

Clinical Effects of Intrathecal Ropivacaine and Ropivacaine with Dexmedetomidine in Inguinal Hernia Cases

R Srinivasan¹, R Selvarajan², Heber Anandan²

¹Assistant Professor, Department of Anesthesiology, Tirunelveli Medical College Hospital, Tirunelveli, Tamilnadu, India, ²Associate Professor, Department of Anesthesiology, Tirunelveli Medical College Hospital, Tirunelveli, Tamilnadu, India

Abstract

Introduction: Ropivacaine is a first single enantiomer-specific compound, which has a reduced risk of cardiotoxicity, neurotoxicity, and rapid recovery of motor function. Post-operative pain relief is an important issue with ropivacaine. It has been used with many adjuvants for lower limb surgery, which has other side effects.

Aim: Aim of the study was to compare the clinical effects of intrathecal ropivacaine and ropivacaine with dexmedetomidine.

Materials and Methods: Inguinal hernioplasty cases were included in the study. Group 1 administered with 0.75% isobaric ropivacaine 3 ml + 0.5 ml normal saline and Group 2 administered with 0.75% isobaric ropivacaine 3 ml + 5 µg dexmedetomidine in 0.5 ml normal saline.

Results: Onset of sensory and motor block was early in Group 2 patients than Group 1 (Group 2 5.58 ± 3.56 > 8.0 ± 1.8 in Group 1) with the $P < 0.05$. Postoperatively Group 2 patients had delayed two segment regression and S2 segment regression, than Group 1 patients. ($P < 0.0001$). In Group 2, patients out of 29 patients two patients were developed bradycardia with hypotension. Motor block duration was more with Group 2 patients than Group 1 ($P > 0.05$). Time of getting rescue analgesia is very much delayed in Group 2 than Group 1 ($P < 0.0001$).

Conclusion: Ropivacaine is a newer ideal, comfortable safe anesthetic of choice for intrathecal use in inguinal hernia surgery cases, American Society of Anesthesiologists (ASA I and II) and by adding dexmedetomidine we get a prolongation of analgesia.

Key words: Dexmedetomidine, Inguinal hernia, Ropivacaine, Subarachnoid block

INTRODUCTION

It is always our priority to select regional anesthesia in almost all procedures as much as possible. The subarachnoid block (or intrathecal) and epidural anesthesia are wonderful method of giving anesthesia in lower abdominal and lower limb surgeries.¹ With the help of lignocaine and bupivacaine, we are using spinal blockade for a long time since its invention.² Lignocaine and Bupivacaine are the drugs used for a long time. In this setting, one of the newer drugs ropivacaine

has emerged and which is available as only isobaric solution. It is used mainly for epidural, nerve plexus blocks.³ Now, only it is available as 0.75% solution and most of us are not using it very much for subarachnoid block. That's why ropivacaine was chosen as 0.75% intrathecal for my study. Dexmedetomidine is one of the newer drugs very much used for sedation and to potentiate the effect of local anesthetics.⁴

Aim

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MATERIALS AND METHODS

This was a randomized, prospective comparative clinical study conducted in the Department of Anesthesiology at

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Corresponding Author: R Selvarajan, Associate Professor, Department of Anesthesiology, Tirunelveli Medical College Hospital, Tirunelveli, Tamil Nadu, India. Phone: 9442036913. Email: jaymichella@gmail.com

Tirunelveli Medical College Hospital, Tirunelveli, Tamil Nadu, India.

Inclusion Criteria

Age between 30 and 60 years and only male cases, American Society of Anesthesiologists (ASA I and II) cases, weight 40-65 kg, elective surgeries (inguinal hernioplasty).

Exclusion Criteria

Patient refusal, known allergy, coagulopathy, patient on β blockers, long-term analgesic therapy, drugs which are known to interact with study drugs. Spinal administration of drug mixture: Group 1 administered with 0.75% isobaric ropivacaine 3 ml + 0.5 ml normal saline and Group 2 administered with 0.75% isobaric ropivacaine 3 ml + 5 μ g dexmedetomidine in 0.5 ml normal saline.

RESULTS

The two groups were matched in respect of their demographic characteristics such as age and weight. The baseline clinical variables such as ASA grade, pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP), sensory, and motor block were matched between the two groups (Table 1).

The two groups were not significantly differed in respect of their mean ages ($45.1 \pm 8.6 = 45.0 \pm 4.9$). Similarly, they were also not significantly differed between the mean weights of two groups ($51.3 \pm 5.3 \approx 49.6 \pm 4.0$ and $P > 0.05$) (Table 1).

The baseline PR, SBP, and DBP were matched and shown in Table 3. The mean PRs between the two groups were not statistically significant ($86.9 \pm 8.9 \approx 84.5 \pm 9.3$ and $P > 0.05$). The mean SBPs between the two groups were not statistically significant ($121.3 \pm 8.3 \approx 120.3 \pm 5.9$ and $P > 0.05$). The mean DBPs between the two groups were not statistically significant ($78.6 \pm 4.4 \approx 79.3 \pm 2.6$ and $P > 0.05$) (Table 2).

