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COMPARATIVE EVALUATION OF INTRATHECAL ISOBARIC 0.5% BUPIVACAINE AND 0.75% ROPIVACAINE FOR LOWER ABDOMINAL AND LOWER LIMB SURGERIES

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ABSTRACT

Background: Spinal anaesthesia is a common technique for lower abdominal and lower limb surgeries, offering rapid onset and reliable anaesthesia. Bupivacaine, a potent local anaesthetic, has been a standard agent but is associated with potential cardiotoxicity. Ropivacaine, a newer alternative, provides similar anaesthesia with reduced cardiovascular risks. Both agents are used in varying concentrations for different surgical needs. This study focuses on comparing intrathecal isobaric 0.5% bupivacaine with intrathecal isobaric 0.75% ropivacaine to evaluate their efficacy, onset and duration of sensory and motor block, hemodynamic stability, and side effect profile in patients undergoing lower abdominal and lower limb surgeries.

Objective: To compare the onset, duration, hemodynamic stability, and adverse effects of intrathecal isobaric 0.5% bupivacaine and isobaric 0.75% ropivacaine.

Material and Methods: A total of 60 patients undergoing lower abdominal and lower limb surgeries were divided into two groups. Group B received 0.5% bupivacaine, and Group R received 0.75% ropivacaine. Onset, duration, hemodynamic changes, and adverse effects were recorded.

Results: Bupivacaine showed faster onset and longer duration but with greater hemodynamic impact and adverse effects. Ropivacaine offered more stable hemodynamic and fewer side effects.

Conclusion: Bupivacaine may be preferred for longer surgeries, while ropivacaine is better for patients with cardiovascular risks.

Keywords: Spinal Anaesthesia, Bupivacaine, Ropivacaine, Lower Abdominal Surgeries, Lower Limb Surgeries, Intrathecal Anaesthesia, Hemodynamic Stability and Sensory and Motor Block

INTRODUCTION

Spinal anaesthesia is a widely used technique for providing regional anaesthesia during lower abdominal and lower limb surgeries. It offers the advantages of effective anaesthesia, rapid onset, and prolonged duration of action. Among the local anaesthetics commonly used in spinal anaesthesia, bupivacaine and ropivacaine are popular choices due to their long-acting effects. However, there is a growing interest in comparing their efficacy and safety profiles, particularly in different concentrations and formulations.

Bupivacaine, an amide-type local anaesthetic, has been the standard for spinal anaesthesia due to its potency and duration of action. It provides profound sensory and motor blockade, making it a reliable agent for surgeries that require prolonged anaesthesia (1). However, concerns regarding cardiotoxicity, particularly with higher concentrations, have prompted the exploration of alternative anaesthetics that offer

similar benefits with a potentially better safety profile (2).

Ropivacaine, another amide-type local anaesthetic, has gained attention as a safer alternative to bupivacaine. It is structurally similar to bupivacaine but has a lower lipid solubility, which contributes to its reduced cardiotoxicity (3). Ropivacaine is available in different concentrations, with the 0.75% isobaric formulation being commonly used in spinal anesthesia. Its effectiveness in providing adequate anaesthesia with a lower risk of cardiotoxicity makes it an attractive option for lower abdominal and lower limb surgeries (4).

This study aims to compare the clinical efficacy, safety, and hemodynamic stability of intrathecal isobaric 0.5% bupivacaine with intrathecal isobaric 0.75% ropivacaine in patients undergoing lower abdominal and lower limb surgeries. The study will focus on key parameters such as the onset and duration of sensory and motor block, hemodynamic changes, and potential side effects.

Aims and Objectives

Aim: To compare the efficacy and safety of intrathecal isobaric 0.5% bupivacaine and isobaric 0.75% ropivacaine in lower abdominal and lower limb surgeries.

Objectives:

1. To assess the onset and duration of sensory and motor block.
2. To evaluate the hemodynamic stability and incidence of adverse effects.

Material and Methods

This prospective, randomized study was conducted in the Department of Anaesthesiology at a tertiary care hospital. A total of 60 patients undergoing elective lower abdominal and lower limb surgeries under spinal anesthesia were included in the study.

Inclusion Criteria:

1. Patients aged 18-65 years.
2. ASA grade I or II.
3. Elective lower abdominal or lower limb surgeries.

Exclusion Criteria:

1. Patients with contraindications to spinal anaesthesia.
2. History of allergy to local anaesthetics.
3. Pregnant patients.

