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Comparison of Levobupivacaine and Bupivacaine in Spinal Anaesthesia in Endourology: A Study of 100 Cases

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Abstract

Introduction: Spinal anaesthesia is a type of neuraxial blockade obtained by blocking the spinal nerves in the sub arachnoid space. The local anesthetic is deposited in the sub arachnoid space act on the spine nerve roots. Spinal anaesthesia is widely used for urological surgeries such as ureteric stone removal, transurethral resection of prostate and transurethral endoscopic surgeries. Many patients undergoing TURP or stone retrieval belong to the elderly age group having co existing pulmonary or cardiac disease. By reducing the dose of local anaesthetic, side effects can be decreased.

Aim & Objectives of the study: To compare the clinical efficacy of Levobupivacaine and Bupivacaine in Spinal anaesthesia based on the, Onset and duration of sensory blockade, Onset and duration of motor blockade, Maximum height of sensory blockade, Haemodynamic parameters, Complications/side effects if any.

Results: the data and statistical analysis suggest that the time to onset of sensory blockade and motor blockade is longer with Levobupivacaine when compared to Bupivacaine. Two segment regression time and recovery of sensory blockade is shorter in Levobupivacaine group. Levobupivacaine could be used as a safer alternative to Bupivacaine in spinal anaesthesia for Tran's urethral endoscopic procedures.

Keywords: Levobupivacaine; Bupivacaine; Spinal anaesthesia

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Introduction

This was a prospective randomized controlled study. After ethical committee approval and informed consent, the study was conducted in 100 eligible patients after explaining the procedure details to the patients the anaesthetic technique was performed. This study was conducted at Government Rajaji Hospital attached to Madurai medical college.

Inclusion criteria

- Elective Ureteroscopic surgeries
- Both sexes
- Age 30-70 years
- ASA I – II

Exclusion criteria

- Patients with history of bleeding disorders or patients on anticoagulant therapy
- Patient's refusal
- Known hypersensivity to amide local anaesthetics
- Height of less than 145cm
- Pregnancy
- Patients with documented neuromuscular disorders
- Patients with respiratory compromise
- Psychiatric illness
- Patients suspected to have a difficult airway (Mallampati class 3 or 4)
- BMI > 35

Materials and Methods

100 adult patients aged 30-70yrs ASA physical status I to II posted

for elective Ureteroscopic surgeries were randomized into 2 groups of 50 each.

Two groups:

Group B- Inj. Hyperbaric Bupivacaine 0.5% 2.5 ml

Group L- Inj. Isobaric Levobupivacaine 0.5% 2.5 ml

The solution is prepared by an anaesthetist colleague outside the operating room so that the anaesthesiologist performing the sub arachnoid block is totally unaware of the drug which is being injected.

Preoperative preparation

Preoperative assessment of the patients included, history regarding the symptoms and their severity, other associated systemic illness, and history of previous surgery. A systematic examination of the cardiovascular and respiratory system was done. The neck of the patient was examined for adequate flexion and extension and assessment of the airway was done. Apart from the basic preoperative investigations like blood hemoglobin, Sugar, Urea, Serum Creatinine, specific investigations like Serum Electrolytes, Electrocardiogram, and Echocardiography were done.

None of the patients received Premedication; other medications were continued until the operating day. In the operating room, all of the patients had both legs with an elastic bandage wrapped. Monitoring devices such as ECG, Non invasive Bloodpressure, Pulseoximeter probe were attached and base line values recorded. After 500 ml of Ringer lactate was administered, the back was painted and draped. The anaesthetic drugs were administered intrathecally under aspetic conditions and with patients in lateral decubitus position through a 25 gauge quincke's needle in the median approach at L3-4 intervertebral space slowly atleast for 10 seconds without barbotage or aspiration.

Patient was put into supine position with pillow under the head. Standard monitoring was continued throughout the operation. Sensory blockade was assessed by using pin prick test on each side of mid clavicular line; Motor blockade was assessed by Modified Bromage scale. (0 = no motor block, 1 = inability to raise extended legs, 2 = inability to flex knees and 3 = inability to flex ankle joints). These tests were performed every 2 min for up to 30 min after spinal anesthesia and every 30 min postoperatively until the sensory and motor variables were back to normal.

Supplementary oxygen 3 liters/min via polymask if spO2 was less than 93% with the patient breathing room air. The surgical procedure was started 10 mins after beginning of spinal anaesthesia or when sensory level is at T10. Patient is put in Lithotomy position. Intra operatively patient received 2ml/kg/hr of Normal saline and thereafter Haemodynamic variables and spO2 were recorded every 5 mins until 30mins until the end of the procedure. At the end of the procedure, patient was put back to supine position and around 250 ml of Normal saline was rushed. Haemodynamic parameters were monitored until 15 mins after the end of the procedure. Patient was shifted to the Post anaesthesia care unit and haemodynamic variables and sp02 were measured every 1 hr until 3 hrs or until recovery of dorsiflexion of great toe.

