

Hemodynamic changes of intrathecal hyperbaric ropivacaine and bupivacaine in Lower abdominal surgeries- a comparative study

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Abstract

Introduction: Various drugs have been tried till date to get better anesthetic properties and minimal side effect. The newer drug Ropivacaine being comparatively less cardio toxic, also produces minimal motor blockade of shorter duration which relieves the psychological distress of being immobile for a longer period of time after surgery compared to intrathecal Bupivacaine during lower abdomen and lower limb surgeries. **Aims and objectives:** to compare the hemodynamic changes of intrathecal hyperbaric ropivacaine and bupivacaine in Lower abdominal surgeries. **Material and methods:** In the present study two groups were compared undergoing Lower abdominal surgeries. Group R received 3ml of 0.5 % hyperbaric ropivacaine and group B received 3ml of 0.5% hyperbaric bupivacaine. Monitoring of vitals and observation for the block parameters were carried out and was compared between these two groups. **Results:** It was observed that the mean age, weight and height of the patients in the both the groups (ropivacaine and bupivacaine) were comparable. Ropivacaine has longer onset of action compared to bupivacaine. Ropivacaine had a significant lesser degree of motor blockade compared to bupivacaine. There was no significant difference regarding haemodynamic change while comparing both the groups. **Conclusion:** Thus from the above discussion we could conclude that ropivacaine has better hemodynamic stability as compared to bupivacaine group. And it can be used more efficiently in short surgical procedures.

Key Word: hyperbaric ropivacaine, hyperbaric bupivacaine, efficacy.

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INTRODUCTION

Spinal anaesthesia was introduced into clinical practice by Karl August Bier in 1898¹. More than a century has passed and even today, it is one of the most popular techniques for both elective and

emergency surgical procedures particularly Caesarean sections, lower abdominal surgeries, orthopaedic lower limb surgeries and urological surgeries just to name a few.² Spinal anesthesia, defined, as the regional anesthesia obtained by blocking nerves in the subarachnoid space is a popular and common technique used worldwide. The advantages of an awake patient, simple to perform, rapid onset of action, minimal drug cost, minimal stress response, relatively less side effects and rapid patient turnover has made this the choice for many surgical procedures.³ Lignocaine had been the most widely used local anesthetic for spinal anesthesia because of its faster onset and shorter duration of action but it is associated with very high incidence of transient neurological symptoms⁴. Presently the most widely used drug bupivacaine 0.5% which is cardiotoxic and also

produces motor blockade of prolonged duration. Ropivacaine is a relatively new amide long acting enantiomerically pure (S enantiomer) local anaesthetic with high pka and low lipid solubility, and it is considered to block sensory nerves to greater degree than motor nerves and having similar local anaesthetic properties and chemical structure to that of bupivacaine.⁵ The newer drug Ropivacaine being comparatively less cardio toxic, also produces minimal motor blockade of shorter duration⁶ which relieves the psychological distress of being immobile for a longer period of time after surgery compared to intrathecal Bupivacaine during lower abdomen and lower limb surgeries⁷.

AIMS AND OBJECTIVES

To compare the hemodynamic changes of intrathecal hyperbaric ropivacaine and bupivacaine in Lower abdominal surgeries.

MATERIAL AND METHODS

The present study was conducted at V.M.K.V.M.C Hospital. Before starting the study ethical approval was obtained from the Medical Ethics Committee of the Vinayaka missions University and the institutional review board of department of Anesthesiology. Consent of the patients was taken in addition to hospital committee approval.

Following inclusion and exclusion criteria was used to select the study subjects.

Inclusion criteria

- Patients undergoing elective lower abdominal surgeries such as appendectomy hernioplasty, herniorrhaphy, ovariectomy, hysterectomy etc.
- ASA I and II

Exclusion criteria

RESULTS

Table 1: Characteristics of patients according to age, weight, height and ASA classification

Variable	Group R (ropivacaine)	Group B (bupivacaine)	T test	P value
Age (years)	40.32 ± 12	45.4 ± 12.7	1.45	0.1517
Weight (kg)	54 ± 10.1	56.8 ± 8.2	1.07	0.287
Height (cm)	166.8 ± 7.4	165.6 ± 8.1	0.54	0.586
ASA (I/ II)	20/5	18/7	NA	NA
Onset of sensory block	9.8 ± 1.13	9.6 ± 1	0.662	0.531
Duration of sensory block	176.4 ± 13.8	213.4 ± 10.8	10.55	< 0.001*
maximum degree of motor block	10.51±2.5	8.75±2.0	2.74	0.0084*
Total duration of motor block	126 ± 17.5	195.2±37.7	8.324	<0.001*

It was observed that characteristics of patients’ age, weight, height and ASA classification showed no statistically significant differences between ropivacaine and bupivacaine group. (P > 0.05) Ropivacaine has longer onset of action compared to bupivacaine. 9.6 ± 1 min in bupivacaine group while was 9.8 ± 1.13 min in ropivacaine

- ASA III or more.
- Patients with poor myocardial contractility, coagulopathy, back problems, spine deformity and local skin infections of site of injection
- Patients on potent antiplatelets, or on anticoagulants.
- Known allergy to the trial drugs.
- Patient refusal

By using above mentioned inclusion and exclusion criteria 50 patients were selected for the study. Informed written consent was taken from all patients before starting the study. The selected patients were divided in to two groups containing 25 patients each.

