



COMPARATIVE STUDY OF 0.5% BUPIVACAINE WITH 0.75% ROPIVACAINE USED FOR SUBARACHNOID BLOCK IN PATIENTS UNDERGOING ELECTIVE CAESAREAN SECTION

Anaesthesiology

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ABSTRACT

Spinal anesthesia, is a form of regional anaesthesia which involves injection of a local anaesthetic into the cerebrospinal fluid (CSF), through a spinal needle. The desired effect of spinal anaesthesia is to block the transmission of nerve signals to and from the affected area. Sensory signals from the site are blocked, thereby eliminating pain, and blockade of motor signals to the area eliminate movement.

Aims And Objectives: To compare the effectiveness of intrathecal Inj. Bupivacaine and Inj. Ropivacaine in caesarean section.

Materials And Method: 60 ASA-I and ASA-II fit patients were divided into 2 equal groups of 30 patients each i.e. group I and group II. The patients were allocated to the respective groups by a computer generated model. GROUP I (CONTROL GROUP): In this group patients were given 0.5% hyperbaric Bupivacaine 2ml intrathecally. GROUP II (STUDY GROUP): In this group patients were given 0.75% isobaric Ropivacaine 2ml intrathecally. Under all aseptic precautions, sub-arachnoid block was given with 26G Quincke's needle in sitting position using mid-line approach. Group A was injected with 2ml 0.5% of bupivacaine and Group B was injected with 2 ml 0.5% of ropivacaine. Pulse, blood pressure and SpO2 were measured every 3 minutes for first 15 minutes, then every 5 minutes for next 15 min, thereafter every 10mins. Testing of Sensory block was done by using pinprick test. Only when it reached T5-T6 level, surgical incision was allowed. The degree of motor blockade was assessed by loss of antigravity movements of the legs by Modified Bromage scale.

Results: It was observed that, both the groups were comparable with respect to the patient's demographic profile and hemodynamic stability.

Conclusion: We conclude from our study that 0.75% isobaric ropivacaine when given intrathecally and compared with 0.5% hyperbaric bupivacaine produces a faster onset of sensory and motor block, similar two dermatomal regression of the sensory block, earlier recovery from the motor blockade and a similar duration of postoperative analgesia as bupivacaine.

KEYWORDS

INTRODUCTION

Spinal anesthesia, is a form of regional anaesthesia which involves injection of a local anaesthetic into the cerebrospinal fluid (CSF), through a spinal needle. The desired effect of spinal anaesthesia is to block the transmission of nerve signals to and from the affected area. Sensory signals from the site are blocked, thereby eliminating pain, and blockade of motor signals to the area eliminate movement. Bupivacaine was introduced in 1965 and has been extensively used in regional anesthesia. It has long duration of action and produces adequate sensory & motor blockade. However, its disadvantages & side effects are cardiac and central nervous system toxicity⁷. These adverse effects have led to a search for drugs with lesser toxicity. Newer long-acting local anaesthetics (ropivacaine, levobupivacaine) have been introduced for clinical use because they have lesser cardiac toxicity on overdose and are more specific on sensory rather than motor nerve fibers.

Ropivacaine was developed and marketed as the pure S (-) enantiomer of propivacaine. It has lower lipophilicity than bupivacaine; which decreases potential for CNS toxicity and cardiotoxicity¹⁴. Ropivacaine has a short time to onset of anaesthesia. Its duration of sensory and motor blockade is appropriate for the indication or procedure.

In the present study, we compared the efficacy of 2 ml of 0.75% isobaric ropivacaine with a control group using 2 ml of 0.5% hyperbaric bupivacaine given intrathecally in caesarean sections.

MATERIALS AND METHODS

Source of data will be collected from 60 ASA-I and ASA-II fit patients (30 in each group) scheduled for elective and emergency caesarean delivery under subarachnoid block. Written informed consent was taken from all the patients.

GROUP I (CONTROL GROUP):

In this group patients were given 0.5% hyperbaric Bupivacaine 2ml intrathecally.

GROUP II (STUDY GROUP):

In this group patients were given 0.75% isobaric Ropivacaine 2ml

intrathecally.

