e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(5); 768-774

Original Research Article

A Comparative Study of Fentanyl and Clonidine as an Adjuvant to Intrathecal Hyperbaric Bupivacaine with Fentanyl or Clonidine alone with Bupivacaine for Lower Abdominal Surgeries

Vidhi Patel[1], Neel Patel[2], Palak A Chudasama[3], Hardik Z Patel[4]

[1]Junior resident, Anesthesia Department, Medical College, Baroda, Gujarat, India

[2]Junior resident, Anesthesia Department, GMERS Medical College, Himmatnagar, Gujarat, India

[3]Associate Professor, Anesthesia Department, GMERS Medical College, Himmatnagar, Gujarat, India

[4]Associate professor, Department of Anaesthesiology, GMERS Medical College, Valsad, Gujarat, India

Received: 01-03-2022 / Revised: 03-04-2022 / Accepted: 29-04-2022
Corresponding author: Dr. Hardik Z Patel
Conflict of interest: Nil

Abstract

Background: Lower abdominal and limb surgeries are performed under spinal anaesthesia but its main drawback is that the analgesia is of limited duration. Hence, additives which cause the prolongation of the duration of motor as well as sensory block will be beneficial in reducing the morbidity of the patients in the postoperative period. Several clinical studies have been conducted on intrathecal use of fentanyl and clonidine in various lower abdominal surgeries

Objectives: This study was conducted to compare the effect of combination of fentanyl (25µg) and clonidine (30µg) as an adjuvant to intrathecal hyperbaric bupivacaine (15mg) to fentanyl and clonidine alone with bupivacaine for lower abdominal surgeries.

Materials and Methods: Present study was conducted on 90 patients of ASA grade 1 or 2 posted for lower abdominal surgeries. All patients were randomly divided into three groups of 30 patients each. Group A: 0.5% bupivacaine heavy 3 ml (15mg) + fentanyl (25µg) + 0.9% normal saline. Group B: 0.5% bupivacaine heavy 3 ml (15mg) + clonidine (30µg) + 0.9% normal saline. Group C: 0.5% bupivacaine heavy 3 ml + fentanyl (25µg) + clonidine (30µg) + 0.9% normal saline. Perioperative complications, sedation score, time to first dose of rescue analgesic and total duration of analgesia were noted.

Results: Heart rate and blood pressure was more decreased in group B and group C compared to group A. Hypotension and bradycardia were more in Group B and Group C compared to Group A. Pruritus was seen in Group A and Group C but not seen in Group B. In group A, 100% patients were awake. About 86.67% and 83.33% patients were awake in group B and group C respectively. Duration of analgesia was significantly prolonged in group C as compared to group A and group B.

Conclusion: The combination of intrathecal clonidine and fentanyl with hyperbaric bupivacaine significantly prolongs duration of postoperative analgesia with good haemodynamic stability and nonsignificant adverse effects compared to fentanyl and clonidine used alone with hyperbaric bupivacaine intrathecally

Keywords: Analgesia, bupivacaine, clonidine, fentanyl, haemodynamic stability

Introduction

Effective treatment of pain represents an important component of postoperative recovery. It serves to the blunt autonomic, somatic, and endocrine reflexes with a resultant potential decrease in perioperative morbidity. Despite advances in treatment of postoperative pain, many patients still suffer from pain after surgery, probably due to difficulties in balancing postoperative analgesia with acceptable side effects Lower abdominal and limb surgeries are performed under spinal anaesthesia, as it is easy to perform, single shot technique when compared to epidural and general anaesthesia. But its main drawback is that the analgesia is of limited duration. Hence, additives which cause the prolongation of the duration of motor as well as sensory block will be beneficial in reducing the morbidity of the patients in the postoperative period.[1–3]

Bupivacaine is the most popular local anesthetic drug for subarachnoid blockade because of less neurotoxicity. However, intrathecal bupivacaine alone may be insufficient to provide prolonged post-operative analgesia, even with high sensory block. So, various adjuvants are used like ketamine, midazolam, clonidine, opioids, neostigmine etc. to prolong the effect of local anesthetic drug. Their site of action is different from that of local anesthetic agent. [4–6]

