Original Research Article

A comparative study to know the effectiveness of butorphanol versus fentanyl in laparoscopic surgeries for balanced anaesthesia

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Abstract

Background: Fentanyl and butorphanol both opioids are belonging to different subgroups are in use for balanced anaesthesia for long time. The present study aimed to compare effectiveness of butorphanol vs fentanyl in laparoscopic surgeries for balanced general anaesthesia. **Material and Methodology:** The present study is randomised comparative study. Total 70 patients of ASA grade I and II, aged between 20-50 years, of both sex were selected from routine operative list after taking written consent and were divided into 2 groups, each of 35. **Group B:** Inj Butorphanol 1mg just after induction, repeated with 0.5mg after 30 mins. **Group F:** Inj Fentanyl 2µg/kg just after induction repeated with 0.5µg/kg after 30 mins. Induction was done with Inj Propofol 2mg/kg and Inj Succinylcholine 1.5 mg/kg iv. Intubation was done with oral cuffed portex endotracheal tube and anaesthesia was maintained with 33% O2 and 66%N2O, traces of isoflurane, Inj vecuronium as a muscle relaxant and intermittent positive pressure ventilation. Intraperitoneal gas insufflation of CO2 was allowed upto Intraabdominal pressure between 14 to 15 mmHg. At the end of the surgery patients were reversed with Inj Neostigmine 0.06 mg/kg and Inj Glycopyrrolate 8 µg/kg intravenously. Mean arterial pressure and mean pulse rates were compared at various intervals as- before premedication, just after pre-medication, before and after giving drug, just after induction, on intubation and intraoperatively at interval of 3 min, 6 min, 9 min, 12 min, Before pneumoperitonium, 15th min during pneumoperitonium, 30th min, 45th min 60th min, after CO2 release, after extubation, immediate post-op, 15 min post-op, 30 min post-op, and then postoperatively up to 1 hour. Any other complications were also noted in both groups. **Results:** group B which received butorphanol as an opioid showed significantly lower mean pulse rates at post intubation 9 min, 12 min and just before pneumoperitoneum and mean arterial pressures were also significantly lower at post intubation 6 min,9min, 12min and upto post pneumoperitoneum 15 min compared to group F which received fentanyl. very few patients experienced nausea and vomiting in both groups. Sedation was seen in 15 patients of group B which received butorphanol **Conclusion:** From the present study we conclude that the butorphanol in a dose of 1mg (repeated 0.5mg after 30min) has better haemodynamic stress reducing agent than fentany 2mcg/kg (repeated 0.5mcg/kg after 30 min) in laparoscopic surgeries.

Key Word: butorphanol, fentanyl.

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INTRODUCTION

The use of opiods began in 1869, by CLAUDE BERNARD with use of morphine as premedication. Since then a series of opioids have been used for balanced anaesthesia which is a form of general anaesthesia encompassing five components: amnesia, analgesia, muscle relaxation, abolition of autonomic reflexes and homeostasis. The recent trend for control of intraoperative and post-operative pain is towards multimodal analgesia where adequate analgesia is provided using 2 or more analgesic agents, thereby reducing undesirable side effects of each agent and improving the efficacy of each with smaller doses.[2] Butorophanol is a synthetic opioid which is agonist at kappa receptors and antagonist at µ receptor. Fentanyl is a synthetic opioid that is structurally related to pethidine which is more potent and has a better safety margin.

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Analgesic effects of butorphanol and fentanyl have been evaluated extensively for acute and chronic pain for last many years. Many of these studies have shown promising results for intra-operative and post-operative pain. They have also shown to have favourable effects on pressor response caused by laryngoscopy and intubation during general anaesthesia.[1,2] Present study was done to evaluate efficacy of i.v. Butorphanol v/s i.v. Fentanyl intraoperatively for balanced anaesthesia in patients undergoing laparoscopic surgeries.

METHODOLOGY

The present study is a randomized comparative study. Total 70 patients of ASA grade I and II, aged between 20-50 years, of both sex were selected from routine operative list after taking written consent and were divided into 2 groups, each of 35.

Group B: Inj Butorphanol 1mg just after induction, repeated with 0.5mg after 30 mins.

Group F: Inj Fentanyl 2µg/kg just after induction repeated with 0.5µg/kg after 30 mins.

