

## Original Research Article

# Intrathecal Fentanyl to Bupivacaine Intensify Sensory and Motor Block without Prolonging Recovery Time for Urosurgeries

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**Abstract: Introduction:** Spinal anesthesia is the most commonly used technique for lower abdominal surgeries postoperative pain control is a major problem because spinal anesthesia using only local anesthetics is associated with relatively short duration of action, and thus early analgesic intervention is needed in the postoperative period. Short acting spinal anaesthesia may help to prevent complications associated with delayed immobilization. **Objective:** To examine whether adding intrathecal Fentanyl to bupivacaine intensify sensory and motor block without prolonging recovery time for urosurgeries. **Materials and Methods:** A prospective observational study was contact at dept. of Anaesthesia, Shaheed Tajuddin Ahmad Medical College Hospital, Gazipur, Bangladesh from March to August 2021. Seventy five (75) patients included in our study. American Society of Anaesthesiologists physical status I and II scheduled for elective urological procedures were studied in a double-blinded, randomized prospective manner. Random allocation was done as, Group A (n=25) receiving intrathecal bupivacaine 12.5 mg; Group B (n=25) bupivacaine 10 mg with 25 µg of fentanyl; and Group C (n=25), bupivacaine 5 mg with 25 µg of fentanyl. Assessment of sensory, motor block and duration of sensory analgesia was done. **Results:** In our study the demographic data were comparable in all the three groups. The time for two segment regression was statistically significant between all three groups (p<0.001). The mean time for two segment regressions for group A was 104.8 minutes whereas for group B mean time was 161.8 min and for group C mean time was 80.37 minutes. It was longest for group B and shortest for group C. The total duration of motor block was compared among the three groups after initiation of the SAB. There was statistically significant difference regarding total duration of motor block, time for two segment regression and duration of sensory analgesia between each pair of groups. The duration of motor block, time for two segment regression and duration of sensory analgesia was found to be longest in Group B and shortest in Group C. There were no significant differences in the incidence of complications. **Conclusion:** Addition of 25 µg fentanyl to 5 mg bupivacaine resulted in short-acting motor block whereas with 10 mg of bupivacaine, it increased the intensity and duration of motor block, prolonged sensory analgesia and two segment regression times.

**Keywords:** Bupivacaine, Fentanyl, Spinal anaesthesia, Urosurgeries.

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## INTRODUCTION

Spinal anesthesia is the most commonly used technique for lower abdominal surgeries postoperative

pain control is a major problem because spinal anesthesia using only local anesthetics is associated with relatively short duration of action, and thus early analgesic intervention is needed in the postoperative

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period. A number of adjuvants, such as clonidine and midazolam, and others have been studied to prolong the effect of spinal anesthesia [1]. It produces sympathetic block, sensory analgesia, and motor block, depending on dose, concentration, or volume of local anaesthetic. A common problem during lower abdominal surgeries under spinal anesthesia is visceral pain, nausea, and vomiting [2]. The addition of fentanyl to hyperbaric bupivacaine improves the quality of intraoperative and early postoperative subarachnoid block [3, 4]. The addition of opioids to local anesthetic solution have disadvantages, such as pruritus and respiratory depression. Nevertheless, precipitous hypotension and difficulty in controlling the level of analgesia are major disadvantages of spinal block. There is considerable controversy over the use of vasopressors and intravenous fluids to treat or prevent the hypotension of Spinal Anaesthesia (HAS) [5]. These observations have generated towards alternating local anaesthetics solution or in combination with opioids [6]. Intrathecal opioids enhance analgesia from subtherapeutic doses of local anaesthetic [7], and make it possible to achieve successful spinal anaesthetic using otherwise inadequate doses of local anesthetic [8]. Yet because intrathecal fentanyl causes neither by itself nor in combination with bupivacaine any further depression of efferent sympathetic activity, it is possible to enhance the sensory blockade without altering the degree of sympathetic blockade [8]. Spinal anesthesia can provide good perioperative pain control. The pre-surgery block contributes to intra-operative analgesia and reduces the need for other analgesics [9]. The use of the lower doses of local anesthetics combined with opioids, while providing a spinal block, may result in a better hemodynamic response of the patients and minimal incidence of the side effects [10]. Besides analgesia, this anesthetic technique protects patients by reducing the immune response and the incidence of the postoperative complications.

