SCIENTIFIC ARTICLE

Efficacy and Safety of Ultrasound-Guided Distal Blocks for Analgesia Without Motor Blockade After Ambulatory Hand Surgery

Nicolas Dufeu, MD, Florence Marchand-Maillet, MD, Arthur Atchabahian, MD, Nicolas Robert, MD, Yasmine Ait Yahia, MD, Didier Milan, MD, Cyrille Robert, MD, Marine Coroir, MD, Marc Beaussier, MD, PhD

Purpose To assess the suitability of ultrasound-guided (USG), single-injection distal block(s) for pain management after outpatient hand and wrist bone surgery.

Methods We conducted a retrospective review of 125 of 198 consecutive ambulatory surgery patients who underwent hand and wrist bone surgery between June 2010 and January 2012. All patients received a USG axillary block using a short-acting local anesthetic (lidocaine) and secondary 1, 2, or 3 (median, radial, or ulnar) USG distal analgesic block(s) using a long-acting local anesthetic (ropivacaine). All patients were contacted by phone on the first postoperative day. All patients received a concomitant prescription of acetaminophen and nonsteroidal anti-inflammatory drugs with opioids as a rescue treatment. Effectiveness and duration of the distal nerve blocks, compliance with analgesic treatment and rescue opioids requirement, opioid-related side effects, prolonged upper limb motor block, quality of sleep on first postoperative night, and patient satisfaction were evaluated.

Results Most distal analgesic blocks were effective (120 of 125; 96%), with an average duration of nearly 12 hours On the first day after surgery, 28 patients (23%) had a numeric verbal scale greater than 3, although 14 of them had taken the rescue opioids. No patient reported prolonged motor blockade or insensate limb. Opioid-related side effects occurred in 23% of patients.

Conclusions After hand and wrist bone surgery, USG selective distal blocks using a long-acting local anesthetic, combined with oral analgesics, were effective in a large majority of patients. However, pain control was suboptimal for some especially painful procedures such as wrist surgery, trapeziometacarpal arthrodesis, and finger amputation. *(J Hand Surg Am. 2014;39(4):737–743.*

Type of study/level of evidence Therapeutic IV.

Key words Hand surgery, ambulatory surgery, postoperative pain, regional analgesia, ultrasound guidance.

From the Department of Anesthesiology, Intensive care and Outpatient Surgery Unit; and the Department of Orthopedic and Trauma Surgery, St Antoine University Hospital, Assistance Publique, AP-HP, Paris, France; and the Department of Anesthesiology, New York University Hospital for Joint Diseases, New York, NY.

Received for publication July 12, 2013; accepted in revised form January 6, 2014.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Marc Beaussier, MD, PhD, Department of Anesthesia and Intensive Care, Saint Antoine University Hospital, 184 rue du Faubourg Saint Antoine, 75571 Paris Cedex 12, France; e-mail: marc.beaussier@sat.aphp.fr.

0363-5023/14/3904-0019$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2014.01.011

POSTOPERATIVE PAIN IS THE MOST common problem for patients after ambulatory distal upper extremity bone surgery.[1] Gerbershagen et al[2] performed 179 types of operations on 50,523 patients. Hand surgery patients reported high pain that was poorly controlled by opioids. Among the 40 procedures with the highest pain scores (median numeric verbal scale [NVS], 6–7), there were 22 orthopedic/trauma procedures on the extremities. For example, metacarpal and interphalangeal joint arthrodesis (rank 8 of 179) and resection arthroplasty

(rank 11) were shown to be especially painful on an NVS of up to 8 out of 10 (mean, 6.1). Inadequate pain management and opioid-related postoperative nausea and vomiting are the leading causes of delayed discharge, unplanned admission, and patient dissatisfaction.[3] In this setting, regional anesthesia, especially under ultrasound guidance (USG), might be the ideal technique because it provides optimal analgesia with a concomitant reduction in opioid consumption.[4] Axillary blockade of the brachial plexus is a suitable option for distal upper limb bone surgery, because it blocks all nerves involved and allows the use of a pneumatic tourniquet.

