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RESEARCH ARTICLE

The Clinical Efficacy of Hyperbaric Solution of Ropivacaine (0.5%) With Hyperbaric Bupivacaine (0.5%) in Spinal Anaesthesia

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Abstract

Spinal anaesthesia has the definitive advantage that profound nerve block can be produced in a large part of the body by the relatively simple injection of a small amount of local anaesthetic. Traditionally, bupivacaine has emerged as the most commonly used drug for spinal anesthesia. Department of Anaesthesia, Analgesia and Intensive Care Medicine, BSMMU from July 2023 to August 2024. However, since it has undesirable effects such as hypotension, bradycardia, prolonged duration of motor paralysis, cardiotoxicity and central nervous system toxicity. The present study designed to compare the clinical efficacy of hyperbaric solution of Ropivacaine (0.5%) with that of hyperbaric Bupivacaine (0.5%) in spinal anaesthesia. In present randomized double blind prospective comparative study, after approval of ethical committee, 90 patients of either sex, ASA grade I and II, aged 21-65 years scheduled for different surgical procedures on abdomen, genitourinary region and lower extremity were included in this study. The sample size was determined by power analysis. The patients were randomly allocated into two groups. An informed consent was taken. Group A - Received inj. Ropivacaine 3 ml of 0.5% hyperbaric (in glucose 8.3%) solution. Group B - Received Injection Bupivacaine 3 ml of 0.5% hyperbaric (glucose 8%) solution. Following observations were Made-Time of onset of sensory block, maximum cephalic spread (dermatome), time to maximum cephalic spread, two segment regression time (min) and total duration of sensory block. The mean time for onset of sensory block was earlier in group B as compared to group A (3.28 ± 1.78 vs 7.26 ± 2.25 minutes) thus, the difference was statistically significant (P <0.001). The mean time of maximum cephalic spread of sensory block in both groups was statistically not significant (15.96 ± 4.34 vs 17.32 ± 4.83 min. in Groups A and B) (p>0.05). Mean time of two segment regression in group B was higher than group A (66.72 ± 12.56 vs 81.4 ± 13.58 min). This difference was statistically significant (P< 0.001). The mean total duration of sensory block in group A was 133.52 ± 18.69 min. and in group B was 188 ± 52.23 min. the difference in two groups was statistically significant (P< 0.001). The mean time for onset of motor block in group A was10.32 ± 4.20 minutes and in group B was 6.28 ± 1.64 min. The difference in two groups was statistically significant (P<0.001). The mean time of total duration of motor blockade in group A and group B was 69.74 ± 50.36 and 120 ± 61.72 min. the difference in two groups was statistically significant (p<0.001). The mean duration of surgery in both groups was almost similar (62.37 ± 28.56 and 72.34 ±32.98 min in groups A and B). The difference in was statistically not significant (P>0.05).

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Nausea was seen in 2 (4.4%), patients in group A and 3 (6.6%) patients in group B (P value 0.53) and P> 0.05, this difference was statistically not significant. Vomiting was seen in 1(2.2%), patients in group A and 2 (4.4%) patients in group B i.e. vomiting was seen in more number of patients in group B than in Group A (P value 0.5572) and P > 0.05, this difference was statistically not significant. The clinical profile of the block (onset, extent, suitability for surgery, duration) produced, not the relative potencies of the two drugs. This suggest that Ropivacaine may be suitable for short procedures where a rapid return of ambulatory function is desirable, such as in the day case setting, where its recovery profile could confer a distinct clinical advantage.

Keywords: Ropivacaine, Bupivacaine, Spinal Anaesthesia, Side Effects.