The study was carried out in the Department of Anaesthesiology, B.L.D.E.(deemed to be university) Shri. B M Patil Medical College, Hospital and Research Centre, Vijayapura. The sample size was calculated on the basis of study conducted by Anand S Nirgude, Varsha Suryavanshi[1]. The anticipated mean and standard deviation of systolic blood pressure at intubation during abdominal surgeries was 130.07± 11.09 and 139.0 ± 8.66. The minimal sample size was 35 per group with 95% level of significance and 90% power. Data was presented using mean ± Standard deviation, percentages and diagrams. Significant differences between quantitative data were found using unpaired t test / Wilcoxon signed rank test to compare two groups. Significant difference between Qualitative data was compared using Chi square test. The study population of 70 with age and sex matched were randomly selected and divided by computer generated random number tables in to two groups with 35 patients in each group. Patients with history of hypertension, having allergy to butorphanol or fentanyl, inability or refusal to consent were all excluded from the study. Patient were included in the study by thorough Preanaesthetic evaluation with respect to history of underlying medical illness, previous history of surgery, anaesthetic exposure and prior hospitalization. All patients were thoroughly examined with respect to general condition, vital signs, height, weight, cardiovascular system, respiratory system, central nervous system and the vertebral spine. Airway assessment was done by mallampati grading Investigations or interventions required in this study were routine standardized procedures like Complete Blood Count, BT, CT, Urine Routine, Random blood sugar, Blood urea, Serum creatinine, Chest Radiograph, ECG, HIV and HBs Ag. Informed written consent was taken from each patient of both groups. Patients were kept nil by mouth at least for 8 hours prior to surgery. Pulse oximeter, NIBP, ECG will be connected and baseline values were recorded. All patients in both the groups were monitored for pulseoximeter, NIBP, SPO2, ETCO2 and ECG before premedication, just after pre-medication, before and after giving drug, just after induction, on intubation and intra operatively at interval of 3 min, 6 min, 9 min, 12 min, Before pneumoperitonium, 15^{th} min during pneumoperitonium, 30^{th} min, 45^{th} min 60^{th} min, after CO2 release, after extubation, immediate post-op, 15 min post-op, 30 min post-op, and then postoperatively up to 1 hour. Intravenous fluids were started with 18G i.c. on right hand with lactated ringer and DNS on weight basis. Premedication: Inj Glycopyrrolate 4µgm/kg and Inj midazolam 0.08 mg/kg, were given i.m. 45 minute prior to the surgery to both groups. Antiemetic prophylaxis in the form of Inj Ranitidine 1mg/kg i.v and Inj Ondansetron 4mg i.v. to both the groups was given. Patients in both the groups were pre-oxygenated with 100% oxygen by mask for 3 minutes. Inj Butorphanol 1 mg was given intravenously and 0.5 mg will be repeated after 30 minutes to Group B patients. In Group F patients ; Inj fentanyl 2µg /kg will be given iv. and then 0.5 µg/kg will be repeated after 30 minutes. Induction was done with Inj Propofol 2mg/kg and Inj Succinylcholine 1.5 mg/kg iv. Intubation was done with oral cuffed portex endotracheal tube and anaesthesia was maintained with 33% O_2 and 66%N_2O, traces of isoflurane, Inj vecuronium as a muscle relaxant and intermittent positive pressure ventilation. Intraperitoneal gas insufflation of CO2 was allowed upto Intra abdominal pressure between 14 to 15 mmHg. At the end of the surgery patients were reversed with Inj Neostigmine 0.06 mg/kg and Inj Glycopyrrolate 8 µg/kg intravenously. All patients were observed for any side effects like bradycardia, hypotension, nausea, vomiting, respiratory depression, sedation, dysphoria and pain(by visual analogue scale), in the post operative period.

RESULTS

During the study period total 70 patients, 35 patients in each group showed no statistically significant differences with respect to age, sex and weight as shown in table-1 Table -2 shows mean pulse rates of both groups at various intervals. Mean pulse rates are significantly (statistically) higher for group F at interval post intubation 9min, 12 min and just before pneumoperitoneum than group B. After that also upto at post pneumoperitoneum 15min mean pulse rates are higher for group F but statistically not significant. Hence butorphanol reduces stressor

response significantly at these intervals. At all other intervals changes are comparable in both groups Table -3 shows mean areterial pressures of both groups. There is statistically significant difference at intervals starting from post intubation 6 min, 9 min, 12 min and upto post pneumoperitoneum 15 min. Mean arterial pressures are significantly higher for group F compared to group B at these intervals. This shows that butorphanol significantly reduces stress response at these intervals. At all other intervals there is no significant difference. Table -4 shows post operative complications of both groups. In group B, 3patients had nausea and 1 patient had vomiting while in group F, 4 patients experienced nausea and 2 patients had vomiting. Table-4 also shows incidence of sedation which is seen in 15 patients of group B which is significant. Apart from these there were no other complications noted in both groups. Post operative analgesia was comparable in both groups and there was no difference in rescue analgesic demand.

