Original Article

Indian Journal of Anesthesia and Analgesia
Volume 10 Number 1 January-March 2023
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.10123.1

A Comparative Study of Epidural Butorphanol and Fentanyl as Adjuvants with 0.5% Bupivacaine for Postoperative analgesia in Lower Abdominal Surgeries

Swathi Mallikarjuna[1], Vinayak Sirsat[2]

How to cite this article:
Swathi Mallikarjuna, Vinayak Sirsat/A Comparative Study of Epidural Butorphanol and Fentanyl as Adjuvants with 0.5% Bupivacaine for Postoperative Analgesia in Lower Abdominal Surgeries/Indian J Anesth Analg. 2023;10(1)9-13.

Abstract

The pain is considered as sixth vital sign. Achieving adequate peri-operative and post -operative analgesia is of paramount importance to the anesthesiologist. This can be done by multiple approaches. One such technique is use of Epidural opioids. This study evaluates the analgesic efficacy of epidural fentanyl and butorphanol in lower abdominal surgeries for post -operative analgesia.

Aims: To compare the degree of post-operative analgesia using butorphanol and fentanyl administered by epidural route.

Settings and Design: Study setting: Tertiary care Hospital

Study Design: A Prospective Double Blinded Randomised Clinical Study

Methods and Material: A total of 60 Patients posted for elective lower abdominal surgeries were randomly selected for the study. The patients aged 20-60 years of ASA grade one and two posted for elective lower abdominal surgery were selected for the study. Drugs used were explained to the patients and also educated about Verbal numerical scale for assessment of pain.

Patients were divided into two groups: Group A: receives Butorphanol 1mg mixed with 15 ml Bupivacaine 0.5%diluted upto 20 ml. Group B: receives Fentanyl 100 microgram mixed with 15 ml Bupivacaine 0.5% diluted upto 20 ml.

Statistical analysis used: Statistical data was analysed using • Chi-square test • Student t-test (Paired and unpaired t-test) • A P value of < 0.05 is significant and >0.05 is not significant

Results: The demographic variables were comparable in both groups.

Both inj. Butorphanol 1 mg and Inj. Fentanyl 100 mcg given epidurally with Inj. Bupivacaine 0.5% as a single shot provided excellent operative conditions and satisfactory post-operative analgesia in both the groups. However, the duration of post-operative analgesia was much longer in the butorphanol group than Fentanyl

Author's Affiliation: [1]Senior Resident, Department of Anesthesiology and Critical Care, All India Institute of Medical Sciences, Rishikesh 249203, Uttarakhand, India, [2]Associate Professor, Department of Anesthesiology, Government Medical College, Latur 413512, Maharashtra, India

Corresponding Author: Swathi Mallikarjuna, Senior Resident, Department of Anesthesiology and Critical Care, All India Institute of Medical Sciences, Rishikesh 249203, Uttarakhand, India.

E-mail: swathimallikarjuna82@gmail.com

Received on: 31.01.2023

Accepted on: 15.02.2023

group and was statistically significant. No serious side effects were noted in both groups. The method is economical, safe, convenient and acceptable and also poly pharmacy is avoided.

Conclusions: Both fentanyl and butorphanol are safe and effective as epidural agents for postoperative analgesia with little side effects.

Keywords: Post-operative analgesia; Epidural analgesia; Butorphanol; Fentanyl; Lower abdominal surgery.

Key Messages: Epidural opioids such as fentanyl and butorphanol acts via spinal cord receptors to improve the quality and the duration of analgesia with dose sparing effects of the local anesthetics. Using these agents for postoperative analgesia is a cost effective, time sparing and provides excellent analgesia in lower abdominal surgeries.

INTRODUCTION

Pain is one of the devastating experience and as an anesthesiologist, it is our responsibility to provide pain free period to the patient both in perioperative and postoperative period. Opioids are commonly used as adjuvants to local anesthetics in epidural analgesia.[1] Bupivacaine is widely used local anesthetic in epidural anesthesia and analgesia because of its long duration of action and differential blockade.