1. Introduction

In this rapidly evolving and hectic world, with an increasing need for early mobilization and rapid and complete recovery with minimal side effects, local anesthesia has gained wide acceptance among anesthesiologists worldwide and offers many advantages [1]. Traditionally, bupivacaine is the most commonly used drug for spinal anesthesia. However, due to side effects such as hypotension, bradycardia, prolonged motor paralysis, cardiotoxicity, and central nervous system toxicity [2,3,4], a long-acting pure S-enantiomer of ropivacaine has been identified [5]. Spinal anesthesia has the important advantage of being able to create deep nerve blocks in most parts of the body by a relatively simple injection of a small amount of local anesthetic. However, the main challenge of this technique is to control the spread of local anesthetic through the cerebrospinal fluid (CSF) to achieve a blockade sufficient (in extent and degree) for the desired surgery without causing unnecessary excessive spread, thus increasing the risk of complications [6]. Local anesthetics are drugs that cause a temporary and reversible loss of sensation or feeling in a localized area of the body without loss of consciousness [7]. New local anesthetics have been introduced with the aim of reducing local tissue irritation, minimizing systemic, cardiac, and central nervous system toxicity, and achieving a more rapid onset of action and a longer duration of action [8]. In nonobstetric patients, several studies have shown that hyperbaric bupivacaine has a greater cranial spread than plain bupivacaine. Hyperbaric bupivacaine is distributed more widely in the subarachnoid space, which may result in a lesser degree of motor blockade compared to plain bupivacaine. Ropivacaine is a long-acting amide local anesthetic with a potentially improved safety profile compared to bupivacaine [7, 8]. Ropivacaine is less lipophilic than bupivacaine and less likely to penetrate large myelinated motor fibers, resulting in relatively reduced motor blockade. Increasing concentrations of both drugs resulted in greater and longer-lasting motor blockade. Ropivacaine had a slower onset, shorter duration, and less intense motor blockade than bupivacaine at the same concentration. Ropivacaine is a new aminoamide local anesthetic (LA) similar in chemical structure to bupivacaine but 30–40% less potent. Ropivacaine is nearly identical to bupivacaine in terms of onset, quality, and duration of sensory blockade, but has a shorter duration of motor blockade and a better safety profile [9]. However, bupivacaine is also associated with many side effects, including impaired exercise capacity, urinary retention, and cardiovascular and central nervous system toxicity. Notably, there have been reports of deaths due to bupivacaine-induced cardiac toxicity after accidental intravenous injection in adults [10]. It is approximately half as potent as Ropivacaine in spinal anesthesia when used in hyperbaric solution [11]. Hyperbaric Ropivacaine produced more predictable and reliable sensory and motor block, with faster onset than a plain solution. Plain solution of Ropivacaine is associated with a less favourable pattern of block [12]. The hyperbaric formulation allows for a relatively rapid motor block onset, with shorter duration of motor and sensory block. The isobaric formulation has a slower onset and provides a longer duration of both sensory and motor block.

2. Material and Methods

The present randomized, double blind, prospective, comparative study done in Department of Anaesthesia, Analgesia and Intensive Care Medicine, BSMMU from July 2023 to August 2024. on 90 patients of either sex, ASA grade I and II, aged 21-65 years scheduled for different elective surgical procedures on lower abdomen, genitourinary region and on lower extremity were included in this study. They were randomly divided into two groups of 45 each, after obtaining approval from the institutional ethical committee. Pre-anaesthetic evaluation was done in each patient a day before surgery. All Patients were explained about the procedure and an informed consent taken for the same.

A detailed medical history of all critical illnesses and history of previous surgeries will be collected.

Hypertensive patients who are hemodynamically stable with antihypertensive therapy and patients without IHD will be included in the study. Patients with poorly controlled hypertension, IHD, psychiatric and neurological disorders, contraindications to spinal anesthesia such as known allergies, hypersensitivity to local anesthetics, lumbar spine infections, sepsis, platelet disorders and coagulation disorders receiving anticoagulant therapy were excluded from the study.

Routine tests such as hemoglobin percentage, urine tests for sugar and albumin will be performed on each patient. Patients will be randomly divided into two groups. In groups A and B, randomization was performed by taking random batches from sealed bags. All patients were blinded to the spinal medication administered. According to randomization, the amount to be injected during the spinal block was prepared in a syringe labeled with only the patient's serial number. The residents who observed the patients during surgery and in the recovery room were blinded to the medication administered.

