

## Spinal Anesthesia with 0.5% Hyperbaric Bupivacaine with Neostigmine for Prolong Anaesthesia

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## Abstract

## Original Research Article

**Introduction:** Pain is perhaps the most feared symptom of disease, which man is always trying to alleviate and conquer since ages. The relief of pain has been the fundamental aspect of the practice of anaesthesiology and remains one of the most important and pressing responsibilities of the anaesthesiologist. Presently, spinal anesthesia is a safe, convenient & economical form of regional anesthesia technique, & has gained widespread popularity in developing world. **Objective:** To compare the effectiveness spinal anesthesia with 0.5% hyperbaric bupivacaine with neostigmine for prolong anaesthesia. **Materials and Methods:** The present prospective study was undertaken Dept. of Anesthesiology, Department of Anesthesiology, Medical College for women and Hospital, Uttara, Dhaka, Bangladesh from January to June 2021. After obtaining local ethical committee approval & a written informed valid consent, a prospective study was conducted on 100 patients (Random sampling based on type of surgery) undergoing infra umbilical surgery under spinal anaesthesia. The patients were randomly divided into following two groups with 50 subjects in each group where group-A received Intrathecal Bupivacaine 0.5% (Hyperbaric) 3ml and 50µg of neostigmine (0.1ml) were group-B. **Results:** Out of total 100 parturient in the study, in comparison between group A age mean±SD 44.16±14.17 and group B 45.88±10.17 and weight (kg) mean±SD group A 70.88±6.52 and group B 68.28±8.99. No statistical difference was observed which was tested by applying unpaired t test (p>0.05). No statistical difference was observed which was tested by applying unpaired t test (p>0.05). Group A had 27 (54%) male patients and 23 (46%) female patients whereas Group B had 28 (56%) male patients and 22 (44%) female patients. The gender distribution in the two groups as per Fisher's test were comparable and statistically not significant (p>0.05). Group A had 33 patients (66%) with Class I grading and 17 (34%) patients with Class II grading, whereas Group B had 35 (70%) patients with Class I grading and 15 (30%) patients with Class II grading. The ASA Grading of the patients between two groups were comparable and statistically not significant as per Fisher's test (p>0.05). **Conclusion:** The present study concluded that when intrathecal neostigmine 50 mcg was added to 0.5% hyperbaric bupivacaine there was significantly early onset of sensory block and longer duration of motor blockade. The mean time required to attain maximum motor block was also significantly lesser.

**Keywords:** Spinal Anaesthesia, Block Anaesthesia, Neostigmine, Bupivacaine.

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## INTRODUCTION

Pain is perhaps the most feared symptom of disease, which man is always trying to alleviate and conquer since ages. The relief of pain has been the fundamental aspect of the practice of anaesthesiology and remains one of the most important and pressing responsibilities of the anaesthesiologist. Presently, spinal anesthesia is a safe, convenient & economical form of regional anesthesia technique [1], & has gained widespread popularity in developing world [2]. Pain is

perhaps elaborated as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Acute post-operative pain is a complex physiological reaction to tissue-injury, visceral distension or disease. It is manifested by autonomic, psychological and behavioural responses that result in patient specific unpleasant, unwanted sensory and subjective emotional experience. Bupivacaine 0.5% (H) was only drug for spinal anesthesia after discontinuation of lidocaine intrathecal drug use. Bradycardia and hypotension are hemodynamic side

effects of use of high dose of local anesthetic agent to prolong the duration of analgesia [3]. Various adjuvant like ketamine, clonidine, adrenaline, midazolam, epinephrine, neostigmine and opioids (morphine & fentanyl) have been used with intrathecal bupivacaine [4, 5]. Neostigmine is a cholinesterase inhibitor which leads to an increase of the acetylcholine concentration. It has been frequently added to local anesthetics for caudal epidural analgesia (11-12). As an adjuvant neostigmine can effectively prolong the duration of subarachnoid block and could provide better hemodynamic stability during spinal anesthesia [6, 7]. Postoperative pain leads to delayed mobilization and its associated complications. With the development of an expanding awareness of the epidemiology and pathophysiology of pain, more attention is focused on the multimodal management of pain to improve the quality of pain relief, augment functionality, leading to early mobilization, and reduce physiological and emotional morbidity. Appropriate monitoring of depth of sedation thus remains important, as also the search for an agent with a shorter recovery time. Among the local anesthetics, 0.5% hyperbaric bupivacaine is the most commonly used drug for spinal anesthesia [8]. The most important disadvantage of single injection SAB is the limited duration. However, each drug has its limitations and side effects, and the need for alternative methods and drugs always exist. Pain is the fifth vital sign and a critical focus of the anaesthesiologist. Pain is perhaps elaborated as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Acute post-operative pain is a complex physiological reaction to tissue-injury, visceral distension or disease. It is manifested by autonomic, psychological and behavioural responses that result in patient specific unpleasant, unwanted sensory and subjective emotional experience. Postoperative pain leads to delayed mobilization and its associated complications. With the development of an expanding awareness of the epidemiology and pathophysiology of pain, more attention is focused on the multimodal management of pain to improve the quality of pain relief, augment functionality, leading to early mobilization, and reduce physiological and emotional morbidity.