Study groups

Hyperbaric ropivacaine was prepared by adding 25% to ropivacaine 0.7% isobaric.

- **Group R:** receive 3ml of 0.5 % hyperbaric ropivacaine.
- **Group B:** receive 3ml of 0.5% hyperbaric bupivacaine.

Hyperbaric ropivacaine was prepared by adding 25% dextrose to 0.7% isobaric ropivacaine

Detail information about the patients was noted on a prestructured proforma. All the standard protocol was followed preoperative assessment and preparation of the patients.

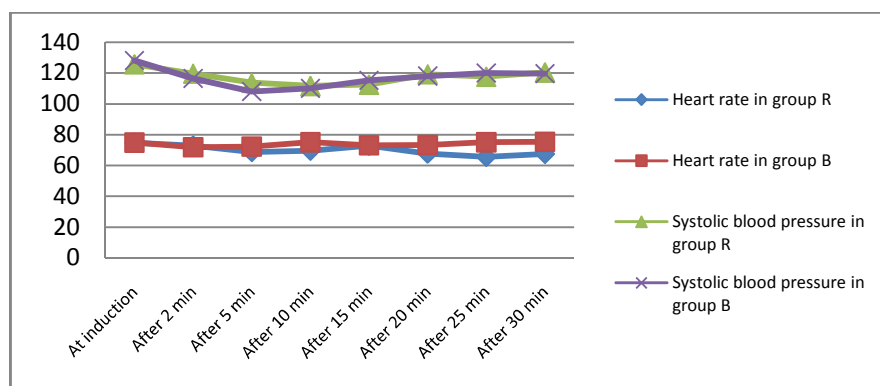
All patients of both groups were monitored for hemodynamic parameters such as heart rate and systolic arterial pressure during the surgery and during recovery period. Sensory block assessment was done by observing onset, duration and level using pinprick test. In motor block assessment total duration of motor block and time for maximum degree motor block was also noted. Post operative side effects of the drugs were also noted in the both groups. Data were collected, tabulated, coded then analyzed using SPSS computer software version 17.0.

group. Ropivacaine has a shorter duration of sensory action compared with bupivacaine it was 176 ± 13.8min for ropivacaine and 213±10.8 min for bupivacaine. Ropivacaine had a significant lesser degree of motor blockade compared to bupivacaine. And also total

duration of motor block was shorter for ropivacaine when compared with bupivacaine.

Table 2: Comparison between heart rate and systolic blood pressure between two groups during surgery

Time	Heart rate			Systolic blood pressure		
	Ropivacaine	Bupivacaine	p value	Ropivacaine	Bupivacaine	p value
At induction	74.8 ± 4.6	74.9 ± 5.3	0.433	125.6 ± 11.5	128.0 ± 12.2	0.275
After 2 min	72.9 ± 7.8	71.9 ± 8.1	0.448	119.6 ± 12.4	116.4 ± 15.7	0.426
After 5 min	68.9 ± 6.5	72.3 ± 9.4	0.354	113.6 ± 13.2	108.0 ± 14.1	0.934
After 10 min	69.6 ± 6.7	75.1 ± 6.4	0.267	111.6 ± 15.7	110.0 ± 12.6	0.413
After 15 min	72.9 ± 6.5	73.1 ± 7.0	0.308	112.4 ± 14.2	115.2 ± 11.9	0.693
After 20 min	67.8 ± 5.7	73.3 ± 9.3	0.894	119.2 ± 14.1	118.0 ± 9.1	0.663
After 25 min	65.7 ± 5.0	75.1 ± 3.8	0.984	117.6 ± 15.3	120.0 ± 8.1	0.571
After 30 min	67.5 ± 5.5	75.4 ± 4.0	0.246	120.4 ± 14.5	119.6 ± 7.9	0.489

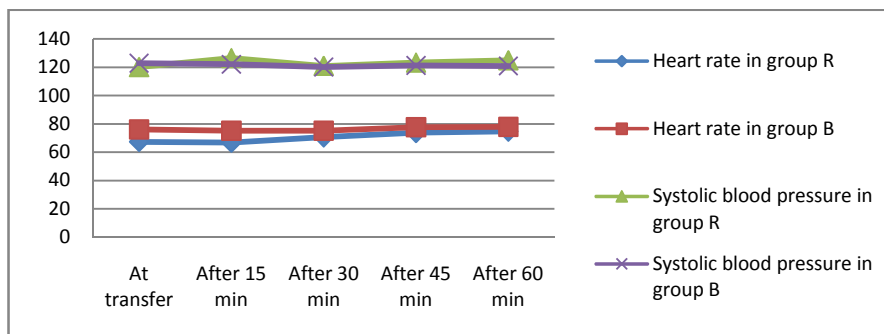


Graph 1: Comparison between heart rate and systolic blood pressure during surgery

Heart rate and systolic blood pressure was monitored at the time of induction of anesthesia and during the surgery. It was observed that there was no significant difference regarding haemodynamic change while comparing both the groups.

