ISSN 2515-8260 Volume 09, Issue 02, 2022

Comparative study of intrathecal fentanyl and dexmedetomidine as adjuvant with bupivacaine in elective lower abdominal surgeries

[1]Dr. Velagapudi Krishna Chaitanya, [2]Dr. NP Bharath Kumar

[1,2]Assistant Professor, Department of Anaesthesiology, Mamata Medical College, Khammam, Telangana, India

Corresponding Author:
Dr. NP Bharath Kumar

Abstract

Introduction: Spinal anesthesia is most commonly used for lower abdominal surgeries due to its low cost and ease of administration as well as rapid onset of anaesthesia. Adjuvants like Fentanyl and dexmedetomidine are used to accelerate and prolong the anaesthetic effect depending on the purpose. This study was done to compare the effects of intrathecal hyperbaric bupivacaine with fentanyl and bupivacaine with dexmedetomidine for lower abdominal surgeries.
Materials and Methods: 100 patients undergoing elective lower abdominal surgeries were divided into 2 groups, Group F where patients were given Bupivacaine with fentanyl and Group D, where they were given Bupivacaine with dexmedetomidine.
Results: A significantly longer duration of motor and sensory block was observed in the patients with Dexmedetomidine group than in the Fentanyl group. The mean time for the regression to Bromage 0 was also longer in Dexmedetomidine group (425.83 ± 26.38 mins) as was the duration of analgesia (260.48 ± 31.45 mins).
Conclusion: Dexmedetomidine has better hemostability, better quality of intraoperative analgesia, with lesser demands for analgesic in comparison to Fentanyl and hence can be used as an alternative.

Keywords: Dexmedetomidine, fentanyl, spinal anaesthesia, bupivacaine.

Introduction

Spinal anesthesia is most commonly used for lower abdominal surgeries due to its low cost and ease of administration as well as rapid onset of anaesthesia. However, it is commonly associated with postoperative pain. This is due to the use of local anesthesia which has short duration of action during the spinal anesthesia procedure. Other than visceral pain, nausea and vomiting is also common among the patients with spinal anesthesia in patients undergoing lower abdominal surgeries [1-3].
Therefore, there is a need for early analgesics to ease the pain in the post-operative period. Adjuvants like morphine, fentanyl, dexmedetomidine, clonidine and midazolam are used to accelerate and prolong the anaesthetic effect depending on the purpose. They are given as epidural, intravenous or intrathecal [4, 5]. Improvement of the quality of early and

ISSN 2515-8260 Volume 09, Issue 02, 2022

intraoperative subarachnoid block is attained by the addition of fentanyl, an opiod, to bupivacaine [6]. This results in a rapid recovery of the patients motor function and thereby an early discharge from the hospital [7]. They are certain disadvantages when opioids are added to the local anaesthetic drugs like respiratory depression and pruritus.

Hemodynamic stabilization is attained by dexmedetomidine, which is a new and highly sensitive α2-adrenergic receptor agonist. This drug acts as a neuraxial adjuvant and gives stable and good quality prolonged and intraoperative analgesia [7-9]. It is also associated with decrease in heart rate and blood pressure [10]. There have been no neurological defects due to this drug in many of the human and animal studies, making it one of the preferred choice [11, 12].

This study was done to compare the effects of intrathecal hyperbaric bupivacaine with fentanyl and bupivacaine with dexmedetomidine for lower abdominal surgeries.

Materials and Methods

This prospective comparative study was done by the Department of Anaesthesia at Mamata Medical College, Khammam during the period March 2017 to March 2019. This study was cleared by the Institutional Ethical Committee. 100 patients over the age of 18 years, with ASA Grade 1 and 2, who had come for various lower abdominal surgeries were enrolled into the study. The nature of the study was explained to the patients and their attenders and informed consent was taken from all the patients.

These 100 patients were randomly assigned into one of the 2 groups, Group F where patients were given Bupivacaine with fentanyl and Group D, where they were given Bupivacaine with dexmedetomidine. All these patients had American Society of Anaesthesiologists Grade 1 and 2, with no contraindications for spinal anaesthesia. Patients who had hypertension, or were on antidepressants, those who were known cases of cardiac or respiratory dysfunction were excluded from the study.