Clinical studies have suggested that intrathecal fentanyl acts as μ (mu) receptor agonist at supraspinal site leading to analgesia that is greater than morphine, pethidine and alfentanil. Fentanyl, a lipophilic opioid, after intrathecal administration diffuses into epidural space and subsequently into the plasma suggesting that it acts not only through spinal opioid receptors but also systemically. Fentanyl added to bupivacaine intrathecally provides better surgical anesthesia and increased reliability of block than intrathecal bupivacaine alone.[3] Clonidine is an alpha-1 and alpha-2 adrenoreceptor agonist with a predominant alpha-2 action (α2:α1:200:1). Neuraxial placement of clonidine inhibits spinal substance P release and nociceptive neuron firing produced by noxious stimulation. Substance P release inhibits the cGMP for its analgesic effect.[7] So far, the literature reviewed several clinical studies have been conducted on intrathecal use of fentanyl and clonidine in various lower abdominal surgeries. We conducted this study to compare the effect of combination of fentanyl (25μg) and clonidine (30μg) as an adjuvant to intrathecal hyperbaric bupivacaine (15mg) to fentanyl and clonidine alone with bupivacaine for lower abdominal surgeries.

Materials and Methods

Present study was conducted on 90 patients aged 45-65 years, of either sex, ASA grade 1 or 2 posted for lower abdominal surgeries. All patients were randomly divided into three groups of 30 patients each.

- Group A: 0.5% bupivacaine heavy 3 ml (15mg) + fentanyl (25μg) + 0.9% normal saline.
- Group B: 0.5% bupivacaine heavy 3 ml (15mg) + clonidine (30μg) + 0.9% normal saline.
- Group C: 0.5% bupivacaine heavy 3 ml + fentanyl (25μg) + clonidine (30μg) + 0.9% normal saline.

Detailed preoperative history was taken and routine laboratory investigations were reviewed. Written informed consent was taken from the patient. Under all strict aseptic and antiseptic precaution, with

patient in sitting/left lateral position, lumbar puncture was performed at L3-L4 intervertebral space via midline/lateral approach with 23G Quincke's needle and one of the selected drugs was given after clear and free flow of CSF at the rate of 0.2 ml/second. Pulse, BP, RR and SpO_2 were recorded every 5 minutes till first half an hour then every 15 minutes till 1st hour & then every half an hour till the end of surgery.

Patients were assessed for degree of sedation through Chernik Sedation Score. No sedative or analgesic medication was used during perioperative period. Patients were observed for any perioperative complications and treated accordingly. Patients were monitored postoperatively for every half an hour till 5 hours and then every 1 hour till 12 hours after giving spinal anaesthesia. Patients were inquired frequently for the degree of pain they felt with the help of visual analogue scale (VAS). No analgesic was given unless requested by the patient or VAS score ≥4. Time to first dose of rescue analgesic was noted. Total duration of analgesia was noted.

Result

Demographic characteristics of all the patients were comparable among all the three groups. There was no significant difference in onset of sensory and motor block among all three groups (p>0.05). Time for regression of sensory block as well as motor block was longer in group C as compared to group A and Group B.

Table 1: Comparison of sensory and motor blockade between three groups

Sensory blockage	Group A	Group B	Group C	P value
Onset of sensory block (min)	3.8±0.84	3.77±0.68	3.7±1.02	0.232
Time for regression of sensory block to S2 dermatome (min)	197.33±6.61	312.2±11.68	407.87±14.06	0.02
Onset time to achieve score 3 motor block (min)	9.97 + 0.61	9.9 + 0.76	9.8 + 1.32	0.261
Time for regression of motor block from score 3 to score 0 (min)	173.87 + 6.60	279.3 + 13.2	380.7+ 28.89	0.01

