A Comparative Study of Epidural Bupivacaine-Fentanyl and Bupivacaine-Clonidine for Post operative Pain Relief in Lower Abdominal Surgeries

Jitendra Agrawal[1,*], Rakhi Mittal[2], Santosh Mishra[3], Bhanu Chaudhary[4]

[1]Assistant Professor, [3]Ex Resident, [4]Professor, G R Medical College, Gwalior
[2]Consultant, Composite Hospital, BSF Tekanpur

***Corresponding Author:**
E-mail: drjagrawal@gmail.com

ABSTRACT

Background: *Abdominal surgery can lead to postoperative pain, organ dysfunctions and lengthy hospital stay due to different neurohumoral changes. If not controlled, postoperative pain may be damaging and costly for the patient, hence there is a need of appropriate therapy for pain management.*

Aim: *To analyze efficacy and safety of 100 µg clonidine and fentanyl as an adjuvant to 20 ml of 0.5% bupivacaine hydrochloride for postoperative pain.*

Materials and Methods: *A prospective study was done on 90 patients belonging to American Society of Anesthesiology (ASA) grade I or II, who were referred for major lower abdominal surgery. Patients were randomly divided into three groups (30 patients each) to receive: 2ml of normal saline (Group B) or 100 µg of clonidine (Group BC) or100 µg of fentanyl (Group BF) as an adjuvant to 20 ml of 0.5% bupivacaine hydrochloride. Postoperative pain was assessed over 8 h using Visual Analogue Scale (VAS). The frequency of rescue analgesia, sedation score along with events like nausea, vomiting, shivering or pruritus was also recorded.*

Results: *Significantly less pain was noted in Group BC compared to Group BF ($p<0.05$). Duration of analgesia was more in Group BC compared to Group BF ($p<0.05$). Out of 30 patients in each group, 93.34% in Group B, 90% in Group BC and 86.67% in Group BF had sedation score of zero. Episode of nausea and vomiting were less in all groups. Pruritus was found in 20% patients of Group BF.*

Conclusion: *Clonidine is better choice as adjuvant to epidural bupivacaine hydrochloride for postoperative pain relief because of prolonged duration of analgesia and less side effects.*

Key words: *Bupivacaine, Clonidine, Fentanyl, Post-operative analgesia*

Access this article online

Quick Response Code:	Website: www.innovativepublication.com
	DOI: 10.5958/2394-4994.2015.00032.3

INTRODUCTION

Postoperative pain management is one of the most important area of anaesthesia.[1]An ideal epidural analgesic technique for abdominal surgery is one which provide effective pain relief, there are minimum side effects and it provides high patient satisfaction.[2]One more agent may be added to epidural infusions to heighten analgesia while minimizing side effects options can be opiates, ketamine, clonidine, benzodiazepines etc.[1]

Method is said to be good if it prolong postoperative analgesia followed by epidural block, same can be achieved by adding different adjuvant to the local anaesthetic like bupivacaine hydrochloride.[3] When compared with opioid analgesia by either intravenous or epidural routes, epidural route of a local anesthetic and opioid mixture are better in relieving pain.[4]

This study compares the analgesic efficacy and the safety profile of clonidine an α- agonist and fentanyl a µ receptor agonists as an adjuvant to bupivacaine hydrochloride for postoperative analgesia and to find out which receptors are more responsible for pain.

MATERIALS AND METHODS

The present prospective randomized study was done in 90 patients of both the sex aged between 18-60 years after obtaining Institutional Ethics Committee approval and a written informed consent from all patients. Patients belonging to ASA grade I and II were included in the study. Patients not willing to be a part of the study, having local skin infection along lumbar spine, spinal deformity, chronic backache, headache, drug addiction, neurological deficit, bleeding/clotting disorder, cardiovascular disease, systemic metabolic disorders like severe hepatic or renal disease, history of treatment with antihypertensive and/or NSAIDs were excluded from the study.

All 90 enrolled patients were randomly divided into three Groups: Group B, Group BC and Group BF.

Group B (n=30): 20 ml of 0.5% Bupivacaine hydrochloride + 2 ml of normal saline.
Group BC (n=30): 20 ml of 0.5% Bupivacaine hydrochloride + 0.66 ml of 100 µg clonidine +1.34 ml of normal saline; clonidine solution containing 150 µg per ml was diluted to 3ml using normal saline. 2ml was used for the study.
Group BF (n=30): 20 ml of 0.5% Bupivacaine hydrochloride+ 2ml of 100 µg fentanyl.