Post operatively patients were monitored for any episodes of:

- Bradycardia
- Hypotension
- Nausea
- Vomiting
- Respiratory depression-respiratory rate and oxygen saturation was monitored.
- Hypotension: fall of more than 30% from the baseline blood pressure or the systolic blood pressure less than 90mmHg, it was treated with fluids, vasopressors like Inj. Ephedrine 6mg i.v bolus as and when necessary.
- Bradycardia: if rate goes below 50/minute, then Inj. Atropine 0.3mg i.v was used.
- Hypoxia: if spO_2 falls < 93% and was treated with supplemental oxygen via Polymask.
- Baseline, intraoperative and postoperative pulse rate, blood pressure, oxygen saturation were recorded using multiparameter monitor.
- Post operative complications like Nausea, Vomitting, and Shivering were also noted.
- Inj. Metaclopramide 10mg IV, Inj. Pentazocine 30mg i.v was administered for the management of Vomitting, Shivering respectively.

Observation and Results

Two groups:

Group B- Inj. Hyperbaric Bupivacaine 0.5% 2.5 ml

Group L- Inj. Isobaric Levobupivacaine 0.5% 2.5 ml

Statistical tools

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using Epidemiological Information Package (EPI 2010) developed by Centre for Disease Control, Atlanta.

Using this software range, frequencies, percentages, means, standard deviations, chi square and 'p' values were calculated. Kruskul Wallis chi-square test was used to test the significance of difference between quantitative variables and Yate's chi square test for qualitative variables. A 'p' value less than 0.05 is taken to denote significant relationship. The Group Levobupivacaine had a mean age of 40.40 ± 13.905 and the Group Bupivacaine had a mean age of 42.260 ± 11.535. p value was 0.468 which was not statistically significant (**Table 1**).

In Group L, mean onset time of sensory blockade upto level T10 was 4.54± 1.147 and Group B mean onset time to sensory blockade up to level T10 was 2.92 ± 0.695, p value was 0.001 which was statistically significant (**Table 2**). The mean time to reach Modified Bromage scale 3 was longer in Group L which was 9.060 ± 1.778 mins when compared to Group B which was 5.40

Table 1 Time to onset of sensory blockade.

	Mean	S.D	P Value
Levobupivacaine	4.54	1.147	0.001
Bupivacaine	2.92	0.695	Significant

Table 2 Time to reach Modified Bromage scale 3

	Mean	S.D	P Value
L	9.06	1.195	0.001
B	5.4	1.195	Significant

Table 3 2 segment regression time.

	Mean	S.D	P Value
L	88.14	6.395	0.001
B	101.22	8.21	Significant

± 1.195 mins. The time to offset of motor blockade in Group L is 256.00 ± 27.68 mins when compared to Group B which is 248.96 ± 40.45 mins, p value is 0.312 which is statistically not significant. The mean two segment regression time in Group L was 88.140 ± 6.395 minutes while in Group B was 101.22 ± 8.21 minutes, p value was 0.001 which statistically significant (**Table 3**).

In Group L and Group B, 1 case of Hypotension each. In, Group L, 8 cases of shivering was reported while in Group B-3 cases. In Group L, 1 case of bradycardia was encountered while in Group B, 2 cases. The post operative complications were statistically not significant in both the groups with p value of 0.058. In Group L and Group B, 1 case of Hypotension each. In, Group L, 8 cases of shivering was reported while in Group B-3 cases. In Group L, 1 case of bradycardia was encountered while in Group B, 2 cases. The post operative complications were statistically not significant in both the groups with p value of 0.058.

Discussion

Spinal anaesthesia is ideal for endourological procedures. Levobupivacaine is a new drug which is becoming popular because of its equipotency with Bupivacaine. It has lower cardio vascular and central nervous system side effects. Levobupivacaine has a faster protein binding rate due to which there is decreased degree of toxicity. Elderly individuals have co existing cardiac or pulmonary complications so therefore it is necessary to limit the extent of blockade in order to avoid adverse effects. Baricity is an important determinant of the extent of spinal blockade.

Levobupivacaine is now available as an isobaric solution. Thus the distribution is not affected by gravity and the level of blockade would be lesser than that of hyperbaric solution. Thus unnecessary high spinal blockade can be avoided. This also produces better haemodynamic stability. Hence, we conducted this study to evaluate the clinical efficacy of Isobaric Levobupivacaine and Hyperbaric bupivacaine in spinal anaesthesia for endourological procedures.

Onset of sensory blockade

According to this study, the average time for the onset of sensory blockade was 4.54 mins in Levobupivacaine group and 2.92 mins in the Bupivacaine group. Lee et al. observed that there is no significant difference in onset of sensory and motor blockade or Haemodynamic changes between both the drugs in patients undergoing urological procedures [1]. Opas Vanna et al. also observed that there is no significant difference in the onset time of sensory blockade .This does not correlate with our study.

Maximum Height of sensory blockade

The maximum level of sensory blockade was found to be T6 (T6-T10) in Levobupivacaine group and T4 (T4-T8) in Bupivacaine group. The height of blockade is lower with Levobupivacaine as it is an isobaric solution. The position of the patient during and after injection of local anaesthetic does not have an effect on the levels of anaesthesia. Isobaric solutions are commonly used when level of anaesthesia T10 or below are required.