INCLUSION CRITERIA:

1. ASA grade I and ASA grade II patients.
2. Singleton full term pregnant patients posted for elective caesarean sections.
3. Age between 20 and 45 years.
4. Haemodynamically stable patients with all routine investigations within normal limits and without any other co morbidities.
5. Availability of informed consent and willingness of the patient to be a part of the study.

EXCLUSION CRITERIA:

Patients with ASA physical status III or more.

1. Patients below 20 years and above 45 years of age.
2. Patients having resting blood pressure more than 140/90 mm Hg,
 - history of hypertension,
 - pre-eclampsia or eclampsia,
 - hyperthyroidism,
 - coexisting neurologic, cerebrovascular disorder
3. Patients with history of allergy to local anaesthetic and any contraindications to spinal anaesthesia.
4. Patients having known foetal abnormalities.
5. The patients without consent.
6. Patients undergoing emergency caesarian section.

METHODOLOGY

A detailed history, thorough general examination was done for all the patients undergoing LSCS. Pre-operatively the procedure was explained to the patients and a written consent was taken.

PROCEDURE

Patients were kept nil by mouth overnight, prior to the scheduled day of operation. Vital parameters like pulse rate, respiratory rate, oxygen saturation (SpO2), blood pressure and ECG changes in pre-operative

room were monitored. They were preloaded with i.v Ringer Lactate 500 ml 15 minutes before sub arachnoid block.

Under all aseptic precautions, sub-arachnoid block was given with 26G Quincke's needle in sitting position using mid-line approach. Group A was injected with 2ml 0.5% of bupivacaine and Group B was injected with 2 ml 0.5% of ropivacaine. Pulse, blood pressure and SpO₂ were measured every 3 minutes for first 15 minutes, then every 5 minutes for next 15 min ,thereafter every 10mins.

Testing of Sensory block was done by using pinprick test. Only when it reached T5-T6 level ,surgical incision was allowed. The degree of motor blockade was assessed by loss of antigravity movements of the legs by Modified Bromage scale

- 1- No movements
- 2- Almost complete block, able to move feet.
- 3- Partial block, just able to move knees.
- 4- Detectable weakness of hip flexion while supine, (full flexion of knees)
- 5- No Detectable weakness of hip flexion while supine.
- 6- Able to perform partial knee bend

The following readings were noted for assessment of onset of blockade:

- T0- Time of Spinal anaesthesia
- T1- Time of onset of sensory block (loss of pinprick sensation)
- T2- Time of onset of motor block (inability to lift the extended leg)
- T3- Time of peak sensory block
- T4- Time of peak motor block

Monitoring of pulse rate, respiratory rate, SpO₂, blood pressure and blood loss was done intraoperatively. Side effects (nausea, vomiting, pain, shivering, pruritus, sedation, respiratory discomfort) of the drugs on every patient was noted and treated appropriately. Patients were assessed for quality of spinal anaesthesia and scored using

Campbell score

1. Wide awake
2. Sedated but easily arousable
3. Drowsy and difficult to arouse
4. Unarousable

Subsequently, patients were transferred to the Post operative room ,where residual sensory blockade (when sensation to pinprick regressed by two-dermatome segment - TS) and its wearing off time (when patient starts to lift legs against gravity-T6) were noted. Patients were then transferred from the post-operative room to ward.

Postoperative pain was also recorded after the sensory block wore off with VAS (Visual Analogue Score) and when VAS reaches 5 or more, rescue analgesia with Injection Diclofenac Sodium 75 mg I.M to the patients.

VAS represents patient's opinion on degree of pain. It is calculated using a 10 cm line on a piece of white paper, one end of line is marked as "0" i.e "no pain" at all, while other end is marked as "10" i.e "worst pain" he or she has ever felt. They rated the degree of pain by making a mark on the scale.



