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Spinal Anaesthesia for Simple Urological Cases: A Comparative Study of 0.5% Hyperbaric Bupivacaine and 4% Lignocaine

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Abstract **Original Research Article**

Background: Regional Anesthesia especially central neuroaxial blockade is preferred over General anesthesia, particularly in surgical procedures involving the lower abdomen and lower limbs. The primary factors behind the widespread use of Spinal Anesthesia are its affordability, ease of application, potent analgesia, sufficient muscular relaxation, minimal blood loss, and minimal metabolic changes. ***Objective:*** The study was made to evaluate the effect between 0.5% hyperbaric Bupivacaine and 4% Lignocaine in spinal anaesthesia for different simple urological cases like Urethrocystoscopy, OIU, URS, URS ICPL for lower ureteric stone, TURP etc. to see the level of sensory and motor block, effect of two drugs in haemodynamic status like blood pressure, heart rate and other complication like nausea, vomiting, shivering and duration of anaesthesia and pain level between two groups. ***Method:*** This experimental study was conducted at a urological center of Dhaka city from January 2020 to January 2021, from where written informed consent was taken from 50 patients to obtain this study. ***Result:*** The patients selected for this study was divided into two groups. Group "A" got 2 ml of hyperbaric Bupivacaine (0.5%) (10 mg) and group "B" got 2 ml of Lignocaine (4%) (80 mg). The number of patients in each group was 25. The spinal anaesthesia was given at the level of L2 to L3 and L3 to L4 level. 28% of the patients from both of the groups felt pain when the timing of the operation was more than one hour and when they required water pressure for operative purposes. It was seen that hypotension, bradycardia and shivering was more common in group "A" rather than group "B". Sensory and motor blocks were almost similar in both groups. ***Conclusion:*** Patients were not preloaded before anaesthesia which is very common in spinal anaesthesia. Ephedrine HCL was needed to at least 20% of the patients of group "A" and 10% of the patients in group "B". Inj. pethidine was needed more commonly in group "A". For more details, result further evaluation needed for better outcome.

Keywords: Spinal anaesthesia, urology, bupivacaine, lignocaine.

INTRODUCTION

Regional Anesthesia (Spinal Anesthesia and Peripheral nerve block)is preferred over general anesthesia, particularly in surgical procedures involving the lower abdomen and lower limbs, ever since Dr. August Bier first documented the intrathecal infusion of cocaine in 1898 [1]. The primary factors behind the widespread use of spinal anesthetia are its affordability, ease of application, potent analgesia, sufficient muscular relaxation, minimal blood loss, and minimal metabolic changes [2-4]. It does, however, have significant negative side effects, such as severe hypotension, respiratory distress, nausea, vomiting, and a delayed recovery from motor block. One of the most popular local anesthetic agents for spinal anesthesia in urological surgery is Bupivacaine. It causes well-known dose-dependent long-lasting analgesia and anesthesia, which are linked to postoperative urinary retention and delayed motor function recovery. As a result, numerous studies have looked for a minimally effective dose with fast-track protocols and non- compromising anesthesia safety. As a result, 0.5% hyperbaric Bupivacaine has become a popular anesthetic for spinal anesthesia [7-9].

However, the high dose of intrathecal Bupivacaine can result in a significant level of sensory and motor blockade with haemodynamic instability, delayed recovery and ultimately postponing discharge for day case surgery [10–12]. In order to prevent these negative effects, spinal anesthesia for inguinal herniorrhaphy commonly combines a modest dose of bupivacaine with an additional intrathecal fentanyl [13, 14]. Combining these two causes a synergistic effect that lengthens the sensory block's duration without causing increased sympathetic block or delaying recovery [15]. The fast-track protocol requirements could not be met since even smaller dosages of bupivacaine weren't always linked to a significant improvement in the course of events [16]. Although Lignocaine seems to be the perfect drug for spinal anesthesia for day case surgery due to its quick onset, short hospital stay, and low level of side effects. The purpose of the study was to compare the effects of 0.5% hyperbaric bupivacaine and 4% lignocaine on spinal anesthesia in various simple urological procedures like urethrocystoscopy, OIU, URS, URS ICPL for lower ureteric stone removal, and TURP. It also examined the degree of sensory and motor block, the effectiveness of the two drugs on hemodynamic status, including blood pressure and heart rate, complications like nausea and vomiting.