Good venous access was ensured using an intravenous cannula on the table, and preloading was performed with 20 ml lactated Ringer's solution per kg of body weight. A monitor such as Multipara was connected to record baseline pulse rate, blood pressure, respiratory rate, and oxygen saturation. All patients were pretreated with ranitidine injection 1 mg/kg IV, ondansetron injection 0.08 mg/kg IV, and midazolam injection 0.02 mg/kg IV. All aseptic precautions were observed and lumbar punctures were performed in the L3-L4 or L4-L5 space using a 23-gauge Quincke spinal cannula. After achieving a free, clear, continuous flow of cerebrospinal fluid, drugs were administered intrathecally as follows:

Group A: received an injection of 3 ml of ropivacaine 0.5% hyperbaric (in 8.3% glucose) solution. Ropivacaine solution was prepared aseptically immediately prior to injection (by adding 2 ml of 0.75% ropivacaine and 1 ml of glucose 25%).

Group B: received an injection of 3 ml 0.5% hyperbaric (glucose 8%) solution of bupivacaine. Hyperbaric bupivacaine solution was commercially available. Patients were immediately placed in a supine position and sensory pain was measured with needle insertions every 2 minutes for up to 30 minutes.

After anesthesia was strong enough, the surgeon was allowed to operate. The start time of the operation was recorded. During the operation, pulse rate, systolic and diastolic blood pressure, respiratory rate, and oxygen saturation were monitored using a multiparameter monitor at induction and 2, 5, 10, 15, 20, 25, 30, 45, and 60 minutes later. Any hypotension (>30 μL from basal blood pressure) was treated with an intravenous injection of 7.5 mg mephentermine and lactated Ringer's solution. Bradycardia (pulse rate <60 beats/min) was treated with an intravenous injection of 0.6 mg atropine. All patients received adequate intravenous fluids. Other side effects, such as nausea, vomiting, pruritus, somnolence, and respiratory depression, were also recorded if they occurred. The time of completion of the procedure was recorded and the duration of the procedure was calculated. An unseen individual from both groups observed the patients in the recovery room. In the recovery room, pulse rate, blood pressure, respiratory rate, and SPO2 were monitored using a multiparameter monitor on arrival and at 15, 30, 45, and 60 minutes later. The time to regression below L1 and the duration of motor blockade (Bromage scale to 0) were recorded. The total duration of sensory and motor blockade was defined as the interval from intrathecal administration to the point at which sensory blockade was fully restored or the Bromage score returned to zero. Patients were transferred to the ward with written instructions to avoid the use of analgesics or sedatives postoperatively unless the patient complained of moderate pain and to record the time of first voiding. Patients were monitored for side effects such as nausea, vomiting, pruritus, hypotension, bradycardia, somnolence, and respiratory depression (respiratory rate <10 breaths/min).

2.1 Statistical Analysis

For quantitative data of both groups, mean and standard deviation were calculated. To find out the significant difference between two groups Z- test was used. For qualitative data, Chi square test was used. A difference with significant level < 0.05 was considered statistically significant and p<0.001 as highly significant.

3. Results

Total 90 patients included in our study. The groups were comparable concerning age, weight, BMI, and ASA status (Table 1). Patients of both sexes were included in the study. In group A, 66.6% of the patients were male while only 33.4% patients were females. In group B, 71.1% of the patients were male while 28.9% patients were females. All patients were in the age group of 21 – 65 years. The mean age of patient's in group A was 47.5 ±15.55 years and in group B was 43.82 ± 15.35 years. The numbers of male patients were more since the conditions for which the operations done were common in male than in female. Thus, the difference was statistically not significant (P> 0.05).