Baseline sensory block between the two groups was not significant ($P > 0.05$) (Table 3).

Table 4 describes the baseline ASA grade between the two groups. The two groups were not significantly differed between them ($P > 0.05$).

The two groups namely ropivacaine (Group 1) and ropivacaine and dexmedetomidine (Group 2) were not significantly differed at baseline, and hence they were comparable during and after surgery.

The two groups were compared during and after surgery to study the effectiveness of two drugs at different intervals in respect of sensory and motor blocks on set. The mean onset of sensory blocks between the two groups was statistically significant ($P < 0.0001$). The mean onset of Motor blocks between the two groups was statistically significant ($P < 0.0001$) (Table 5).

Table 6 shows the PR at different interval starting from 3 min to 8 h. From 3 min to 2 h, there was no significant

Table 1: Comparison of age between 2 groups

Age (years)	N (%)	
	Group 1	Group 2
30-39	10 (34.5)	5 (17.2)
40-49	6 (20.7)	17 (58.6)
50-59	13 (44.8)	7 (24.2)
Total	29 (100.0)	29 (100.0)
Mean \pm SD	45.1 \pm 8.6	45.0 \pm 4.9

SD: Standard deviation

Table 2: Comparison of base line PR, SBP, and DBP between two groups

Variables	Mean \pm SD		P value
	Group 1	Group 2	
PR	86.9 \pm 8.9	84.5 \pm 9.3	>0.05
SBP	121.3 \pm 8.3	120.3 \pm 5.9	>0.05
DBP	78.6 \pm 4.4	79.3 \pm 2.6	>0.05

PR: Pulse rate, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, SD: Standard deviation

Table 3: Comparison of sensory level between two groups

Sensory level	Group 1	Group 2	P value
T7	6	10	>0.05
T8	23	19	
Total	29	29	

Table 4: Comparison of ASA grade between two groups

ASA grade	Group 1	Group 2	P value
I	25	26	>0.05
II	4	3	
Total	29	29	

ASA: American Society of Anesthesiologists

Table 5: Onset of sensory blockade (T10) and motor blockade (2) between two groups

Blockade	Mean \pm SD		P value
	Group 1	Group 2	
Sensory	8.0 \pm 1.8	5.58 \pm 3.56	<0.0001
Motor	10.14 \pm 5.2	5.37 \pm 3.6	<0.0001

SD: Standard deviation

difference between the two groups. At 4 h, the PR among the Group 1 subjects was significantly greater than the Group 2, and the same was attributed to the risk of rescue analgesia. At 8 h, the PR was greater in Group 2 due to the above reason.

Table 7 shows the SBP at different interval starting from 3 min to 8 h. From 3 min to 2 h, there was no significant difference between the two groups. At 4 h, the PR among the Group 1 subjects was significantly greater than the Group 2, and the same was attributed to the risk of rescue analgesia. At 8 h, the PR was greater in Group 2 due to the above reason.

Table 8 shows the DBP at different interval starting from 3 min to 8 h. From 3 min to 1 h, there was no significant difference between the two groups. At 4 h, the PR among the Group 1 subjects was significantly greater than the Group 2, and the same was attributed to the risk of rescue analgesia. At 8 h, the PR was greater in Group 2 due to the above reason.

Table 9 shows the analgesia of two groups. The mean analgesia of Group 2 was 453.1 ± 20.2 and Group 1 was 217.2 ± 17.5 . The Group 2 patients had a longer duration of analgesia than the Group 1 patients ($453.1 \pm 20.2 > 217.2 \pm 17$ and $P < 0.0001$).

Figure 1 illustrates the significance of longer duration of analgesia of Group 2 than the Group 1.

Table 10 shows the two segment regression and S2 regression of two groups. The mean two segment regression of Group 2 was 131.7 ± 18.2 and Group 1 was 89.0 ± 18.2 . The Group 2 patients had a longer duration of two segment regression than the Group 1 patients ($131.7 \pm 11.4 > 89.0 \pm 18.2$ and $P < 0.001$). Similarly, S2

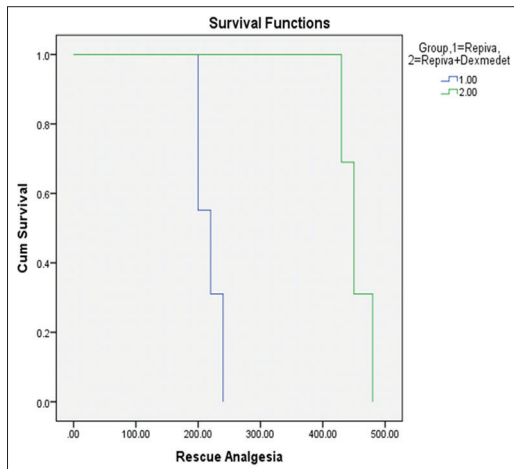


Figure 1: Survival of analgesia between two groups

Table 6: Comparison of pulse rate at different interval between the two groups

Intervals	Mean±SD		P value
	Group 1	Group 2	
3 min	91.8±13.8	92.0±13.5	>0.05
6 min	89.3±13.7	83.4±12.9	>0.05
15 min	79.8±14.4	75.0±17.2	>0.05
30 min	81.1±12.8	76.9±14.3	>0.05
1 h	82.0±9.0	81.1±5.2	>0.05
2 h	86.3±103	83.9±7.3	>0.05
4 h	113.6±9.0	89.8±8.0	<0.0001
8 h	107.2±7.3	112.3±11.3	<0.05

