Original Article

DOI: 10.7860/JCDR/2026/85298.24495

Anaesthesia Section

Hyperbaric Ropivacaine versus Hyperbaric Bupivacaine in Transurethral Resection of Prostate under Spinal Anaesthesia: A Double-blinded Randomised Controlled Study

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ABSTRACT

Introduction: Subarachnoid block is the preferred technique for Transurethral Resection Of Prostate (TURP). Ropivacaine has lower cardiotoxic potential and produces less intense motor blockade than racemic bupivacaine.

Aim: To compare hyperbaric ropivacaine vs hyperbaric bupivacaine in TURP under spinal anaesthesia.

Materials and Methods: This double-blinded randomised controlled study was conducted in the Department of Anaesthesiology and Critical Care, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India, from December 2022 to January 2024 on 60 adult male patients aged 18-65 years undergoing TURP under spinal anaesthesia. Patients in Group-R (n=30) received 2.2 mL (16.5 mg) of hyperbaric 0.75% ropivacaine intrathecally. Patients in Group-B (n=30) received 2.2 mL (11 mg) of hyperbaric 0.50% bupivacaine intrathecally. The following parameters were observed: total duration of sensory block, onset time of sensory block, highest sensory level attained, two-segment regression time, onset and duration of motor block and incidence of adverse events. In between group comparisons of normally distributed continuous variables were performed using the independent Student's t-test. For non normally distributed data, the Mann-Whitney U test was applied. Categorical variables were compared using the Chi-square test or Fisher's-exact test, as appropriate. A p-value <0.05 was considered statistically significant.

Results: Both groups were comparable in terms of demographic parameters. The total duration of sensory block was significantly shorter in Group-R compared to Group-B (121.40±34.62 min vs 164.50±23.03 min, p<0.001). The onset of sensory block was significantly delayed in Group-R compared to Group-B (7.36±3.83 min vs 4.60±1.67 min, p = 0.002). The total duration of motor block was significantly shorter in the ropivacaine group (139.6±25.7 min) compared to the bupivacaine group (180.7±18.1 min; p<0.001). Hypotension occurred more frequently in Group-B compared to Group-R (40.0% vs 0%; p<0.001).

Conclusion: Intrathecal administration of 2.2 mL (16.5 mg) of commercially available 0.75% hyperbaric ropivacaine provides adequate surgical anaesthesia for TURP with optimal sensory and motor blockade, while demonstrating better haemodynamic stability as compared to bupivacaine.

Keywords: Anaesthetics, Bradycardia, Haemodynamic, Hypotension, Local anaesthetic

INTRODUCTION

Subarachnoid block remains the preferred anaesthetic technique for TURP because it allows early recognition of perioperative complications such as bladder perforation and TURP syndrome, while also providing satisfactory intraoperative anaesthesia and postoperative analgesia [1]. In addition to these established advantages, an analysis by Darwish OM et al., reported that neuraxial anaesthesia was associated with a statistically significant advantage in 30-day postoperative outcomes compared with general anaesthesia in patients undergoing TURP [2].

In elderly patients undergoing TURP, spinal anaesthesia is preferred, as many of these patients have coexisting pulmonary or cardiac disease [1] and age-related physiological changes may increase vulnerability to the effects of general anaesthetic drugs [3]. TURP requires a sensory block up to the T10 dermatome [1] and the duration of surgery is usually around 60-75 minutes, making the choice of intrathecal local anaesthetic important.

Bupivacaine has long been widely used for spinal anaesthesia because of its reliable sensory block and favourable duration of action. However, it is also associated with important limitations, including prolonged motor block [4], cardiovascular and central nervous system toxicity [5]. It has also been linked with spinal anaesthesia-induced hypotension and a recent meta-analysis in non obstetric populations reported that the incidence of hypotension was significantly higher with intrathecal bupivacaine than with ropivacaine. The same meta-analysis also found that bupivacaine was associated with longer sensory and motor block durations, whereas ropivacaine provided a shorter block duration [6].

Ropivacaine, a pure S-enantiomer aminoamide local anaesthetic, was introduced as a potentially safer alternative to bupivacaine. Compared with bupivacaine, it is less cardiotoxic, produces greater differential blockade and tends to cause a less intense and shorter motor block [7]. These characteristics are clinically relevant in elderly TURP patients, in whom excessive sympathetic blockade, prolonged immobility and haemodynamic instability are undesirable. Several studies supported the use of ropivacaine as an effective intrathecal agent [8-10], although the dose comparisons used in these studies suggest that ropivacaine may be less potent than bupivacaine and may not produce equivalent effects at equal milligram doses. A 3:2 dose ratio between ropivacaine and bupivacaine has often been used in comparative studies [6].