Demographic details were collected from all the patients on admission and they were subjected to a thorough clinical evaluation. A day prior to the surgery, they all underwent a complete pre-anaesthetic evaluation. The patient was advised fasting for 8 hours prior to the surgery.

In the operation room, the patient was connected to the ECG, NIBP, SpO2 HR and RR monitors. The baseline reading of all these conditions were noted. 18G cannula was attached to the patients and 500ml of lactated Ringer's solution was added. Patients in the Group F were given 2.5ml of 0.5% hy[perbaric bupivacaine and 0.5ml of 25mcg fentanyl, which amounted to a total of 3ml. Similarly, Group D patients were given 0.5ml of 5mcg dexmedetomidine along with 0.5% hyperbaric bupivacaine making a total of 3ml. The patient was asked to sit and spinal anaesthesia was given to the patients in this position. After the injection, the time was noted and the patients was made to lie down in supine position. Adequate sensory and motor blockade of the anesthesia was established before catheterization of the patient's bladder. The sensory blockade was defined as the time between the administrations of the spinal anesthesia to the total loss of sensation at the site of the surgery. The motor blockade was the time between the administrations of the anaesthesia to the time the patient was unable to lift the extended legs.

The achievement of the highest dermatomal level of sensory blockade was said to be the level of maximal sensory blockade which was also noted. The time for regression of 2 segments from the maximal sensory blockade as well as the time taken for the regression from the maximal sensory blockade upto the sacral segments were also noted. Using the Bromage scale the motor block was analysed (Table: 1).

ISSN 2515-8260 Volume 09, Issue 02, 2022

Table 1: Bromage Scale

Scale	Signs
0	Free movement of the legs and feet with the ability to raise the legs
1	Inability to raise the legs but able to move the knees and feet
2	Inability to raise the legs and knees, but able to move the feet
3	Inability to raise or move the legs, knees, feet and toes.

Time taken for the regression of the Motor blockade from Bromage 3 to Bromage 0 was taken and the sedation score was analysed using the Ramsay Sedation Score for every 15 minutes till the end of the surgery (Table: 2).

Table 2: Ramsay Sedation Score and Score Responsiveness

Score	Responsiveness
1	Patient is agitated, anxious and restless
2	Patient is sane, well oriented and cooperative
3	Patient responds to the commands
4	Brisk response to light glabellar tap and loud sound stimulus
5	Sluggish response to light glabellar tap and loud sound stimulus
6	No response

Every 5 minutes from the start of the surgery, the vital signs such as heart rate, Oxygen saturation, and Respiratory rate were noted for the first 1 hour. For the next hour, the vital signs were noted every 10 minutes and then for every 15 minutes.
Post operatively, the patients were monitored for vital signs and complications. In case of complications, they were treated accordingly and the same were noted. Pain was assessed using Visual Analog Scale (VAS) score (table: 3). from the sensory block to the time when the patient begins to feel pain is the time of rescue analgesia. For rescue analgesic, 50mg i.v. tramadol was given.

Table 3: VAS Score

0	No pain	Excellent Analgesia
1-3	Mild Pain	Good Analgesia
4-6	Moderate Pain	Fair Analgesia
7-10	Severe pain	Poor analgesia

The statistical analysis was done by SPSS software. Comparisons were done by CHI Square test and depicted by using charts and tables.

Results

Among the total 100 patients, 51 were males and 49 were females. 28 patients in the Group F were males and 22 were females, while in the Group D, 23 were males and 27 were females. The mean age in the Fentanyl group was 41.47 ± 4.94 years and in the dexmedetomidine group, it was 43.36 ± 5.83 while the height was 162.3 ± 7.37 cms and 164.88 ± 13.24 cms in Group F and Group D respectively. The weight was 64.37 ± 7.28 kgs among the Group F and 66.82 ± 8.28 kgs among the Group D (Table: 4).

