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Original Research Article

Comparative Study of the Effect of Varying Dose of Intrathecal Fentanyl on Clinical Efficacy in Patients Undergoing Lower Limb Orthopedic Surgeries

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Abstract:

Introduction: Central neuraxial blocks are one of the most commonly and routinely used anaesthetic technique globally. Various adjuvants have regularly been used as an adjuvant to potentiate the efficacy of the local anaesthetics and to prolong the duration of action**.** Various studies have been done on Fentanyl that shows increase in the analgesia without unwanted side effects. The increasing demand for spinal anaesthesia in lower limb surgeries and importance of pharmacokinetic and pharmacology of new drugs have made to appreciate the importance of studying the effects of new adjuvant drugs in spinal anaesthesia. Hence the study was conducted.

Methodology: The present prospective observational study was conducted amongst 105 patients undergoing lower limb orthopedic surgeries during September 2020 to December 2022 at a tertiary care hospital. Patients were divided as follows: Group A: receiving 15 mcg intrathecal Fentanyl with hyperbaric Bupivacaine 15mg. Group B: receiving 25 mcg intrathecal Fentanyl with hyperbaric Bupivacaine 15mg. Group C: as control receiving hyperbaric bupivacaine 15mg**.**

Results: The mean duration of surgery in group A was 105min, in group B it was 104min, and in group C 106 min. Out of the total subjects in group A 16 (45.7%) subjects achieved T6, 13 (37.1%) subjects in group B achieved T6 while in the case of group C, 14 (40%) of subjects achieved T6. The mean duration of time for two-segment regression from the highest sensory level in group A was 72min; in group C it was 69.2min; in group B it was higher than the remaining two groups 83.7min with statistical significance. The mean duration of postoperative analgesia in group A was 217.6min; in group C it was 213.0min; in group B it was higher than the remaining two groups 271.4 min statistical significance. The mean arterial pressure among Group A, Group B & Group C at a preoperative time, 5,15,30,45, and 90 minutes. A greater fall in MAP was seen in group B than in group A & group C at 5, & 15 minutes. The comparison of the mean of MAP among 3 groups at 5, 15, 30, 45, & 90 minutes was found to be statistically significant.

Conclusion: We concluded that subjects receiving 25 mcg intrathecal Fentanyl with hyperbaric Bupivacaine 15mg provided better anesthesia and prolonged postoperative analgesia for spinal anesthesia for lower limb orthopaedic surgeries.

Keywords: Fentanyl, Bupivacaine, Lower Limb, Spinal Anaesthesia, Analgesia.

Introduction

Central neuraxial blocks are one of the most commonly and routinely used anaesthetic technique globally. Spinal anaesthesia a variant of central neuraxial block has numerous advantages over general anaesthesia and epidural anaesthesia. Various adjuvants, e.g., Morphine, Buprenorphine, Fentanyl, clonidine, phenylephrine, ketamine etc., have regularly been used as an adjuvant to potentiate the efficacy of the local anaesthetics and to prolong the duration of action. [1]

Bupivacaine is commonly used for subarachnoid block in patients undergoing lower abdominal surgeries. [2] Bupivacaine is commonly used for subarachnoid block in parturients undergoing caesarean section; however, intrathecal bupivacaine alone may be insufficient to provide complete anesthesia. [3] To improve the quality of subarachnoid block, it is a common practice to add intrathecal opioids. [4] Primarily, it reduces the dose of LA required and minimizes the side effects and prolongs the duration of anesthesia. [5] Various studies have been done on Fentanyl that shows increase in the analgesia without unwanted side effects. [6]

The increasing demand for spinal anaesthesia in lower limb surgeries and importance of pharmacokinetic and pharmacology of new drugs have made to appreciate the importance of studying the effects of new adjuvant drugs in spinal anaesthesia. Hence the study was conducted.

Aim: To compare the effect of varying dose of intrathecal fentanyl on clinical efficacy in patients undergoing lower limb Orthopedic surgeries.

Methodology:

The present prospective observational study was conducted amongst the patients undergoing lower limb orthopedic surgeries during September 2020 to December 2022 at a tertiary care hospital. A total of 105 participants were involved divided into 3 groups (35 each). By simple randomization method, study participants were distributed into three groups.

A. **Inclusion Criteria:** Patients undergoing lower limb orthopaedics surgeries under Spinal Anaesthesia, patient age between 20-60 years of either gender with ASA Grade I-II.