The evidence specific to TURP remains heterogeneous. Malinovsky JM et al., compared 15 mg isobaric ropivacaine with 10 mg isobaric bupivacaine in endoscopic urological surgery and found similar

motor and haemodynamic effects, but less potent anaesthesia with ropivacaine; inadequate spinal anaesthesia occurred in 16% of patients receiving ropivacaine [11]. In contrast, Atabekoğlu S and Bozkırlı F, using a 3:2 dose ratio in geriatric transurethral resection patients, reported that intrathecal isobaric ropivacaine and bupivacaine were both well-tolerated and produced similar sensory and motor block characteristics, with lower bradycardia in the ropivacaine group [3]. More recent TURP studies using hyperbaric ropivacaine with fentanyl have reported better haemodynamic stability and shorter motor block than hyperbaric bupivacaine, again suggesting that ropivacaine may be advantageous in elderly patients [12].

Another important issue is baricity. The intrathecal spread of local anaesthetics is strongly influenced by solution density and baricity. Hyperbaric preparations generally provide more predictable cephalad spread and more reliable block characteristics than plain solutions. However, much of the earlier literature on spinal ropivacaine relied on manually prepared hyperbaric mixtures created by adding dextrose to isobaric ropivacaine, because commercially prepared heavy ropivacaine was not widely available [13-15].

Previous comparative studies in TURP have generally evaluated larger intrathecal volumes, such as 3 mL or 2.8 mL and in some studies, ropivacaine was combined with intrathecal adjuvants such as fentanyl [12,15,16]. Therefore, the block profile of a reduced-volume, standardised, commercially available hyperbaric ropivacaine preparation without dependence on adjuvants remains insufficiently defined in this setting. This constitutes the main gap in the literature. Ropivacaine has consistently shown a trend towards shorter motor block and a better haemodynamic profile [17]. However, it remains unclear whether a reduced volume of standardised hyperbaric ropivacaine can provide adequate surgical anaesthesia for TURP while potentially limiting excessive cephalad spread and haemodynamic disturbance.

Hence, the present study was undertaken to evaluate the block characteristics of a standardised commercially available hyperbaric ropivacaine preparation administered in a reduced intrathecal volume of 2.2 mL and to compare it with hyperbaric bupivacaine in patients undergoing TURP. The novelty of the present study lies in its focus on a lower intrathecal volume of a standardised commercially available heavy ropivacaine preparation in a TURP population, thereby addressing both the issue of dose-volume reduction and the limitation of earlier studies that used manually prepared hyperbaric solutions or larger intrathecal volumes.

The authors hypothesised that 2.2 mL of standardised hyperbaric ropivacaine would provide adequate anaesthesia with improved haemodynamic stability and a clinically favourable recovery profile compared with hyperbaric bupivacaine. The primary objective was to compare the total duration of the sensory block. Secondary objectives were the comparison of onset time of sensory block, highest sensory level attained, two-segment regression time, onset and duration of motor block and incidence of adverse events such as hypotension and bradycardia.

MATERIALS AND METHODS

This double-blinded randomised controlled study was conducted in the Department of Anaesthesiology and Critical Care, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, from December 2022 to January 2024. The Institutional Ethics Committee approval was taken (EC/NEW/INST/2022/HR/0189). The study was registered with Clinical Trial Registry of India (CTRI/2023/08/056816). Written informed consent was taken from all participants before inclusion in the study. The research was carried out in accordance with the ethical principles outlined in the Declaration of Helsinki and was reported in compliance with the Consolidated Standards of Reporting Trials (CONSORT) guidelines.

Sample size calculation: The sample size was estimated using data from the study by Kulkarni KR et al., which reported the mean duration of sensory block as 155.24±60 minutes with ropivacaine and 190.5±80 minutes with bupivacaine [18]. Based on these findings, a mean difference of 35.5 minutes with a pooled Standard Deviation (SD) of 45 minutes was assumed. Using 95% confidence level, 80% power and an alpha error of 0.05, the minimum required sample size was calculated to be 25 patients per group using the following formulae.