Table1. *Comparison of demographic data between the two groups*

Parameters	Group A Mean ± SD	Group B Mean ± SD	P value
Age (years)	47.5 ±15.55	43.82 ± 15.35	0.81
Weight (kg)±SD	66.86±10.80	67.64±12.26 0.79*	0.79*
BMI (kg/cm2)±SD	27.48±8.68	27.07±9.02	0.85*
ASA score (I/II)	15/30	14/31	0.78
Surgery duration(min)±SD	50.12±10.72	49.14±14.83	0.77*

Table 2. *Onset and duration of sensory and motor block with time to first rescue analgesic*

Parameters	Group A	Group B	P value
	Mean ± SD	Mean ± SD	
Onset of sensory block (min)	7.26 ± 2.25	3.28 ± 1.78	0.0000
Mean time to maximum cephalic spread (min)	15.96 ± 4.34	17.32 ± 4.83	0.29
Two segment regression time (min)	66.72 ± 12.56	81.54 ± 13.58	0.0000
Total duration of sensory block (min)	133.52 ± 18.69	188 ± 52.23	0.0000
Mean time of onset of motorblock (min)	10.32 ± 4.20	6.28 ± 1.64	0.0000
Total duration of motor block (min)	69.74 ± 50.36	120 ± 61.72	0.0000
Average duration of surgery (min)	62.37 ± 28.56	72.34 ± 32.98	0.98

The mean time for onset of sensory block was found to be 7.26 ± 2.25 minutes in group A while 3.28 ± 1.78 minutes in group B. The onset of sensory block was earlier in group B as compared to Group A (P 0.0000). Thus, the difference was statistically significant (P <0.001). Mean time of two segment regression in group A was 66.72 ± 12.56 min and in group B was 81.4 ± 13.58 minutes. Duration of regression was more rapid in Group A than in group B. (P value 0.000). The mean time total duration of sensory block in group A was 133.52 ± 18.69 minutes and in group B was 188 ± 52.23 minutes. The onset of motor block was delayed in group A than in group B. The mean time of total duration of motor blockade in group A was 69.74 ± 50.36 minutes and in group B was 120 ± 61.72 minutes. The total duration of motor block was shorter in Group A than in group B while the p value was 0.0000. Thus, the difference in two groups was statistically significant (P<0.001). The mean time of maximum cephalic spread of sensory block in group A was 15.96 ± 4.34 minutes and in group B was 17.32 ± 4.83 minutes. Time required to reach maximum dermatome level was earlier in group A than in group B, as it blocks one dermatome level below than group B. (P value 0.29) (P >0.05). The mean duration of surgery in patients in group A was 62.37 ± 28.56 minutes and in group B was 72.34 ± 32.98 minutes while the p value was 0.98. The difference in two groups was statistically not significant (P>0.05).

Table 3. *Pulse Rate*

Pulse Rate	Group A	Group B	P value
	Mean ± SD	Mean ± SD	
Baseline	72.58 ± 8.62	74.36 ± 8.85	0.809
2 Min	79 ± 9.59	82.28 ± 9.84	0.836
5 Min	75.92 ±10.89	76.96 ± 8.75	0.61
10 Min	73.92 ± 11.11	71.76 ± 11.45	0.421
15 Min	72.56 ± 11.84	72.68 ± 8.84	0.65
20 Min	72.16 ± 9.66	71.56 ± 9.34	<0.001
25 min	73.16 ± 9.41	70.76 ± 8.60	0.001
30 Min	73.28 ± 9.03	70.92 ± 8.08	<0.001
45 Min	73.8 ± 8.52	71.72 ± 7.76	0.001
60 Min	74.96 ± 8.35	72.24 ± 7.85	<0.001

Intraoperative and postoperative mean pulse rate changes in both groups at various intervals. Mean pulse rate of patients in group A at induction was 72.58 ± 8.62 beats/minute and in group B was 74.36 ± 8.85 beats/minute which was comparable in both groups. At 2 Min it was 79 ± 9.59 and 82.28 ± 9.84; at

5 Min 75.92 ±10.89 and 76.96 ± 8.75; at 10 Min 73.92 ± 11.11 and 71.76 ± 11.45; at 15 Min 72.56 ± 11.84 and 72.68 ± 8.84; at 20 Min 72.16 ± 9.66 and 71.56 ± 9.34; at 25 min 73.16 ± 9.41 and 70.76 ± 8.60; at 30 Min 73.28 ± 9.03 and 70.92 ± 8.08; at 45 Min 73.8 ± 8.52 and 71.72 ± 7.76; at 60 Min 74.96 ± 8.35 and 72.24 ± 7.85 respectively in groups A and B.