Table 4: Demographic details of the patients

Demographic details	Group F	Group D	P value
Male/Female	28/22	23/27	NS
Mean Age (in years)	41.47 ± 4.94	43.36 ± 5.83	NS

Height (in cms)	162.3 ± 7.37	164.88 ± 13.24	NS
Weight in kgs	64.37 ± 7.28	66.82 ± 8.28	NS
BMI	25.72 ± 6.18	24.18 ± 5.99	NS

Most of the surgeries among the Group F was Inguinal hernia with 26 (52%) of the patients and in Group D, Hysterectomy was the most common type of surgery. IN Group F, hysterectomies were done in 18 (36%) opf the patients while in Group D, 19 (38%) of the patients underwent inguinal hernia. 6 (12%) in Group F and 9 (18%) in Group D underwent Urinary bladder and ureteric surgery. The mean surgery duration was 184 ± 39 mins in Group F and 192 ± 44 mins in group D (table: 5).

Table 5: Type of lower abdominal surgeries

Type of surgery	Group F	Group D
Inguinal hernia	26 (52%)	19 (38%)
Hysterectomy	18 (36%)	22 (44%)
Urinary bladder and ureteric surgery	6 (12%)	9 (18%)
Duration of surgery (in mins)	184 ± 39	192 ± 44

The time between the injection and the highest sensory level was 12.8 ± 5.9 mins in Group F and 12.2 ± 6.2 mins in Group D. The time for regression of 2 segments from highest sensory level was 78 ± 8.17 mins in Group F and 119 ± 27.3 mins in Group D and this difference was found to be significant. The time of regression to S1 was also found to be significant between the two groups. In Group F it was 196 ± 21.6 mins and in Group D it was 488 ± 27.3. Though the onet to Bromage 3 was not significant between the 2 groups, the regression to Bromage 0 was highly significant, with 151.82 ± 18.45 in Group F and 425.83 ± 26.38 in Group D.

Table 6: Sensory Block details

Anaesthetic details	Group F	Group D	P value
Highest Sensory Levels	T5 (T4-T8)	T5 (T4-T8)	NS
Time between injection and highest sensory level (in mins)	12.8 ± 5.9	12.2 ± 6.2	NS
Time for regression of 2 segments from highest sensory level	78 ± 8.17	119 ± 27.3	<0.001
Time of regression to S1	196 ± 21.6	488 ± 27.3	<0.001
Onset of Bromage 3 (in mins)	10.93 ± 4.1	10.69 ± 3.85	NS
Regression to Bromage 0	151.82 ± 18.45	425.83 ± 26.38	<0.001
Time to rescue analgesia	159.48 ± 20.71	260.48 ± 31.45	<0.001
Sedation Score	3	3	NS

There was no significant difference in the mean arterial pressure between the two groups (Fig: 1)

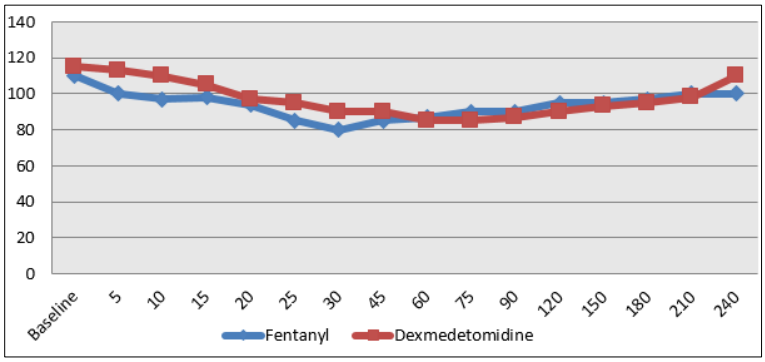

Fig 1: Mean arterial Pressure

The mean heart rate was slightly lower among the patients given dexmedetomidine compared the those given fentanyl drug (Fig: 2).