Table 1: Demographic Data

	Group B	Group F
Mean age(years)	32±8.4	33±10.2
Mean weight(kg)	51.48±8.9	46±10.12
Sex (M:F)	12:23	15:20

Table 2: Changes In Mean Pulse Rate Due To Stressor Response

Time	Group B(n=35)	Group F(n=35)	P value
Before premedication	82.26±5.12	78.42±6.42	>0.05
After premedication	80.36±4.24	82.02±7.13	>0.05
Before giving drug	78.81±6.18	77.13±5.26	>0.05
After giving drug	79.16±4.78	83.60±5.22	>0.05
After induction	76.06±3.90	72.88±7.02	>0.05
On intubation	116.2±9.11	114.69±8.48	>0.05
Intraop at 3 min	110.06±7.03	108.90±4.88	>0.05
6 min	106.44±6.79	107.05±5.71	>0.05
9 min	88.01±6.99	102.91±8.89	<0.05
12 min	90.15±7.20	103.33±8.13	<0.05
Before pneumoperitoneum	86.73±8.19	92.15±9.21	<0.05
Post pneumo 15 min	83.14±6.54	86.61±9.63	>0.05
30 min	86.04±9.01	84.83±7.74	>0.05
45 min	79.14±10.03	82.57±11.32	>0.05
60 min	74.93±8.55	80.06±7.44	>0.05
After co2 release	70.44±8.39	74.03±4.26	>0.05
After extubation	94.34±11.22	102.47±5.87	<0.05
Immediate post-op	92.08±8.02	101.65±6.12	<0.05
Post-op 15 min	83.14±6.61	86.32±9.32	>0.05
30 min	79.03±8.86	80.19±7.99	>0.05
1 hr	76.81±6.29	79.22±4.05	>0.05

Table 3: changes in mean arterial pressures(mmhg) due to stressor response

Time	Group B(n=35)	Group F(n=35)	P value
Before premedication	88.18±6.34	86.13±3.87	>0.05
After premedication	90.92±7.14	92.31±4.66	>0.05
Before giving drug	86.32±6.61	89.71±5.35	>0.05
After giving drug	85.04±5.82	84.32±3.79	>0.05
After induction	90.28±6.72	88.83±7.47	>0.05
On intubation	114.88±9.38	115.19±8.31	>0.05
Intraop at 3 min	110.83±6.32	112.10±8.90	>0.05
6 min	104.02±8.03	110.01±3.93	<0.05
9 min	102.50±7.43	108.86±4.76	<0.05
12 min	88.84±9.24	102.02±6.25	<0.05
Before pneumoperitoneum	86.31±5.78	98.67±5.40	<0.05
Post pneumo 15 min	88.04±8.14	97.43±4.86	<0.05
30 min	84.12±8.32	90.01±9.98	>0.05
45 min	81.88±7.33	85.86±8.78	>0.05
60 min	82.09±6.10	83.11±8.14	>0.05
After co2 release	79.86±8.23	80.06±5.37	>0.05

After extubation	94.19±10.85	92.13±11.01	>0.05
Immediate post-op	92.14±9.27	91.09±9.67	>0.05
Post-op 15 min	84.61±10.34	85.43±7.98	>0.05
30 min	88.75±8.22	87.41±9.04	>0.05
1 hr	86.63±7.49	88.07±8.85	>0.05

Table 4: Postoperative Complications(Number Of Patients

	Group B(n=35)	Group F(n=35)
Nausea	3	4
Vomiting	1	2
Dysphoria	0	0
Bradycardia	0	0
Hypotension	0	0
Delayed recovery	0	0
Sedation	15	0