Pain Score:

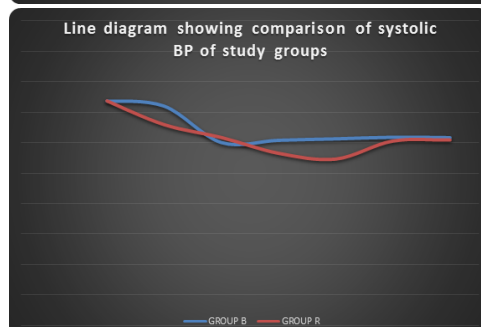
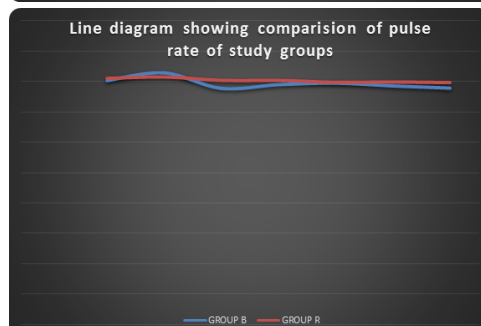
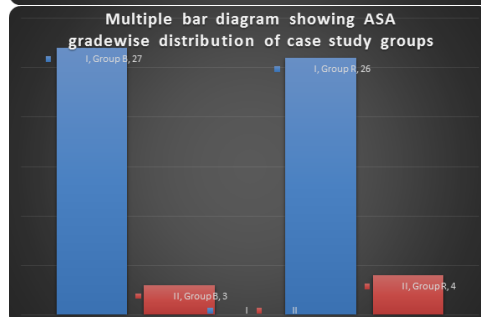
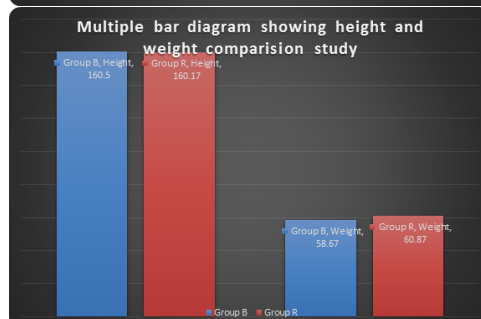
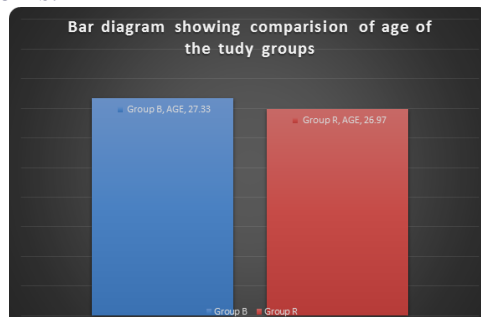
- 0-3 mild
- 3-7 moderate
- >7 severe