B. **Exclusion Criteria:** Patients not willing to spinal anesthesia**,** Spinal deformities, Local skin infection**,** Blood dyscrasias, Cardiac diseases**,** Renal diseases**,** History of opioid dependence and Surgery with the tourniquet.

Methods of data collection: Detailed information regarding socio-demographic factors and detailed history was taken. Also, a detailed physical and systemic examination was done & documented.

The patients were randomly allocated to three groups of 35 each. After taking all aseptic measures, the skin was infiltrated with a 25G Quincke's spinal needle introduced at the L3-4 or L4-L5 intervertebral space with the patient in the sitting position. Patients were monitored with ECG, NIBP, SPO2, and Respiration at regular intervals of every 5 minutes and continued in the postoperative period until the Visual Analog Scale (VAS) of >4, where rescue analgesia was given.

The sensory and motor block level was evaluated at 2, 4, 6, 8, 10, and 15 min and after that at 15 min intervals for six hours. The sensory block level was evaluated with a pinprick test, and the motor block level was determined according to the Modified Bromage Scale (1 – complete block, 2 – able to move feet only, 3 – just able to move the knees, 4 – full flexion of knees, 5-no detectable weakness of hip flexion while supine, 6-able to perform partial knee bend). During the tracking of the sensory block in patients, maximum sensory block level, time to achieve maximum sensory block, and its regression to L1 dermatome was recorded. While tracking the motor block, the time to achieve maximum motor block and the duration was also recorded.

Surgical anesthesia was considered "adequate," if there was no complaint of pain from the patient, and/or need for additional analgesia. Pain grade was measured at the time of incision and every 15 min thereafter in the OR and RR. Pain grade if severe was considered inadequate analgesia/anesthesia and treated with fentanyl and if the pain was unbearable after three doses of fentanyl, general anesthesia was administered.

In the postoperative period, the time to first analgesic demand was noted when VAS was more than 4 and intravenous diclofenac, 75 mg was administered.

Three groups were as follows:

Group A: receiving 15 mcg intrathecal Fentanyl with hyperbaric Bupivacaine 15mg

Group B: receiving 25 mcg intrathecal Fentanyl with hyperbaric Bupivacaine 15mg

Group C: as control receiving hyperbaric bupivacaine 15mg

Patients were assessed for clinical efficacy by measuring pain grade, need for rescue

analgesia, conversion to GA, and complaints of the inadequacy of surgical anesthesia

by the surgeon.

Data Entry and Analysis: The data was entered in an MS Excel sheet, compiled, and tabulated. Percentages were calculated and a graphical presentation was used wherever necessary using Microsoft Office Excel 2010 software. Frequency, percentage, and proportion were calculated. The proportions were compared using the Chi-square test whenever necessary. Statistical evaluation was performed using paired and unpaired t-tests and analysis of variance. SPSS (Statistical Packages for Social Sciences) version 24.0 (trial version) was used for data analysis. Statistical difference was considered significant only if the p-value was < 0.05.

Hemodynamic Changes: Pulse rate, Systolic blood pressure, Diastolic blood pressure, mean arterial blood pressure, and SPO2 were monitored at 0,5,15,30,45,90 minutes.

Assessment of Sensory Blockade: Sensory blockade was tested by pinprick sensations using a hypodermic needle and the time of onset of sensory blockade, and duration of the sensory blockade was charted.

Assessment of Motor Blockade: We used a modified Bromage scale to assess the quality of motor blockades. Time taken for the onset of motor blockade and the duration of motor blockade were recorded.

Duration of Analgesia: The pain intensity was assessed using a visual analog scale (VAS) score with points ranging from 0 to 10. Patients were trained for the use of the VAS score and were asked to mark the pain intensity intraoperatively and post-operatively. They were asked to mark the pain level on the scale. Pain score: 0-3= mild, 3-7= moderate, >7=severe.

The patients were evaluated postoperatively after the sensory block weaned off with a VAS score of 10 and with a VAS score of 5 or more. Patients were administered Inj. diclofenac sodium 75 mg i.m.

Results:

Table 1: Comparison as per the duration of surgery

		Group A	Group B	Group C	Total	p
Duration of Surgery	Mean (SD)	105.0 (30.6)	104.7 (19.0)	106.1 (21.6)	105.3 (24.0)	0.968

Table no.1 shows that the mean duration of surgery in group A was 105min, in group B it was 104min, and in group C 106min. Statistical association in the mean duration of surgery among all 3 groups was found to be statistically non-significant.

