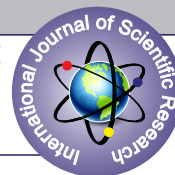


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COMPARATIVE EVALUATION OF INTRATHECAL HYPERBARIC ROPIVACAINE WITH FENTANYL VERSUS HYPERBARIC BUPIVACAINE WITH FENTANYL IN LOWER LIMB AND LOWER ABDOMINAL SURGERIES: A RANDOMIZED DOUBLE-BLIND INTERVENTIONAL STUDY



Anaesthesiology

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ABSTRACT

Background: Spinal anaesthesia is widely used for lower limb and lower abdominal surgeries. Bupivacaine is the conventional drug of choice but is associated with prolonged motor block and hemodynamic changes. Ropivacaine, a pure S-enantiomer, offers reduced cardiotoxicity and greater motor-sparing potential. Addition of intrathecal fentanyl enhances sensory blockade without significantly prolonging motor impairment. **Objective:** To compare intrathecal hyperbaric ropivacaine with fentanyl versus hyperbaric bupivacaine with fentanyl in terms of block characteristics, duration of analgesia, hemodynamic stability, and adverse effects. **Methods:** In this prospective, randomized, double-blind study, 160 ASA I–II patients aged 18–60 years scheduled for elective lower limb or lower abdominal surgery were allocated into two groups (n=80 each). Group RF received 15 mg 0.5% hyperbaric ropivacaine + 25 µg fentanyl, and Group BF received 15 mg 0.5% hyperbaric bupivacaine + 25 µg fentanyl intrathecally. Onset and duration of sensory and motor block, hemodynamic variables, time to first rescue analgesia, and complications were recorded. **Results:** Demographics were comparable. BF group showed faster sensory onset (5.01 ± 0.37 vs 5.46 ± 0.32 min, $p < 0.0001$) and motor onset (4.57 ± 0.35 vs 9.02 ± 0.41 min, $p < 0.0001$), longer sensory duration (203.5 ± 10.2 vs 178.3 ± 9.8 min, $p < 0.0001$) and motor duration (188.2 ± 8.7 vs 142.5 ± 8.3 min, $p < 0.0001$), and prolonged time to rescue analgesia (3.49 ± 0.16 vs 2.99 ± 0.47 h, $p = 0.0001$). Hypotension and bradycardia occurred more frequently in BF ($p < 0.05$). **Conclusion:** Hyperbaric bupivacaine with fentanyl provides denser and longer-lasting block but causes more cardiovascular depression. Hyperbaric ropivacaine with fentanyl offers greater hemodynamic stability and faster recovery, making it preferable for shorter surgeries and patients at cardiovascular risk.

KEYWORDS

Bupivacaine, Ropivacaine, Fentanyl, Spinal Anaesthesia, Analgesia.

INTRODUCTION:

Spinal anaesthesia is the preferred technique for infraumbilical surgeries due to its rapid onset, reliable block, and superior postoperative pain control. Bupivacaine, the most commonly used long-acting agent, provides dense sensory and motor block but is associated with prolonged motor recovery and potential cardiotoxicity. Ropivacaine, with its motor-sparing and safer cardiovascular profile, is increasingly being evaluated as an alternative. Hyperbaric formulations allow predictable spread, and addition of lipophilic opioids like fentanyl enhances sensory blockade without proportionately increasing motor block or side effects. This study compares the clinical profile of intrathecal hyperbaric ropivacaine with fentanyl against hyperbaric bupivacaine with fentanyl for lower abdominal and lower limb surgeries.

MATERIALS AND METHODS:

This prospective, randomized, double-blind clinical trial was conducted at Moti Lal Nehru Medical College, Prayagraj, after ethics approval.

Randomization & Intervention: 160 patients were allocated into two groups (n=80) via computer-generated randomization.

Group RF: 15 mg 0.5% hyperbaric ropivacaine + 25 µg fentanyl intrathecally.

Group BF: 15 mg 0.5% hyperbaric bupivacaine + 25 µg fentanyl intrathecally.

Assessment:

Sensory Block Onset: time to T10 loss of pinprick.

Motor block onset/duration: Modified Bromage scale.

Hemodynamics: HR, SBP, DBP, MAP at fixed intervals.

Postoperative Analgesia: time to first rescue analgesic (VAS > 4).

Adverse Effects: hypotension, bradycardia, nausea, vomiting, pruritus, shivering.

RESULTS:

Demographics were similar between groups. Mean surgical duration was slightly longer in RF ($p = 0.004$). BF had significantly faster onset of sensory ($p < 0.0001$) and motor block ($p < 0.0001$), longer duration of

both ($p < 0.0001$), and longer time to rescue analgesia ($p = 0.0001$). Hypotension and bradycardia were more frequent in BF ($p < 0.05$). Oxygen saturation and adverse events (nausea, vomiting, pruritus) were comparable.

DISCUSSION:

Our findings show that bupivacaine with fentanyl provides a denser, longer block with delayed analgesic requirement but at the cost of greater hemodynamic depression, consistent with Khezri et al. (2013) and Shukla et al. (2011). Ropivacaine with fentanyl, though producing shorter block, offers better cardiovascular stability and quicker motor recovery, aligning with Bajwa et al. (2010) and Choi et al. (2003). For short-duration procedures or in patients with limited cardiac reserve, ropivacaine may be preferable, while bupivacaine remains suited for longer surgeries requiring dense motor block.

CONCLUSION:

Both drug combinations are effective and safe for spinal anaesthesia. Bupivacaine-fentanyl provides more intense and prolonged blockade, whereas ropivacaine-fentanyl offers hemodynamic stability and earlier recovery, making choice dependent on surgery duration and patient comorbidities.

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