

# The Feasibility of Spinal Anesthesia for Daycare Surgeries: Is Ropivacaine the Choice?

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## ABSTRACT

Spinal anesthesia is a preferable anesthesia technique for various abdominal and below abdominal surgeries. There are different local anesthetics available for spinal anesthesia. By choosing the recently available isobaric ropivacaine, making it hyperbaric by addition of dextrose with the right choice of adjuvant, which is devoid of undesirable effects, must provide better analgesia and early cessation of motor blockade. The myth and controversies involving the usage of drugs intrathecally for daycare surgeries, their advantages, disadvantages, and indication of each adjuvant along with doses are discussed in this review.

**Keywords:** Adjuvant, Ambulatory surgeries, Magnesium sulfate, Ropivacaine, Spinal anesthesia.

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## INTRODUCTION

Ambulatory surgeries place a high demand on anesthetic technique. It refers solely to patients being discharged from the hospital shortly after surgery, Spinal anesthesia is now a preferable anesthesia technique for various daycare orthopedic, obstetric, and lower abdominal surgeries.<sup>1</sup> With the emergence of newer local anesthetic, Ropivacaine (approved by European Union for intrathecal use in 2004) has been demonstrated to provide safe and reliable spinal anesthesia of intermediate duration, with relatively shorter duration of motor blockade compared to bupivacaine; encouraging earlier mobilization in patients.<sup>2,3</sup> Ropivacaine, made hyperbaric by adding desired quantity of dextrose, has been compared with isobaric solution for spinal anesthesia, and a predictable block with better cephalad spread and a quicker sensory and motor regression with the former has been proven. Opioid adjuvants have been used with intrathecal ropivacaine for extending the duration of the block, and their associated side effects like nausea, vomiting, bladder retention, pruritus paralytic ileus, and respiratory depression have been noted. Intrathecal magnesium sulfate has been used in humans since 1906.<sup>4</sup> This can prevent and abolish central sensitization. Ropivacaine is emerging as a local anesthetic of choice to provide spinal anesthesia for daycare surgeries of shorter duration,<sup>3</sup> and magnesium sulfate is a non-opioid adjuvant devoid of various undesirable effects.

The literature search was done using keywords spinal anesthesia, ropivacaine, magnesium sulfate using PubMed and Google Scholar, and articles published between 2010 and 2020 time period.

## HISTORY OF INTRATHECAL ADJUVANT FOR AMBULATORY SURGERIES

Spinal anesthesia is commonly used for daycare ambulatory surgeries in place of general anesthesia used earlier. The main advantage of its use in ambulatory surgeries is the reliability of drug spread and duration of the block. Although various beneficial effects of intrathecal local anesthetic are proved, its use is limited by dose-dependent adverse effects. Adjuvants are additives used

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intrathecally for their synergistic effect by prolonging the duration of the block and also limiting the cumulative dose of local anesthetic required. Opioids used intrathecally are limited by their adverse effect like nausea, respiratory depression, pruritus, etc. Hence, the use of epinephrine and other alpha 2 agonists like clonidine and dexmedetomidine were used because of their vasoconstrictive properties limiting the systemic absorption of the drug. Other commonly used adjuvants like steroids, anti-inflammatory agents, midazolam, ketamine, magnesium sulfates, etc., are used considering their safety profile.

## INTRATHECAL HYPERBARIC ROPIVACAINE FOR DAYCARE SURGERY

The clinical effects were studied by Luck et al.<sup>5</sup> between three groups using hyperbaric Bupivacaine, Levobupivacaine, and Ropivacaine in spinal anesthesia who received 3 mL containing 5 mg/mL and made hyperbaric by addition of 30 mg/mL of glucose. This study showed that there was a nonsignificant difference between the group regarding the time of onset of sensory block, the extent of spread, and the time of maximum spread. They found that regression of sensory block of the Ropivacaine group was rapid, which was demonstrated by the duration of sensory loss at the T10 level and the total duration of sensory block. They also found out

that patients with Ropivacaine had more rapid recovery and shorter time to independent mobilization compared to other groups. They concluded that hyperbaric Ropivacaine provided spinal anesthesia of shorter duration than bupivacaine and levobupivacaine, which were clinically indistinguishable.

Kulkarni et al.<sup>6</sup> studied comparisons between equal doses of 0.5% hyperbaric Ropivacaine and 0.5% hyperbaric Bupivacaine for spinal anesthesia, undergoing elective infraumbilical surgeries in which 3 mL of hyperbaric Ropivacaine 5 mg/mL containing 83 mg/mL of dextrose vs hyperbaric Bupivacaine 5 mg/mL containing 80 mg/mL of dextrose. The specific gravity to determine the baricity of both the drugs was tested by the urine dip-stick method, and they were found to be comparable. They concluded that Ropivacaine 15 mg in 83 mg/dL dextrose provided spinal anesthesia of shorter duration than Bupivacaine 15 mg in 80 mg/dL dextrose, thus early mobilization, hence proving effective drug for daycare surgeries.