Butorphanol is an opioid-receptor k agonist and μagonist and antagonist and used for postoperative analgesia due to its analgesic and sedative properties.[2,3] Fentanyl is μ receptor agonist with analgesic efficacy greater than morphine and commonly used opioid as analgesic agent.[4] The present study was conducted to compare and assess the analgesic efficacy of epidural butorphanol and epidural fentanyl for post-operative analgesia in lower abdominal surgeries.

MATERIALS AND METHODS

This study was conducted after the approval of Ethical committee of Government Medical college, Latur, Maharashtra, India. After obtaining the written and informed consent of the patients, 60 adult patients of aged 18-60 years of either sex of American Society of Anaesthesiologist [ASA] grade I or II undergoing lower abdominal surgery randomly divided into two groups for the study. Exclusion criteria were Patients refusal, ASA grade III and IV, Contraindications to epidural anesthesia, Age <20 years and >60 years, Patients with history of drug allergy, Pregnancy and with significant cardiac, respiratory, neurological and hepatic disease. Patients enrolled for the study were familiarised with Verbal Numeric Scale (VNS) scoring to grade the pain (Fig. 1)

All Patients were counselled and the consent taken for epidural anesthesia. Tablet Alprazolam 0.25 mg was given the night before surgery and Tab Ranitidine 150 mg was given as premedication on the day of surgery. In the operating room, the patient was connected to standard ASA monitorssuch as electrocardiography, non-invasive blood pressure, pulse oximetry (SpO_2) and respiratory rate (RR). A peripheral venous access with 18G cannula was secured. The patients were pre-loaded with Ringer's lactate 10-15 ml/kg over 15-20 min prior to epidural block. With proper positioning and under all aseptic precautions epidural space was identified in L 3-4 intervertebral space using 18G Tuohy's needle with the loss of resistance to air technique. Epidural catheter was fixed at proper position after confirmation.

A test dose of 3 ml of 2% lignocaine with adrenaline was given after initial negative aspiration for blood and cerebrospinal fluid. Then, 20 ml of 0.5% plain bupivacaine along with one of the two study drugs was injected into the epidural space. Patients were randomly divided by computer generated random numbers into two groups of 30 each: Group A: receives Butorphanol 1mg mixed with 15 ml Bupivacaine 0.5% diluted upto 20 ml. Group B: receives Fentanyl 100 microgram mixed with 15 ml Bupivacaine 0.5% diluted upto 20 ml. The study drugs were prepared by a trained anesthesiologist giving the epidural block and making the observations in the intra-operative as well as the post-operative period and they are unaware of the study drug used. The hemodynamic parameters including Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and oxygen saturation (SpO_2) were monitored and noted every 5 min for the first 20 min and then every 10 min until the end of surgery and every 2 hours till 24

hours post-operatively. The block is assessed by the Onset of analgesia as the time from injection of epidural solution up to loss of pin prick sensation in any dermatome. Completion of analgesia as the time from initial onset of analgesia up to the time when analgesia attained its maximum dermatomal level.

Motor block was assessed using the bromage scale. The motor block was measured at 0, 10, 20 and 30 min post-drug administration and every 30 min post-surgery until the regression of the motor block Sensory block was assessed by pin-prick method using a blunt needle at 0, 2, 5, 10, 20, 30 and 60 min post-drug injection into the epidural space.

Post-operatively, the pain scores were assessed on the VNS scale every hour till 6 h and then every 2 h till 24 h. Vitals were recorded at the same time intervals as pain scores. Duration of analgesia was taken as the time from the onset of analgesia up to the time when the VNS reached.[5] Patient was then given the rescue analgesic drug Tramadol 100 mg in 10 ml normal salinethrough the epidural catheter and study in that patient ceased. The epidural catheter was kept for 24 h in the post-operative period and post-operative analgesia was maintained with epidural top ups with Tramadol 100 mg in 10 ml normal saline on patient demand. Complications such as, nausea and vomiting, urinary retention, headache, pruritus, respiratory depression was noted and treated accordingly.

Statistical analysis:

The data collected was subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS version 13). the sample size was calculated with the help of power analysis. Assuming type I error of 0.05 and a type II error of 0.1 to detect 30 min difference in post-operative analgesia so as to yield a power of 80%, a sample size of 30 patients was calculated for each group. A total of 60 patients of either sex randomly selected for the study.