Comparison of two mean formula:

N=Size per group;

SD=Standard Deviation= 45

Mean difference=190.5-155=35.5

$Z_{\alpha/2}=Z_{0.05/2}$=Z0.025=1.96-From Z table at type I error of 5

$Z_{\beta}=Z_{0.20}$=0.84 - at 80% power

$$N = \frac{2\left(Z_{\frac{\alpha}{2}} + Z_{\beta}\right)^2}{(\delta_0)^2} \times SD^2$$

$$N = \frac{2\,(1.96 + 0.84)^2 \times (45)^2}{(35.5)^2}$$

$$N = \frac{15.68 \times 2025}{1260.25} = 25.19 = 25$$

To account for potential dropouts or protocol deviations, the sample size was increased and 30 patients were finally included in each group.

Inclusion criteria: Adult male patients aged 18-65 years, belonging to American Society of Anaesthesiologists (ASA) physical status I–III, scheduled to undergo transurethral resection of the prostate under spinal anaesthesia were enrolled in the study.

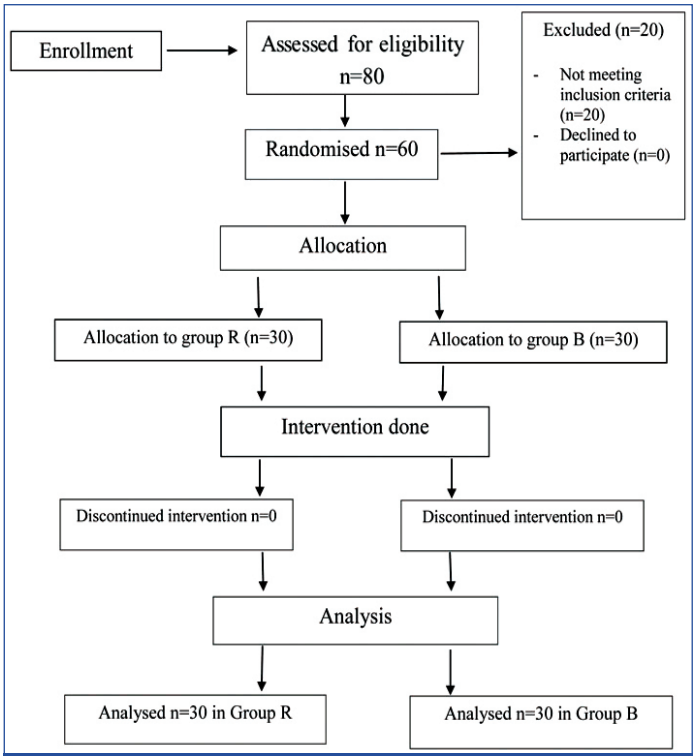
Exclusion criteria: Patients were excluded if they had contraindications to spinal anaesthesia, local infection at the puncture site, coagulopathy, spinal deformity, Body Mass Index (BMI) ≥30 kg/m², or a known allergy or hypersensitivity to local anaesthetic agents.

Study Procedure

All patients underwent a standard pre-anaesthetic evaluation. History, clinical examination and routine investigations were done. Additional investigations were done as per the patient profile. Standard fasting institutional protocol was followed for all patients.

Randomisation was performed using a computer-generated random number sequence which was created by an independent faculty member who was not involved in patient recruitment, drug preparation, block administration, or outcome assessment. Eligible patients were enrolled by the primary investigator after obtaining written and informed consent [Table/Fig-1]. Group allocation was concealed using sequentially numbered, opaque, sealed envelopes. The envelopes were opened immediately before drug preparation by an anaesthesiologist not involved in block performance or data collection. The anaesthesiologist who opened the sealed envelope also assigned the participant to Group-R or Group-B.

The anaesthesiologist performing the spinal block and assessing sensory and motor blockade was blinded to group allocation. The study medications were prepared in identical syringes containing equal volumes (2.2 mL) by an anaesthesiologist who was not involved in data collection or outcome assessment. The patients were blinded to the drug administered. The use of computer-generated randomisation, allocation concealment with sealed opaque envelopes, preparation of study drug by an independent anaesthesiologist, identical syringe volumes and blinded outcome assessment were undertaken to minimise selection, performance and detection bias. The intrathecal ropivacaine and bupivacaine doses were selected in a 3:2 ratio, based on prior literature [6].



[Table/Fig-1]: Consolidated Standards of Reporting Trials (CONSORT) flowchart.

Group-R (n=30): Patients in this Group received 2.2 mL (16.5 mg) of 0.75% hyperbaric ropivacaine administered intrathecally [6].

Group-B (n=30): Patients in this Group received 2.2 mL (11 mg) of 0.5% hyperbaric bupivacaine administered intrathecally [6].

