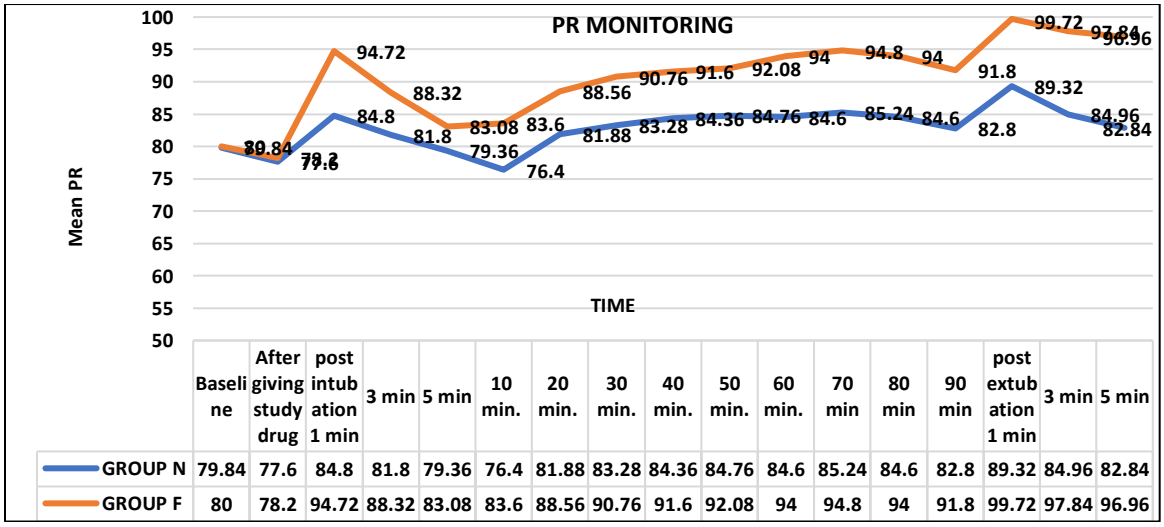

Figure -1: Comparision of mean pulse rate between both groups at different time intervals

Graph-1 shows the baseline mean heart rate was comparable in both the groups i.e., group N 79.840±3.602 and group F 80.000±3.403. Thereafter the mean heart rate after giving study drug decreased from baseline in both the groups i.e.,77.6±3.536 in group N and 78.2±3.367 in group F which was also comparable . But the mean heart rate at 1min, 3 min post intubation increased in both the groups but rate of increase was more in

group F (18.4%) than group N(6.2%) which was statistically significant (p<0.05) . At 5 min post intubation the HR returned to baseline level in group N but group F showed sustained rise in HR even after 5 min post-intubation and the difference was statistically significant (p< 0.05).