Table 4. *Recovery Room*

Recovery Room	Group A	Group B	P value
	Mean ± SD	Mean ± SD	
Baseline	122 ± 10.7	114.04 ± 10.89	0.0684
2 Min	78 ± 7.07	73.58 ± 7.73 2	0.0283
15 Min	75.88 ± 7.05	74.96 ± 7.71	0.0459
30 Min	77.04 ± 6.92	77.24 ± 7.29	0.0326
45 Min	77.88 ± 7.28	78.88 ± 7.15	0.0136
60 Min	79.92 ± 7.74	78. 62 ± 13.12	0.0157

An at induction was 122 ± 10.7 mmHg and in group B was 114.04 ± 10.89 mmHg which was comparable in both groups. When patients were transferred to recovery room, the pulse rate changes were 78 ± 7.07 and 73.58 ± 7.73 2 min; at 15 Min 75.88 ± 7.05 and 74.96 ± 7.71; at 30 Min 77.04 ± 6.92 and 77.24 ± 7.29; at 45 Min 77.88 ± 7.28 and 78.88 ± 7.15 and at 60 Min 79.92 ± 7.74 and 78. 62 ± 13.12 0.5485 respectively in groups A and B. It is clear from above that after spinal anaesthesia mean pulse rate is decreased from 5 minutes onwards in both groups. It is found that there were no falls in pulse rate in postoperative periods in recovery room.

Table 5. *Systolic blood pressure*

Systolic blood pressure	Group A	Group B	P value
	Mean ± SD	Mean ± SD	
Baseline	116.28 ± 9.42	119.2 ± 9.96	0.0486
2 Min	118.84 ± 9.68	120.6 ± 8.56	0.0285
15 Min	108.22 ± 6.72	112.32 ± 9.68	0.0141
30 Min	115.28 ± 12.32	111.38 ± 12.27	0.0289
45 Min	119.65 ± 12.67	116.38 ± 11.38	0.0028
60 Min	123.42 ± 9.93	121.48 ± 11.02	0.0024

Mean systolic blood pressure of patients in groups A at induction was 116.28 ± 9.42 mmHg and in group B was 119.2 ± 9.96 mmHg which was comparable in both groups. After spinal anesthesia mean systolic blood pressure of patients in groups A and in group B intraoperatively was 118.84 ± 9.68 mmHg and 120.6 ± 8.56 mmHg at 2 minutes, 108.22 ± 6.72 mmHg and 112.32 ± 9.68 mmHg at 15 min, 115.28 ± 12.32 mmHg and 111.38 ± 12.27 mmHg at 30 minutes, 119.65 ± 12.67 mmHg and 116.38 ± 11.38 mmHg at 45 minutes, 123.42 ± 9.93 mmHg and 121.48 ± 11.02 mmHg at RR 60 minutes, 128.16 ± 9.58 mmHg. This difference in two groups was statistically not significant (P>0.05).

Table 6. *Diastolic blood pressure*

Diastolic blood pressure	Group A	Group B	P value
	Mean ± SD	Mean ± SD	
Baseline	70.89± 15.03	77.54± 14.04	0.0597
After 5 min	58.86± 14.08	66.09± 12.09	0.0243
After 10 min	56.89± 11.99	64.06± 10.72	0.0103
After 15 min	55.00± 11.10	62.51± 9.58	0.0034
After 20 min	54.46± 12.34	63.37± 10.56	0.0018
After 25 min	55.14± 12.30	63.80± 10.73	0.0025
After 30 min	56.86± 13.52	63.20± 10.25	0.0304

At all study intervals DBP was significantly low in group B ($p<0.05$) as compared to group R. But the change in DBP from baseline was not significant ($p>0.05$).