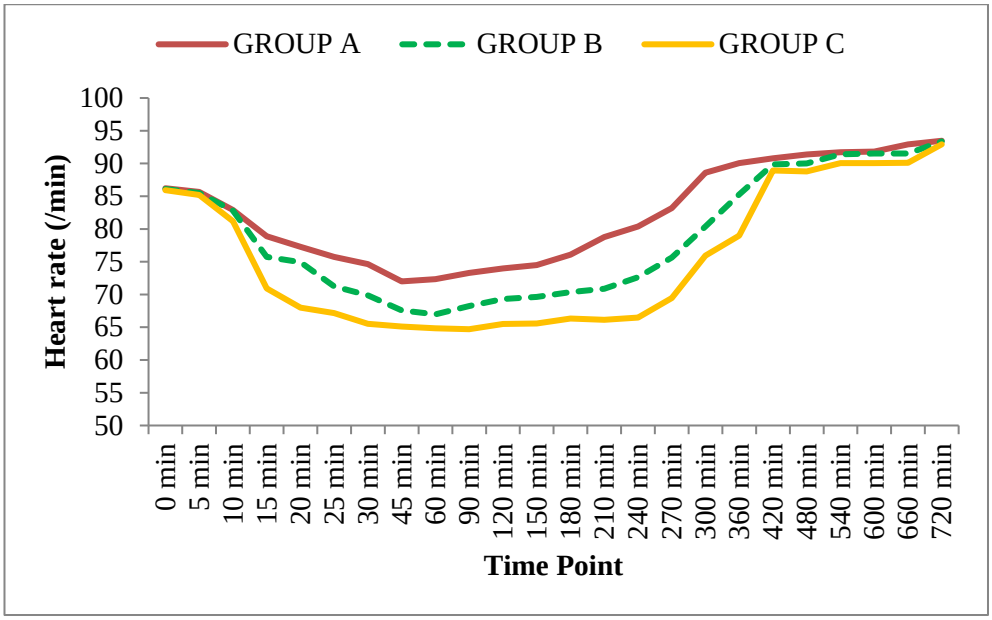

Figure 1: Comparison of Perioperative heart rate among three groups

Figure 1 compares perioperative mean heart rate among all the three groups. At 15 min onwards till 360 min (intraoperative and early postoperative period) after giving subarachnoid block, there was statistically significant difference in HR among all the groups ($p<0.05$). HR was decreased more in group B and group C compared to group A. Postoperatively from 360 min onwards, there was no significant difference in HR among all the three groups ($p>0.05$).

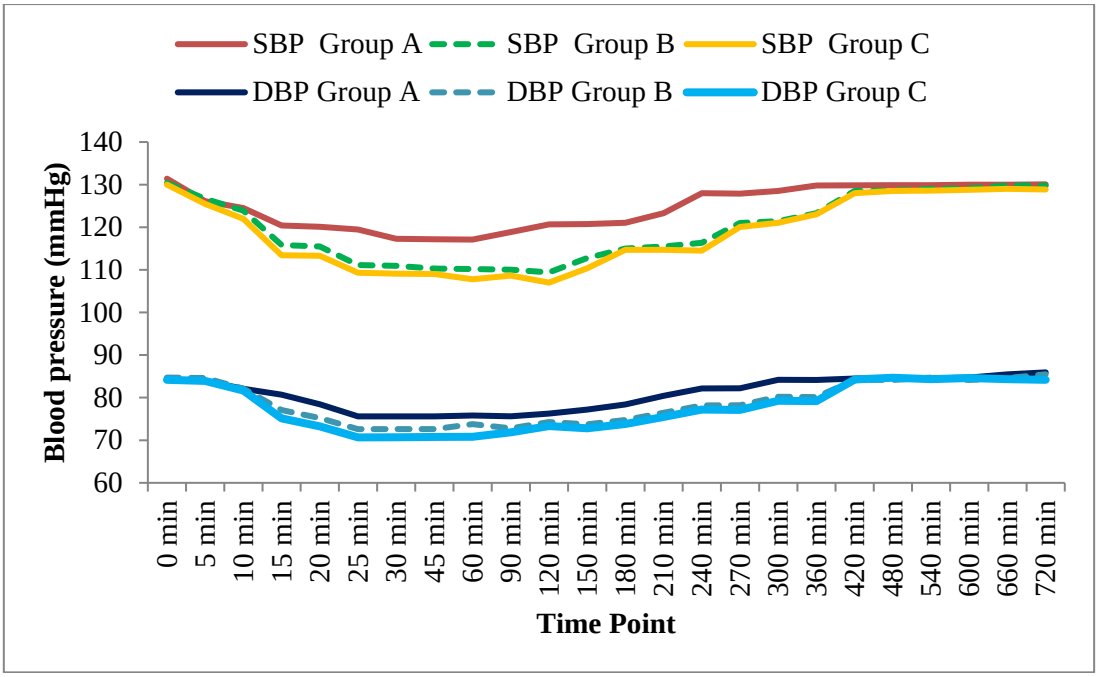

Figure 2: Comparison of Perioperative Blood pressure among three groups

At 15 min onwards till 360 min (intraoperative and early postoperative period) after giving subarachnoid block, there was statistically significant difference in blood pressure among all the groups ($p<0.05$). Decrease in blood pressure was more in group B and group C compared to group A. There was no significant difference in the SpO2 among all the three groups ($p>0.05$).