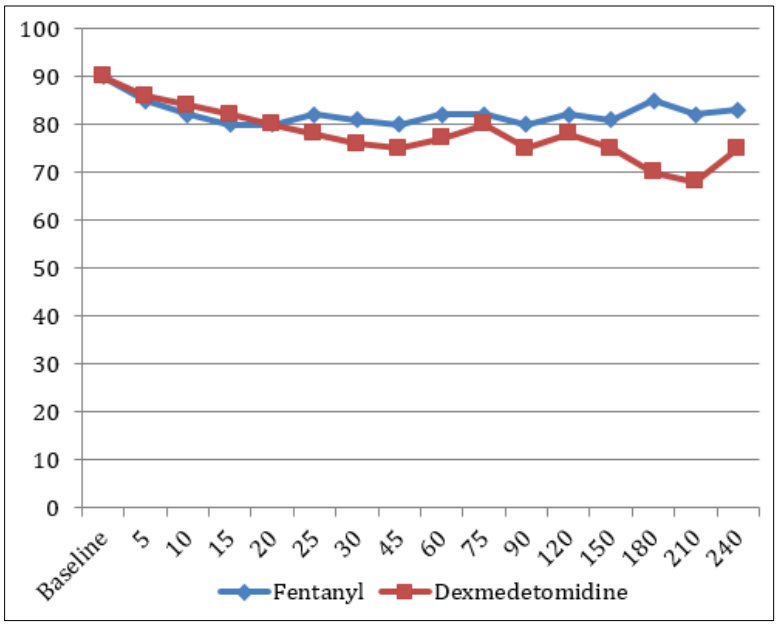

Fig 2: Mean heart rate of the patients in the two groups

Few patients suffered with slight complications. Bradycardia was seen in 5 patients in Group D, while in Group F the same was seen in 2 patients. Nausea was seen in 5 patients in the Fentanyl Group and in Dexmedetomidine group, it was seen in 3 cases, vomiting in 3 cases in Group F and 1 case in Group D, hypotension in 4 patients in Group F and 2 patients in Group D (Fig: 3).

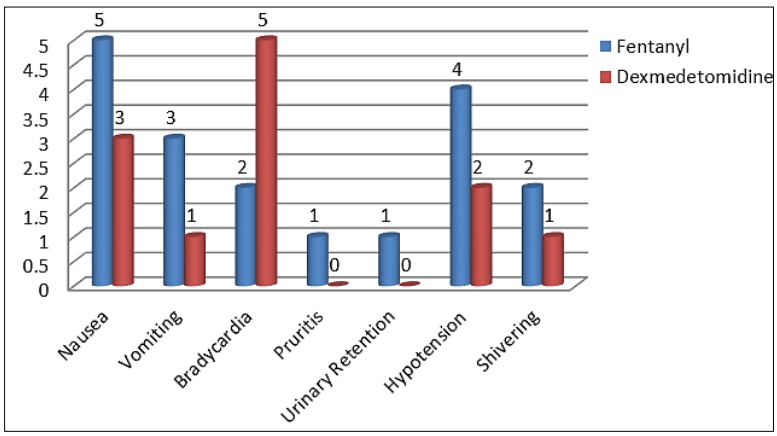

Fig 3: Complications

Discussion

Post-operative pain in the patients affects them physiologically, psychologically, socially and economically [13]. Spinal anesthesia is effective within minutes of administration and gives immense relief to the patient. The prolongation of the duration of the sensory and motor block is achieved by the coadministration of adjuvants. Opioids as an adjuvant allows early ambulation along with the post-operative pain management, thus reducing the length of the hospital stay and reducing the cost. However, they are associated with vomiting, nausea and hyperalgesia [14]. Fentanyl is an opioid which is lipid soluble and can get eliminated from the

