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COMPARATIVE STUDY ON EFFICACY AND SAFETY OUTCOMES OF 0.5% BUPIVACAINE VERSUS 0.75% ROPIVACAINE IN SPINAL ANAESTHESIA FOR ELECTIVE CESAREAN SECTION

Anaesthesiology

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ABSTRACT

Background: Spinal anesthesia is the widespread prevailing neuraxial technique for caesarean delivery in many institutions because of the superior quality of surgical anesthesia, rapid onset of action, excellent patient comfort, and fewer complication rates. Bupivacaine is a commonly used drug for spinal anesthesia during caesarean delivery and Ropivacaine is also becoming popular. **Objective:** To compare between the onset of action and duration of analgesia (sensory and motor) during caesarean delivery between these two drugs. **Materials and Methods:** It is a prospective observational study conducted for a period of 01 year. A total of 76 patients undergoing caesarean section under spinal anesthesia were taken up for the study and they were randomly allocated to receive either ropivacaine 0.75%(n=38) or Bupivacaine 0.5%(n=38). Afterwards, the differences in the anesthetic efficacy, mean duration of motor and sensory block and mean peak time of motor and sensory block were observed. **Result:** There was no significant difference in demographic characteristics between both the groups. The mean duration of sensory block was significantly longer with 0.5% bupivacaine (154.05 ± 7.2 minutes) compared to 0.75% ropivacaine (133.39 ± 4.41 minutes). Similarly, the mean duration of motor block was greater for bupivacaine (156.55 ± 5.1 minutes) versus ropivacaine (147.55 ± 4.46 minutes). The mean time to achieve peak sensory block was slightly prolonged with bupivacaine (14.21 ± 1.33 minutes) compared to ropivacaine (13.55 ± 1.13 minutes). **Conclusion:** Both Bupivacaine and Ropivacaine are good anesthetic agents used in several surgical procedures, ropivacaine is a better choice due to little influence on hemodynamics and shorter duration of sensory and motor block which are useful for recovery and also safe to the patients.

KEYWORDS

Ropivacine, Bupivacine, Spinal anaesthesia, cesarean.

INTRODUCTION

In the present world, with advancement of technology it is necessary to have a pain free medical procedure especially in any surgical procedure both during the procedure and after the procedure. So, it should be the primary objective of an anesthesiologist to relieve the pain of the patient, both during the surgical procedure and in postoperative period since having untreated pain and inadequate anesthesia can have devastating outcome.[1] Spinal anesthesia is the widespread prevailing neuraxial technique for caesarean delivery in many institutions because of the superior quality of surgical anesthesia, rapid onset of action, excellent patient comfort, and fewer complication rates. Though the incidence of hypotension can be as high as 70%–80% when pharmacological prophylaxis is not used.[2] Bupivacaine and ropivacaine have been used as intrathecal drugs alone or in combination with various opioids for caesarean section. Ropivacaine is considered a valid and safe alternative to bupivacaine for spinal anesthesia since it blocks sensory nerve fibers more readily as compared to the motor fibers, and it has shown to be having reduced cardiac toxicity even with increased dose.[3] Both, Ropivacaine and Bupivacaine belong to Amino amide group of local anesthetic drugs. Both the drugs are compared in terms of onset of sensory and motor block, duration of analgesia and its side effects like Hypotension, bradycardia, nausea, and vomiting. Though mechanism of action of both drugs is same as other local anesthetics, some differences are there in their structural, physiochemical, pharmacokinetic as well as pharmacodynamic properties.[4,5]

MATERIALS AND METHODS

The study is conducted at Santosh Medical College and Hospital, Ghaziabad after approval from the Institutional Ethics Committee. It is a prospective observational study involving 76 pregnant women undergoing elective cesarean sections. Participants were divided into two groups: one receiving 0.5% Bupivacaine and the other 0.75% Ropivacaine.