## MATERIALS AND METHODOLOGY

The present prospective study was undertaken Dept. of Anesthesiology, Department of Anesthesiology, Medical College for women and Hospital, Uttara, Dhaka, Bangladesh from January to June 2021. To compare the effectiveness spinal anesthesia with 0.5% hyperbaric bupivacaine with neostigmine for prolong anaesthesia. After obtaining local ethical committee approval & a written informed valid consent, a prospective study was conducted on 100 patients (Random sampling based on type of surgery) undergoing infra umbilical surgery under spinal anaesthesia. The patients were randomly divided

into following two groups with 50 subjects in each group where group- A received Intrathecal Bupivacaine 0.5% (Hyperbaric) 3ml and 50µg of neostigmine (0.1ml) were group-B.

The inclusion criteria of the study participants include those within age range of 30-60 years, ASA grade-I and II and those whose weight are in the range of 40-70 kgs. Unwilling patients, Patients who were contraindicated for spinal anaesthesia, pregnant females and those who had history of angina, palpitations, syncope and ECG abnormalities, finally those who are under beta blockers, calcium channel blockers and any other psychiatric medications are relatively excluded from the study. Quantitative data is presented with the help of Mean and Standard deviation. Comparison within the study groups is performed by using an unpaired t test as per results of normality test. Qualitative data is analysed with the help of frequency and percentage table. Association within the study groups is evaluated by using Fisher test, student 't' test and Chi-Square test. 'p' value less than 0.05 is taken as significant statistically.

## RESULTS

Out of total 100 parturient in the study, in comparison between group A age mean±SD 44.16±14.17 and group B 45.88±10.17 and weight (kg) mean±SD group A 70.88±6.52 and group B 68.28±8.99. No statistical difference was observed which was tested by applying unpaired t test ( $p > 0.05$ ) (Table-1).

In table-2, comparison of the study participants based on gender distribution was observed. Group A had 27 (54%) male patients and 23 (46%) female patients whereas Group B had 28 (56%) male patients and 22 (44%) female patients. The gender distribution in the two groups as per Fisher's test were comparable and statistically not significant ( $p > 0.05$ ).

In table-3 showed that Group A had 33 patients (66%) with Class I grading and 17 (34%) patients with Class II grading, whereas Group B had 35 (70%) patients with Class I grading and 15 (30%) patients with Class II grading. The ASA Grading of the patients between two groups were comparable and statistically not significant as per Fisher's test ( $p > 0.05$ ).

Table-4 depicted that 30% patients each in Group A underwent Appendectomy and Inguinal Hernia Repair procedure while 20% patients each underwent Abdominal Hysterectomy and IT Fracture procedure. 28% patients each in Group B underwent Appendectomy and Inguinal Hernia Repair procedure while 22% patients each underwent Abdominal Hysterectomy and IT Fracture procedure. The comparison of surgical procedure in the two groups as

per Chi- Square test were comparable and statistically not significant ( $p>0.05$ ).

Table-5 shows that the duration of surgery (hours) in both the groups were comparable. No statistically significant difference was found by applying unpaired t test ( $p>0.05$ ).

**Table 1: Comparison of study group as per age (years) and weight (kg) (N=100)**

Variable	Group A			Group B			Unpaired T test	p-value
	N	Mean	SD	N	Mean	SD		
Age (years)	50	44.16	14.72	50	45.88	10.73	0.667	0.51
Weight (kg)	50	70.88	6.52	50	68.28	8.99	1.65	0.10

**Table 2: Comparison of Sex of patients within groups (N=100)**

Sex	Group A		Group B		Fisher test value	p-Value
	N	%	N	%		
Male	27	54%	28	56%	0.843	$p>0.05$
Female	23	46%	22	44%		
<b>Total</b>	<b>50</b>	<b>100%</b>	<b>50</b>	<b>100%</b>		

**Table 3: Distribution of patients according to ASA Grading (N=100)**

ASA Grading	Group A		Group B		p-Value
	N	%	N	%	
I	33	66%	35	70%	$p>0.05$
II	17	34%	15	30%	
<b>Total</b>	<b>50</b>	<b>100%</b>	<b>50</b>	<b>100%</b>	