An at induction was 70.89± 15.03 mmHg and in group B was 77.54± 14.04 mmHg which was comparable in both groups. After diastolic blood pressure of patients in groups A and in group B intraoperatively was 58.86± 14.08 mmHg 66.09± 12.09 mmHg After 5 min, 56.89± 11.99 mmHg and 64.06± 10.72mmHg After 10 min, 55.00± 11.10 mmHg and 62.51± 9.58 mmHg After 15 min, 54.46± 12.34 mmHg and 63.37± 10.56 mmHg After 20 min, 55.14± 12.30 mmHg and 63.80± 10.73 mmHg After 25 min, 56.86± 13.52 mmHg and 63.20± 10.25 mmHg After 30 min.

Table 7. *Shows comparison of side effects in both groups*

Side effects	Group A	Group B	P value
Nausea	02	03	0.53
Vomiting	01	02	0.56
Hypotension	05	07	0.023
Bradycardia	02	03	0.75
No side effects	35	30	0.024

Nausea was seen in 2 (4.4%), patients in group A and 3 (6.6%) patients in group B (P value 0.53) and P > 0.05, this difference was statistically not significant. Vomiting was seen in 1(2.2%), patients in group A and 2 (4.4%) patients in group B i.e. vomiting was seen in more number of patients in group B than in Group A (P value 0.5572) and P > 0.05, this difference was statistically not significant.

4. Discussion

Bupivacaine is long acting local anaesthetic agent of choice for lower limb and lower abdominal surgeries. It binds strongly to cardiac sodium channels leading to a prolonged inhibition of normal conduction. Animal's studies [12] have proved that accidental intravascular bupivacaine results in arrhythmias, cardiac depression and cardiac arrest. Ropivacaine is one of a group of local anaesthetic drugs, the pipecoloxylidides. Mepivacaine and bupivacaine both are well known members of this group. Ropivacaine produces a greater degree of differential block at low concentration and a property of producing frequency dependent block, offers considerable clinical advantage in providing analgesia with minimum motor blockade [13]. The reason for introducing Ropivacaine was the need for a long acting local anaesthetic that is less cardio toxic than Bupivacaine [14]. Looking at this property, in the past year Ropivacaine has been one of the most studied drug, used in ambulatory spinal anesthesia, but Ropivacaine has not offered clear advantage over Bupivacaine about reliability, side effects or faster recovery [15]. However, Total 90 patients included in our study. The groups were comparable concerning age, weight, BMI, and ASA status. Patients of both sexes were included in the study. In group A, 66.6% of the patients were male while only 33.4% patients were females. In group B, 71.1% of the patients were male while 28.9% patients were females. All patients were in the age group of 21 – 65 years. The mean age of patient's in group A was 47.5 ±15.55 years and in group B was 43.82 ± 15.35 years. The numbers of male patients were more since the conditions for which the operations done were common in male than in female. Thus, the difference was statistically not significant (P> 0.05). In present study, the mean time taken for onset of sensory block in Group A was 7.26 ± 2.25 minutes and in group B was 3.28 ± 1.78 minutes. Thus, the difference is statistically significant (P<0.001). Gautier et al [11] who studied intrathecal Ropivacaine for ambulatory surgery and compare plain solutions of Ropivacaine with Bupivacaine. These all might be reason for late onset in group A. Kallio et al [16] who compared plain Ropivacaine15 mg and 20 mg versus Bupivacaine 10 mg, found that median onset of analgesia to T10, was 10 minutes in all groups. They use different doses, different concentrations i.e. 1%, 0.75% and 0.5% and smaller volume (2 ml) of both drugs in their study. In addition, sample size is smaller in their study. All these might be reason for similar onset in all groups. However, in present study we used equal volume, same dose, and similar concentration in both groups. In present study, sample size is larger so results have more accuracy. Fettes et al [10] confirmed in their study that a hyperbaric solution of Ropivacaine produces a more consistent block than a plain one. Reason is addition of glucose lead to a more rapid onset. (10 minutes versus 5 minutes). However, the result of present study is in accordance with the study done by Chung et al [5] who used hyperbaric Ropivacaine 0.5% 18 mg and hyperbaric Bupivacaine 0.5%, 12 mg and found that Onset time of sensory block to T10 was 3.2 ± 1.2 minutes in the Ropivacaine group and 2.5 ± 1.0 minutes in Bupivacaine group. Present study showed that equal doses of hyperbaric Bupivacaine and