Table 3: Comparison between heart rate and systolic blood pressure between two groups at recovery room

Time	Heart rate			Systolic blood pressure		
	Ropivacaine	Bupivacaine	p value	Ropivacaine	Bupivacaine	p value
At transfer	67.4 ± 3.67	75.96 ± 4.18	0.123	120.0 ± 12.24	122.8 ± 9.79	0.174
After 15 min	66.9 ± 4.01	75.08 ± 5.97	0.474	126.4 ± 15.77	122.0 ± 11.5	0.262
After 30 min	70.6 ± 7.04	75.08 ± 9.09	0.073	120.8 ± 10.37	120.0 ± 10.3	0.183
After 45 min	73.7 ± 7.80	77.6 ± 5.56	0.463	123.2 ± 10.29	121.2 ± 10.9	0.669
After 60 min	74.6 ± 6.67	77.8 ± 8.71	0.589	124.8 ± 6.53	120.8 ± 9.5	0.477



Graph 2: Comparison between heart rate and systolic blood pressure recovery room

Heart rate and systolic blood pressure was monitored postoperatively in recovery room also. It was observed that there was very little difference in heart rate and

systolic blood pressure in both the groups and the difference was not statistically significant.

Table 4: Comparison between significant hypotension and significant bradycardia between the two groups

Variable		Group B	
		Ropivacaine	Bupivacaine
Significant hypotension (SBP less than 90)	During surgery	5	6
	During recovery	0	0
Significant bradycardia (HR less than 50)	During surgery	2	3
	During recovery	1	1

In ropivacaine group, out of 25 patients, only 5 patients developed significant lowering of systolic blood pressure (20%) and only 2 (8%) patients developed significant bradycardia. In bupivacaine group, out of 25 patients, only 6 (24%) patients developed significant lowering of systolic blood pressure and 3 (12%) patients developed significant bradycardia. Whereas it was observed that during the recovery period no patient developed significant hypotension whereas significant bradycardia was observed in one case in each group.

DISCUSSION

The present study was undertaken to study compare the hemodynamic changes of intrathecal hyperbaric ropivacaine and bupivacaine in lower abdominal surgeries. It was observed that the mean age, weight and height of the patients in the both the groups (ropivacaine and bupivacaine) were comparable. And no statistical significant difference was observed in these two groups. Thus the two groups were comparable with respect to Age, Weight, Height and ASA grading. It was observed that time for onset of sensory block was more in ropivacaine group as compared to bupivacaine group. Duration of sensory block was more in bupivacaine group than ropivacaine group and the difference was statistically significant. Similar finding were also reported by **Whiteside et al⁸**. The mean time to maximum degree of motor block was more in ropivacaine group (10.51±2.5 min) as compared to bupivacaine group (8.75±2.0) and the difference observed was also statistically significant. The total duration of motor block was much lower and statistically significant in ropivacaine group (126 ± 17.5) than bupivacaine group (195.2±37.7). **Brockway MS et al⁹** and **Morrison LM et al¹⁰** who also observed the similar findings in their studies. It was observed that intra operative and post operative heart rate in ropivacaine and bupivacaine group were comparable. Systolic blood pressure in both groups were also recorded and compared. During the surgery significant hypotension and significant bradycardia were found to occur more often with the Bupivacaine Group as compared to Ropivacaine Group. Six patients in Bupivacaine Group experienced hypotension as compared to five patients in Ropivacaine

Group. During recovery period no patient developed hypotension whereas one patient from each group developed significant bradycardia. The hemodynamic parameter including pulse rate, systolic blood pressure were comparable between both groups and no significant hemodynamic alteration was seen in the two groups. These finding were correlated with the study conducted by **Ogun et al¹¹** and **Mc Namee et al¹²**. The bupivacaine group had a faster onset and episodes of hypotension, nausea and vomiting were more frequent than in ropivacaine group. The maximum sensory block height was similar in both groups. In the context for elective cesarean delivery, a small increase in the speed of onset of anesthesia may not be considered clinically important. On the other hand, the faster onset and higher block probably may have resulted in the increased incidence of hypotension and nausea in hyperbaric bupivacaine. The duration of motor block is shorter in the ropivacaine group with less hemodynamic changes. A more rapid recovery from anesthesia is highly desirable for ambulatory surgery.^{13,14}

CONCLUSION

Thus from the above discussion we could conclude that ropivacaine has better hemodynamic stability as compared to bupivacaine group. And it can be used more efficiently in short surgical procedures.

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