Objective of the Study

The study was made to evaluate the effect of 0.5% hyperbaric bupivacaine and 4% lignocaine in spinal anaesthesia, in different simple urological cases like urethrocystoscopy, OIU, URS, URS ICPL for lower ureteric stone & TURP etc. to see the level of sensory and motor block, effectiveness of two drugs in haemodynamic status like blood pressure, heart rate, complication like nausea, vomiting, shivering and duration of anaesthesia between two groups.

Materials and Methodology

This experimental study was conducted at a urological center of Dhaka city from January 2020 to January 2021, from where written informed consent was taken from 50 patients to obtain this study. The patients selected for this study was divided into two groups. Group "A" got 2 ml of hyperbaric bupivacaine (0.5%) (10 mg) and group "B" got 2 ml of lignocaine (4%) (80 mg). The number of patients in each group was 25. The level of spinal anaesthesia was given in L2 to L3 and L3 to L4 level. Blood pressure, oxygen saturation, heart rate, and a continuous ECG were all monitored in patients. The pinprick test is used to evaluate sensory block, which is indicated by the disappearance of acute pain. A 20- gauge hypodermic needle is used to perform the pinprick test at dermatomal levels in the midclavicular line on both sides. The ethical approval was given by the hospital's ethical review committee. For statistical analysis, SPSS version 20 was used as the statistical tool.

Table 1: Demographic and baseline characteristics of the study patients

Demographic and Baseline Characteristics	Group A	Group B
Age in years (Mean ±SD)	27.7 ± 3.29	28.2 ± 3.31
Male: Female	11:14	12:13
Weight in kg (Mean ±SD)	74.9 ± 8.45	78.3 ± 7.80
Height in cm (Mean ±SD)	1.62 ± 0.04	1.51 ± 0.03
Duration of surgery (minutes) (Mean ±SD)	44.16 ± 6.76	42.7 ± 4.24

There was no statistically significant difference between the groups in terms of their demographic traits or the length of the procedure. Both groups had attained a high enough degree of intraoperative analgesia and anesthesia and did not require more analgesics.

Table 2: Urologic distribution of the study patients

Urologic Cases	Group A		Group B	
	N	Percentage (%)	N	Percentage (%)
Urethrocystoscopy	8	32.0	9	36.0
OIU	6	24.0	5	20.0
URS	4	16.0	4	16.0
URS ICPL for lower ureteric stone	4	16.0	3	12.0
TURP	3	12.0	3	12.0

In both group, most of the patients were found in Urethrocystoscopy and OIU cases (32% and 36%). There were other urologic cases like URS, URS ICPL for lower ureteric stone and TURP in both groups.

Table 3: Level of spinal anesthesia among the study patients

Level of spinal anesthesia	Group A		Group B	
	N	Percentage (%)	N	Percentage (%)
L2-L3	10	40.0	10	40.0
L3-L4	15	60.0	15	60.0

The most frequent level of spinal anaesthesia among the patients of both groups was L3-L4 and L2-L3 was given in rest of the cases.

Table 4: Characteristics of sensory blocks

Characteristics of sensory blocks.	Group A	Group B	P-value
Time to onset of sensory block (min)	2 ± 0.27, 2 (1 - 3)	1.46 ± 0.40, 1 (1 - 2)	
Time for the sensory block to reach T10 (min)	3.6 ± 1.47, 5 (2 - 7)	3.46 ± 1.07, 5 (2 - 7)	<0.05
Time for the sensory block to reach maximum level (min)	10.96 ± 1.97*, 12 (8 - 15)	13.16 ± 2.57 13.50 (9 - 20)	<0.04
Maximum sensory level (T dermatome)	2.56 ± 0.64* 4 (2 - 4)	2.14 ± 0.56 3 (2 - 4)	<0.05
Time to regression by two dermatomes for the sensory block (min)	70.43 ± 12.96* 73 (63 - 78)	75.16 ± 13.86 75 (65 - 80)	<0.05
Regression time to T12 for the sensory block (min)	144.50 ± 11.01* 150 (120 - 160)	161.33 ± 10.56 162.50 (145 - 185)	<0.2

Both groups' sensory block started at around the same time and took about the same amount of time to reach T10 (p > 0.05). Group A experienced a shorter duration for the sensory block to reach its maximum level and a lower maximum sensory block level (p 0.04). The sensory block's regression time to T12 and time to regression by two dermatomes were both longer in Group Lignocaine (p 0.05).