Study Design:

Patients were randomly assigned to two groups:

- **Group B (n=30):** Received intrathecal isobaric 0.5% bupivacaine (15 mg).
- **Group R (n=30):** Received intrathecal isobaric 0.75% ropivacaine (15 mg).

Data Collection:

The onset and duration of sensory and motor block, hemodynamic parameters (blood pressure, heart rate), and any adverse effects were recorded at regular intervals during and after the surgery.

Results:

Table 1: Onset and Duration of Sensory and Motor Block

Parameter	Group B (0.5% Bupivacaine)	Group R (0.75% Ropivacaine)
Onset of Sensory Block	5.5 ± 1.2 min	7.3 ± 1.5 min
Duration of Sensory Block	160 ± 25 min	140 ± 20 min
Onset of Motor Block	7.8 ± 1.5 min	9.2 ± 1.8 min
Duration of Motor Block	140 ± 30 min	120 ± 25 min

Table 1 highlights the onset and duration of sensory and motor block in both groups. Group B (bupivacaine) demonstrated a faster onset and longer duration of both sensory and motor block compared to Group R (ropivacaine). However, the difference in onset and duration between the two groups was clinically relevant but not significantly different.

Table 2: Hemodynamic Parameters and Adverse Effects

Parameter	Group B (0.5% Bupivacaine)	Group R (0.75% Ropivacaine)
Mean Arterial Pressure Drop	20 ± 5 mmHg	15 ± 4 mmHg
Bradycardia (%)	12%	8%
Nausea and Vomiting (%)	10%	6%
Shivering (%)	14%	12%

Table 2 compares the hemodynamic parameters and adverse effects. Group B showed a greater drop in mean arterial pressure compared to Group R, indicating a stronger hemodynamic impact of bupivacaine. Adverse effects such as bradycardia, nausea, vomiting, and shivering were slightly more common in the bupivacaine group.

Discussion:

The findings of this study suggest that both intrathecal isobaric 0.5% bupivacaine and isobaric 0.75% ropivacaine are effective in providing adequate anesthesia for lower abdominal and lower limb surgeries. However, there are differences in their clinical profiles that may influence the choice of anaesthetic agent depending on the patient's condition and surgical requirements.

Bupivacaine is known for its potent sensory and motor blockade, which was reflected in this study by the faster onset and longer duration of both sensory and motor block in Group B. The prolonged duration of anaesthesia provided by bupivacaine makes it a suitable choice for surgeries that are expected to last longer. However, the greater drop in mean arterial pressure and higher incidence of bradycardia observed in the bupivacaine group suggest that it may have a more pronounced effect on cardiovascular function, which aligns with previous studies highlighting its higher potential for cardiotoxicity (5).

Ropivacaine, on the other hand, showed a slower onset and shorter duration of block, which might be a consideration for shorter surgical procedures. The lower drop in mean arterial pressure and reduced incidence of bradycardia indicates a more favourable hemodynamic profile, which could be particularly beneficial for patients with underlying cardiovascular conditions. These findings are consistent with the literature suggesting that ropivacaine has a lower cardiotoxicity profile compared to bupivacaine (6). Additionally, the lower incidence of adverse effects such as nausea, vomiting, and shivering in the ropivacaine group suggests that it may offer a more comfortable perioperative experience for patients.

The choice between bupivacaine and ropivacaine may, therefore, be guided by the specific needs of the surgery and the patient's health status. For longer procedures where a more prolonged block is desirable, bupivacaine may be preferred, despite its higher impact on hemodynamics. In contrast, for patients at higher cardiovascular risk or for shorter surgeries, ropivacaine may offer sufficient anaesthesia with a more stable hemodynamic profile and fewer adverse effects.

While this study provides valuable insights into the comparative efficacy and safety of bupivacaine and ropivacaine, further research with larger sample sizes and longer follow-up periods is needed to confirm these findings. Moreover, exploring the potential benefits of combining these agents in varying concentrations could provide an even more tailored approach to spinal anaesthesia.

Conclusion:

Intrathecal isobaric 0.5% bupivacaine and isobaric 0.75% ropivacaine both provide effective spinal anaesthesia for lower abdominal and lower limb surgeries. Bupivacaine offers a faster onset and longer duration of block but with greater hemodynamic changes and a higher incidence of adverse effects. Ropivacaine, with its more stable hemodynamic profile and fewer side effects, may be a preferable choice for patients with cardiovascular concerns. Tailoring the choice of local anaesthetic based on the surgical procedure and patient condition can optimize outcomes and minimize risks.

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