DISCUSSION

Now a days laparoscopic surgeries have replaced many of the open surgeries because of their advantages like smaller incisions, fast recovery, less incidence of complications and relatively less painful. There are various haemodynamic, respiratory, and stress response changes in laparoscopic surgery due to creation of pneumoperitoneum.[9-12] Anand.S. Nirgude , Varsha Suryavanshi *et al* (2017) conducted a study to compare IV fentanyl and IV butorphanol in Propofol based anaesthesia to attenuate hemodynamic response in abdominal surgical cases and concluded that there was statistically significant difference in both the groups in mean SBP and mean DBP after intubation.[1] They came to a conclusion that fentanyl offered better haemodynamic control over butorphanol . But in contrast to our study where all were laparoscopic surgeries we found that the group which received butorphanol showed lesser changes in mean arterial pressures as well as pulse rates after intubation at 9min, 12min and up to 15 min post pneumoperitoneum when compared to the group which received fentanyl. Shital S. Ahire, Shweta Mhambrey *et al* (2016) in their study concluded that butorphanol is an acceptable alternative opioid to fentanyl for use as a component of balanced general anaesthesia at the doses studied, because of its ability to produce prolonged analgesia and amnesia, stable haemodynamic parameters, no postoperative respiratory depression and no prolongation of the recovery room stay.[2]They found that butorphanol 20 µg/kg i.v. prevents response to endotracheal intubation to a greater extent than fentanyl 1 µg/kg i.v and the difference was highly significant statistically. The results of this study are comparable with our study where we have used butorphanol 1mg iv and repeated 0.5 mg after 30 min and other group received fentanyl 2mcg/kg and repeated 0.5mcg/kg after 30 min. Vikramjeet arora, sukhminder jit SB (2012) *et al* in their study concluded that use of butorphanol was associated with less anaesthetic (propofol) consumption, better post operative analgesia with a better protection against post operative shivering. The only major drawback with butorphanol was postoperative hypoxemia and sedation in geriatric patients.[7]The dose of butorphanol used was 40 mcg/kg. We in our study used butorphanol 1mg iv and repeated 0.5mg after 30 min. M. Hanumantha Rao, V. Satyanarayana *et al* (2013) concluded that butorphanol is a better alternative to fentanyl for use as analgesic in laparoscopic surgeries because of its ability to produce prolonged analgesia, and less post-operative complications.[3] In this study fifty patients of American society Anesthesiologists (ASA) grade I and II, scheduled to undergo laparoscopic surgery, were randomized into butorphanol group (Group B) (n=25) and fentanyl group (Group F) (n=25).They compared butorphanol 40mcg/kg(groupB) with fentanyl 2mcg/kg(group F).This study is comparable to our present study but the dose used for butorphanol is 1mg iv repeated 0.5mg after 30 min , while that of fentanyl is same as 2mcg/kg iv repeated 0.5mcg/kg after 30min. In our study each group has 35 patients. Philip BK, sott DA *et al*(1991) in their study Butorphanol was compared with fentanyl as the narcotic component of general anaesthesia for ambulatory laparoscopic surgery and showed that Intraoperatively, patients who received Butorphanol demonstrated lower pulse rate before and after intubation and lower diastolic blood pressure after intubation and Postoperatively, there were no differences in analgesic need.[4]This study also is similar to our present study in that we also found that group which received butorphanol has favourable mean pulse rates and mean arterial pressures especially after 9 minutes and 12 minutes post intubation and upto 15 minutes post pneumoperitoneum and these are statistically significant when compared to fentanyl group. Wetchler BV, Alexander CD *et al*(1989) arrived to a conclusion from their study, 20 mcg/kg butorphanol appears to be as suitable as 2 mcg/kg fentanyl for use as a

preinduction narcotic analgesic, whereas 40 mcg/kg butorphanol appears to be unsuitable due to increased duration of nausea, dizziness.[6] This study is also comparable to our study in that we also used fentanyl 2mcg/kg whereas butorphanol dose used was 1mg in our study while they used 40mcg/kg. In our study nausea and vomiting was seen in both groups, In group F 4 patients had nausea and 2 patients had vomiting whereas in group B 3 patients experienced nausea and 1 patient had vomiting. Sedation was also seen in 15 patients in group B where butorhanol 1mg was used, repeated 0.5mg after 30 min. There were no incidences of sedation in group F. Pandit SK, Kothary SP *et al*(1987) in their study equianalgesic doses of butorphanol (40 mcg/ kg) and fentanyl (2.0 mcg/ kg) were compared as supplements to balanced general anaesthesia for outpatient laparoscopic procedures and concluded that induction, maintenance and recovery characteristics were not different in the two groups except that the post-intubation arterial pressure and heart rate in the fentanyl group were significantly higher than the base line values and the patients receiving butorphanol were more drowsy and also more pain-free in the postoperative period.[5] This is also a similar study as ours but the doses of butorphanol used in this study was 40mcg/kg. Hari Prasad K, Ram Kumar P.A *et al* (2016) in their study showed that Nalbuphine provides good hemodynamic and excellent post-operative analgesia which is comparable to fentanyl but at a less frequent dosing thus decreasing the overall opiod requirement for general anesthesia[8]..Here nalbuphine used in a dose of 0.2mg/kg and fentanyl used in dose of 2mcg/kg. Total of 40 patients were studied in this trial equally divided into two groups.

CONCLUSION

From the present study we conclude that the butorphanol in a dose of 1mg (repeated 0.5mg after 30min) has better haemodynamic stress reducing agent than fentany 2mcg/kg (repeated 0.5mcg/kg after 30 min) in laparoscopic surgeries under general anesthesia with no other major side effects except slight sedation.

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