## MATERIALS AND METHODS

A prospective observational study was conducted at dept. of Anaesthesia, Shaheed Tajuddin Ahmad Medical College Hospital, Gazipur, Bangladesh from March to August 2021. Seventy five (75) patients included in our study. American Society of Anaesthesiologists (ASA) physical status  $\geq$  III, requirement of General Anaesthesia, failed Subarachnoid block (SAB) or requirement of other forms of anaesthesia, duration of Surgery  $>2$  hours, bladder tumour involving lateral wall (requiring obturator nerve block) and contraindications to SAB were excluded. After getting Ethical approval from Institutional Review Board (IRB), the enrolled patients posted for surgery were randomly allocated into three groups by sealed envelope technique: Group A: (n=25)

received 0.5% heavy bupivacaine 12.5 mg (2.5 ml), Group B: (n=25) received 0.5% heavy bupivacaine 10 mg (2 ml) plus 25  $\mu$ g fentanyl (0.5 ml), Group C: (n=25) received 0.5% heavy bupivacaine 5 mg (1 ml) plus 25  $\mu$ g Fentanyl (0.5 ml). The last volume for SAB was adjusted to 2.5 ml by using normal saline. After administering the study drug intrathecally, recording of parameters (Systolic, diastolic and mean blood pressure, heart rate, SpO<sub>2</sub>) every 5 minutes. Level of Sensory block (assessed by pinprick), was assessed at 5 min after the study drug was given, then at 10, 20, 30 min, at the end of operation, and thereafter at 30 min intervals until two segment regression occurred. Motor block assessment was done by using Modified Bromage scale just before the start of the operation, at the end of operation and at 30 min intervals till fully recovered. Surgical procedure was allowed only after the level of sensory block reached T10 dermatomal level. Any complications were noted and intervened. Data were analyzed by using SPSS software version 19, ANOVA with post hoc test (Bonferroni) and chi square test. Continuous data were presented as mean ( $\pm$  SD) and Categorical data were presented as frequency. P value  $< 0.05$  was interpreted as statistically significant.

## RESULTS

In our study seventy five (75) patients the demographic data were comparable in all the three groups. The time for two segment regression was statistically significant between all three groups ( $p < 0.001$ ). The mean time for two segment regressions for group A was 104.8 minutes whereas for group B mean time was 161.8 min and for group C mean time was 80.37 minutes. It was longest for group B and shortest for group C. The total duration of motor block was compared among the three groups after initiation of the SAB (Table-1). The mean duration of motor block in group A was 164.4 minutes while mean duration of motor block in group B was 242.8 min. and mean duration of motor block in group C was 75.02 min. Statistically significant difference ( $p < 0.001$ ) was found between all three groups. The duration of motor block was longest in group B and shortest in group C. In case of sensory analgesia, statistically significant difference ( $p < 0.001$ ) in the duration of sensory analgesia was found among each pair of groups. The longest duration of sensory analgesia was in-group B and the shortest in group C (Table-2). Hypotension was the most common side effect encountered. There were hypotensive episodes in 6 out of 69 cases. Among them, 4 from group A, 3 from group B and 2 from group C. Two patients had nausea and vomiting, which was found in group B only and patients complained of pruritus in groups containing fentanyl (group B and group C) (Table 3 & 4).

**Table 1: Demographic distribution (N=75)**

Age wise distribution (yrs)	Number	Percentage
15-24	3	4.1
25-34	5	6.6
35-44	6	8.2
45-54	11	14.6
55-64	20	26.6
65-74	25	33.3
>=75	5	6.6
Gender		
Male	66	88.0
Female	9	12.0
ASA Physical status		
I	34	45.3
II	41	54.66

**Table 2: Time for two-segment regression (N=75)**

	Time for two segment regression (minutes)		
	A	B	C
Mean	104.8	161.8	80.37
Minimum	85	147	67
Maximum	121	173	93

**Table 3: Total duration of motor block (N=75)**

	Total duration of motor block (minutes)		
	A	B	C
Mean	164.4	242.8	75.02
Minimum	147	221	66
Maximum	185	261	89

**Table 4: Duration of sensory analgesia (N=75)**

	Duration of sensory analgesia (minutes)		
	A	B	C
Mean	253.43	314.56	153.33
Minimum	233	243	141
Maximum	284	333	168