Standard ASA monitoring was started upon arrival in the operating room. An 18-G intravenous cannula was secured. An infusion of Ringer's lactate was initiated. Under strict aseptic conditions, spinal anaesthesia was performed in the sitting position at the L3-L4 or L4-L5 interspace using a 25-G Quincke spinal needle. After confirming free flow of cerebrospinal fluid, 2.2 mL of the allocated study drug was injected intrathecally. The patients were placed in the supine position for assessment of the spinal block.

After achieving a sensory level of T10, patients were placed in the lithotomy position and surgery was started. Failure to achieve a T10 sensory level within 15 minutes was considered block failure and the procedure was converted to general anaesthesia. Such cases were excluded from block characteristic analysis.

For postoperative analgesia intravenous paracetamol 1 g was administered on patient complaint of pain. Subsequently, paracetamol 1 g was continued every eight hours for 24 hours.

Sensory block assessment: The extent of sensory blockade was evaluated bilaterally using the loss of pinprick sensation with a sterile needle. Sensory assessments were recorded at 2, 4, 6, 8, 10, 15, 20, 25, 30 minutes and every 15 minutes thereafter until the two-segment regression.

The extent of motor block was assessed using James Modified Bromage Scale [19].

The following parameters were recorded:

Primary outcome measure: Total duration of sensory block- Time from intrathecal injection to regression to L1 dermatome.

Secondary outcome measures:

a. Onset of sensory block- Time to achieve T10 dermatome level.

b. Highest sensory level attained- Defined as the highest dermatome level where loss of sensation remained unchanged for four consecutive assessments.

c. Two-segment regression time- Time taken for regression of sensory block by two dermatomal segments from the highest level attained.

d. Onset of motor blockade: Time to achieve modified Bromage score 2

e. Maximum motor blockade attained.

f. Time to attain complete motor block (modified Bromage score 3).

g. Total duration of motor block: Time to regression to modified Bromage score 0.

Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Pressure (MAP) and Heart Rate (HR) were recorded at 2, 4, 6, 8, 10, 15, 20, 25, 30 minutes and every 15 minutes thereafter till the completion of surgery. Hypotension was defined as a reduction in SBP greater than 20% from the baseline value and was managed with intravenous fluids and mephentermine 3 mg boluses as required. HR <60 beats/min was defined as symptomatic bradycardia if associated with symptoms and was treated with intravenous atropine 0.6 mg.

STATISTICAL ANALYSIS

Data were entered into Microsoft Excel and analysed using IBM Statistical Package for Social Sciences (SPSS) Statistics for Windows, Version 29.0.2.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarised as mean±SD or median (interquartile range), depending on data distribution, while categorical variables were expressed as frequencies and percentages. Normality of distribution was assessed using the Shapiro-Wilk test. Between-group comparisons of normally distributed continuous variables were performed using the independent Student's t-test. For non normally distributed data, the Mann-Whitney U test was applied. Categorical variables were compared using the Chi-square test or Fisher's-exact test, as appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 60 patients were included in the analysis, with 30 patients allocated to each group. Both groups were comparable in terms of age, BMI, ASA physical status and baseline haemodynamic variables, with no statistically significant differences observed [Table/Fig-2]. The mean of total procedural time, defined as the interval from spinal injection to completion of surgery, was significantly longer in the ropivacaine group (42.23 minutes) compared with the bupivacaine group (37.43 minutes) (p-value=0.021).

Parameters	Group-R (n=30)	Group-B (n=30)	p-value
Age (years) (mean±SD)	57.53±6.68	58.43±5.83	0.744
BMI (kg/m^2) (mean±SD)	23.80±2.44	23.31±2.46	0.442
ASA -PS n (%)			
I	2 (6.7%)	0	0.060
II	22 (73.3%)	17 (56.7%)	
III	6 (20.0%)	13 (43.3%)	
Baseline haemodynamics (mean±SD)			
Baseline HR (beats/min)	77.07±11.85	72.27±10.97	0.109
Baseline MAP (mmHg)	100.03±11.32	95.10±9.53	0.073

[Table/Fig-2]: Baseline patient characteristics.
ASA-PS: American society of anaesthesiologists physical status, HR: Heart rate; MAP: Mean arterial pressure; Independent Student's t-test was used for continuous variables (Age, BMI, baseline haemodynamic parameters), and the Chi-square test was used for the categorical variable (ASA Physical Status). A p-value <0.05 was considered statistically significant

The total duration of sensory block was significantly shorter in Group-R compared to Group-B. The onset of sensory block was significantly delayed in Group-R compared to Group-B. Two-segment regression time was significantly shorter in Group-R. The highest sensory level achieved was comparable between groups [Table/Fig-3]. The onset of motor block was significantly delayed in the ropivacaine group compared to the bupivacaine group. A significantly greater number of patients in the Group-B attained modified bromage score 3 motor blockade. The time to attain maximum motor block was significantly

