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Original Research Article

Levobupivacaine versus ropivacaine in patients undergoing lower abdominal surgeries

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ABSTRACT

Introduction: Regional anesthesia, like Peripheral nerve block, is commonly used for peripheral surgeries to reduce severe intraoperative and postoperative pain relief. .Some studies with levobupivacaine have shown that duration of analgesia of levobupivacaine are longer compared to that of an equivalent dose of bupivacaine or ropivacaine.This study is done to compare efficacy and safety of levobupivacaine with ropivacaine.

Objective: In this study we tried to compare efficacy and clinical characteristics of isobaric forms of intrathecal levobupivacaine 0.5% and ropivacaine 0.75% in lower abdominal surgeries.

Materials and Methods: This prospective, observational and open labeled, comparative study done for a period of one year in a tertiary care health centre, in South India, prior approval from Institutional ethics committee was taken. 60 patients were included and each of 60 patients was randomized (sealed, numbered and opaque envelopes) to one of two groups of 30 patients. Each of the patients enrolled in the study received one of two solutions: levobupivacaine or Ropivacaine, patient was turned supine immediately after injection, time of which was defined as 'zero'. Thereafter, investigator, assessed upper and lower limits of sensory block (analgesia to pinprick), degree of motor block and recorded heart rate and arterial pressure. The patients were then transferred into the operating theatre and assessments were continued at 30 min intervals thereafter until complete motor and sensory blocks regression. Data were analysed using a standard computer-based statistics package.

Results: Mean time of onset of sensory blockade for levobupivacaine was 3.85±0.5 min and in Ropivacaine was 3.90 ± 0.6 min. Mean time of onset of motor blockade in levobupivacaine group was 3.65 ± 0.72 min and in Ropivacaine group was 3.82 ± 0.88 min, mean duration of motor blockade in Levobupivacaine group was 201.15±22.06 min and in Ropivacaine group was 204 ± 21.20 min. Mean time for regression for levobupivacaine was 98.27±10.18 min and for ropivacaine was 96.33 ±8.21min. There is no significant difference, Mean time for first request of analgesic for Levobupivacaine was 262.22 ±36.60 and for Ropivacaine was 261.20 ± 32.71 min. There is no statistically significant difference; there was no statistically significant difference in the incidence of adverse events in both the groups. So both the drugs are considered to be safe in spinal anesthesia.

Conclusion: In conclusion, Ropivacaine and Levobupivacaine has similar onset of sensory and motor blockade with comparable hemodynamic parameters and time for rescue analgesic administration was comparable between two groups and incidence of post- operative complications is not significant with both drugs.

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1. Introduction

Spinal anesthesia is a type of regional anesthesia in which a local anesthetic is injected directly into cerebrospinal fluid that surrounds spinal cord and nerve roots.[1] It blocks pain from entire lower region of body such as hips, belly, pelvis and legs.[1] Because of its proven success, predictability, increased patient satisfaction, low complication rate, better pain control, earlier recovery of bowel function, it is most commonly used in modern practice of anesthesia.[2]

Bupivacaine is commonly used for spinal anesthesia due to its long duration of action and combined motor and sensory blockade, but it has propensity to cause hypotension and bradycardia and there is potential for cardiac toxicity due to high affinity to cardiac myocytes.[3,4] Racemic bupivacaine is an equimolar mixture of dextro and levobupivacaine.

Levorotatory isomers were shown to have a safer pharmacological profile with less cardiac and neurotoxic adverse effects.[5,6]

Levobupivacaine has lower affinity for cardiac sodium channels and greater plasma protein binding affinity compared with dextro isomer; thus, reducing risk of cardio-toxicity.[7] It also results in earlier motor recovery compared with racemic bupivacaine.[8,9] These advantages make levobupivacaine an attractive alternative to racemic bupivacaine for spinal anesthesia.

