Chapter 11
Intravenous Regional Anaesthesia on Comparative Effects of Fentanyl and Magnesium Sulphate as Ropivacaine Adjuvants for Upper Limb Surgeries

R. M. Mulla
Krishna Vishwa Vidyapeeth, India

Vithal K. Dhulkhed
Krishna Institute of Medical Sciences, India

Soudamini Gandhi
Krishna Institute of Medical Sciences, India

Agus Sudaryanto
Universitas Muhammadiyah Surakarta, Indonesia

ABSTRACT

An established method for managing pain during upper limb procedures is intravenous regional anaesthesia or IVRA. The adjuvants are chosen for IVRA significantly impact the duration and effectiveness of regional anaesthesia. This study was piloted to compare the effects of two adjuvants given to ropivacaine in IVRA for upper limb surgeries: magnesium sulphate and fentanyl. A cohort of sixty patients scheduled for hand surgery participated in this prospective study. Two separate groups of subjects were assigned to these subjects: Cluster RF (n = 30) received 0.2% ropivacaine mixed with fentanyl, and Cluster RM (n = 30) received 0.2% ropivacaine mixed with magnesium sulphate. The study evaluated the need for postoperative analgesia at the outset and the duration and start of sensory and motor blockage.

DOI: 10.4018/979-8-3693-5946-4.ch011

INTRODUCTION

A tried-and-true method used in contemporary anesthesiology to achieve regional anaesthesia in the distal portion of a limb is "intravenous regional anaesthesia (IVRA)," also known as Bier's block. Using an intravenous injection, a local anaesthetic is injected into the targeted limb to produce analgesia and muscle relaxation. In many surgical operations, especially those involving the upper limb, the IVRA has proven crucial (Van Zundert et al., 2008). This approach is a desirable option for several surgical procedures since it has several benefits, such as quick onset of action, low systemic effects, and convenience of administration.

Due to its quick onset and short half-life, lignocaine, often known as lidocaine, was historically the principal local anaesthetic drug used in IVRA. For years, lignocaine has been used successfully in various surgical procedures and is considered the gold standard for IVRA (Mulroy et al., 2000). Notwithstanding its efficacy, the temporal limitation of lignocaine has prompted the investigation of substitute local anaesthetic agents that provide a longer duration of surgical anaesthesia.

Bupivacaine is a long-acting amide-type local anaesthetic that was one such alternative that became well-liked. The main way that bupivacaine addresses the drawbacks of lignocaine is by having a longer duration of action, which means that fewer injections are required for protracted surgical procedures. There was great enthusiasm for its usage because it made longer procedures possible with fewer interruptions from the need for extra anaesthetic interventions (Woolf & Chong, 1993).

However, the usage of bupivacaine also raised important questions. There was a chance of major adverse effects from this long-acting local anaesthetic, especially cardiovascular toxicity, which included arrhythmias and cardiac arrest (Yu et al., 2010). The unfavourable effects of bupivacaine on the heart prompted questions about its safety record, which in turn prompted research on substitute local anaesthetics.

Roprivacaine is one such substitute that is gaining popularity. Bupivacaine and ropivacaine share structural similarities, making them two more amide-type local anaesthetics. Due to its safety profile, notably its lower risk of inducing severe cardiovascular toxicity when compared to bupivacaine, ropivacaine has become more and more popular in the field of regional anaesthesia. Because of this feature, ropivacaine is a desirable option for regional anaesthesia procedures like IVRA, where reducing systemic toxicity is crucial (Boswell et al., 2021).

Stereoisomerism in ropivacaine is thought to be the reason for its decreased cardiac toxicity. Whereas bupivacaine is a racemic combination of both R and S enantiomers, ropivacaine is only available as a pure S-enantiomer (levorotatory). The R-enantiomer of local anaesthetics is mainly responsible for their cardiac effects, as it has a greater affinity for cardiac sodium channels. Roprivacaine reduces the risk of negative cardiac effects by employing the S-enantiomer, which makes it a safer choice for regional anaesthesia (Ritchie et al., 2003).

Anesthesiologists and researchers have been interested in the use of ropivacaine in IVRA and how it compares to other local anaesthetics. Although numerous studies have demonstrated that ropivacaine is superior to lignocaine and bupivacaine regarding cardiac safety, research on additions to improve its efficacy and safety profile is still in its early stages (Coelho et al., 1986).

Interestingly, adjuvant usage in regional anaesthesia has become critical to subject outcome optimisation. Medications known as adjuvants are given in addition to local anaesthetics to increase their effects. These drugs can increase the duration and general efficacy of anaesthesia, which can decrease the amount of local anaesthetic required.