Parameters	Group-R (n=30)	Group-B (n=30)	Test statistic	p-value
Onset of sensory block (min) (mean±SD)	7.36±3.83	4.60±1.67	W=611.500	0.002
Highest level of sensory block attained n (%)				
T5	1 (3.3%)	0		
T6	5 (16.6%)	9 (30%)		
T8	15 (50%)	17 (56.7%)		
T10	9 (30%)	4 (13.3%)		
Two-segment regression time (min) {mean (SD)}	40.20 (22.79)	57.83 (19.93)	W=233.000	0.001
Total duration of sensory block (min) (mean±SD)	121.40±34.62	164.50±23.03	t=-5.677	<0.001

[Table/Fig-3]: Sensory block characteristics.
Between-group comparisons were performed using the independent Student's t-test for normally distributed continuous variables and the Wilcoxon Mann-Whitney U test for non normally distributed continuous variables. A p-value <0.05 was considered statistically significant.
W- Test statistic of the Wilcoxon Mann-Whitney U test.
t- Test statistic from independent samples t-test.

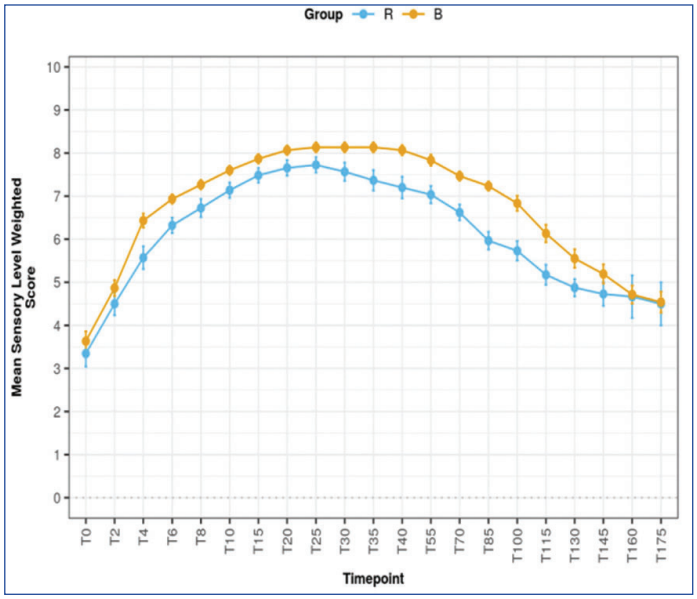
longer in the Group-R compared to the Group-B. The total duration of motor block was significantly shorter in the Group-R compared to the Group-B [Table/Fig-4]. Hypotension occurred significantly more frequently in Group-B compared to Group-R. Total 12 patients out of 30 (40%) required treatment for hypotension in Group-B and none in Group-R (p-value <0.001). The incidence of bradycardia was comparable between groups, two patients in each group had episode of bradycardia [Table/Fig-5], however, only one patient from Group-B with symptomatic bradycardia required treatment for the episode and none required in Group-R (p-value 1.000) as bradycardia was asymptomatic and resolved spontaneously in other patients. The sensory level weighted score was used to numerically represent the height of sensory block over time. Each dermatome level was assigned an ordinal numerical value, with higher cephalad levels receiving higher scores. Thus, a higher score indicated greater cephalad spread of sensory blockade, whereas a falling score indicated block regression [Table/Fig-6]. The motor level weighted score was used for numeric conversion of the degree of motor blockade. Each motor block grade was assigned an ordered score, with lesser motor impairment given lower values and more intense motor blockade given higher values [Table/Fig-7]. Both groups showed significant decrease in HR from baseline followed by a return towards initial value over time (p-value <0.001 within each group). However, when comparing between the groups, there was no statistically significant difference (p-value >0.05), indicating similar HR trends [Table/Fig-8]. Between the two groups, the fall in SBP, DBP and MAP was noted more in Group-B as compared to Group-R (p-value <0.05) [Table/Fig-9-11].