Two segment regression time

The average time for two segment regression of sensory blockade was 88.14 minutes in Levobupivacaine group and 101.22 minutes in Bupivacaine group. Yong X Liang et al. also reported that Levobupivacaine has shorter two segment regression time of sensory blockade [2].

Duration of sensory blockade

The average duration of sensory blockade in Levobupivacaine group was 301.9 minutes and 400.02 minutes in Bupivacaine group. The duration of sensory blockade was shorter in the Levobupivacaine group. Glaser et al. reported similar duration of sensory blockade between levobupivacaine and Bupivacaine in spinal anaesthesia for elective hip replacement surgeries [3]. This does not correlate with our study.

Onset of motor blockade

The average time to onset of motor blockade was 9.06 minutes in Levobupivacaine group and 5.4 minutes in Bupivacaine group. It was delayed in Levobupivacaine group. Luck et al. observed that the onset time of motor blockade was similar with Levobupivacaine and Bupivacaine [4].

Duration of motor blockade

The average duration of motor blockade was 256 minutes in Levobupvacaine Group and 248.96 minutes in Bupivacaine group. It was similar in both the groups. Opas Vanna et al. also observed that the duration of motor blockade was similar in patients undergoing transurethral endoscopic procedures under spinal anaesthesia [5-8]. Fattorini et al. also observed that the duration of motor blockade were similar in patients posted for lower limb major surgeries under spinal anaesthesia [9-12]. Hale Borazan et al. observed that the duration of motor blockade was longer with Levobupivacaine [13,14].

Haemodynamic parameters:

a) Pulse rate- According to this study there is no significant difference in pulse rate between both the groups

b) Systolic Blood Pressure- According to this study, there is no significant difference in fall in systolic blood pressure in both the groups.

c) Diastolic Blood pressure- According to this study, there is no significant difference in fall in diastolic blood pressure between both the groups.

Mantouvalou et al. reported that similar haemodynamic variables between Levobupivacaine and Bupivacaine. They reported higher incidence of Hypotension in the Bupivacaine group [15-18].

Post operative complications:-

Shivering: 8 patients of the Levobupivacaine group had shivering when compared to 3 persons in Bupivacaine group. This was not statistically significant.

Bradycardia: 3 patients in the Levobupivacaine group had bradycardia and was promptly managed with Inj. Atropine 0.3 mg i.v. There was 2 cases of Bradycardia in the Bupivacaine group.

Hypotension: 1 patient developed Hypotension in the Levobupivacaine group and Bupivacaine group. Felipe et al. reported Hypotension as a common complication of Levobupivacaine.

Nausea/Vomitting: There were 1 patients (2%) with Nausea in the Levobupivacaine group and 1 patient (2%) in Bupivacaine group.

Stay in PACU: 2 patients in Levobupivacaine group and 4 patients in Bupivacaine group were shifted to PACU for observation and later shifted to their respective wards.

Breslin et al. reported two cases of Grand mal tonic clonic convulsions after accidental intravascular injection of Levobupivacaine while performing Plasma concentrations that lead to central nervous system toxicity did not produce manifestations of cardiac toxicity. Therefore, Levobupivacaine has a better cardio vascular safety margin [19-25].

Summary

This is a prospective randomized controlled study involving 100 cases posted for elective endourological surgeries under spinal anaesthesia. They are allotted into two groups, Group L receiving 0.5% Isobaric Levobupivacaine and Group B receiving 0.5% Hyperbaric Bupivcaine. The following parameters are noted during the study period. The onset of sensory block, maximum height of sensory block, two segment regression time, onset of motor block, mean duration of sensory & motor block. The hemodynamic parameters noted are pulserate, systolic and diastolic blood pressure, oxygen saturation with pulse oximeter probe. The use of atropine and vasopressors are noted. Any complications during this study were also noted [25-29].

According to the study, there was significant delay in onset of sensoryand motor block in Levobupivacaine group. There was earlier two segment regression time in Levobupivacaine group. The maximum level of blockade was adequate in Levobupivacaine group. There was earlier offset of sensory blockade but offset of motor blockade was similar to Bupivacaine [23-29]. The hemodynamic parameters were well maintained in both groups. Therefore, Levobupivacaine can be used as a safer alternative to Bupivacaine in Spinal anaesthesia especially for elderly individuals with co existing respiratory and cardio vascular compromise undergoing Endourological procedures.

Conclusion

In conclusion, the data and statistical analysis suggest that the time to onset of sensory blockade and motor blockade is longer with Levobupivacaine when compared to Bupivacaine. Two segment regression time and recovery of sensory blockade is shorter in Levobupivacaine group. The Haemodynamic variables and the time to recovery of motor blockade are similar in both the groups. Demographic data like Age, Sex, Weight, and Height are similar in both the groups. Duration of surgery is also similar in both the groups. Levobupivacaine could be used as a safer alternative to Bupivacaine in spinal anaesthesia for Tran's urethral endoscopic procedures.

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