Every patient was evaluated with a thorough pre-anesthetic checkup including routine preoperative investigations one day prior to surgery. Patients were asked to have 6 to 8 hours fasting before surgery. On entering OT, baseline (pre-operative) vital parameters like noninvasive blood pressure(NIBP), pulse oximetry and electrocardiography (ECG) was recorded and IV line was secured. All the patients were catheterized with foley's catheter before induction. Bupivacaine hydrochloride sensitivity test was done in all the patients.

All patients were reassured about the anesthetic procedure. All vital signs were recorded and patients were placed in lateral position keeping the spine absolutely parallel to the ground. Under all aseptic condition local infiltration was done with 2 ml of 1 % lignocaine using 26 gauge needle. A 16-gauge tuohy's needle was introduced in to epidural space at the L3-L4 lumber interspace using the loss-of-resistance technique. The depth of epidural space was identified from the graduations on the Tuohy's needle. A negative aspiration test was performed and 2 ml of sterile water was injected in to epidural space, following this the syringe was disconnected from the needle to rule out accidental subarachnoid tap(evident by return of cerebrospinal fluid). The absence of any reflux confirmed the correct placement of drug in the epidural space. Sterile water, being irritant to nerve roots, produces a warm sensation in the back.

The epidural catheter was passed through the tuohy needle in cephalic direction and placed 3-5 cm in the epidural space. A negative aspiration test was again performed and a test dose of 3 ml containing 45 mg of lignocaine hydrochloride (1.5%) mixed with 15 mcg of epinephrine was injected through the catheter. Free passage of the drug and absence of any reflux of injected fluid confirmed the correct placement of the catheter. Patients were observed for any motor block or rise in hear rate. The needle was then withdrawn. A dressing was applied at the puncture site and the catheter was strapped to the back with adhesive tape.

The patients were shifted back to the supine position and the study drug solution was administered over the period of 10 minutes. Patients were monitored for hemodynamic (pulse and NIBP) at 0min, 5 min, 10 min, 20 min, 30 min, 45 min, 60 min, 90 min, 2 hrs, 4 hrs and 8 hrs intervals from completion of epidural drug administration.

Parameters like time taken for onset of sensory blockade, highest level of sensory block, time taken to achieve highest level of sensory analgesia, time taken for onset of motor blockage, duration of sensory blockage, duration of motor blockage, duration of analgesia were studied in all patients. Onset and establishment of maximum dermatome level of sensory analgesia was evaluated by pin-prick method from completion of epidural block every 2 min till highest level of sensory block is achieved. Motor blockage of lower extremity was checked every 2-3 minutes until grade 3 block achieved according to the Bromage's criteria. Patients who had motor blockade below grade 3 were excluded from the present study. Duration of sensory blockade was taken as time required for sensory block to regress by two segments below the highest level achieved. Assessment of pain was done by visual analogue scale (VAS). All patients were asked to mark on VAS when requested for rescue analgesia to evaluate the intensity of pain.

All the patients were closely observed for complaints like nausea, vomiting, hypotension, hypertension, respiratory depression, motor and sensory deficit, pruritus, bowel dysfunction and urinary retention. Statistical analysis was done by using analysis of variance test (ANOVA) and student t test. P value <0.05 was taken as statistically significant.

RESULTS

In present study, demographic data was not statistically significant among all three groups ($p>0.05$)(Table 1).The mean duration of surgery in all three groups was 88.33±19.53, 88.83±14.72 and 90.17±24.01 minutes respectively. Male to female ratio was 11:19, 12:18 and 13:17 respectively. Out of 30 patients in each group hysterectomy was done in 19 (63.34%) in group B, 18 (60%) in group BC and 15 (50%) in group BF; whereas hernioplasty in 9 (30%) in group B, 7 (23.33%) in group BC and 13 (43.34%) patients in group BF.

There was statistically significant difference ($p<0.05$) between Group B and Group BC and between group B and Group BF in the onset time of sensory block, time taken to achieve highest level sensory block (HLSB) and their duration of sensory block, whereas the difference for same parameters between Group BC and Group BF was statistically insignificant ($p>0.05$) (table 2).

Out of 30 patients in each group, 29 (96.67%) in Group B, 27 (90%) in Group BC and 28 (93.34%) in Group BF achieved T - 6 level of sensory block. Onset of motor block and duration of motor block between all groups was statistically insignificant ($p>0.05$) (table 3).Duration of analgesia was statistically significant ($p<0.05$) between all the groups but VAS at the time of first medication (rescue analgesia) between groups was insignificant ($p>0.05$)(table 4).Out of 30 patients in each group, 28 (93.34%) in Group B, 27 (90%) in

Group BC and 26 (86.67%) in Group BF had sedation score zero. There was no episode of bradycardia (HR<60/ min), hypotension (fall in BP>30% from baseline or SBP<90 mmHg) in any group (graph 1).