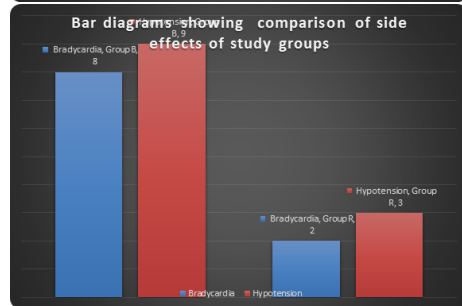
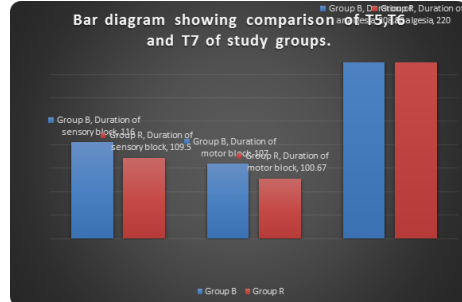
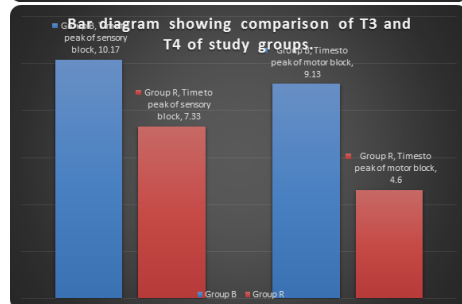
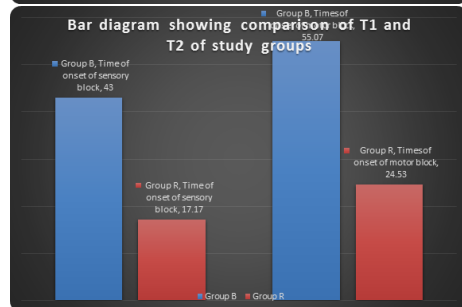
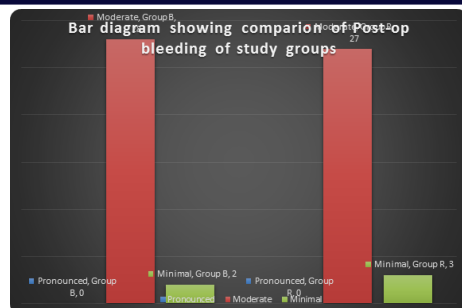
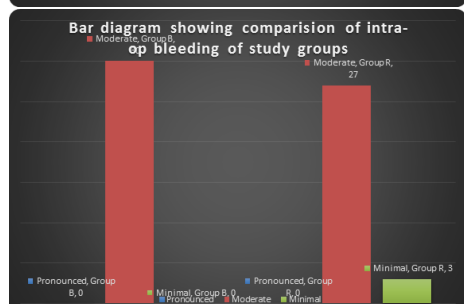
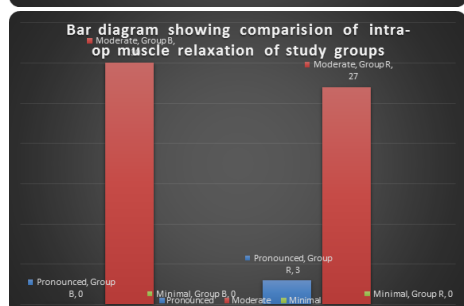
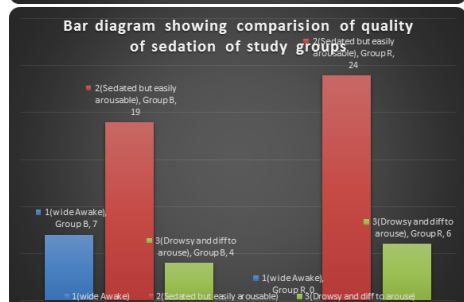
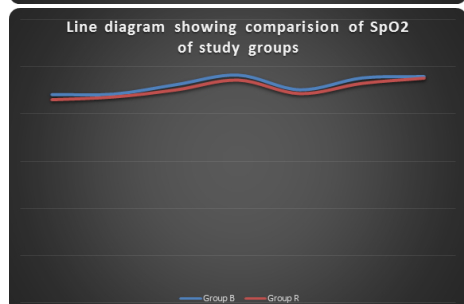
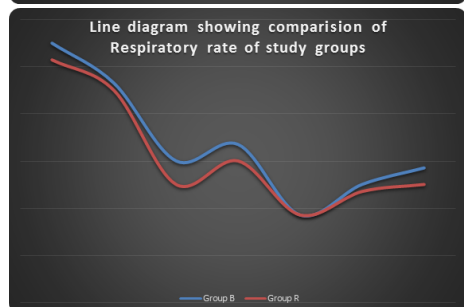
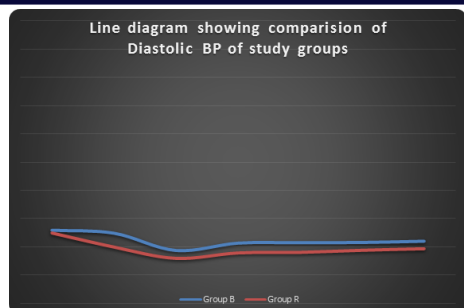
In addition, the operating surgeons were asked to assess the optimal surgical conditions with help of specially devised scale as follows:

	0	1	2
1. Intraoperative muscle relaxation	: Pronounced	Moderate	Nil
2. Intraoperative Bleeding	: Excessive	Moderate	Minimum
3. Postoperative Bleeding	: Excessive	Moderate	Minimum

Results of the two groups were tabulated and subjected to statistical analysis. Statistical Package for Social Sciences (SPSS) software version I I was applied. Z-test was used for comparisons of the components of the total deviation. The results were considered statistically significant when P value was less than 0.05 and statistically not significant when P value was greater than 0.05. Finally the results in the two groups were compared to draw the conclusion.