Table 2: Comparison of peri-operative complications between three groups

Complications	Group A		Group B		Group C	
	Intra-op	Post-op	Intra-op	Post-op	Intra-op	Post-op
Hypotension	0	0	2(6.6%)	0	3(10%)	0
Bradycardia	2(6.6%)	0	3(10%)	0	3(10%)	0
Nausea/ Vomiting	0	0	1(3.33%)	0	1(3.33%)	0
Respiratory depression	0	0	0	0	0	0
Shivering	0	0	0	0	0	0
Urinary retention	0	0	0	0	0	0
Pruritis	2(6.6%)	1(3.3%)	0	0	2(6.6%)	1(3.3%)

Hypotension and bradycardia were more in Group B and Group C compared to Group A. Pruritus was seen in Group A and Group C but not seen in Group B. Nausea/Vomiting was seen in Group B and Group C but not seen in Group A.

Table 3: Comparison of sedation score and analgesic time between three groups

Sedation score	Group A	Group B	Group C	P value
5	30(100%)	26(86.67%)	25(83.33%)	0.07
4	0	4(13.33%)	5 (16.67%)	
≤ 3	0	0	0	
Total analgesic time (minutes)				
Mean ± SD	213.90±12.70	323.50±26.70	433.70±17.54	0.023

In group A, 100% patients were awake. About 86.67% and 83.33% patients were awake in group B and group C respectively. Duration of analgesia was significantly prolonged in group C as compared to group A and group B (table 3).

Discussion

In our study, statistically significant difference ($p < 0.05$) was found among all the groups regarding duration of regression of sensory and motor blockade. Time for regression of sensory block as well as motor block was longer in group C as compared to group A and Group B. Highest sensory dermatomal level was T5-T6. Rajni Gupta et al. studied the effect of fentanyl (25µg) with hyperbaric bupivacaine intrathecally and found that time to regression of sensory block to S1 was 187 ± 12.3 min.[8] Kaabachi O et al. studied the effect of clonidine (1µg/kg) as adjuvant to plain bupivacaine intrathecally and observed that time to recovery of motor block was 252 ± 79 min.[9]

In the present study, at baseline to 15 min, there was no statistically significant difference in HR and blood pressure among all the three groups ($p>0.05$).But, there was statistically significant difference ($p<0.05$) among all the groups regarding HR and blood pressure from 15 min till 360 min after giving subarachnoid block. Decrease in HR and blood pressure were more in group B and group C compared to group A. Poonam Motiani et al. studied the effect of fentanyl (25µg) with bupivacaine intrathecally and found that none of the patients developed significant changes in heart rate or blood pressure during the intraoperative period.[10] Bhavini shah et al. studied the effect of clonidine (1µg/kg) with 0.5% hyperbaric bupivacaine found that heart rate at 15 min. compared to 2 min. was significantly less in clonidine group. Hemodynamic parameters were on lower side with during first hour of surgery.[11] Fareed Ahmed et al. studied the effect of combination of clonidine (25µg) and fentanyl (25µg) with intrathecal hyperbaric bupivacaine and concluded that it provides good haemodynamic stability perioperatively.[12]

In the present study, 6.6% and 10% patients had hypotension intraoperatively in group B and group C respectively. About 6.6%, 10% and 10% patients had bradycardia intraoperatively in group A, group B and group C respectively. Joshi SA. et al. studied the effect of 30µg of clonidine with 0.5 % hyperbaric bupivacaine intrathecally and observed that 36% patients had bradycardia and 44% patients had hypotension perioperatively.[13] Fareed Ahmed et al. studied the combination effect of clonidine(25µg) and fentanyl(25µg) with intrathecal hyperbaric bupivacaine and found bradycardia in 2% patients and hypotension in 2% patients.[12] Gajanan Chavan et al. studied the effect of fentanyl 25µg with hyperbaric bupivacaine intrathecally and found that mild pruritus was complained by 2 (5%) patients given intrathecal fentanyl but did not required any treatment.[14]

In the present study, 100% patients were awake in group A. About 86.67% and 83.33% patients were awake in group B and group C respectively. Chanda Ram et al. studied the effect of intrathecal fentanyl (25µg) and clonidine (30µg) as an adjuvants to 0.5% hyperbaric bupivacaine

in lower limb orthopaedic surgeries and found that intrathecal clonidine provided desirable sedation whereas intrathecal fentanyl was not associated with sedation.[15]