Table 2: Comparison as per highest sensory level achieved in 3 groups

Highest Sensory Level	Group A	Group B	Group C	p
T4	0 (0.0)	3 (8.6)	0 (0.0)	
T6	16 (45.7)	13 (37.1)	14 (40.0)	
T8	12 (34.3)	11 (31.4)	13 (37.1)	
T10	7 (20.0)	8 (22.9)	8 (22.9)	
TOTAL	35 (100)	35 (100)	35 (100)	0.362

Table no.2 shows that, out of the total subjects in group A 16 (45.7%) subjects achieved T6, 13 (37.1%) subjects in group B achieved T6 while in the case of group C, 14 (40%) of subjects achieved T6. The statistical association between the highest sensory levels achieved in the 3 groups was found to be statistically non-significant.

Table 3: Comparison as per the time for two-segment regression from the highest sensory level

		Group A	Group B	Group C	Total	p
Time of two-segment	Mean	72.0	83.7	69.2	73.0	<0.001
regression from	(SD)	(6.3)	(9.8)	(7.1)	(10.2)	
highest SL						

Table no.3 shows that the mean duration of time for two-segment regression from the highest sensory level in group A was 72min; in group C it was 69.2min; in group B it was higher than the remaining two groups 83.7min. The statistical association between the mean duration of time for two-segment regression from the highest sensory level among all 3 groups was found to be statistically significant.

Table 4: Comparison as per the duration of postoperative analgesia

		Group A	Group B	Group C	Total	p
Durationof Post-	Mean	217.6	271.4	213.0	234.0	<0.001
Operative Analgesia	(SD)	(15.1)	(39.0)	(15.6)	(36.9)	

Table no.4 shows that the mean duration of postoperative analgesia in group A was 217.6min; in group C it was 213.0min; in group B it was higher than the remaining two groups 271.4min. The statistical association between the mean duration of postoperative analgesia among all 3 groups was found to be statistically significant.

Table 5: Comparison of Mean Arterial Pressure (MAP)

MAP		Group A	Group B	Group C	Total	p
PREOP	Mean (SD)	91.8 (8.5)	91.2 (5.1)	92.3 (7.0)	91.8 (6.9)	0.782
5MIN	Mean (SD)	79.7 (9.2)	75.6 (1.4)	81.5 (1.9)	79.3 (8.3)	<0.001
15MIN	Mean (SD)	82.8 (6.1)	74.3 (1.8)	87.1 (2.8)	78.7 (7.6)	<0.001
30MIN	Mean (SD)	84.7 (6.1)	81.9 (3.3)	92.2 (2.7)	84.6 (7.3)	<0.001
45MIN	Mean (SD)	91.3 (4.8)	84.8 (3.7)	95.4 (4.3)	94.8 (4.4)	0.018
90MIN	Mean (SD)	92.0 (10.0)	83.6 (7.2)	90.4 (8.3)	88.7 (9.3)	<0.001

Table no.5 shows that the given table shows the mean arterial pressure among Group A, Group B & Group C at a preoperative time, 5,15,30,45, and 90 minutes. A greater fall in MAP was seen in group B than in group A & group C at 5, & 15 minutes. The comparison of the mean of MAP among 3 groups at 5, 15, 30, 45, & 90 minutes was found to be statistically significant.

Table 6: Comparison of Ramsay Sedation Score.

Ramsay Sedation Score	Group A	Group B	Group C	p-value
1	5 (14.3)	4 (11.4)	5 (14.3)	0.032
2	28 (80.0)	21 (60.0)	28 (80.0)	
3	2 (5.7)	10 (28.6)	2 (5.7)	
TOTAL	35 (100)	35 (100)	35 (100)	

Table no.6 shows that, the majority of patients were found to have a Ramsay Sedation Score of 2, comprising 28 patients (80%) from Group A, 21 patients (60%) from Group B, and 28 (80%) from Group C. The results were found to be statistically significant between the groups.

Table 7: Comparison of Side effects.

