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A Comparative Study between Levobupivacaine and Ropivacaine in Inguinal Hernia Surgery under Spinal Anaesthesia

Dr. Udayan Bakshi[1], Dr. Souvik Saha[2*]

[1]Director, Anaesthesiology Department, Woodlands Multispecialty Hospital, Kolkata, West Bengal, India
[2]Assistant Professor, Anaesthesiology Department, Diamond Harbour Govt. Medical College & Hospital, West Bengal, India

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***Corresponding author:** Dr. Souvik Saha

Abstract **Original Research Article**

Subarachnoid block is the anaesthesia technique of choice and is gold standard for lower abdominal surgery compared to general and epidural anaesthesia. Levobupivacaine and ropivacaine are the two most recently introduced local anesthetics with lower risk of cardiotoxicity [1, 2]. In this study, 100 patients of ASA I-II, aged between 20-60 years of either sex, scheduled for elective inguinal hernia surgery were chosen and divided into two groups of 50 each. Patients were randomly allocated to receive intrathecally either 3.5 ml of 0.5% isobaric Levobupiovacaine (group x) or 3.5ml of 0.5% isobaric Ropivacaine (group y).Time taken to achieve peak sensory (T10 dermatome) and motor blockade,duration of block, recovery characteristics and hemodynamic changes were recorded. Any adverse symptoms were noted .This study revealed that 0.5% Ropivacaine produced better and faster sensory blockade with early regression of motor blockade compared to 0.5% Levobupivacaine. Hence, Ropivacaine can be used successfully for inguinal hernia surgeries where early recovery is well appreciated by the patients.

Keywords: Levobupivacaine, Ropivacaine, inguinal hernia surgery, spinal anaesthesia.

INTRODUCTION

Subarachnoid block using Bupivacaine is the anaesthesia technique of choice for lower abdominal surgery. Levobupivacaine is the pure S(-)enantiomer of racemic bupivacaine with lower risk of cardiovascular and central nervous system toxicity than bupivacaine. Ropivacaine, the first pure (S-enantiomeric), local anaesthetic has lower and different toxicity profile compared to bupivacaine. Both these drugs are available as isobaric solutions in India. We decided to compare the efficacy of 3.5 ml of 0.5% isobaric Levobupiovacaine (group x) and 3.5ml of 0.5% isobaric Ropivacaine (group y) in lower abdominal surgery in terms of peak sensory and motor blockade time, duration of block, recovery characteristics and hemodynamic changes.

MATERIAL & METHODS

After obtaining approval from the institutional ethical committee and written informed consent, 100 patients of ASA I to II of both genders, aged 20-60 years scheduled for elective surgery for inguinal hernia in spinal anesthesia were randomly allocated into two groups. All patients received tab diazepam (0.2mg/kg) orally at previous night. In the operating room they were pre-hydrated with 15ml/kg body weight of ringers lactate. After proper aseptic precaution subarachnoid block was performed at L3-L4 or L4-L5 intervertebral space according to height of the patient. Group x patients received 3.5ml 0.5% isobaric Levo-bupivacaine & Group y patients received 3.5ml 0.5% isobaric Ropivacaine. Vital parameters like pulse rate, mean blood pressure, ECG and oxygen saturation were measured .The sensory and motor blockade were assessed by pin prick method and Bromage scale respectively at 2 minutes interval till satisfactory height and depth of block was suitable for the surgical procedure and thereafter every 15 minutes till the end of surgery. Patients with partial or complete failure of spinal anaesthesia were excluded from the study. The mean arterial pressure (MAP), heart rate (HR), pulse oximetry were recorded every 5 minutes after starting of spinal anaesthesia. Hypotension is defined as a decrease of MAP by 20% from baseline and was treated by intravenous Mephenteramine boluses of 3mg/ml. Bradycardia is defined by HR less than 50/min was treated by 0.6mg intravenous atropine. Onset time of sensory blockade, Maximum level of analgesia, time to achieve maximum level of sensory & motor blockade,

duration of sensory block and time to regress sensory & block were noted.

RESULTS & ANALYSIS

Table-1: Age distribution in group X and group Y

Age group (years)	Group X	Group Y	p-value
<30 years	14	12	0.36
31-40 years	15	10	
41-50 years	16	20	
50-60 year	03	07	
Total	48	49	

There is no statistical significant difference in the age wise distribution of patients between the groups. Two in Group X and one patient in Group Y were excluded from the study due to inadequate anaesthesia.

Table-2: Sex distribution in group X and group Y

Sex	Group X		Group Y	
	Number of patients	Percent %	Number of patients	Percent %
Male	32	66.7	32	65.3
Female	16	33.3	17	34.7
Total	48	100	49	100

There is no significant difference in the sex distribution of the patients between the groups. In both the groups there is a predominance of male patients.

Table-3: Body weight (kg) distribution of group X and group Y

	Group X(n=48)	Group Y(n=49)	P Value
Mean	56.77 kg	59.65 kg	0.69
SD	7.8	6.7	

There is no statistical significant difference in body weight between the groups

Table-4: ASA grade wise distribution of cases in groups X and group Y

ASA grade	Group X	Group Y	Total
I	46	47	93
II	2	2	4
Total	48	49	97

There is no significant difference in the ASA category distribution of the patients between the group X and group Y.