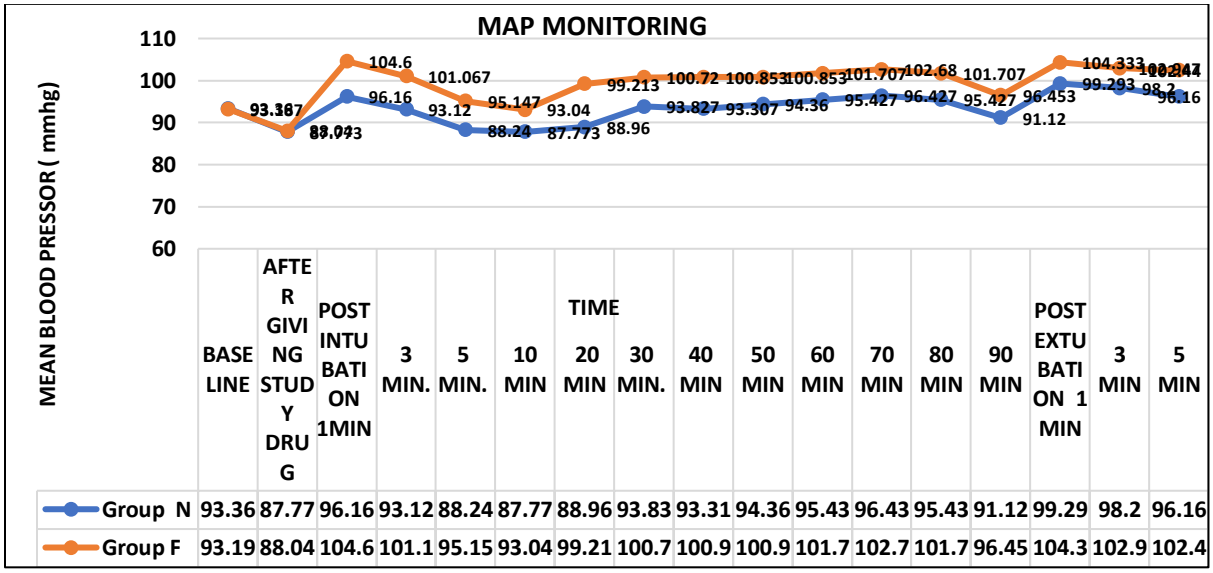

Figure -2: Comparision of mean arterial pressure between both groups

Graph-2 showing comparison of mean arterial pressure between group N and group F. The baseline MAP was comparable in both the groups; i.e., in group N was 93.360±3.448 and in group F was 93.187±2.995. The mean MAP after giving study drug decreased in both the groups. This decrease in mean MAP in both groups was statistically insignificant (P value> 0.05). But the mean MAP immediately after intubation was found to rise in both the groups but rate of rise was more in group F(12.25%) as compared to group N 2.9%)which was statistically significant (p<0.05) . At 3 min post intubation the MAP returned to baseline level in group N but group F showed sustained rise in MAP till 10 min post-intubation and the difference was statistically significant(p< 0.05).

Intra-operatively after creation of pneumoperitoneum, there was rise in MAP due to sympathetic stimulation. Group F showed 8.09% rise in MAP whereas no rise was observed in group N. Group N had better control of MAP than group F in which MAP remained above baseline level at all times of observation and the difference between both the groups remained statistically significant throughout the procedure(P value<0.05). There was transient rise of MAP during extubation in both groups but the rate of rise was seen more in group F (11.9%) than group N(6.35%) and the difference was statistically significant(p<0.05).

Both the drugs are associated with decrease in SBP, DBP and MAP following their administration, but Group N showed better control of blood pressure changes during laryngoscopy & intubation , after creation of pneumoperitoneum and following extubation when compared to group F.

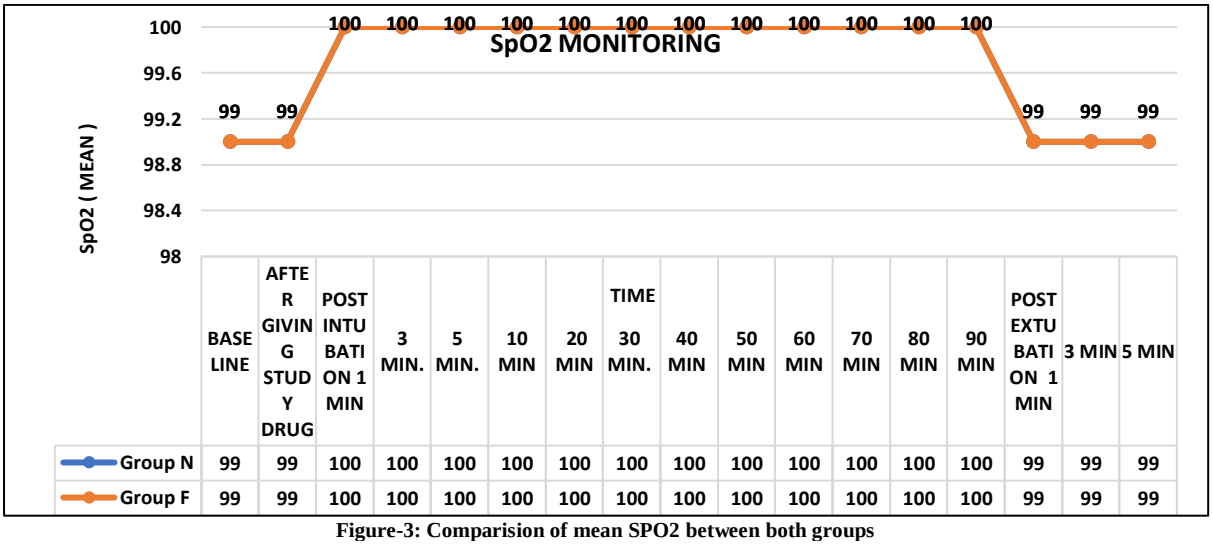

Figure-3: Comparision of mean SPO2 between both groups

Graph-3 showing comparison of MEAN SpO2 among groups N and group F. Base line value of mean SpO2was 99± 0.523and 99± 0.600in group N and group F respectively with a P value of 0.455, showing statistically insignificant difference between the groups. The difference in both the groups in changes in SpO2 at different time intervals had P value > 0.05 which was statistically insignificant.