hyperbaric Ropivacaine showed no significant difference in regards to mean height of sensory block (T5 in Bupivacaine group and T6 in Ropivacaine group). Whiteside et al, [17] who found that the time to maximum extent of cephalic spread was similar in both groups [Ropivacaine 20 minutes (10 – 30 minutes), Bupivacaine - 20 minutes (5 – 30 minutes)]. The present study is in accordance with the studies done by J.F.Luck et al.[18] who found, the time to maximum cephalic spread were in all groups [Bupivacaine 25 minutes (10 – 30 minutes), and Ropivacaine 20 minutes (2 - 30 minutes)],but statistically not significant. The present study showed results in accordance with the study of Chung et al. [5], found that time to peak level were later in the Ropivacaine group. Present study shows results in accordance with the studies done by Gautier et al [11], who compared equal doses of Ropivacaine 8 mg (4 ml of 0.2%) and Bupivacaine 8 mg (4 ml of 0.2%). The extent of sensory block was similar in both groups (T8). The exact dermatome level is higher in present study as volume of drugs, dose of drugs used are different and hyperbaric solutions were used. The major effect of adding glucose is to reduce the incidence of very limited blocks or producing blocks that are more extensive. Mean time of two segment regression in group A was 66.72 ± 12.56 minutes and in group B was 81.4 ± 13.58 minutes. Duration of regression was more rapid in Group A than in group B (P value 0.000). This difference was statistically significant (P < 0.001). The results of present study are in coincides with the studies done by Whiteside et al [17] who found that mean duration of sensory block at T10 was shorter in Ropivacaine group (Ropivacaine 56.5 (28 - 145) minutes; Bupivacaine 118 (80 - 238) minutes; p=0.001). McNamee et al [19] comparing plain Ropivacaine 5 mg /ml with Bupivacaine 5 mg/ml for major orthopedic surgery found that the median duration of sensory block at the T10 dermatome was 3 hours (range 1.5 - 4.6 hours) in Group A and 3.5 hours (2.7 - 5.2 hours) in Group B (P<0.0001). The results of present study are in accordance with the study done by Gautier et al [11] who found that when equal doses of Ropivacaine 8 mg (4ml of 0.2%) and Bupivacaine 8 mg (4ml of 0.2%) were compared, the duration of sensory block produced was lesser with Ropivacaine (130 minutes versus 181minutes). The result coincides with the study done by Chung et al [5]; they found that the duration of sensory block was shorter in Ropivacaine group (162 minutes versus 188 minutes). Present study results were also comparable with Kallio et al [16] in regards to degree of motor block (75% developed grade III block), and median full motor recovery (120 minutes), after spinal anaesthesia with 15 mg hyperbaric Ropivacaine. Fettes et al [10] found similar results in regards with degree of motor block, in group of hyperbaric Ropivacaine (72.5% developed grade III block). The mean time of total duration of motor blockade in Group A was 69.74 ± 50.36 minutes and in group B was 120 ± 61.72 minutes which was comparable in both groups. As regards to the duration of motor block, the results of our study are in accordance with the studies done by McDonald et al [20], they found that equal doses of drugs produced motor block, which regressed faster with hyperbaric Ropivacaine (104 minutes versus 143 minutes). Also our results coincides with the study of Chung et al [5], they found that the duration of motor block was shorter in hyperbaric Ropivacaine group (113 versus 158 minutes). In present study, the mean duration of surgery in patients in Group A was 62.37 ± 28.56 minutes and in group B was 72.34 ± 32.98 minutes. This difference in two groups was statistically not significant (P>0.05). Mean pulse rate of patients in group A at induction was 72.58 ± 8.62 beats/minute and in group B was74.36 ± 8.85 beats/minute which was comparable in both groups. This difference in two groups was statistically not significant when compared in intraoperative and postoperative period (P>0.05). In Ropivacaine group, out of 50 patients, only 6 patients developed significant lowering of systolic blood pressure and only 2 patients developed significant bradycardia. In Bupivacaine group, out of 50 patients, 15 patients developed significant lowering of systolic blood pressure and 4 patients developed bradycardia. Mean systolic blood pressure of patients in groups A at induction was 116.28 ± 9.42 mmHg and in group B was 119.2 ± 9.96 mmHg which was comparable in both groups. After spinal anesthesia mean systolic blood pressure of patients in groups A and in group B intraoperatively was 118.84 ± 9.68 mmHg and 120.6 ± 8.56 mmHg at 2 minutes, 108.22 ±6.72 mmHg and 112.32 ± 9.68 mmHg at 15 min, 115.28 ± 12.32 mmHg and 111.38 ± 12.27mmHg at 30 minutes, 119.65 ± 12.67 mmHg and 116.38 ± 11.38 mmHg at 45 minutes, 123.42 ± 9.93 mmHg and 121.48± 11.02 mmHg at 60 minutes. This difference in two groups was statistically not significant (P>0.05). When patients were transferred to recovery room, the mean systolic blood pressure was 122 ± 10.7 and 114.04 ± 10.89 mmHg, at 15 minutes, 124.36 ±10.25 and 117.08 ± 10.87mmHg, at 30 minutes 126.56 ± 9.90 and 120.64 ± 11.07 mm of Hg at 45 minutes, 127.4 ± 9.93 and 123.38 ± 11.23 and at 60 minutes 128.16 ± 9.58 and 124.96 ± 11.13 in groups A and B

