Ropivacaine: Is it a good choice for spinal anesthesia?

Ropivacaine, a long-acting amide local anesthetic agent, is a pure S(–) enantiomer of propivacaine. It has reduced potential for cardiotoxicity and neurotoxicity and is thus safer than the racemic preparation, bupivacaine. Ropivacaine has lower lipid solubility than bupivacaine, which is responsible for its lower penetration into myelinated motor fibers and thus lesser motor blockade with greater sensory-motor differentiation.

Ropivacaine can be used for epidural anesthesia and analgesia, caudal block, spinal anesthesia, peripheral nerve blocks, local infiltration, or intra-articular administration. It is less potent than bupivacaine when used in low doses such as for epidural analgesia or spinal anesthesia. However, in high doses, for example, when used for peripheral nerve block, the potency and efficacy of these agents appears to be similar. Ropivacaine is commercially available only as an isobaric preparation and, therefore, hyperbaric solution, if required, needs to be prepared by addition of dextrose. This needs a word of caution as the indigenous mixing of dextrose may present a risk of infection.

In view of the reduced toxic potential, ropivacaine has a definite edge over bupivacaine in regional anesthetic techniques requiring large volumes of local anesthetic. However, this drug has also been extensively studied over last many years for its intrathecal use. When identical doses of isobaric ropivacaine and bupivacaine were compared, ropivacaine was found to have almost similar efficacy but shorter duration of sensory and motor block. On using bupivacaine and ropivacaine in 1:1.5 dose ratio, the block characteristics were almost comparable with the two local anesthetics.

This was followed by attempts to compare isobaric with hyperbaric ropivacaine as the hyperbaric local anesthetics are known to provide a more predictable spread and higher sensory block. The increase in density by addition of glucose promotes more even distribution of local anesthetic due to the effect of gravity on spread of drug bolus along the slopes of the lumbar curve in the supine position. Various workers comparing isobaric and hyperbaric intrathecal ropivacaine demonstrated that hyperbaric preparation was associated with higher success rate, faster onset, and more consistent and predictable sensory and motor block. There was a longer duration of clinically useful block, defined as a level of T10; however, it was associated with a faster recovery of sensory and motor block. Shorter times to mobilization, micturition and home readiness were also reported. Hemodynamic changes in both these studies were unremarkable and did not differ between isobaric and hyperbaric groups.

Considering the superiority of hyperbaric over the isobaric ropivacaine, it becomes important to examine its status when compared to hyperbaric bupivacaine, the most commonly used drug for spinal anesthesia. Many workers have addressed this issue. Although different results have been given regarding the onset time, extent of sensory block and incidence of hypotension; these studies by Whiteside et al. and Luck et al. agree on the shorter duration of sensory and motor block and the lesser degree of motor block produced by hyperbaric ropivacaine than hyperbaric bupivacaine. Luck et al. also observed significantly shorter time to mobilization and micturition. They did not find any statistically significant differences in heart rate, systolic arterial pressure, or the incidence of hypotension between the groups. However, Whiteside et al., while comparing hyperbaric ropivacaine 0.5% with hyperbaric bupivacaine 0.5% used for spinal anesthesia for elective surgery, found a significantly lower incidence of hypotension with ropivacaine. Only 15% patients in ropivacaine group developed hypotension in contrast to 70% in the bupivacaine group. Another study comparing 8 mg hyperbaric bupivacaine and 12 mg hyperbaric ropivacaine, both with fentanyl, in spinal anesthesia for major orthopedic procedures in geriatric patients concluded that the ropivacaine caused less motor block and hemodynamic side effects than bupivacaine. Less hypotension and bradycardia may be considered as a great advantage especially in geriatric patients with cardiac pathology.

Thus, intrathecal ropivacaine results in a shorter duration of sensory block and a lesser degree of motor block when compared to intrathecal bupivacaine. Moreover, intrathecal ropivacaine produces less hemodynamic side-effects than intrathecal bupivacaine.
In the present issue, Dar et al., have compared similar concentrations and doses of the hyperbaric preparations of the two local anesthetics.\textsuperscript{10} They administered spinal injection of either 3 ml (15 mg) of 0.5% hyperbaric ropivacaine or 3 ml (15 mg) of 0.5% hyperbaric bupivacaine to the patients undergoing lower limb or hip surgery. Although the quality of anesthesia was excellent in both groups, the onset of sensory and motor block was slower in patients receiving ropivacaine. Furthermore, the duration of sensory as well as motor block was shorter in these patients. Although ephedrine requirements did not significantly differ between the groups; the ropivacaine administration was associated with a lower incidence of hypotension. Only 19% patients receiving ropivacaine in contrast to 66% of patients receiving bupivacaine developed hypotension. The results of this study support the earlier view that the intrathecal ropivacaine can be used to provide good quality anesthesia with lesser hypotension; however, it has a shorter duration than bupivacaine.

The characteristics of an ideal spinal anesthetic agent in day care setting would include a rapid onset of a reliable block providing adequate surgical anesthesia of appropriate duration, rapid recovery of sensory and motor block and minimal side-effects.\textsuperscript{8} The local anesthetic agents available for spinal anesthesia in day care surgery include lignocaine, bupivacaine, levobupivacaine and ropivacaine. Lignocaine has block and recovery characteristics ideal for day surgery; however, it is associated with a very high incidence of transient neurological symptoms.\textsuperscript{11} Bupivacaine and levobupivacaine have a long duration of block. Thus, ropivacaine may be the most suited for this purpose. Another alternative is to use low-dose bupivacaine with adjuvants. The commonly used intrathecal adjuvants are fentanyl and clonidine. Intrathecal fentanyl increases the incidence of side-effects such as pruritus, nausea, vomiting, and urinary retention;\textsuperscript{12} whereas clonidine increases duration of motor block besides causing more hypotension\textsuperscript{13} and thus is not suited for day care setting.

Based on the available evidence, ropivacaine may not be the local anesthetic of choice for spinal anesthesia in cases with relatively longer duration. However, its faster recovery characteristics resulting in shorter duration associated with better hemodynamic profile and earlier mobilization and voiding would make it suitable for short procedures being conducted in day care settings.

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How to cite this article: Mohta M. Ropivacaine: Is it a good choice for spinal anesthesia?. J Anaesthesiol Clin Pharmacol 2015;31:457-8.

Source of Support: Nil, Conflicts of Interest: None declared.