RESULTS:





DISCUSSION

Spinal anaesthesia is widely used for LSCS. It has been the mainstay for regional anaesthesia in developing countries, especially in India. Various local anaesthetics have been injected into the intrathecal space to achieve intrathecal blockade, starting with cocaine way back in 1898. It has several advantages over general anaesthesia for caesarean sections. Rate of failed intubation, pulmonary aspiration of gastric contents and the depressant effects of general anaesthetics on neonate is decreased. Spinal anaesthesia is simple, quicker, cost effective and has faster onset with superior quality of block. It has less failure, lesser risk of systemic toxicity due to local anaesthetic agent and there is lesser transfer of drugs to foetus due to usage of lower doses. However, the most common adverse effect of spinal anaesthesia

is hypotension. There is lumbosacral block associated with chemical sympathectomy. It is found that the incidence of hypotension during spinal anaesthesia is 75-85%.

We have conducted this study on patients undergoing LSCS under spinal anaesthesia. 60 adult patients (20--45 years) of either sex of ASA grade I or II were randomly divided into Group B (Bupivacaine 2ml) and Group R (Ropivacaine 2ml), 30 patients each.

These findings were found similar with the findings of the following studies:

Mantouvalou et al in 2008 performed a study to compare the anaesthetic efficacy and safety of three local anesthetic agents: racemic bupivacaine and its two isomers: ropivacaine and levobupivacaine, in patients undergoing lower abdominal surgery. The onset of motor block was significantly faster in the ropivacaine group compared with that in the bupivacaine group and almost the same of that in the levobupivacaine group ($P < 0.05$).

Whiteside et al in 2003 compared the clinical efficacy of hyperbaric Bupivacaine with that of the commercially available hyperbaric preparation of ropivacaine. They observed that time to peak motor blockade was delayed in the Bupivacaine group (20 min) as compared to Ropivacaine group (15 min), $P < 0.0001$.

Kallio et al in 2004 carried out another study in which they compared intrathecal plain solutions containing ropivacaine 15 and 20 mg versus bupivacaine 10mg in a prospective, randomized, double-blinded study. This study included 90 ambulatory lower-extremity surgery patients who received 2 ml of ropivacaine 1%, ropivacaine 0.75%, or bupivacaine 0.5%. They observed that the time for two dermatomal regression of sensory level was prolonged in the ropivacaine group-15mg (90 min) when compared with the bupivacaine group-10 (70 min). Thus it can be concluded that the two segment regression of sensory level is prolonged with ropivacaine when compared with bupivacaine at a dose ratio of 3:2.

Sanchez et al in 2009 compared the effects of intrathecal isobaric ropivacaine (IR) versus isobaric bupivacaine (IB) in a dose ratio of 3:2 in non-ambulatory urologic and orthopedic surgery. 117 patients scheduled for surgery were randomized and assigned in a double-blind fashion to receive either 15 mg of IR ($n = 58$) or 10 mg of IB ($n = 59$). They concluded that the motor blockade was longer in the IB group (266.5 $\pm$ 29.5) compared to the IR groups (226.4 $\pm$ 22.3 min), $p < 0.001$.

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In 2002, McNamee et al compared the efficacy and safety of plain ropivacaine 5 mg/ml with plain bupivacaine 5 mg/ml in 66 patients of ASA I or II undergoing total hip arthroplasty. They observed that the muscle relaxation was excellent in both the groups and there was no difference in blood loss in both the groups.

LIMITATIONS OF THE STUDY

We can give only a generalized conclusion, however, due to a relatively small sample size. For more specific trends to become obvious, it will be needed to have much larger sample size. Various parameters like sensory and motor data and VAS score are subjective in relation to what the patient responds to. Thus there could have been some disparity in the time noted for the same.

CONCLUSION

We conclude from our study that 0.75% isobaric ropivacaine when given intrathecally and compared with 0.5% hyperbaric bupivacaine produces a faster onset of sensory and motor block, similar two dermatomal regression of the sensory block, earlier recovery from the motor blockade and a similar duration of postoperative analgesia as bupivacaine.

Therefore 0.75% isobaric ropivacaine can be safely used in shorter lower abdominal surgeries like caesarean sections

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