Ropivacaine is amide local anaesthetic with local anaesthetic properties similar to those of bupivacaine.[10,11] It is presented as a single-enantiomer and has been used extensively for local infiltration, epidural and peripheral nerve block and clinical data have shown that it is effective and safe for regional anaesthetic techniques.[12] When identical doses of isobaric ropivacaine and bupivacaine were compared, ropivacaine was found to have almost similar efficacy but shorter duration of sensory and motor block.[13]

Many studies have been done to compare various forms of bupivacaine, ropivacaine and levobupivacaine.[14] Most of them used low doses and potency ratio between levobupivacaine and ropivacaine was not taken into consideration.

Therefore, this study was conducted to compare efficacy and characteristics of isobaric forms of intrathecal levobupivacaine 0.5% with ropivacaine 0.75% in equipotent doses for lower abdominal surgeries.

2. Materials and Methods

This prospective, observational and comparative study done for a period of one year in a tertiary care health centre, in South India, prior approval from Institutional ethics committee was taken. 60 patients were included and allocated into two groups randomly, group A and group B, comprising of 30 patients in each group.

Inclusion Criteria: American Society of Anesthesiologists (ASA) class I & II patients of either sex, age between 20-50 years. Exclusion Criteria: Patient's refusal, patients who have contraindications to spinal anaesthesia / Local anaesthetic drugs, patients having h/o diabetes, neurological and musculoskeletal diseases.

On arrival in anaesthetic room, routine monitoring with ECG, non-invasive arterial pressure, and pulse oximetry were commenced and venous access secured, patient was placed in left lateral decubitus position for lumbar puncture, which was performed using a mid-line approach at the second or third lumbar interspace and appropriate anaesthetic solution injected over 10–15 s. Each of 60 patients was randomized (sealed, numbered and opaque envelopes) to one of two groups of 30 patients. Each of the patients enrolled in the study received 3 ml of one of two solutions: levobupivacaine or Ropivacaine each with glucose. All solutions were prepared aseptically by the anaesthetist administering spinal block immediately before injection, patient was turned supine immediately after injection, time of which was defined as 'zero'. Thereafter, investigator, assessed upper and lower limits of sensory block (analgesia to pinprick), degree of motor block (modified Bromage scale:[15] 0, no motor block; 1, inability to raise extended leg, able to bend knee; 2, inability to bend knee, can flex ankle; and 3, no movement) and recorded heart rate and arterial pressure 2, 5, 10, 15, 20, 25, and 30 min after injection. The patients were then transferred into the operating theater and assessments were continued at 30 min intervals thereafter until complete motor and sensory blocks regression. Hypotension (defined as .30% decrease in systolic arterial pressure from baseline) was treated with i.v. ephedrine 3 mg. I.V. fluids were administered only to replace estimated intraoperative losses.

Once sensory block had fully regressed, patients were encouraged to mobilize carefully under supervision. Bladder catheterization was performed when surgically indicated and time to micturition was recorded in all other patients. Patients were visited every 24 h to identify any adverse events. Sample size was chosen to be consistent with our previous experience and studies. Data are presented as median (range), mean (SD), or frequencies as appropriate. Data were analyzed using a standard computer-based statistics package.

3. Results

Table 1: Showing weight distribution in each group

Weight (Kg)	Group A	Group B
Range	45-70	46-68
Mean± SD	57.20 ± 5.20	57.33 ± 6.11

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Table 2: Showing height distribution in each group

Height (cm)	Group A	Group B
Range	150-170	148-168
Mean ± SD	152.76 ± 5.69	152.66 ± 5.57

Table 3: Showing mean time of onset of sensory block in minutes

	Time (Mean ± SD)
Group A (Levobupivacaine)	3.85±0.5
Group B (Ropivacaine)	3.90 ± 0.6
p value	>0.05(Not significant)

Table 4: Showing mean time of onset of motor block in minutes

	Time (Mean± SD)
Group A (Levobupivacaine)	3.65 ± 0.72
Group B (Ropivacaine)	3.82 ± 0.88
p value	>0.05(Not Significant)

Table 5: Showing mean duration of motor block in minutes

	Time (Mean± SD)
Group A (Levobupivacaine)	201.15±22.06
Group B (Ropivacaine)	204 ± 21.20
p value	> 0.05(Not significant)