Table 5: Characteristics of motor blocks

Characteristics of motor blocks.	Group A	Group B	P-value
Time to onset of motor block (min)	3.1 ± 0.88*, 4 (2 - 6)	2.35 ± 0.61 2 (2 - 4)	<0.05
Time to maximum motor block level (min)	10.36 ± 2.35* 12 (5 - 15)	5.13 ± 1.56 6 (4 - 10)	<0.05
Regression time for the motor block (min)	98 ± 9.13* 100 (80 - 115)	131.66 ± 7.15 135 (125 - 155)	<0.05

In comparison to Group A, Group B time to motor block onset was quicker (p 0.05). Each patient in both groups experienced a complete motor block within 20 minutes. With the hyperbaric bupivacaine, motor block emerged more quickly and persisted longer (p 0.05).

Table 6: Complications among the study patients

Complication	Group A		Group B		P value
	N	Percentage (%)	N	Percentage (%)	
hypotension	8	32	9	36	<0.05
bradycardia	6	24	6	24	<0.05
Nausea	4	16	3	12	<0.05
Vomiting	2	8	3	12	<0.05
Shivering	1	4	1	4	<0.05
Pain	4	16	3	12	<0.05

It was seen that hypotension, bradycardia and shivering was more common in group "A" rather than group "B". (p < 0.05).

DISCUSSION

This study's primary goal was to assess the efficiency and safety of lignocaine and bupivacaine in straightforward urological surgical procedures. In our study, both groups had similar age in years, a similar male to female participant ratio, height, weight, and operation time in minutes. In the current investigation, the sensory block's onset and the amount of time it took to reach T10 were comparable in both groups (p > 0.05). Group A's maximum sensory block level was lower and it took less time for the sensory block to reach its maximum level (p 0.04). The sensory block's regression time to T12 and time to regression by two dermatomes took longer in Group B (p 0.05). Only 20 patients from each group were examined in a research by Punj *et al.*, [22]. They used 2 mL of 0.5% bupivacaine and 2 mL of 5% lignocaine (a total of 100 mg) (10 mg). Due to the increased volume and dose of the medication employed in their trial, the mean time for the onset of sensory block and motor block was shorter [23]. A total of 30 patients were evaluated in a study by Williams *et al.*, and they were randomly divided into two groups (3.5 mL of 2% lignocaine and 3 mL of 0.5% bupivacaine) [24]. Williams *et al.*, investigation. 's utilized greater drug dosages (70 mg lignocaine and 15 mg bupivacaine), however the onset of sensory block took longer than it did in our study [24]. This discrepancy can be related to the method used to evaluate sensory block, which involved spraying ethylene chloride [25]. In comparison to Group A, Group B's latency to motor block onset was quicker (p 0.05). Each patient in both groups experienced a complete motor block within 20 minutes. With the hyperbaric bupivacaine, motor block emerged more quickly and persisted longer (p 0.05). In contrast to our findings, Williams *et al.*, discovered that the mean duration of the sensory and motor block was longer in their investigation due to the larger medication doses employed [24]. For quick surgical procedures, spinal anesthesia with lignocaine has proven to be effective since it has a predictable onset and offers a moderately long-lasting dense sensory and motor block. The decision is supported by a track record of safe use spanning more than a few decades. Unfortunately, certain instances of neurotoxicity in the last ten years have raised concerns about the use of lignocaine for spinal anesthesia [17, 18]. Therefore, some authors advise against using it for spinal anesthesia. Transient neurologic symptoms (TNS) are a phenomenon that may be related to all local anesthetics, but they are 7-9 times more common after lignocaine than after bupivacaine [26]. It is significant to highlight that, despite almost a century of usage, spinal anesthesia is only now being acknowledged as having negative effects [27]. There are no temporary neurologic effects in the study utilizing lignocaine as spinal anesthesia [28]. Additionally, none of the participants in our study displayed any transitory neurologic symptoms. In our investigation, both groups were successful in providing 50 subjects with appropriate anesthesia for the urological surgery. Both groups reported no significant issues comparison of our work with related research [22, 24, 29].

Conclusion

For urological treatments carried out in a day care facility, spinal anaesthesia is a dependable and secure way to put a patient for surgery. According to this study, 80 mg of 4% lignocaine, as compared to 10 mg of 0.5% bupivacaine, is the preferred anesthetic for simple urological procedures. The main advantages of using 80 mg of 4% lignocaine include early motor and sensory function recovery and subsequent early discharge. As a result, the use of day care urological treatments is expanded. It also promotes day care surgery in remote areas with limited medical resources and a low demand for medical and paramedical staff. Therefore, spinal anesthesia using 80 mg of 4% lignocaine is preferred over 10 mg of 0.5% bupivacaine for simple urological procedures. This experimental study strongly recommends much more future research in this field.

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