Chapter 10
Comparative Analysis of Fentanyl and Dexmedetomidine as Adjuvants With Lignocaine in Intravenous Regional Anesthesia for Upper Limb Surgeries

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ABSTRACT

Bier's block, or intravenous regional anaesthesia, is typical for upper limb surgery. Tourniquet discomfort remains a major issue with IVRA, hence adjuvants should be investigated to increase patient satisfaction and comfort. Fentanyl and dexmedetomidine are compared in IVRA for upper limb procedures in this study. A randomised controlled trial included 55 elective upper limb surgery participants. Patients were randomised to Group B (lignocaine and dexmedetomidine) or Group A (lignocaine and fentanyl). Analgesia quality, tourniquet pain, postoperative pain, time to obtain analgesia, and total consumption were assessed. In this study, both adjuvant combinations entanyl plus Lignocaine or dexmedetomidine and Lignocaine—provided excellent or good anaesthesia in most patients (84 percent in Group A and 76 percent in Group B). Group A had less tourniquet pain (mean 1.8) than Group B.

DOI: 10.4018/979-8-3693-5946-4.ch010

INTRODUCTION

Bier's block, also referred to as intravenous regional anaesthesia (IVRA), is a frequently used regional anaesthesia procedure that has long been acknowledged as beneficial for upper limb surgery (Salam Sami & Muslih, 2021). Prominent for its ease of use, affordability, quick start of action, and low systemic toxicity, IVRA is a desirable option for a variety of upper limb surgeries, including wrist, forearm, and hand surgeries (Karmaniolou et al., 2021). This introduction is to give a thorough examination of the main features of IVRA, the difficulties it presents, and the possible contribution of adjuvants—specifically, fentanyl and dexmedetomidine to improving its efficacy (Nishiyama, 2019).

The simplicity of IVRA's methodology is its main strength. Applying a dual-cuff tourniquet to the upper limb, usually the arm, means placing one cuff close to the surgical site and the other cuff farther away from the planned surgical field (Modir et al., 2022). After a local anaesthetic solution is injected into a leg vein, the cuff proximal to the location is inflated, but the distal cuff is left deflated. The proximal cuff's pressure restricts the local anaesthetic's effects on the affected limb by preventing it from being absorbed into the body (Kamali et al., 2019). This technique provides fast anaesthesia, protects the patient from the hazards associated with general anaesthesia, and eliminates the necessity for complex nerve blocks, which in certain situations may be less successful or technically difficult (Nijs et al., 2021).

Despite its many benefits, IVRA is not without difficulties and constraints. A major issue with this method is the discomfort that patients go through as the tourniquet is inflated and deflated (Kaur et al., 2023). This agony, which is also known as tourniquet pain, is brought on by the mechanical pressure and ischemia that the inflated cuff induces. (Pujara et al., 2021). This occurrence can cause discomfort ranging from moderate to unbearable, which makes patients more anxious and uncomfortable during surgery (Modir et al., 2021). Patients may therefore need more analgesia, which could increase the risk of systemic adverse effects, which are frequently linked to opioids and include nausea, vomiting, and drowsiness (Wang et al., 2023). The investigation of adjuvants, which are compounds added to local anaesthetics to enhance the quality and duration of anaesthesia while minimising the discomfort associated with tourniquet-induced pain, has resulted from the need to reduce tourniquet pain and enhance the IVRA experience overall (Karam et al., 2022).

Fentanyl and dexmedetomidine are two adjuvants that have attracted a lot of interest in the context of IVRA (Moshiri et al., 2021). These medicines have the potential to improve the overall quality of anaesthesia, improve tourniquet tolerance, and provide better pain control during surgical operations when used sparingly in conjunction with local anaesthetics (Osama et al., 2023). We will examine the unique characteristics and modes of action of fentanyl and dexmedetomidine in more detail in the upcoming sections so that you can see how these adjuvants help achieve the objective of IVRA optimisation (Kaur et al., 2022).

Because of how it works, the synthetic opioid analgesic fentanyl is particularly potent. Strong agonistic action is exerted on the μ-opioid receptor, predominantly found in the central nervous system (Khilji et al., 2022). Fentanyl reduces pain perception by activating this receptor, which modifies pain perception at the brain level (Al-Jassani et al., 2022). Fentanyl has shown promise in improving tourniquet tolerance and reducing tourniquet discomfort when used as an adjuvant in IVRA, making the procedure more bearable for patients (Arif et al., 2023). Its quick beginning of action, which guarantees that patients receive pain relief quickly, is another factor contributing to its popularity in regional anaesthesia (Bashar et al., 2022). Furthermore, fentanyl's comparatively short half-life permits accurate regulation of opioid exposure, hence reducing the possibility of systemic opioid adverse effects. Fentanyl is a notable adjuvant