Out of 30 patients in each group, one (3.33%) in Group B, one (3.33%) in Group BC and 5 (16.66) in Group BF had episode of nausea and vomiting. Shivering was marked in 2 (6.66%) patients of Group B and 1 (3.33%) patients of each Group BC and Group BF. Mild pruritus was found in 6 (20%) patients of Group BF.

Table 1: Demographic data of study population in groups*

Parameter	Group B	Group BC	Group BF
Age (Year)	44±10.08	46±10.18	42±11.64
Weight (kg)	56.1±6.31	58.7.09	56.2±5.24
Height (cm)	158±8.56	160±7.32	161±5.98

**data are expressed in Mean±SD, p>0.05 between all the groups*

Table 2: Sensory Blockade in All Groups*

S.No	Parameters	Group B	Group BC	Group BF
1	Onset of sensory block	17.73±2.09	9.53±1.59	10.2±1.63
2	Time to achieve highest level of sensory block	21.48±2.1	12.3±1.5	12.86±1.71
3	Duration of sensory block	157±12.58	212±9.63	208±14.13

**data are expressed in mean±SD (min), p<0.05 between B and BC and B and BF, p>0.05 between Group BC and Group BF*

Table 3: Motor Blockade in All Groups*

S.No	Parameters	Group B	Group BC	Group BF
1	Onset of motor block	19.68±1.72	18.95±2.51	19.98±1.84
2	Duration of motor block	249±12.2.28	256±17.86	252±17.79

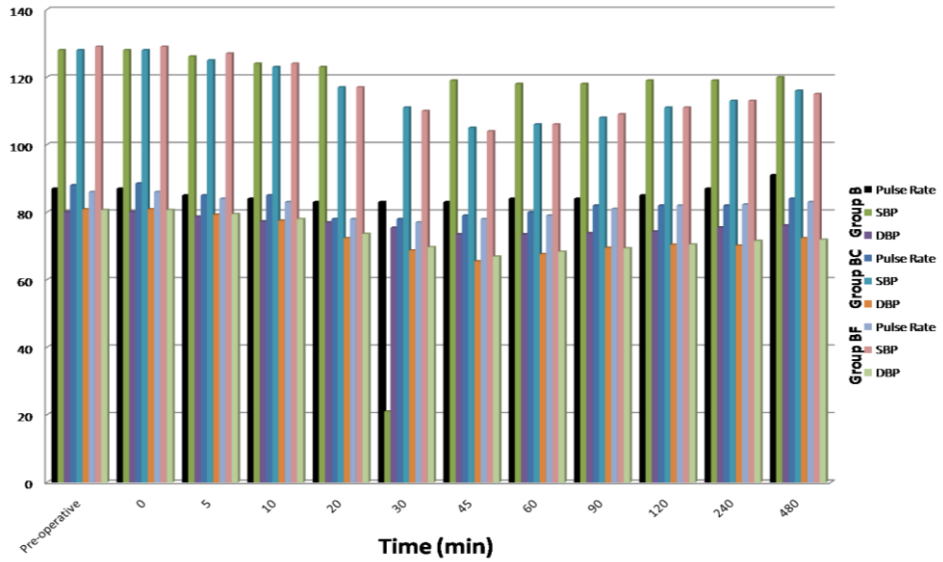
**data are expressed in mean±SD (min); Grade III motor block, p>0.05 between all the groups*

Table 4: Parameters of Analgesia in All Groups *

S.No	Parameters	Group B	Group BC	Group BF
1	Duration of Analgesia (min)[#]	272±14.72	440±17.86	422.1±20.89
2	VAS at 1st pain medication[$]	37.77±4.62	38.33±3.97	38.7±3.21

**data are expressed in mean±SD (min), [#] p<0.05 between all groups, [$] p>0.05 between all groups*

Graph 1: Comparison of Hemodynamic date between groups



DISCUSSION

Pain control is very essential for good care of patients after surgery. Surgery results in tissue injury with concomitant release of histamine and other inflammatory mediators.[1] During epidural anesthesia, the drugs diffuse straight into the spinal cord superficial neurons in lamina I and II of the dorsal horn. Very fine caliber C- and A-fibers terminate within lamina I and II, hence they are thought to be a important element in the nociceptive processing system.[1]In present study, the onset of sensory block was tested by pinprick method and it was found to be statistically significant between group B and group BC and between group B and BF ($p<0.05$) and insignificant between group BC and BF. That means epidural fentanyl or clonidine when added to epidural bupivacaine, improve the onset of time of sensory block. Many studies have confirmed this finding.[4,6] Chopra et al found that onset of time of sensory block was faster in Group BC (10.48±4.2) as compared to Group BF (17.2±5.4) which was statistically significant ($p<0.05$). Karki et al also found that the time of sensory onset was 9.82±3.10 minutes in clonidine group as compared to 15.02±2.6 minutes in control group.[8]