## DISCUSSION

Spinal anaesthesia is the method of choice requiring little anaesthetic drug with minimal physiological disturbance and allows early recognition of complications of prostrate surgery [11]. Incidence of post lumbar puncture headache is also less in this elderly patient population [12]. Drugs with longer duration of action may have advantages in these patients such as comfortable pain free recovery with decreased requirement of systemic analgesics. Local and Opioids anesthetics administered together intrathecally have been shown to have a synergistic analgesic effect [13, 14]. Intrathecal opioids enhance analgesia from subtherapeutic doses of local anesthetics and make it possible to achieve spinal anaesthesia using otherwise inadequate doses of local anaesthetic [7, 8, 15]. The decrease in sympathetic efferent activity after spinal anaesthesia is related to the dose of bupivacaine, and intrathecal fentanyl causes no further depression of the efferent sympathetic activity [16]. Therefore, it may be possible to achieve spinal anaesthesia with less

hypotension by using a reduced dose of local anesthetic in combination with fentanyl. In our study the demographic data were comparable in all the three groups. The time for two segment regression was statistically significant between all three groups ( $p < 0.001$ ). The mean time for two segment regressions for group A was 104.8 minutes whereas for group B mean time was 161.8 min and for group C mean time was 80.37 minutes. It was longest for group B and shortest for group C. The total duration of motor block was compared among the three groups after initiation of the SAB. Lipophilic opioids (e.g. fentanyl and sufentanil) are increasingly being administered intrathecally as adjuncts to local anesthetics. Several investigators have evaluated intrathecal fentanyl with smaller doses of spinal local anesthetics. Liu *et al.*, [17] found that fentanyl 20  $\mu\text{g}$  in combination with spinal lidocaine (50  $\mu\text{g}$ ) prolonged sensory anaesthesia without prolonging recovery of motor function or time to micturition. Spinal anaesthesia with bupivacaine and fentanyl has been used in geriatric patients (70-83 years) undergoing knee or hip replacement surgery

resulting in decreased postoperative pain intensity and preservation of cognitive function [18]. Most relevant to this study is the evidence that intrathecal opioids can greatly enhance analgesia from subtherapeutic doses of local anaesthetic [7, 15]. In our study the case of sensory analgesia, statistically significant difference ( $p < 0.001$ ) in the duration of sensory analgesia was found among each pair of groups. The longest duration of sensory analgesia was in-group B and the shortest in group C (Table-2). Hypotension was the most common side effect encountered. There were hypotensive episodes in 6 out of 69 cases. Among them, 4 from group A, 3 from group B and 2 from group C. Two patients had nausea and vomiting, which was found in group B only and patients complained of pruritus in groups containing fentanyl (group B and group C) (Table 3 & 4). It can be assumed that the recovery and mobilization of the patient could be faster if the motor block was less intense. Liu *et al.* [17] found that fentanyl 20  $\mu\text{g}$  in combination with spinal lidocaine prolonged sensory anaesthesia without prolonging recovery of motor function or time to micturition. The prolongation of sensory blockade without delay in time to voiding was also seen in the study by Liu and colleagues [17]. The results suggests that the addition of 25  $\mu\text{g}$  of fentanyl to 10 mg of bupivacaine (Group B) prolonged and intensified motor block, prolonged the two segment regression time and also prolonged the total duration of sensory analgesia. On the other hand, 5 mg of bupivacaine with the 25  $\mu\text{g}$  of fentanyl (Group C) resulted in short acting motor block with adequate level of sensory analgesia for similar operative procedures. The patients in Group C could have been discharged home on the day of surgery. Despite the encouraging results, our study has some limitations regarding the number of cases enrolled and also further requirement of studies to find the optimal dosing of intrathecal combination of bupivacaine and fentanyl.

## CONCLUSION

In conclusion, this study demonstrates that addition of fentanyl 25  $\mu\text{g}$  to bupivacaine 5mg resulted in short lasting motor block but adequate level of sensory analgesia for surgical procedures requiring T10 dermatomal level. And when fentanyl 25  $\mu\text{g}$  was added to increased dose of bupivacaine (10 mg), it increased both the duration and intensity of motor block, prolonged the time for two segment regression of sensory level and the total duration of analgesia as well.

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