Table-5: Mean time for onset of sensory block (min) group X and group Y

	Mean	SD	P Value
Group X	8.02	0.92	0.004
Group Y	4.91	0.98	

The mean time of onset of sensory blockade at T 10 in group X is 8.02±0.92 mins and group Y is 4.91±0.98 mins. There is a statistical significant difference between the two groups (p value=0.004).

Table-6: Time for maximum sensory blockade (min) in groupX and groupY

	Mean	SD	P Value
Group X	15.91	3.92	0.62
Group Y	16.73	3.54	

The mean time taken for attaining the maximum sensory blockade is 15.91±3.92 mins in group X and 16.73±3.54 mins in group Y. There is no statistical significant difference between the two groups.

Table-7: Maximum level of sensory blockade attained group X and group Y

Peak sensory block	Group X	Group Y	Total
T6	19	21	40
T8	22	21	43
T10	7	7	14
Total	48	49	97

There is no statistical significant difference in maximum level of sensory blockade attained group X and group Y.

Table-8: Motor onset (minutes) in group X and group Y

	Mean	SD	P Value
Group X	7.43	0.74	0.46
Group Y	7.16	1.17	

There is no statistical significant difference in Motor onset in Group X and Group Y attained.

Table-9: Grade of motor blockade in Group X and Group Y

	Group X (Number of patients)	Group Y (Number of patients)	p-value
Bromage1	1	1	0.26
Bromage2	2	2	
Bromage3	45	46	

There is no statistical significant difference in Grade of motor blockade in Group X and Group Y attained.

Table-10: Time for maximum motor block (min) group X and group Y

	Mean	SD	P Value
Group X	14.37	3.44	0.004
Group Y	11.63	2.23	

There is statistical significant difference in Time for maximum motor block (min) group X and group Y (P=0.004).

Table-11: Two segment sensory regression (min) group X and group Y

	Mean	SD	P Value
Group X	149.12	9.08	0.002
Group Y	121.08	11.87	

There is statistical significant difference in two segment sensory regression (min) group X and group Y (p=0.002).

Table-12: Comparison of Sensory regression to level S1 in group X and group Y

	Mean	SD	P Value
Group X	288	19.13	0.371
Group Y	285	13.48	

There is no statistical significant difference in comparison of Sensory regression to level S1 (min) in group X and group Y.

Table-13: Comparison of Motor regression to Bromage 0 in Group X and Group Y

	Mean	SD	P Value
Group X	270	13.66	0.002
Group Y	203	8.62	

There is statistical significant difference in Comparison of Motor regression to Bromage 0 in Group X and Group Y

Table-14: Mean heart rate at various time intervals in group X and groupY

	Group X (Mean±SD)	Group Y (Mean±SD)	p-value
Basal HR	82.47±10.48	77.85±7.75	
HR–5min	93.62±15.13	92.26±11.62	
HR–10min	94.56±13.93	93.67±13.5	
HR–15 min	91.75±14.45	92.06±12.65	
HR–20 min	89.08±14.96	87.00±13.26	
HR–25 min	89.20±12.61	86.12±12.71	0.325
HR–30min	87.00±12.50	85.00±11.52	
HR–35 min	85.87±10.27	83.22±10.97	
HR–40 min	85.07±10.85	81.24±9.87	
HR–45 min	83.85±8.12	81.36±7.65	
HR–50 min	81.97±8.12	78.85±8.69	
HR–55 min	79.58±8.13	77.34±6.76	
HR–60 min	80.31±7.51	77.63±6.81	
HR–65min	80.08±7.51	78.44±7.03	
HR–70min	80.25±7.91	78.12±6.27	
HR–75min	80.79±8.74	77.12±6.23	
HR–80min	80.68±8.78	77.75±6.00	
HR–85 min	78.22±6.66	77.75±6.00	
HR–90 min	76.87±5.82	79.81±10.5	

There is no statistically significant difference in the mean heart rate between groups at various intervals.

Table-15: Mean SBP at various intervals in group X and group Y

	Group X (Mean±SD)	Group Y (Mean±SD)	p-value
Basal SBP	123.75±7.95	121.12±11.96	
SBP–5min	126.35±14.02	126.02±11.79	
SBP–10min	127.47±15.03	127.56±12.99	
SBP–15 min	124.39±16.08	126.44±13.59	
SBP–20 min	123.56±17.11	126.40±10.7	
SBP–25 min	125.12±13.46	125.67±11.56	0.315
SBP–30min	123.50±10.85	122.87±10.22	
SBP–35 min	123.58±10.94	123.08±9.46	
SBP–40 min	123.83±8.05	122.42±9.73	
SBP–45 min	121.12±6.87	120.75±18.27	
SBP–50 min	122.33±8.61	121.44±8.36	
SBP–55 min	122.10±7.68	121.16±8.70	
SBP–60 min	121.54±7.57	121.44±7.45	
SBP–65min	120.81±6.77	121.06±7.03	
SBP–70min	119.14±8.15	120.71±7.68	
SBP–75min	120.81±8.04	120.55±7.78	
SBP–80min	120.04±7.5	119.93±7.2	
SBP–85 min	123.62±8.5	125.68±8.2	
SBP–90 min	122.09±6.81	122.48±7.40	

There is no statistically significant difference in the mean SBP between group X and group Y at various intervals.