Kallio et al.<sup>7</sup> compared intrathecal plain vs hyperbaric solution containing Ropivacaine. It was a prospective, randomized study. They found that complete motor block was 10 minutes vs 20 minutes in HYPERBARIC vs PLAIN group, respectively. Use of hyperbaric solution prolonged duration of analgesia. On contrary, duration of sensory block from an injection of anesthetic to complete recovery was shorter with hyperbaric solution, thus attaining discharge criteria earlier.

### ADJUVANT TO INTRATHECAL ROPIVACAINE

Dayioglu et al.<sup>8</sup> studied the effects of magnesium sulfate 50 mg to low-dose bupivacaine with fentanyl and the spread, duration, regression of block, and postoperative analgesia in knee arthroscopic surgeries. It was a randomized, double-blind trial. They found that the addition of magnesium (50 mg) prolongs the time of regression of two segments in the maximum block height and time to regression to L2 level, but did not affect the maximum sensory level or time to reach the maximum height. They also found that the time for ambulation was longer with the magnesium group than with the saline group. Total analgesia consumption did not decrease with magnesium group in the first 24 hours, but the first analgesia requirement decreased with magnesium group. They concluded that the addition of magnesium prolonged the first-time analgesia requirement and total analgesic requirement in 24 hours of the patient undergoing knee arthroscopy.

Pal Singh et al.<sup>9</sup> compared Buprenorphine vs Fentanyl as an adjuvant to Ropivacaine 0.75% in lower limb surgeries in a randomized double-blinded study. They found out that mean duration of sensory block was prolonged with adjuvant. The duration of analgesia was longer with adjuvant than with plain Ropivacaine. The first requirement and the total analgesia requirement were decreased with adjuvant than the plain solution. The motor block was also delayed with opioid adjuvant significantly. They concluded that when opioid was added to the local anesthetic when used intrathecally significantly prolongs duration of spinal anesthesia and the quality of postoperative analgesia.

### VARIOUS DOSES OF INTRATHECAL MAGNESIUM SULFATE AS ADJUVANT

Jabalamel et al.<sup>10</sup> studied the effect of adding different doses of intrathecal magnesium sulfate for spinal anesthesia for cesarean section. In which, 132 women enrolled were randomly divided into 4 groups, in which, each group received 50 mg, 75 mg,

100 mg, and plain local anesthetic, respectively. They found that the duration of sensory block and motor block was longer with 100 mg of magnesium sulfate as an adjuvant. They concluded that 75 mg of magnesium sulfate used intrathecally prolonged duration of sensory and motor block without increasing major side effects.

Ozalevli et al.<sup>11</sup> studied the effect of adding different doses of intrathecal magnesium sulfate to Bupivacaine and Fentanyl in spinal anesthesia study in 102 patients undergoing lower extremity surgery who were randomly allocated to receive 1 mL of preservative-free 0.95% sodium chloride or 50 mg of magnesium sulfate 5% following 10 mg of bupivacaine 0.5% plus 25 µg of fentanyl intrathecally. The duration of sensory and motor block was significantly lower with magnesium sulfate as adjuvant. The duration of spinal anesthesia was longer with magnesium sulfate as adjuvant. They concluded that the addition of 50 mg of magnesium sulfate prolonged the block without any side effects.

### RECOVERY CHARACTERISTICS AND DISCHARGE CRITERIA

Successful daycare surgery for safe patient discharge requires alertness, ambulation, analgesia, and alimentation. Low-dose intrathecal magnesium provides early recovery of sensory and motor blocks ensuring early ambulation in patients.<sup>12</sup> The postoperative analgesia requirement was low using intrathecal magnesium sulfate as adjuvant. The first onset of pain was also delayed using intrathecal magnesium sulfate as adjuvant compared with plain local anesthetic alone. Thus, the use of ropivacaine along with intrathecal magnesium sulfate as adjuvant is ideally a drug for daycare ambulatory surgery.<sup>13</sup>

### CONCLUSION

Ambulatory surgery can be performed effectively with spinal anesthesia. The availability of intrathecal ropivacaine has increased the option available to anesthetist by providing more effective and predictable anesthesia. The adverse effects of various opioids adjuvants used intrathecally are overcome by the use of magnesium sulfate providing better analgesia and making spinal anesthesia safe, effective, and economical alternative to general anesthesia for ambulatory surgery.

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