A block using a short-acting local anesthetic is often ineffective in duration to adequately manage postoperative pain, especially when bone surgery is performed.[5] McCartney et al[6] reported the time to first analgesic request after 1.5% lidocaine brachial plexus block to be 97 minutes on average. Conversely, using a long-lasting local anesthetic may cause prolonged motor blockade, with patients commonly reporting having a "dead arm" and/or unpleasant paresthesias at home,[7] and it may risk accidental injury, even though none have been reported to date. Moreover, a survey of the Society for Ambulatory Surgery showed that 16% of responding anesthesiologists were reluctant to discharge a patient with an insensate extremity after a peripheral nerve block with long−acting local anesthesia.[8] The primary reasons were potential for patient injury (49%) and inability of patients to care for themselves (28%).

An alternative solution would be to associate an axillary block using a short-acting agent for surgical anesthesia and 1, 2, or 3 complementary block(s) using a long-acting agent for postoperative analgesia. These blocks should be performed as distally as possible to limit motor blockade and anesthetize only those nerves innervating the surgical area. The patient could then quickly recover from the proximal motor block, with the benefit of having long-lasting selective distal analgesic blocks. In the past, this approach would not have been considered acceptable; with neurostimulation, blocking a nerve that is anesthetized more proximally was discouraged because of the risk of unrecognized nerve injury and intraneural injection. The use of USG, which allows visualization of the nerves, continuous observation of the needle tip, and assessment of the spread of the injected local anesthetic, has made this strategy safer.[4]

In this retrospective evaluation, we assessed the results of the performance of 1, 2, or 3 (median, radial, and/or ulnar) single injection distal block(s) using a long-acting ropivacaine after an axillary block performed with short-acting lidocaine for distal bone surgery of the upper extremity in an ambulatory setting.

MATERIALS AND METHODS

Our regional research ethics committee approved this single-center retrospective study. The records of all consecutive patients who received distal blocks for postoperative analgesia after ambulatory hand and wrist bone surgery performed under axillary blockade between June 2010 and January 2012 were analyzed.

Patients had been selected and scheduled for outpatient surgery in our university hospital ambulatory unit. According to our usual practice, all patients received an axillary block using lidocaine for surgical anesthesia and 1 or more analgesic distal blocks using long-acting ropivacaine preoperatively. Exclusion criteria were coagulation disorders, anticoagulant treatment, allergy to amide local anesthetics, known neuropathy of any etiology in the operative extremity, local infection, pregnancy, current high-dose opioid use, and inability to communicate with the unit staff because of language barrier or cognitive issues. Patients did not receive oral premedication. All nerve blocks were performed by a senior anesthesiologist or a supervised fellow. Nerves were located using USG with a high-frequency linear 6- to 13-MHz probe (M-Turbo; Sonosite, Bothell, WA). Nerves were identified in a transverse (short-axis) cross-section view. Blocks were performed using a 50- or 80-mm, 22-gauge insulated needle (Nanoline; Pajunk, Geisingen, Germany) inserted in-plane. Considering the possibility of anatomical variations in nerve distribution and the use of an arm tourniquet, all 4 nerves (median, ulnar, radial, and musculocutaneous) were systematically located and blocked individually at the axillary level. The local anesthetic was injected in divided doses circumferentially around the target nerves, using about 5 mL/nerve of 1.5% lidocaine with epinephrine 1:200,000.

Immediately after the axillary block and before surgery, based on the surgical approach and the hardware to be implanted, the surgeon identified the nerve(s) likely to transmit painful stimuli. According to this evaluation, 1 (median, radial, or ulnar), 2, or 3 nerves were blocked. Using USG, median and ulnar nerves were identified distal to the elbow crease and the radial nerve proximal to that crease. To limit motor blockade, nerves were tracked distally, and blocks were performed as distally as possible,