respectively. The present study results are in comparable with the studies done by Gautier et al [11] and McDonald et al [20], in which there were no significant differences in blood pressure changes. The study results done by Whiteside et al [17] in which there was hemodynamic stability in Ropivacaine group, only 15% of patients developed significant lowering of systolic blood pressure, which was comparable to present study results. Mean diastolic blood pressure of patients at induction in Group A was 75.96 ± 5.97 mm Hg and in group B was 77.8 ± 4.62 mm Hg, which was comparable in both groups. This difference in two groups was statistically significant (P<0.05). It is clear from above that after spinal anaesthesia mean diastolic blood pressure is decreased from 5 minutes onwards in both groups intraoperatively and postoperatively. Nausea was seen in 2 (4.4%), patients in group A and 3 (6.6%) patients in group B (P value 0.53) and P > 0.05, this difference was statistically not significant. Vomiting was seen in 1(2.2%), patients in group A and 2 (4.4%) patients in group B i.e. vomiting was seen in more number of patients in group B than in Group A (P value 0.5572) and P > 0.05, this difference was statistically not significant. The results coincides with the study of Chung et al [5]; they found that there is no difference in regards to side effects between both groups. In addition, the result coincides with they found that there is no postoperative neurological symptoms in the first 24 hours. They found that on the first postoperative day, 81% of the discharged patients, equally distributed among the three groups, one patient in the Bupivacaine 10 mg group complained of back pain at the puncture site. Two patients in the Ropivacaine 15 mg group complained of headache, which had ended by the evening of the day of operation. In the Ropivacaine 20 mg group, one patient complained of a slight headache, but this was managed with a non-steroidal anti- inflammatory drugs.

5. Conclusion

The key issue is the difference in the clinical profile of the block (onset, extent, suitability for surgery, duration) produced, not the relative potencies of the two drugs. This suggest that Ropivacaine may be suitable for short procedures where a rapid return of ambulatory function is desirable, such as in the day case setting, where its recovery profile could confer a distinct clinical advantage. Hyperbaric Ropivacaine shows late onset of sensory blockade, equal time to reach maximum dermatome level, early regression and shorter total duration of sensory blockade as compared to hyperbaric Bupivacaine. Both the sensory and motor blocks are also subject to a more rapid recovery with hyperbaric Ropivacaine compared with hyperbaric Bupivacaine. Patients receiving hyperbaric Ropivacaine required shorter time to first micturition as compared to Bupivacaine.

6. References

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