Parameters	Group-R (n=30)	Group-B (n=30)	Test statistic	p-value
Onset of motor block(min) (mean±SD)	10.47±9.61	2.67±1.95	W=724.000	<0.001
Maximum motor blockade attained by participants n (%)				
Modified Bromage Score 2	10 (33.3%)	2 (6.7%)	χ^2=6.667	0.010
Modified Bromage Score 3	20 (66.7%)	28 (93.3%)		
Time to attain max motorblock (min) {mean (SD)}	17.17(19.68)	5.60 (1.77)	W=646.500	0.003
Total duration of motor block(min) (mean±SD)	139.57±25.73	180.67±18.12	t=-7.152	<0.001

[Table/Fig-4]: Motor block characteristics.
Between-group comparisons were performed using the independent Student's t-test for normally distributed continuous variables and the Mann-Whitney U test for non normally distributed continuous variables. Categorical variables were compared using the Chi-square test. A p-value <0.05 was considered statistically significant.
W- Test statistic of the Wilcoxon Mann-Whitney U test
χ^2 - Test statistics of the Chi-square test
t- test statistic of the t-test.

Variables	Group-R (n=30)	Group-B (n=30)	p-value
Hypotension n (%)	0	12 (40.0%)	<0.001
Bradycardia n (%)	2 (6.7%)	2 (6.7%)	1.000
Nausea n (%)	0	7 (23.3%)	0.024

[Table/Fig-5]: Incidence of adverse events.
Data are presented as numbers (%).
Hypotension was defined as a >20% decrease in SBP from baseline.
Bradycardia was defined as a HR <60 beats/min. Between-group comparisons were performed using Chi-square test or Fisher's-exact test, as appropriate. A p-value <0.05 was considered statistically significant



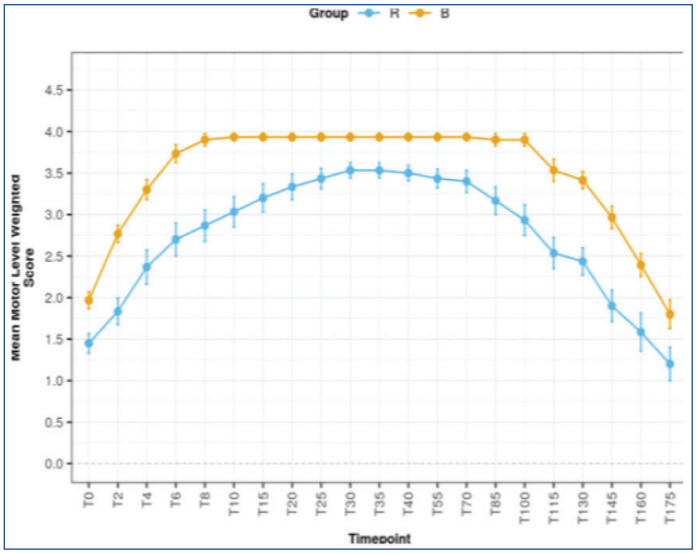
Sensory level weighted score	Corresponding Dermatome level
10	T5
9	T6
8	T8
7	T10
6	T11
5	T12
4	L1
3	L2
2	L3
1	L4

[Table/Fig-6]: Comparison of sensory block profile over time between the two groups using sensory level weighted scores.

DISCUSSION

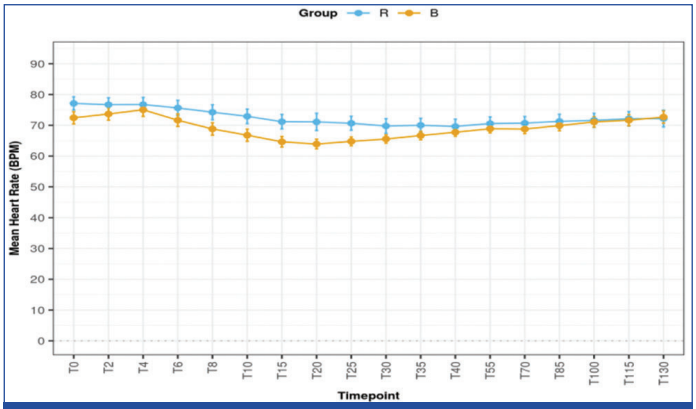
The findings of the present study demonstrate that intrathecal administration of 2.2 mL of 0.75% hyperbaric ropivacaine provided effective anaesthesia for TURP, with a shorter duration of sensory and motor block than hyperbaric bupivacaine, while preserving haemodynamic stability, thus accepting the study hypothesis.