CSF rapidly as a result, there are reduced chances of respiratory depression [15].
Age, sex and BMI between the 2 groups in our study was insignificant. Similar results were seen in a study by Bengali *et al*, where the demographic details between the two groups was insignificant [16].
The time taken to attain the highest sensory level was 12.8 ± 5.9 mins in Group F and 12.2 ± 6.2 mins in Group D, with no significant difference. A study by Rashmi Bengali *et al*. reported similar findings [16]. Similar case was seen in a study by Hari Kishore *et al*. [17], where in they reported that the onset of the sensory and motor block was similar in both the groups. The onset was similar in another study by Al Ghanem *et al*. and Rajni Gupta *et al*, corroborating our study [5, 11]. A study by Al Mustafa *et al*. reported the onset and regression of the sensory block with dexmedetomidine was dose dependent [6]. Rashmi Bengali *et al*. reported similar results [16].
In the present study, the time for regression from 2 segments from the highest sensory level was significantly higher in the Group D patients compared to the Group F patients. There was a longer duration of motor and sensory block among the patients in the Dexmedetomidine group. Similar results were reported in another study by Hari Kishore *et al*, where patients given Dexmedetomidine had significantly longer duration of sensory and motor block compared to the patients administered Fentanyl which was similar to our study [16].
The mean time of regression to S1 was 488 ± 27.3mins in Group D and 196 ± 21.6 mins in Group F in the present study. In a study by Gupta *et al*, the sensory regression to S1 was 187 ± 12 mins in Group F and 476±23 min in group D corroborating our study [11].
The mean time of regression to Bromage 0 in Group F was 151.82 ± 18.45 mins and Group D was 425.83 ± 26.38 mins. In a study by Hari Kishore *et al*, it took 176.2± 5.71 min to reach Bromage 0 in group D while it took 166.36 ± 5.97 min in Group F [8]. In a study by Varaprasada Rao and Venkataraman, the motor blockage to Bromage 0 took 275 min in Group D patients and 199 mins in Group F patients, which was lower compared to our study, nevertheless statistically significant [18].
There was no significant difference in the mean arterial pressure between the two groups. Basuni *et al*. also found that the blood pressure was comparable in both the groups and not statistically different [19].
There was no difference in the sedation score in our study while in a study by Raees Ahmed *et al*, the sedation score in patients given dexmedetomidine was higher than the patients given fentanyl [20].
The mean heart rate was slightly lower among the patients given dexmedetomidine compared those given fentanyl drug. Similar results were reported in a study by Khan *et al*. [21] and Rao *et al*. [22].

Conclusion

Dexmedetomidine is a good substitute for fentanyl as an adjuvant to bupivacaine when used in spinal anesthesia. It has better hemostability, better quality of intraoperative analgesia, with less demands for analgesic. The side effects such as nausea and vomiting are also lesser.

References

1. Elia N, Culebras X, Mazza C, Schiffer E, Tramèr MR. Clonidine as an adjuvant to intrathecal local anesthetics for surgery: Systematic review of randomized trials. Reg Anesth Pain Med. 2008;33:159-67.
2. Boussofara M, Carlès M, Raucoules-Aimé M, Sellam MR, Horn JL. Effects of intrathecal midazolam on postoperative analgesia when added to a bupivacaine-clonidine mixture. Reg Anesth Pain Med. 2006;31:501-5.