Time taken to achieve highest level of sensory block between Group B and Group BC and between Group B and Group BF was significant ($p<0.05$), but insignificant between group BC and BF. Similar pattern was observed in duration of sensory blockade between all the three groups. Hence, results indicate that epidural bupivacaine hydrochloride-fentanyl or bupivacaine hydrochloride-clonidine combination increases the duration of sensory block. Results were similar to Alves et al who found that duration of analgesia was significantly higher in the clonidine group ($p<0.001$).[5] Onset and duration of motor blockade among all the groups was insignificant ($p>0.05$), which indicate that epidural fentanyl or clonidine when added to epidural bupivacaine hydrochloride did not have any additive/synergistic effect on motor blockade. Chopra et al in their study showed that both fentanyl and clonidine increases duration of analgesia when added to bupivacaine, which is similar to our findings.[6] Our study also showed that there was a significant fall in vital parameters like pulse rate, SBP and DBP in all three groups ($p<0.05$). None of the patients in any group had an episode of bradycardia and hypotension. Singh et al showed the similar findings.[7]

In present study, post-operative pain relief was assessed by VAS. Patients were asked to mark on the scale the degree of pain at the time of first medication and among all the groups it was found to be insignificant. In terms of side effects, when clonidine and fentanyl added to bupivacaine hydrochloride did not have significant sedative effect. Nausea and vomiting was observed in 16.66% of the patients in Group BF and 3.33% patient in Group BC and Group B had it. Pruritus was observed only in Group BF (20%). Chhabra et al observed pruritus as a side effect in 8.6% patients in their study.[9]Pruritus may be due to systemic absorption of fentanyl and subsequent histamine release.[10]

In the present study epidural bupivacaine hydrochloride-clonidine group found to be devoid of any marked side effects compared to bupivacaine hydrochloride-fentanyl group. We conclude that clonidine is a safe and better alternative to fentanyl as an adjuvant to epidural bupivacaine hydrochloride for post- operative pain relief because of its prolonged duration of analgesia and fewer side effects. However the limitation of our study is the small sample size and it was not a blinded study.

REFERENCES:

1. Karnawat R, Chhabra S, Mohammed S, Paliwal B. Comparison of Effect of Epidural Bupivacaine, Epidural Bupivacaine hydrochloridePlus Fentanyl and Epidural Bupivacaine hydrochloridePlus Clonidine on Postoperative Analgesia after Hip Surgery. J AnesthClin Res 2013; 4(12): 1-6.
2. Jain J, Joad AK, Jain V. Epidural clonidine for postoperative pain after lower abdominal surgery: A dose - response study. Indian J Pain 2013;27(2):67-74.
3. Tandon U, Bhatnagar V, Kunal K, Sharma A. A comparative analysis of the use of Clonidine Vis a Vis Fentanyl when used as an adjunct to Bupivacaine hydrochloridefor Postoperative analgesia. Indian Journal of Basic and Applied Medical Research 2015; 4(2):151-8.
4. Moawad HES, Mokbel EM. Postoperative analgesia after major abdominal surgery: Fentanyl–bupivacaine hydrochloridepatient controlled epidural analgesia versus fentanyl patient controlled intravenous analgesia. Egyptian Journal of Anaesthesia 2014; 30: 393–7
5. Alves TC, Braz JR. Clinical Evaluation of Clonidine associated to ropivacaine for epidural anesthesia. Res Bras Anestesiol 2002; 52 (4):410-9.
6. Chopra P, Talwar V. Low dose intrathecal clonidine and fentanyl added to hyperbaric bupivacaine hydrochlorideprolongs analgesia in gynecological surgery. J AnaesthesiolClinPharmacol 2014;30:233-7.
7. Singh R, Gupta D, Jain A. The effect of addition of intrathecal clonidine to hyperbaric bupivacaine hydrochlorideon postoperative pain after lower segment caesarean section: A randomized control trial. Saudi J Anaesth 2013; 7(3): 283–90
8. Karki G, Singh V, Srivastava P, Nand HS. Effect of Clonidine as an Adjuvant to Bupivacaine hydrochloridein Epidural Anaesthesia. Sch J App Med Sci2014; 2(6B):2087-94.
9. Chhabra AR, Jagtap SR, Dawoodi SF. Comparison of clonidine versus fentanyl as an adjuvant to intrathecalropivacaine for major lower limb surgeries: A randomized double-blind prospective study. Indian J Pain 2013; 27 (3): 170-4.
10. Reich A, Ständer S, Szepietowski JC. Drug-induced Pruritus: A Review. ActaDermVenereol 2009; 89: 236–44.