In the present study, ropivacaine showed slower onset and less cephalad spread of sensory block than bupivacaine, with no difference in maximum sensory level attained. However, bupivacaine produced a significantly longer sensory block duration (by 43 minutes) and delayed regression. These findings regarding sensory block characteristics are consistent with results reported in previous studies. Gupta S et al., reported a slower onset as well as a lesser duration of sensory block with a total volume of 3 mL hyperbaric ropivacaine + fentanyl compared with 3 mL bupivacaine + fentanyl in patients of more than 55 years of age planned for TURP. They demonstrated a prolonged sensory block duration with Group-B as compared to Group-R (210 vs

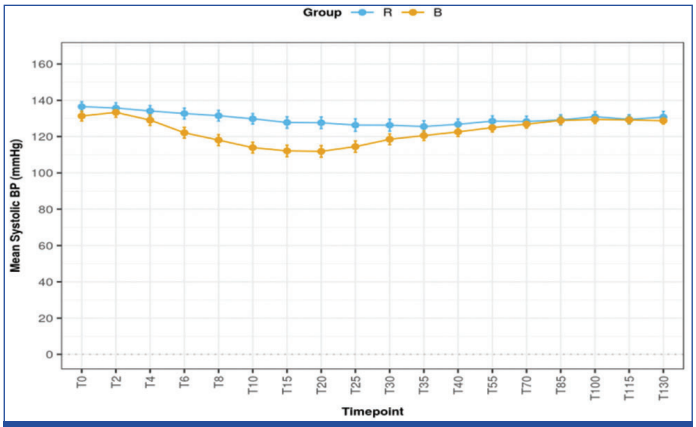


Motor level weighted score	Corresponding modified bromage score
1	0 (no block)
2	1 (minimal blockage)
3	2 (partial blockage)
4	3 (complete blockage)

[Table/Fig-7]: Comparison of motor block profile over time between the two groups using motor level weighted scores.

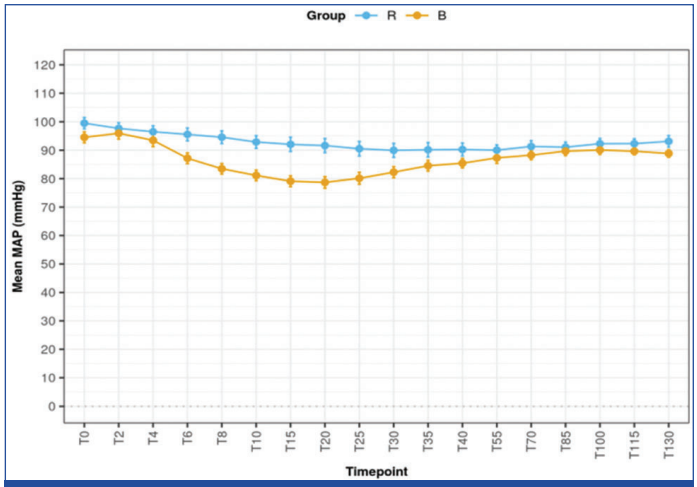


[Table/Fig-8]: Comparison of Heart Rate (HR) over time between the ropivacaine and bupivacaine groups.

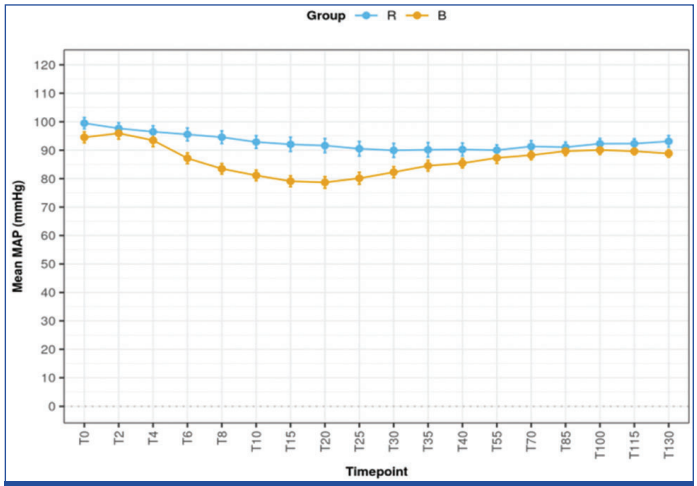


[Table/Fig-9]: Comparison of SBP over time between the ropivacaine and bupivacaine groups.

160 minutes, respectively) [12]. Maria R and Patel C reported a sensory block duration of 136.17 minutes with 3 mL of ropivacaine compared with 202.40 minutes with bupivacaine in TURP patients [15]. Chaudhary A et al., reported a highest level of T10 with 2 mL of ropivacaine and up to T9 with ropivacaine + fentanyl in TURP procedures indicating that even lower volume of intrathecal ropivacaine provides optimal level for this procedure [20]. Tarkase AS and Kulkarni KR et al., observed maximum cephalad spread up



[Table/Fig-10]: Comparison of DBP over time between the ropivacaine and bupivacaine groups.