3. Alahuhta S, Kangas-Saarela T, Hollmén AI, Edström HH. Visceral pain during caesarean section under spinal and epidural anaesthesia with bupivacaine. Acta Anaesthesiol Scand. 1990;34:95-8.
4. Brown LD. Spinal Anesthesia in Miller's anesthesia. Miller RD Editor. 7th edition Churchill Livingstone Elsevier Philadelphia. 2010;2:1611-1638.
5. Pitkanen M. Techniques of Neural Blockade in Clinical Anesthesia in Cousins and Brindenbaugh's Neural Blockade in Clinical Anesthesia and Pain Medicine. Cousins MJ Editor. 4th edition. Lippincott Williams and Wilkins China, 2009, 216-217.
6. Hunt CO, Naulty JS, Bader AM, Hauch MA, Vartikar JV, Datta S, *et al*. Perioperative analgesia with subarachnoid fentanyl-bupivacaine for Cesarean delivery. Anesthesiology. 1989;71:535-40.
7. Al-Ghanem SM, Massad IM, Al-Mustafa MM, Al-Zaben KR, Qudaisat IY, Qatawneh AM, *et al*. Effect of Adding Dexmedetomidine versus Fentanyl to Intrathecal Bupivacaine on Spinal Block Characteristics in Gynecological Procedures: A Double Blind Controlled Study. Am J Appl Sci. 2009;6:882-7.
8. Al-Mustafa MM, Abu-Halaweh SA, Aloweidi AS, Murshidi MM, Ammari BA, Awwad ZM, *et al*. Effect of dexmedetomidine added to spinal bupivacaine for urological procedure. Saudi Med J. 2009;30:365-70.
9. Kanazi GE, Aouad MT, Jabbour-Khoury SI, Al Jazzar MD, Alameddine MM, Al-Yaman R, *et al*. Effect of low-dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block. Acta Anesthesiol Scand. 2006;50:222-7.
10. Venn RM, Grounds RM. Comparison between dexmedetomidine and propofol for sedation in the intensive care unit: Patient and clinician perceptions. Br J Anaesth. 2001;87:684-90.
11. Gupta R, Bogra J, Verma R, Kohli M, Kushwaha JK, Kumar S. A Comparative study of intrathecal Dexmedetomidine and Fentanyl as adjuvants to Bupivacaine. J Anaesth Clin Pharmacol. 2011;27(3):339-343.
12. Gupta R, Bogra J, Verma R, Kohli M, Kushwaha JK, Kumar S. Dexmedetomidine as an intrathecal adjuvant for postoperative analgesia. Indian J Anaesth. 2011;55(4):347-351.
13. Fairbanks CA, Stone LS, Wilcox GL. Pharmacological profiles of alpha 2 adrenergic receptor agonists identified using genetically altered mice and isobolographic analysis. Pharmacol Ther. 2009 Aug;123(2):224-38.
14. Kehlet H, White PF. Optimizing anesthesia for inguinal herniorrhaphy: general, regional, or local anesthesia? Anesth Analg. 2001 Dec;93(6):1367-9.
15. Rathmell JP, Lair TR, Nauman B. The role of intrathecal drugs in the treatment of acute pain. Anesth Analg. 2005 Nov;101(5 Suppl):S30-S43.
16. Rashmi Bengali, Tushar Patil, Priya Buddhadeo. A Comparative Study of Intrathecal Dexmedetomidine and Fentanyl as an Adjuvant to Bupivacaine. J Med Sci and Clin Res. 2015;3(12):8697-8703.
17. Hari Kishore, Paul O. Raphael, Binu Puthur Simon, Thomas T. Vellapally. A Comparative Study of Intrathecal Dexmedetomidine and Fentanyl as Adjuvants to Bupivacaine for Lower Abdominal Surgeries. Journal of Evidence based Medicine and Healthcare. 2015 Jan 12;2(2):123-130.
18. Varaprasada Rao T, Anantha Venkata Raman. A Comparative Study of Intrathecal Dexmedetomidine and Fentanyl in Lower Abdominal Surgeries. Ind. J Anaesth Analgesia. 2018;5(10):1728-1733.
19. Basuni AS, Ezz HAA. Dexmedetomidine as supplement to low-dose levobupivacaine spinal anesthesia for knee arthroscopy. Egypt J Anaesth. 2014;30(2):149-153.
20. Ahmad R. A Comparative Study of Intrathecal Low Dose Bupivacaine and Dexmedetomidine with Low Dose Bupivacaine and Fentanyl. IOSR J Dent Med Sci. 2016;15(4):09-17.

ISSN 2515-8260 Volume 09, Issue 02, 2022

21. Khan AL, Singh RB, Tripathi RK, Choubey S. A comparative study between intrathecal dexmedetomidine and fentanyl as adjuvant to intrathecal bupivacaine in lower abdominal surgeries: A randomized trial. Anesth essays Res. 2015;9(2):139-148.
22. Rao S, KS, NSS. A Comparative Study of Intrathecal Dexmedetomidine and Fentanyl As Adjuvants To Bupivacaine for Infra-Umbilical Surgeries. J Evol. Med Dent Sci. [Internet]. 2015;4(6):962-967.