Statistical data was analysed using

- Chi-square test
- Student t-test (Paired and unpaired t-test)
- A P value of <0.05 significant 0.05 not significant.

RESULTS

The patients aged 20-60 years of ASA grade one and two posted for elective lower abdominal surgeries such as appendicectomy, inguinal hernia repair, abdominal hysterectomy, gynaecological procedures were selected for the study.

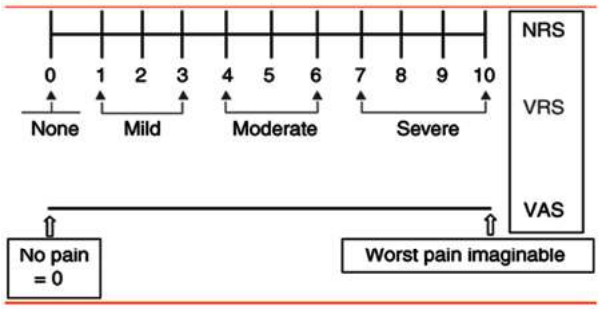

Fig. 1: Verbal Numeric Scale for pain assessment (NRS-Numeric Rating Scale/VAS-Visual Analog Scale)

In our study mean duration of analgesia with a mean of 12.6±2.5 hours in group A and the mean duration of 7.7±2.8 hours in group B. Hence the duration of analgesia with butorphanol group was more compared with the group B fentanyl drug.

The highest level is achieved with the mean of 15.7±3.4 min in group A butorphanol compared with 13.9±3 min in group B fentanyl drug. The onset is earlier in group B fentanyl drug compared with the group A drug butorphanol.

Both the groups maintained hemodynamic stability, there was no significant changes with respiratory parameters in either of the groups both intra and post-operative period.

With the above observations it can be summarise that both inj. Butorphanol 1 mg and Inj. Fentanyl 100 mcg given epidurally with Inj. Bupivacaine 0.5% as a single shot provided excellent operative conditions and satisfactory post-operative analgesia in both the groups. However, the duration of postoperative analgesia was much longer in the butorphanol group than Fentanyl group, with side effects like pruritis is more as compared to butorphanol group. Hence both the drugs, butorphanol and fentanyl were effective for postoperative analgesia and as the duration of analgesia was more, the procedure can either be done as a single shot injection, thus obviating the need for an epidural catheter whenever not available. The method is

Table 1: Mean pain scores assessed by VNS scale at various time intervals

VNS assessed at time (hours)	Group A		Group B		p value
	Mean	SD	Mean	SD	
1	0.5	0.0	0.7	0.4	0.027*
2	0.5	0.0	1.0	0.6	<0.001*
4	0.6	0.2	1.5	1.0	<0.001*
6	0.9	0.6	2.2	1.2	<0.001*
8	1.3	0.8	3.4	1.5	<0.001*
10	2.3	1.5	2.9	1.8	0.168
12	2.7	1.4	2.7	1.7	0.905
14	3.3	1.3	1.8	0.5	<0.001*
16	3.2	1.4	1.9	0.7	<0.001*
18	0.8	0.6	1.0	0.9	0.324
20	0.8	0.3	1.0	0.0	<0.001*

economical, safe, convenient and acceptable and also polypharmacy is avoided.

DISCUSSION

Pain is a complex subjective experience, which has proved difficult to measure in reproducible way. Satisfactory pain relief has always been a difficult problem in clinical practice. Since the discovery of opioid receptors in the spinal cord, the action of narcotics has become clearly understood. We studied epidurally administered opioids such as fentanyl and butorphanol for intraoperative and postoperative analgesia. The demographic variables were comparable in both groups.

Our study demonstrated that addition of these agents to 0.5% bupivacaine and administered via epidural route quickens the onset and as well completion of analgesia.

Our study showed the duration of analgesia or time to rescue analgesia with a mean of 12.6±2.5 in group A and the mean duration of 7.7±2.8 in group B as shown in fig. 2.