Side Effects	Group A	Group B	Group C	Total (100)	p
Hypotension	4 (33.3)	5 (41.7)	3 (25)	12	0.754
Bradycardia	4 (36.4)	5 (45.4)	2 (18.2)	11	0.491
Respiratory Depression	0 (0.0)	3 (75)	1 (25)	04	0.162
Sedation	2 (20)	7 (70)	1 (10)	10	0.033
Shivering	0 (0.0)	2 (66.7)	1 (33.3)	03	0.357
Vomiting	0 (0.0)	1 (100)	0 (0.0)	01	0.364

Table no.7 shows that, 4 patients in Group A, 5 in group B, and 3 patients in Group C had their MAP fall below 70 mmHg. The incidence of hypotension & bradycardia was higher in Group B compared to Groups A & C. Sedation was seen in 70% of patients of group B while 20%, & 10% in Groups A, & B respectively. 2 patients from group B experienced postoperative shivering. The association between all 3 groups & post- operative side effects was not found to be statistically significant.

Discussion:

The present comparative study was conducted to study the effect of varying doses of intrathecal fentanyl on clinical efficacy in patients undergoing lower limb orthopedic surgeries.

A total of 105 participants were divided into 3 groups (35 each). Three groups were as follows: Group A consists of subjects receiving 15 mcg intrathecal Fentanyl with hyperbaric Bupivacaine 15mg. Group B consists of subjects receiving 25 mcg of intrathecal Fentanyl with hyperbaric Bupivacaine 15mg. Group C as control receiving hyperbaric bupivacaine 15mg.

Similarly, a study conducted by M. S. Khanna, & Dr. Ikwinder KJP Singh [7] on 40 elderly patients posted for hip replacement or DHS (Dynamic hip screw), where patients were distributed in 2 groups and were given a total of 3 ml of volume, with 12.5 mg of 0.5% Bupivacaine plus saline in the first group and 12.5 mg of Bupivacaine with 25 micrograms of Fentanyl in the second group.

In addition to that, Khan FA, Hamdani GA [8] conducted a study in 2006 to compare the characteristics of spinal anesthesia characteristics in terms of effects, postoperative analgesia, and side effects after adding Fentanyl or Buprenorphine along with hyperbaric Bupivacaine. They used 2ml of 0.75% Bupivacaine with 10 mcg of intrathecal Fentanyl for uro-surgical procedures.

A comparative study conducted by Rao Sumesh et al [9] on 40 patients posted for elective caesarean section. In contrast to our study, in this study the patients were divided in 2 groups and were administered 1.0 ml of hyperbaric Bupivacaine with 25mcg of Fentanyl and the second group received 1.6 ml of hyperbaric Bupivacaine with dextrose solution to make the volume equal.

Sheetal Jagtap et al [10] in 2014 performed a study involving 60 patients posted for lower limb surgeries. The patients were randomly distributed and were given 15 mg of 0.5% ropivacaine with 25 microgram Fentanyl in group RF and 15 mg of 0.5% Bupivacaine with 25 micrograms of Fentanyl in group A.

Rashmi Pal, K. K. Arora et al [11] in 2015 included 90 patients posted for lower abdominal study and randomly divided them into 3 groups. The first group received 3.0ml of 0.5% of hyperbaric Bupivacaine + 50µg (0.33ml) of Clonidine with 0.17 ml normal saline while the other group received 3.0ml of 0.5% hyperbaric Bupivacaine (15mg) with 25µg (0.5ml) Fentanyl. The third group received 3.0ml of Bupivacaine heavy 0.5% (15mg) +

Buprenorphine 75µg (0.25ml) + normal saline (0.25ml).

Time to onset of sensory & motor block

In our study, the mean duration of onset of sensory block in group A was 2.2min; in group C it was 2.4min; in group B it was higher than the remaining two groups 2.8min. The statistical association between the mean duration of onset of sensory block among all 3 groups was found to be statistically significant. The mean duration of onset of motor block in group A was 4.2min; in group C it was 4.1min; in group B it was higher than in the remaining two groups 4.7min. The statistical association between the motor block onsets among all 3 groups was found to be statistically significant. Similar, to our study, H. Singh, J Yang et al [12] studied & concluded that adding Fentanyl to local anaesthetic significantly lengthens the duration of sensory block and decreases the analgesic necessity in the initial postoperative phase.