[Table/Fig-11]: Comparison of MAP over time between the ropivacaine and bupivacaine groups.

to T6 in patients receiving ropivacaine and T5 in patients receiving bupivacaine [13,18].

Early recovery of motor function is an important component of enhanced recovery pathways and may contribute to shorter postoperative hospital stay [21]. In the present study, the mean onset of motor block at modified Bromage score 2 was delayed in Group-R than in Group-B. The time required to achieve complete motor block (modified Bromage score 3) was 17.17 minutes in Group-R and 5.60 minutes in the Group-B. In addition to longer duration of motor block, the intensity of motor blockade was also greater in the bupivacaine than in ropivacaine group. The motor block characteristics observed in the present study were consistent with previous literature. Gupta S et al., reported a slower onset and a lower intensity of motor block with ropivacaine + fentanyl as compared to bupivacaine + fentanyl [12]. Similarly, Maria R and Patel C demonstrated a significantly longer duration of motor block with bupivacaine than with ropivacaine (180.37 vs 113.50 minutes) [15]. Kalbande JV et al., also reported a significantly prolonged motor block duration of 196.75 minutes with bupivacaine vs 159.06 with ropivacaine in patients planned for infraumbilical procedures [10]. The recent meta-analysis by Khalil RS et al., reported a significantly shorter duration of motor block with ropivacaine compared with bupivacaine ($p<0.001$) [6]. Kulkarni KR et al., also found that the intensity of motor block is significantly less with ropivacaine when compared to bupivacaine [18]. Ropivacaine, although has a delayed onset of motor block, once established, it provides adequate duration to comfortably perform TURP.

In the present study, a greater reduction in SBP, DBP and MAP were noted in bupivacaine as compared to ropivacaine group.

Hypotension frequently arises as a complication following spinal anaesthesia. This could be particularly concerning in elderly patients who generally undergo TURP procedures. Intergroup analysis showed an increased predilection for hypotension with bupivacaine group (p-value <0.001). However, none of the patients in the ropivacaine group required i.v. mephentermine, probably due to the lower volume used in the study. Atabekoğlu S and Bozkırlı F, reported that hypotension episodes were comparable between groups R and B and there were no statistically significant differences in ephedrine requirements between the two groups [3]. In another study, patients undergoing lower limb surgery, authors reported that a greater number of patients in Group-B (8%) developed hypotension compared to Group-R (4%) [9]. Whiteside JB et al., demonstrated an increased use of ephedrine with bupivacaine [14]. Gupta S et al., reported a significantly greater number of patients (11%) developed hypotension in Group-B when compared to Group-R (4%) [12].

Bradycardia is another significant complication associated with spinal anaesthesia. However, the present study showed similar trends in both the groups. Atabekoğlu S and Bozkırlı F, reported bradycardia was observed in two patients in Group-R and in eight patients in Group-B (p<0.05) [3]. Kalbande JV et al., also noted similar trends with the episode of bradycardia in both the groups (3.12% in Group-R vs 12.5% in Group-B) [10].

In the present study, seven patients reported nausea in the Group-B, while none reported in Group-R. Only one patient in the Group-B experienced vomiting, which was successfully treated with i.v. ondansetron 4 mg. No episode of dysrhythmia and desaturation were reported in either group throughout the study period.

Limitation(s)

The present study was conducted at a single centre, which may limit the generalisability of the findings. Additionally, the study primarily focused on TURP procedures, which may limit the broader applicability of the findings to other surgical interventions. Postoperative analgesic consumption was not recorded. Future research should consider evaluating the economic implications of the anaesthetic agents by assessing drug-related costs.

CONCLUSION(S)

Intrathecal administration of 2.2 mL (16.5 mg) of commercially available 0.75% hyperbaric ropivacaine provides adequate surgical anaesthesia for TURP. The duration of sensory block, motor block and two-segment regression was significantly shorter with ropivacaine. Ropivacaine showed better haemodynamic stability, with significantly less hypotension, while bradycardia was comparable between groups. Thus, reduced-volume commercially available hyperbaric ropivacaine appears to be a useful alternative to hyperbaric bupivacaine for TURP, especially when shorter motor recovery and better haemodynamic stability are desired.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Dec 22, 2025
- Manual Googling: Jun 13, 2026
- iThenticate Software: Jun 16, 2026 (4%)

ETYMOLOGY: Author Origin

EMENDATIONS: 9

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Dec 20, 2025**
Date of Peer Review: **Feb 12, 2026**
Date of Acceptance: **Jun 18, 2026**
Date of Publishing: **Oct 01, 2026**