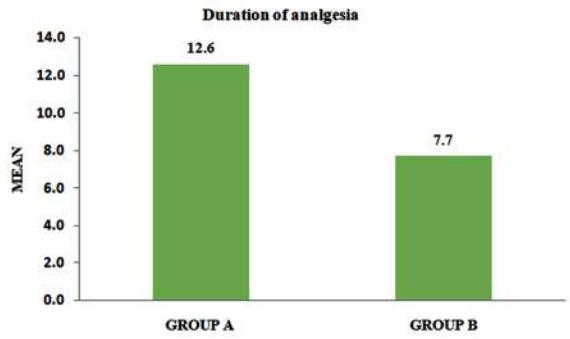

Fig. 2: The duration of analgesia as shown in two groups

The pain scores were assessed using the VNS scale with less number indicates less pain and it remained low for a significant period post-operatively with the addition of butorphanol and fentanyl to bupivacaine. The mean postoperative pain scores by VNS at different time intervals compared between the two groups is shown in table 1. Our study showed that butorphanol provides prolonged duration of analgesia as compared to fentanyl. Various studies have compared the analgesic efficacy of butorphanol and fentanyl in caesarean section and other abdominal surgeries.[5,6]

Opioid analgesics are not devoid of side effects. They are well known to cause nausea, vomiting, pruritis, respiratory depression and urinary retention. No patient had respiratory depression or urinary retention in any group. Nausea and vomiting in group A is around 36.7% which is a majority side effect among group A and in group B is around 6.7%. The results are statistically significant and the nausea and vomiting is higher in group A than group B. Pruritus as a side effect is around 10% in group A and 33.3% in group B and the results are statistically significant and hence pruritus is common with group B drug fentanyl.

Our results were comparable with those reported by Malik et al.[7] and Bajwa et al.[8]

CONCLUSION

The onset of analgesia is faster with fentanyl compared to butorphanol group. The duration of analgesia and the post-operative analgesia was of longer duration with the butorphanol group and we concluded that epidural butorphanol is better in providing prolonged post-operative analgesia as compared to Fentanyl. Regarding the side effects,

the incidence of nausea and vomiting was more in butorphanol as compared to fentanyl group, which is easily treated with antiemetics like Ondansetron. However more studies with different dosages and different techniques of both the study drugs should be conducted to evaluate the efficiency and to conclude the above facts.

Acknowledgement: None

Conflict of Interest: None declared

REFERENCES

1. Camann WR, Hurley RH, Gilbertson LI, Long ML, Datta S. Epidural nalbuphine for analgesia following caesarean delivery: Dose-response and effect of local anesthetic choice. Can J Anaesth 1991;38(6):728-32.
2. Bharti N, Chari P. Epidural butorphanol-bupivacaine analgesia for postoperative pain relief after abdominal hysterectomy. J Clin Anesth 2009;21:19-22.
3. Shrestha CK, Sharma KR, Shrestha RR. Comparative study of epidural administration of 10 ml of 0.1% bupivacaine with 2 mg butorphanol and 10 ml of 0.25% plain bupivacaine for analgesia during labor. JNMA J Nepal Med Assoc 2007;46:1-6.
4. Mather LE. Clinical pharmacokinetics of fentanyl and its newer derivatives. Clin Pharmacokinet 1983; 8; 422-46.
5. Banerjee S, Pattnaik SK. A comparative study between epidural butorphanol, nalbuphine, and fentanyl for post-operative analgesia in lower abdominal surgeries. Asian J Pharm Clin Res. 2017;10(5):383-8.
6. Kim DH, Kim TJ, Park NH. Comparison of Butorphanol and Fentanyl Administered with Bupivacaine for Patient Controlled Epidural Analgesia after Cesarean Section. Korean Journal of Anesthesiology. 1998 Jan 1;34(1):126-31.
7. Malik P, Manchanda C, Malhotra N. Comparative evaluation of epidural fentanyl and butorphanol for postoperative analgesia. Journal of Anaesthesiology Clinical Pharmacology. 2006 Oct 1;22(4):377-82.
8. Kaur J, Bajwa SJ. Comparison of epidural butorphanol and fentanyl as adjuvants in the lower abdominal surgery: A randomized clinical study. Saudi journal of anesthesia. 2014 Apr;8(2):167.