Table 6: Showing degree of motor block based on modified bromage

Bromage scale	Group A	Group B
0	Nil	Nil
1	Nil	Nil
2	8	10
3	22	20

Table 7: Showing mean time of motor and sensory block regression in minutes

Group	Mean± SD
A (Levobupivacaine)	98.27±10.18
B (Ropivacaine)	96.33 ±8.21
p value	>0.05

Table 8: Showing time of rescue analgesic administration in minutes

Group	Mean± SD
A (Levobupivacaine)	262.22 ±36.60
B (Ropivacaine)	261.20 ± 32.71
p value	>0.05

Table 9: Showing adverse events in each group

Adverse event	Levobupivacaine	Ropivacaine
Headache	0	0
Nausea	3	2
Vomiting	0	0
Shivering	14	16
Hypotension	7	8
Bradycardia	4	2

4. Discussion

Spinal anesthesia has enjoyed a long history of success and recently celebrated a centennial anniversary.[16] Anesthesiologists master spinal anesthesia early during training with achievement of competence (> 90% technical success rate) after only 40–70 supervised attempts.[17,18]

Characteristics of an ideal spinal anesthetic agent would include a rapid onset of a reliable block providing adequate surgical anesthesia of appropriate duration, rapid recovery of sensory and motor block and minimal side-effects.[19] The local anesthetic agents available for spinal anesthesia include lignocaine, bupivacaine, levobupivacaine and ropivacaine. Lignocaine is associated with high incidence of transient neurological symptoms.[20]

Ropivacaine, a long-acting amide local anesthetic agent, has reduced potential for cardiotoxicity and neurotoxicity and is thus safer than the racemic preparation, bupivacaine.[21] Previous studies like Glaser et al.[22] and Cuvas et al.[23] have shown levobupivacaine to be as effective as bupivacaine for use in spinal anesthesia

In our study, mean time of onset of sensory blockade for levobupivacaine was 3.85±0.5 min and in Ropivacaine was 3.90 ± 0.6 min.There is no significant difference; these results are similar to studies done by Vampugalla PS et al.[24] Bozkirli F et al,[25] S N Bhat et al.[26] and Malinowski et al,[27] Moizo et al.[28]

Mean time of onset of motor blockade in levobupivacaine group was 3.65 ± 0.72 min and in Ropivacaine group was 3.82 ± 0.88 min. There is no significant difference, these results are similar to studies done by S N Bhat et al[26] and Malinowsky et al.[27]

Mean duration of motor blockade in Levobupivacaine group was 201.15±22.06 min and in Ropivacaine group was 204 ± 21.20 min. There is no significant difference; these results are in contrast with previous studies done by Athar M et al.[29] and Erturk et al.[30]

Mean time for regression for levobupivacaine was 98.27±10.18 min and for ropivacaine was 96.33 ±8.21min. There is no significant difference, these results are in contrast with study done by SN Bhat et al.[26]

Mean time for first request of analgesic for Levobupivacaine was 262.22 ±36.60 and for Ropivacaine

was 261.20 ± 32.71 min. There is no statistically significant difference, these results are similar to studies done by Bozkirli F et al.[31] Taspinar et al.[32] and Ogun C O et al.[33]

There was no statistically significant difference in the incidence of adverse events in both the groups. So both the drugs are considered to be safe in spinal anesthesia

5. Conclusion

Safety of spinal agents and complications from spinal anesthesia continue to be examined and reexamined. In conclusion, Ropivacaine and Levobupivacaine has similar onset of sensory and motor blockade with comparable hemodynamic parameters and time for rescue analgesic administration was comparable between two groups and incidence of post- operative complications is not significant with both drugs. Both Ropivacaine and Levobupivacaine can be used for lower abdominal surgeries.

6. Limitations

Limited patient population, limited duration of study and no blinding was done. As different surgeries were taken up in this study, onset of pain at surgical incisional site may not give accurate duration of analgesia.

7. Source of Funding

None.

8. Conflict of Interest

None.

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