SD: Standard deviation

Table 7: Comparison of SBP at different interval between the two groups

Intervals	Mean±SD		P value
	Group 1	Group 2	
3 min	121.4±9.8	120.5±6.8	>0.05
6 min	118.9±8.6	115.2±4.2	>0.05
15 min	111.9±10.1	108.8±1.9	>0.05
30 min	109.0±9.7	106.8±2.7	>0.05
1 h	111.2±6.2	109.5±2.5	>0.05
2 h	112.5±5.7	113.9±4.5	>0.05
4 h	128.3±4.9	114.7±4.0	<0.0001
8 h	117.4±5.6	128.9±5.0	<0.05

SBP: Systolic blood pressure, SD: Standard deviation

Table 8: Comparison of DBP at different interval between the two groups

Intervals	Mean±SD		P value
	Group 1	Group 2	
3 min	77.2±7.0	76.9±5.4	P>0.05
6 min	75.5±6.9	76.6±4.8	P>0.05
15 min	70.0±7.6	70.0±0.0	P>0.05
30 min	71.0±6.6	66.6±4.8	P>0.05
1 h	69.7±4.9	69.7±1.8	P>0.05
2 h	70.4±4.4	73.1±4.7	P>0.05
4 h	78.4±7.4	73.1±4.7	P<0.001
8 h	73.0±6.1	83.4±4.8	P<0.05

DBP: Diastolic blood pressure, SD: Standard deviation

Table 9: Comparison of rescue analgesia between two groups

Variable	Mean±SD		P value
	Group 1	Group 2	
Rescue analgesia	217.2±17.5	453.1±20.2	<0.0001

SD: Standard deviation

Table 10: Comparison of two segment regression and S2 regression between the groups

Variable	Mean±SD		P value
	Group 1	Group 2	
2 segment regression	89.0±18.2	131.7±11.4	<0.0001
S2 regression	243.1±20.2	297.9±25.3	<0.0001

SD: Standard deviation

Table 11: Comparison between two groups in motor block duration in hours

Variable	Mean±SD		P value
	Group 1	Group 2	
Motor duration	2.63±0.41	3.94±0.38	P>0.05

SD: Standard deviation

regression was also significantly greater in Group 2 than in Group 1 ($297.9 \pm 25.3 > 243.1 \pm 20.2$ and $P < 0.0001$).

Table 11 shows motor block durations between two groups. In Group 2, patients had long duration of blockade ($3.94 \pm 0.38 > 2.63 \pm 0.41$ and $P > 0.05$).

DISCUSSION

Subarachnoid block is a simple, frequently used technique which provides very effective analgesia in lower abdominal surgeries. Ropivacaine is a newer drug with a more safety margin with reduced risk of cardiotoxicity. Dexmedetomidine is an α_2 agonist which is very much used nowadays as an additive with local anesthetics. It gives intraoperative and post-operative analgesia with a single dose of subarachnoid block. Moreover, it is devoid of opioid side effects but may produce sedation, bradycardia, and hypotension. The onset of sensory and motor block was early in Group 2 patients than Group 1 (Group 2 $5.58 \pm 3.56 > 8.0 \pm 1.8$ in Group 1) with the $P < 0.05$. In Bogra *et al.*'s study, the addition of ropivacaine intrathecally produces a prolongation in the duration of the motor and sensory block.⁵ Bradycardia and hypotension are the known features of subarachnoid block. In our study in Group 2 patients out of 29 patients 2 patients were developed bradycardia with hypotension, they required atropine and ephedrine. Al-Ghanem *et al.* have reported the use of dexmedetomidine to be associated with decrease in heart rate and blood pressure.⁶ No patients have developed

any nausea or vomiting in both groups. But in Group 2, patients were free of anxiety and they were comfortable. Both groups did not require any sedation intraoperatively. Postoperatively Group 2 patients had delayed two segment regression and S2 segment regression, than Group 1 patients ($P < 0.0001$). Motor block duration was more with Group 2 patients than Group 1 ($P > 0.05$). Time of getting rescue analgesia is very much delayed in Group 2 than Group 1 ($P < 0.0001$). Yaksh and Reddy studied that a powerful analgesia can be produced by selectively activating adrenergic, opiate, and baclofenergic receptor systems in the spinal cord.⁷

CONCLUSION

Ropivacaine is a newer ideal, comfortable safe anesthetic of choice for intrathecal use in inguinal hernia surgery cases, ASA I and II and by adding dexmedetomidine, we get a prolongation of analgesia.

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