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# Evaluation of the Analgesic Effect of Adding Neostigmine to Lidocaine in Intravenous Regional Anesthesia for Carpal Tunnel Syndrome Surgery

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## Abstract

**Background:** Neostigmine, a reversible acetylcholinesterase inhibitor (AChEI), has shown potential as an adjunct to local anesthetics like lidocaine in peripheral nerve blocks, including carpal tunnel syndrome (CTS). It may prolong analgesia by activating muscarinic receptors involved in pain modulation. Some studies report that adding neostigmine to lidocaine improves the duration of anesthesia and postoperative pain relief, particularly in upper limb procedures. However, results are mixed, possibly due to differences in doses or nerve barrier permeability. Overall, neostigmine's role in enhancing analgesia in nerve blocks such as Bier's block and CTS remains an active area of investigation.

**Aim of study:** This study aims to assess the analgesic efficacy of adding 0.5 mg neostigmine to 2% lidocaine in adult patients undergoing upper limb surgery under intravenous regional anesthesia (IVRA). Specifically, it evaluates the impact of this combination on intraoperative and postoperative pain, analgesic requirements, and recovery profiles, thereby contributing to improved perioperative pain management strategies.

**Patients and methods:** A total of 52 patients admitted to Al-Fayhaa Teaching Hospital, Basrah, Iraq, were randomized into two groups of 26 patients each. One patient excluded from analysis from each group. In the control group, local anesthesia of 3 mg/kg lidocaine was administered with 40 mL of normal saline. While the neostigmine group patients received 3 mg/kg lidocaine with 0.5 mg neostigmine, the same amount of saline was administered. Physiological parameters, sensation, and motor activity onset time, and recovery time after intravenous regional anesthesia were registered.

**Results:** The neostigmine group included males (4%) and females (96%) with a mean age of 41.76±5.69 years, while the control group included males (20%) and females (80%) with a mean age of 37.6±5.00 years. There were no differences in the demographic data (American Society of Anesthesiologists (ASA), gender, weight), in addition to pinprick onset and recovery times, touch onset time, and block recovery time between both groups. A significant difference was observed in the age, surgical duration time, tourniquet time, touch recovery time, and motor block onset time between both groups ( $p < 0.05$ ). In addition, no significant differences in postoperative complications were observed between the two groups ( $p = 0.074$ ). However, there was a significant association in analgesic need, whether intraoperative or to reduce tourniquet pain, among the compared groups ( $p < 0.001$ ).

**Conclusion:** The addition of neostigmine to lidocaine in the surgical treatment of CTS shows no significant benefits regarding postoperative pain relief, but it is of benefit during the operation.

**Categories:** Anesthesiology

**Keywords:** adjuncts, carpal tunnel syndrome, intravenous regional anaesthesia, lidocaine, neostigmine

## Introduction

Carpal tunnel syndrome (CTS) is a symptomatic compression neuropathy of the median nerve in the wrist, affecting approximately 3.8% of the population. Surgical treatment often employs regional anesthesia techniques, including intravenous regional anesthesia (IVRA) [1-3].

Introduced by Karl August Bier in 1908, IVRA involves injecting a local anesthetic intravenously after occluding venous drainage with a pneumatic tourniquet. This technique is simple, effective, and boasts a success rate of 96% to 100% [4, 5]. Contraindications include difficulty in obtaining IV access and certain medical conditions [6]. Despite its safety, potential complications such as nerve damage and tourniquet pain may arise [7]. Patients receiving IVRA generally have quicker recovery times and lower demands for analgesia compared to general anesthesia [8].

### How to cite this article

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