In the present study, duration of analgesia was significantly prolonged in group C (433.70±17.54 min) as compared to group A (213.90±12.70 min) and group B (323.50±26.70 min). Sweety Rana et al. studied the efficacy of intrathecal fentanyl (15µg), clonidine (45µg) and fentanyl-clonidine combination as an adjuvant to hyperbaric bupivacaine and found that duration of analgesia was (240.83 ± 31.62 min) in bupivacaine-fentanyl group, (323±57.98 min) in bupivacaine-clonidine group and (424.50±45.95 min) in bupivacaine-clonidine-fentanyl group.[16]

Conclusion

The combination of intrathecal clonidine and fentanyl with hyperbaric bupivacaine significantly prolongs duration of postoperative analgesia with good haemodynamic stability and nonsignificant adverse effects compared to fentanyl and clonidine used alone with hyperbaric bupivacaine intrathecally.

References

1. Larson MD. Miller's Anaesthesia: Sixth Edition. Philadelphia: Elsevier; 2005. Hist Anaesth Pract Mill RD; 25-26
2. McConachie I: Anaesthesia for the high risk patient. Cambridge Univ Press. 2002: 70-4
3. Edward Morgan, Maged S. Mikhail, Michael J. Murray: Clin Anaesthesiol 4th ed. 2006
4. Hawksworth C, Serpell M: Intrathecal anaesthesia with ketamine: Reg anaesthesia1998;23283-8
5. Liu S, Chiu AA, Carpenter RL: Fentanyl prolongs lidocaine spinal anaesthesia without prolonging recovery. AnaesthAnalg1995;80:730-4
6. Yaksh TL, Allen JW: The use of intrathecal Midazolam in humans: a case study of process. AnesthAnalg 2004;98(6):1536-45
7. Liu N, Bonnet F, Delaunay L, Kermarec N: Clonidine produces analgesia by actions on alpha2-adrenoceptors. Br J Anaesth 1993;70515-8
8. Rajni Gupta, Reetu Verma, Jaishri Bogra, Rajesh Raman, and Jitendra Kumar Kushwaha: A Comparative study of intrathecal dexmedetomidine and fentanyl as adjuvants to bupivacaine. J Anesth Clin Pharmacol 2011 Jul-Sep; 27(3) 339–43
9. Olffa Kaabachi: Clonidine 1 ug/kg is asafe and effective adjuvant to plain bupivaicaine in spinal anaesthesia in adolescent. Int Anaesth Res Soc 2007; 105(2)517
10. Poonam Motiani, Sujata Chaudhary, Nitin Bahl, AK Sethi: Intrathecal sufentanil versus fentanyl for lower limb surgeries. J Anesthesiol Clin Pharmacol 2011; 27(1)67-73
11. Bhavini Shah, Ramchandra Shidgaye, Devdas Divekar, Minnu Panditra:A randomized, double blind, controlled study on the effects of addition of clonidine to bupivacaine used for patients undergoing spinal anesthesia. Sri Lankan J Anesthesiol
12. Ahmed F, Khandelwal M, Sharma A. A comparative study of the effect of clonidine, fentanyl, and the combination of both as adjuvant to intrathecal bupivacaine for postoperative analgesia in total abdominal hysterectomy. J Anaesthesiol Clin Pharmacol 2017 Jan;33(1)102
13. Joshi SA, Khadke VV, Subhedar RD, Patil AW, Motghare VM: Comparative evaluation of intrathecal midazolam and low dose clonidine: efficacy, safety and duration of analgesia. A randomized, double blind, prospective clinical trial. Indian J Pharmacol 2012;44(3)357-61
14. Chavan G, Chavan A, Ghosh A. Effect of intrathecal fentanyl on subarachnoid block with 0.5% hyperbaric

bupivacaine. Int J Heal Biomed Res 2014 Jul;267-76
15. Chanda R, Shukla C, Chauhan MS. A Comparative Study Of Intrathecal Fentanyl And Clonidine As Adjuvants To 0.5% Hyperbaric Bupivacaine In Lower Limb Orthopedic Surgeries.2019;3(7).
16. Rana S, Singh SP, Asad M, Bakshi V. Comparative evaluation of the efficacy of intrathecal fentanyl, clonidine and fentanyl-clonidine combination as an adjuvant to bupivacaine for infra-umblical surgery. J Case Reports 2018 May 13;8(1)67-71