**Table 4: Comparison of Surgical procedures done on patients within groups (N=100)**

Surgical Procedure	Group A		Group B		Chi-Square value	p-Value
	N	%	N	%		
Appendectomy	15	30%	14	28%	0.164	$p>0.05$
Inguinal Hernia Repair	15	30%	14	28%		
Abdominal Hysterectomy	10	20%	11	22%		
IT Fracture	10	20%	11	22%		
<b>Total</b>	<b>50</b>	<b>100%</b>	<b>50</b>	<b>100%</b>		

**Table 5: Duration of Surgery in both Groups (N=100)**

	Group A		Group B		Unpaired t test	p-value
	Mean	SD	Mean	SD		
<b>Duration of surgery(mins)</b>	54.32	1.78	54.98	2.26	1.622	0.11

## DISCUSSION

Pain is perhaps the most feared symptom of disease, which man is always trying to alleviate and conquer since ages. Since the first use of spinal anesthesia in the late 19 century, it has emerged as a safer, more economical and highly convenient method of anesthesia as compared to other regional counterpart. Bupivacaine 0.5% has emerged with a monopoly in the field of drugs used for spinal anesthesia, since the discontinuation of lidocaine intrathecally. The relief of pain has been the fundamental aspect of the practice of anaesthesiology and remains one of the most important and pressing responsibilities of the anaesthesiologist. In the present study the mean age and weight was 44.16 (SD 14.72), 70.88 (SD6.52) in group A and 45.88 (SD 10.73), 68.28 (SD 8.99) in group B respectively and it was comparable in both the groups. No statistical difference was found by applying unpaired t test ( $p>0.05$ ). Similarly, the duration of surgery (hours) in both the groups were comparable. The results obtained were comparable with the study conducted by

Yoganarasimha N *et al.*, [9], Group A had 27 (54%) male patients and 23 (46%) female patients whereas Group B had 28 (56%) male patients and 22 (44%) female patients. Group A had 33 patients (66%) with Class I grading and 17 (34%) patients with Class II grading, whereas Group B had 35 (70%) patients with Class I grading and 15 (30%) patients with Class II grading. The gender distribution and ASA Grading of the patients between two groups were comparable and statistically not significant. 30% patients each in Group A underwent Appendectomy and Inguinal Hernia Repair procedure while 20% patients each underwent Abdominal Hysterectomy and IT Fracture procedure. 28% patients each in Group B underwent. The comparison of surgical procedure in the two groups as per Chi- Square test were comparable and statistically not significant ( $p>0.05$ ). Group A showed early onset of sensory block ( $98.70\pm7.44$  secs) compared to Group B ( $160.24 \pm 9.01$  secs) and this difference was statistically significant ( $p< 0.05$ ). The spread of sensory block was similar in both groups. Similarly In a comparative study

done by Yoganarasimha N *et al.*, [9], the group that received neostigmine and bupivacaine showed early onset of sensory block compared to the group that received intrathecal clonidine and bupivacaine. The cephalad spread of sensory block was similar in both groups. Yoganarasimha N *et al.*, [9], conducted a prospective randomized experimental study observed that addition of 50 µg neostigmine significantly enhanced the onset of sensory block and motor block as compared to clonidine. Neostigmine group showed well maintained haemodynamics. The both group that received intrathecal clonidine and bupivacaine had prolonged analgesia (362 ± 36 mins) compared to the group that received neostigmine and bupivacaine (300 ± 25 mins) (P < 0.05) with no serious adverse effects noted perioperatively in either group. Shah JR *et al.*, [10], in a comparative study observed that addition of intrathecal fentanyl to bupivacaine was more advantageous than bupivacaine with normal saline with special regard to its analgesic properties among surgical patients. Neostigmine increase the time of first rescue analgesia as supported by Lauretti *et al.*, [11], and Shakya *et al.*, [12] in their study. Incidence of hypotension and bradycardia was less with neostigmine than Fentanyl and patients were more hemodynamically stable as reported by Carp *et al.*, [13], Pan and Mok [14] and Shakya *et al.*, [12] in their study. Time to reach maximal level of sensory block, peak level and development of complete motor block was not influenced by use of intrathecal Neostigmine, as demonstrated by Lauretti *et al.*, [11] in patient undergoing vaginal hysterectomy and Almeida *et al.*, [15].

## CONCLUSION

The present study concluded that when intrathecal neostigmine 50 mcg was added to 0.5% hyperbaric bupivacaine there was significantly early onset of sensory block and longer duration of motor blockade. The mean time required to attain maximum motor block was also significantly lesser.

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