Inclusion Criteria: 1) All patients undergoing Caesarean Section for delivery. 2)Patients aged between 19 to 35 years of age.

Exclusion Criteria: 1) Any drug allergies. 2)History of bleeding disorders.

A thorough pre anesthetic checkup was done for all the patients. Detailed history of present illness, any relevant history of disease was also recorded. All the patients had overnight fasting and received premedication with Tab metoclopramide 10mg and Tab Ranitidine 150mg HS. In operation theatre, Bupivacaine 0.5% or Ropivacaine 0.75% were used according to the weight and height of the patient and were given at a rate of approximately 0.2 mL/sec for spinal anesthesia.

The following observations were made: 1) The time taken for the individual drug to show its action 2)Total duration of analgesia and the recovery from the drug (sensory and motor). 3) Mean time to achieve peak sensory and motor block.

Statistical analysis: Significance of difference in proportions (qualitative variables) was calculated using t test and chi square test. Significance level of p value was taken as $p < 0.05$.

RESULTS:

Table 1: Demographic and Anthropometric profile

Characteristics	Bupivacaine Group	Ropivacaine Group	Std Deviation
Mean Age (Yrs)	26.89±2.72	26.68±2.44	2.57
Mean height (cm)	156.89±5.46	156.02±5.47	5.45
Mean weight (kg)	55.72±7.08	56.01±6.06	6.55
Mean BMI (kg/m^2)	22.57±2.02	22.96±1.69	1.86

Table 1: Shows no significant difference between both the groups with regards to demographic data which include mean age, mean height, mean weight and mean BMI.

Table 2: Distribution of study participants according to characteristics of time for sensory block (N=76)

Sl No.	Criteria	Mean time of Sensory Block (min)	Std Deviation
01.	Bupivacaine Group	3.6	0.72
02.	Ropivacaine Group	4.37	0.91

Table 2: Mean time of sensory block for study participants who were given 0.75% ropivacaine was observed to be higher as compared to that of study participants who were given 0.5% bupivacaine (4.37±0.91 min v/s 3.6±0.72 min).

Table 3: Distribution of study participants according to characteristics of time for motor block (N=76)

Sl No.	Criteria	Mean time of motor block (min)	Std Deviation

01.	Bupivacaine Group	12.37	1.65
02.	Ropivacaine Group	11.58	1.24

Table 3: When assessed for time taken for motor block by bupivacaine and ropivacaine, it was observed that participants who were given 0.5% bupivacaine had slightly higher mean time of motor block (12.37±1.65 min) as compared to those who were given 0.75% ropivacaine, where mean time of motor block was 11.58±1.34 min.

Table 4: Distribution of study participants according to characteristics of duration of sensory block (N=76)

Sl No.	Criteria	Mean duration of sensory block (min)	Std Deviation
01.	Bupivacaine Group	154.05	7.2
02.	Ropivacaine Group	133.39	4.41

Table 4: Mean duration of sensory block for study participants who were given 0.5% bupivacaine was observed to be higher as compared to that of study participants who were given 0.75% ropivacaine (154.05±7.2 min v/s 133.39±4.41 min).

Table 5: Distribution of study participants according to characteristics of duration of motor block (N=76)

Sl No.	Criteria	Mean duration of motor block (min)	Std Deviation
01.	Bupivacaine Group	156.55	5.1
02.	Ropivacaine Group	147.55	4.46

Table 5: When assessed for duration of motor block by bupivacaine and ropivacaine, it was observed that participants who were given 0.5% bupivacaine had higher mean duration of motor block (156.55±5.1 min) as compared to those who were given 0.75% ropivacaine, where mean duration of motor block was 147.55±4.46 min.