Also, a study conducted by Spencer Liu, Andrew et al [13] concluded that adding intrathecal Fentanyl improves the efficacy in terms of quality and duration of Lidocaine induced spinal blockade. They performed a randomized double-blind study where they injected 5% Lidocaine without preservative in dextrose with and without 20 µg of injection Fentanyl in cross-over manner. They suggested that combining 20 mcg of Fentanyl with Lidocaine, improves the duration of sensory blockade without prolonging the motor blockade or time to micturition.

In contrast to the results in our study, M. S. Khanna, & Dr. Ikwinder KJP Singh [14] conducted a study on 40 elderly patients posted for hip replacement or DHS. Patients were distributed in 2 groups and were given a total of 3 ml of volume, with 12.5 mg of 0.5% Bupivacaine plus saline in the first group and 12.5 mg of Bupivacaine with 25 micrograms of Fentanyl in the second group. They observed that adding 25 micrograms of Fentanyl to Bupivacaine for spinal anesthesia did not show many alterations in the motor blockade, but it prolonged the sensory blockade and improved intraoperative and postoperative analgesia.

A double-blind study was done by A.M. Korhonen et al [15] on 100 patients posted for arthroscopic knee repair, divided the patients into two groups the patients were given 4 mg of Bupivacaine in one group and the other group received 3mg of Bupivacaine with 10 mcg of Fentanyl intrathecally. They concluded that the addition of opioids in spinal anesthesia increases success rates. It does not prolong the motor blockade and thereby reducing the PACU stay. In contrast to the results in our study, Sheetal Jagtap et al [10] performed a study involving 60 patients posted for lower limb surgeries. The patients were randomly distributed and were given 15 mg of 0.5% ropivacaine with 25 microgram Fentanyl in group RF and 15 mg of 0.5% Bupivacaine with 25 micrograms of Fentanyl in group A. they observed that intrathecal ropivacaine with Fentanyl provide better hemodynamic stability than the other group with Bupivacaine. The sensory blockade was similar in both groups.

Similar, to the present study, Rashmi Pal, K. K. Arora et al [11] in 2015 included 90 patients posted for lower abdominal study and randomly divided them into 3 groups. The first group received 3.0ml of 0.5% of hyperbaric Bupivacaine + 50µg (0.33ml) of Clonidine with 0.17 ml normal saline while the other group received 3.0ml of 0.5% hyperbaric Bupivacaine (15mg) with 25µg (0.5ml) Fentanyl. The third group received 3.0ml of Bupivacaine heavy 0.5% (15mg) + Buprenorphine 75µg (0.25ml) + normal saline (0.25ml). Their study displayed a substantial difference in the duration of sensory and motor blockade.

Duration of analgesia

In present study, the mean duration of postoperative analgesia in group A was 217.6min; in group C it was 213.0min; in group B it was higher than the remaining two groups 271.4min. The statistical association between the mean duration of postoperative analgesia among all 3 groups was found to be statistically significant. In contrast to the results found in present study, Catherine O Hunt et al [16] conducted a study with the addition of Fentanyl to Bupivacaine for spinal anesthesia in patients posted for cesarean sections. She observed that the analgesia produced by adding Fentanyl in the dose of 6.25 µg with 0.5% Bupivacaine 10 mg was adequate and did not need intraoperative opioids. She also concluded that on increasing the dose of Fentanyl above 6.25 µg did not show any further increase in the duration of analgesia.

Similar, to the results in our study, Sergio D Belzarena [17] evaluated the efficacy of intrathecal Fentanyl in patients undergoing caesarean section with variable doses. He stated that adding low dose of Fentanyl (25 mcg) to Bupivacaine provides excellent anesthesia with increased postoperative analgesia.

Also, Craig M. Palmer et al [18] evaluated the efficacy of addition low dose Bupivacaine to intrathecal Fentanyl. Their study showed that Bupivacaine enhanced the intrathecal Fentanyl in the terms of duration of action and the quality of analgesia. It was also observed that it speeded the onset of analgesia compared with plain intrathecal Fentanyl.

B. N. Biswas and A. Rudra [19] in 2003 led a study on 40 healthy gravidas undergoing elective lower segment caesarean section. Patients were given 2 ml

of 0.5% Bupivacaine (hyperbaric) with 0.25 ml of normal saline or 12.5 mcg of Fentanyl with 2 ml of 0.5% Bupivacaine. They observed that the duration of complete analgesia was longer with addition of Fentanyl than in placebo. The duration of effective analgesia was also found to be increased in the second group.