Table-16: Mean DBP at various time intervals in group X and group Y

	Group X (Mean±SD)	Group Y (Mean±SD)	p-value
Basal DBP	82.87±16.62	82.61±13.29	
DBP–5min	83.14±10.60	84.34±10.79	
DBP–10min	84.77±10.95	85.28±13.37	
DBP–15 min	80.87±10.64	78.02±13.48	
DBP–20 min	81.96±11.79	79.24±10.44	
DBP–25 min	81.10±13.31	80.40±10.15	0.125
DBP–30min	80.62±53	78.67±9.18	
DBP–35 min	80.91±8.11	78.26±10.03	
DBP–40 min	80.02±8.16	77.79±8.79	
DBP–45 min	79.77±8.17	78.36±7.31	
DBP–50 min	79.12±6.94	77.14±7.32	
DBP–55 min	79.64±7.70	76.83±7.28	
DBP–60 min	78.39±7.70	76.32±7.50	
DBP–65min	77.68±8.02	76.75±7.60	
DBP–70min	76.77±7.53	77.51±7.14	
DBP–75min	77.19±6.51	78.16±7.36	
DBP–80min	77.27±6.55	78.61±6.77	
DBP–85 min	82.87±16.62	80.61±13.29	
DBP–90 min	82.04±10.60	79.34±10.79	

There is no statistically significant difference in the mean DBP between group X and group Y at various intervals.

Table-17: Comparison of SPO2 in Group X and Group Y

	Group X (Mean±SD)	Group Y (Mean±SD)	p-value
BasalSPO2	98.7 ± 0.5	98.7 ± 0.5	
SPO2–5min	99.0 ± 0	98.5 ± 0.5	
SPO2–10min	98.4 ± 0.5	98.3 ± 0.5	
SPO2–15 min	98.3 ± 0.7	98.5 ±0.5	
SPO2–20 min	98.3 ± 0.5	98.7 ± 0.5	
SPO2–25 min	98.5 ± 0.5	98.7 ± 0.5	0.452
SPO2–30min	98.9 ± 0.3	98.6 ± 0.5	
SPO2–35 min	98.7 ± 0.5	98.7 ± 0.5	
SPO2–40 min	98.8 ± 0.4	98.5 ± 0.5	
SPO2–45 min	98.7 ± 0.5	98.7 ± 0.5	
SPO2–50 min	99.0 ± 0	98.5 ± 0.5	
SPO2–55 min	98.4 ± 0.5	98.3 ± 0.5	
SPO2–60 min	98.3 ± 0.7	98.5 ±0.5	
SPO2–65min	98.3 ± 0.5	98.7 ± 0.5	
SPO2–70min	98.5 ± 0.5	98.7 ± 0.5	
SPO2–75min	98.9 ± 0.3	98.6 ± 0.5	
SPO2–80min	98.7 ± 0.5	98.7 ± 0.5	
SPO2–85 min	98.8 ± 0.4	98.5 ± 0.5	
SPO2–90 min	98.7 ± 0.5	98.7 ± 0.5	

There is no statistically significant difference in the mean SPO2 between group X and group Y at various intervals.

DISCUSSION

Subarachnoid block is a safe, simple technique which also offers a high level of post–anesthesia satisfaction for patients. Levobupivacaine, a local anesthetic drug is the pure S(-)enantiomer of racemic bupivacaine. It has a lower risk of cardiovascular and central nervous system toxicity than bupivacaine in both animals and human studies. Ropivacaine, a pure enantiomer is being increasingly used for spinal anaesthesia in caesarean section, lower abdominal and perineal surgeries including lower limb surgeries [3]. Advantages claimed are shorter duration of motor block with similar sensory block properties compared to Levobupivacaine [4-6]. In our study, onset of sensory block was slow in Levobupivacaine. Level of sensory block was comparable and duration of analgesia at

S1(S1regression) was significantly shorter with Ropivacaine compared to Levobupivacaine which is comparable to study conducted by Gautier et al[6].Onset of motor blockade was faster and duration of motor blockade was also shorter with Ropivacaine compared to Levobupivacaine. However all the patients in either groups attained complete motor blockade. With respect to hemodynamic parameters intrathecal Levobupivacaine and Ropivacaine provided a higher degree of cardiovascular stability with a lesser incidence of hypotension and bradycardia. There was no incidence of side effects like Nausea, vomiting, Shivering or PDPH in either groups.

CONCLUSION

0.5% Ropivacaine produced better and faster sensory blockade with early regression of motor blockade compared to 0.5% Levobupivacaine. Hence, Ropivacaine can be used successfully for inguinal hernia surgeries where early recovery is well appreciated by the patients.

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