Table 6: Distribution of study participants according to characteristics of peak sensory block (TPSL) (N=76)

Sl No.	Criteria	Mean TPSL (min)	Std Deviation
01.	Bupivacaine Group	14.21	1.33
02.	Ropivacaine Group	13.55	1.13

Table 6: Mean time of peak sensory block among study participants who were given 0.5% bupivacaine was observed to be higher than those who were given 0.75% ropivacaine (14.21±1.33 min as compared to 13.55±1.13 min)

DISCUSSION:

No significant difference seen between both the groups with regards to demographic data which include mean age, mean height, mean weight and mean BMI. Mean time of sensory block for study participants who were given 0.75% ropivacaine was observed to be slightly delayed as compared to that of study participants who were given 0.5% bupivacaine (4.37±0.91 min v/s 3.6±0.72 min). The results were found to be comparable to the study conducted in the year **2020** by **Gadre AK et al**[6] with mean time of sensory block as 4.20±0.085 min and 4.33±0.844 min for bupivacaine and ropivacaine group respectively. But the results were found to be different from the results of study conducted by **Tadu LC et al**[7] in **2014** and **Vallabha Ravi Teja et al**[8] in the year **2012-2014** where mean time of onset of sensory block in bupivacaine group was 2.63±0.66 min and 2.37±0.63 min respectively and for ropivacaine group, it was found to be 2.88±0.67 min and 2.58±0.56 respectively. The difference in size of study population may be attributed to the difference observed here.

When assessed for time taken for motor block by bupivacaine and ropivacaine, it was observed that participants who were given 0.5% bupivacaine had slightly higher mean time of motor block (12.37±1.65 min) as compared to those who were given 0.75% ropivacaine, where mean time of motor block was 11.58±1.34 min. The results differed from that of study conducted by **Gadre AK et al**[9] **in 2020,** where mean onset of motor block was found to be 4.83±0.834 min and 5.40±0.675 min in bupivacaine and ropivacaine group respectively. This difference may also be attributed to the difference of sample size considered for conduct of study in both studies.

Kasza T et al[10] in their study conducted in year **2005** reported that the mean duration of sensory block in bupivacaine and ropivacaine group was found to be 130±24 min and 129±29 min respectively. Their findings were found to be comparable to the findings of the current study where mean duration of sensory block for study participants who were given 0.5% bupivacaine was observed to be more as compared to that of study participants who were given 0.75% ropivacaine (154.05±7.2 min v/s 133.39±4.41 min). However, these results differed from the ones reported by **Tadu LC et al**[48] and **Divya Sethi**[11] in their studies of **2014** and **2019** respectively, where mean duration of sensory block was found to be much higher than the findings of the current study. Mean duration of motor block by bupivacaine and ropivacaine was observed to be 156.55±5.1 min and 147.55±4.46 min respectively. The results were found to be similar for bupivacaine group with a mean duration of 154.5±8.77 min, but was different for ropivacaine group with a mean duration of motor block of 124.17±8.91 min in a study conducted by Gadre et al. The results differed for both groups in another study conducted in the year **2005** by **Kasza T et al**[12] and in another study conducted in **2014** by **Tadu LC et al**[13] where mean duration of motor block was found to be lower and higher respectively as compared to the duration observed in the current study.

Mean time of peak sensory block among study participants who were given 0.5% bupivacaine was observed to be higher than those who were given 0.75% ropivacaine (14.21±1.33 min as compared to 13.55±1.13 min). This difference of means among both groups with respect to peak sensory block has been discussed seldomly in the literature and hence the present study adds to the literature for the given aspect of the mean peak time of sensory block for induction of the study participants using 0.5% bupivacaine and 0.75% ropivacaine.

CONCLUSION:

Both Bupivacaine and Ropivacaine are good anesthetic agents used in several surgical procedures specially in lower abdominal surgeries like caesarean sections. Despite both being placed equal on various parameters, as a conclusion of the present study it is accepted that bupivacaine in the given strength of 0.5% has more motor and sensory block duration as compared to 0.75% ropivacaine but 0.75% ropivacaine can be used as a better agent in elective cesarean section as time taken for the surgery is less and early mobilization can be done.

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