A comparative study conducted by Rao Sumesh et al [9] on 40 patients posted for elective caesarean section. The patients were divided in 2 groups and were administered 1.0 ml of hyperbaric Bupivacaine with 25mcg of Fentanyl and the second group received 1.6 ml of hyperbaric Bupivacaine with dextrose solution to make the volume equal. They observed similar results that adding Fentanyl to intrathecal Bupivacaine increased the onset of spinal blockade and lengthened the duration of sensory blockade. There were less requirements for the analgesic in the patients with Fentanyl.

Hemodynamic Variability

In our study, the mean systolic blood pressure among Group A, Group B & Group C at a preoperative time, 5,15,30,45, and 90 minutes. A greater fall in SBP was seen in group B than in group A & group C at 5, 15, and 30 minutes. The comparison of mean SBP among 3 groups at 5, 15, 30, & 90 minutes was found to be statistically significant. While the mean diastolic blood pressure among Group A, Group B & Group C at a preoperative time, 5,15,30,45, and 90 minutes. A greater fall in DBP was seen in group B than in group A & group C at 5, 15, & 30 minutes. The comparison of mean DBP among 3 groups at 5, 15, 30, 45, & 90 minutes was found to be statistically significant.

Sergio D Belzarena [17] also observed hemodynamic variability in their study groups with significant changes in heart rate. Two patients in group 0 and group 50, three patients in group 75, and four patients in group 25 experienced hypotension which was treated with ephedrine. This is similar to our study.

Jaishri Bogra et al [20] in 2005 conducted a study on 120 females posted for caesarean section who were administered intrathecal Fentanyl. The patients were allocated in to 6 groups and were given 8, 10, 12.5 mg of Bupivacaine alone, whereas the rest 3 groups were given the same drugs in combination with intrathecal 12.5 mcg of Fentanyl. They observed that the combination of local anesthetic and the opioid reduce visceral pain and has lesser incidences of complication. The results contrast with present study.

A study conducted by Sheetal Jagtap et al [10] on 60 patients posted for lower limb surgeries. The patients were randomly distributed and were given 15 mg of 0.5% ropivacaine with 25 microgram Fentanyl in group RF and 15 mg of 0.5% Bupivacaine with 25 micrograms of Fentanyl in group A. they observed that intrathecal ropivacaine with Fentanyl provide better hemodynamic stability than the other group with Bupivacaine.

Side effects

In our study, 4 patients in Group A, 5 in group B, and 3 patients in Group C had their MAP fall below 70 mmHg. The incidence of hypotension & bradycardia was higher in Group B compared to Groups A & C. Sedation was seen in 70% of patients of group B while 20%, & 10% in Groups A, & B respectively. 2 patients from group B experienced postoperative shivering. The association between all 3 groups & postoperative side effects was not found to be statistically significant.

Similarly, Sergio D Belzarena [17] evaluated the efficacy of intrathecal Fentanyl in patients undergoing caesarean section with variable doses. He stated that adding low dose of Fentanyl (25 mcg) to Bupivacaine provides excellent anesthesia with increased postoperative analgesia and minimal side effects. In addition to that, Scott Reuben and Dunn S.M. et al [21] conducted a dose response study with various doses of intrathecal Fentanyl in elderly patients posted for lower limb revascularization surgeries. The patients were administered intrathecal

Fentanyl via a spinal catheter in 0, 5,10,20,40 or 50 mcg Fentanyl postoperatively after complete regression of anesthesia. They observed that patients receiving 40 µg of intrathecal Fentanyl had satisfactory analgesia for nearly 5 hrs with a lesser frequency of side effects.

Khan FA, Hamdani GA [8] conducted a study in 2006 to compare the characteristics of spinal anesthesia characteristics in terms of effects, postoperative analgesia, and side effects after adding Fentanyl or Buprenorphine along with hyperbaric Bupivacaine. They used 2ml of 0.75% Bupivacaine with 10 mcg of intrathecal Fentanyl for uro-surgical procedures. In contrast to the present study, they observed that Buprenorphine 30 mcg was associated with increased incidences of nausea and vomiting.

Conclusion

We concluded that subjects receiving 25 mcg intrathecal Fentanyl with hyperbaric Bupivacaine 15mg provided better anesthesia and prolonged postoperative analgesia as compared to Inj fentanyl 15 micrograms when added to 15mg hyperbaric Bupivacaine for spinal anesthesia for lower limb orthopaedic surgeries.

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