Table– 2: Comparison of sedation score in b0th groups

Ramsay sedation score	Group N [n=30]		Group F [n=30]		P Value
	N	%	N	%	
1	04	13.3%	2	6.6%	<0.00001
2	24	80%	25	83.33%	
3	2	6.6%	3	10%	
4	0	0.00%	0	0.00%	
5	0	0.00%	0	0.00%	
6	0	0.00%	0	0.00%	

Discussion

Most of the prior studies have taken the dose of Nalbuphine that is most effective to be 0.2 mg/kg. Too high dosage poses a risk of developing side effects such as nausea, vomiting, respiratory depression and sedation. Fentanyl doses used in studies were between 1.0 µg/kg and 5.0 µg/kg. Higher doses were associated with increased incidence of PONV and increased sedation. We chose the doses in our study based on the assumption that Nalbuphine is equipotent to Morphine[10]. Fentanyl on an mg basis is about 80 times more potent than Morphine and a dose of 2µg/kg was therefore chosen to be almost equipotent to Nalbuphine 0.2mg/kg and effective in attenuating hemodynamic reflexes to laryngoscopy and intubation with least side effects.

Patients in the Nalbuphine group had a minimal increase in heart rate during laryngoscopy, intubation, after pneumoperitoneum intraoperatively and postextubation as compared to Fentanyl which was found to be statistically significant. Systolic, diastolic and mean blood pressure were significantly better controlled in Nalbuphine group as compared to Fentanyl at all the time intervals. Pressor response to pneumoperitoneum was also better attenuated by Nalbuphine group than the Fentanyl group and the difference was statistically significant.

HEART RATE: As shown in Graph-1 the baseline mean heart rate was comparable in both the groups i.e., group N 79.840±3.602 and group F 80.000±3.403. Thereafter the mean heart rate after giving study drug decreased from baseline in both the groups i.e.,77.6±3.536 in group N and 78.2±3.367 in group F which was also comparable . But the mean heart rate at 1 min, 3 min post intubation increased in both the groups but rate of increase was more in group F (18.4%) than group N(6.2%) which was statistically significant ($p<0.05$). At 5 min post intubation the HR returned to baseline level in group N but group F showed sustained rise in HR even after 5 min post-intubation and the difference was statistically significant ($p< 0.05$). This was in accordance with a comparative study conducted by Aqusa Buchh, K Gupta et al[5].

Contrasting results were found by Khan et al[10] who observed 15% increase in HR in Nalbuphine group as compared to 4% in Fentanyl group at extubation. Ahsan-ul-Haq et al[7] and Kay et al**[11]** in their study found significant rise in heart rate in patients of Nalbuphine group (53.4%) as compared to patients in Fentanyl group (15.5%).

BLOOD PRESSURE: Graph-2 shows changes in MAP. The baseline MAP was comparable in both the groups; i.e., in group N was 93.360±3.448 and in group F was 93.187±2.995. The mean MAP after giving study drug decreased in both the groups i.e., in group N 87.773±2.807 and in group F 88.040 ±2.400. This decrease in mean MAP in both groups was statistically insignificant (P value> 0.05). But the mean MAP immediately after intubation was found to rise in both the groups but rate of rise was more in group F(12.25%) as compared to group N 2.9%)which was statistically significant ($p<0.05$). At 3 min post intubation the MAP returned to baseline level in group N but group F showed sustained rise in MAP till 10 min post-intubation and the difference was statistically significant ($p< 0.05$). Both the drugs are associated with decrease in SBP, DBP and MAP following their administration, but Group N showed better control of blood pressure changes during laryngoscopy & intubation, after creation of pneumoperitoneum and following extubation when compared to group F. Our observation correlates with the studies conducted by Bhandari, Rastogi et al[12].

SPO2: Graph 3 shows that the oxygen saturation at all the observations in both the groups was found comparable. Mean SpO2 was maintained above 98% at all the time intervals. No desaturation was observed after extubation in either of the groups. All the patients were extubated after complete reversal of muscle relaxation, when there was eye opening and response to verbal commands. Nalbuphine and Fentanyl cause respiratory depression at much higher doses than that used in the present study. Hence desaturation was not observed in the study.

SEDATION: As shown in Table 2 postoperatively, in the Nalbuphine group, 80% of the patients were calm, oriented and co- operative (grade 2) , 6.6% of the patients were drowsy, but responded to commands (grade 3) and 13.3% patients were apprehensive and restless (grade 1). In the Fentanyl group, 83.33% of the patients were calm, oriented and co – operative (grade 2) and 10% of the patients were drowsy and responded to commands (grade 3) and 6.6% of the patients were apprehensive and restless (grade 1). Post-operative sedation was more in Nalbuphine group as compared to Fentanyl group and the difference was statistically significant among both groups ($p<0.00001$). These results are similar with the studies conducted by R Bhandari, S Rastogi et al[12].

Conclusion

From the observation and results of our study it is concluded that I.V. Nalbuphine when given in the dose of 0.2 mg/kg as a premedicant is significantly effective in attenuating the haemodynamic responses during intubation, laryngoscopy and pneumoperitoneum in laparoscopic surgery when compared to Fentanyl2.0 µg/kg. It also provides better hemodynamic stability without major side effects during laparoscopic surgery.

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