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Efficacy of axillary nerve block in elbow arthroscopic surgery: a randomized trial

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Background: The purpose of this study was to evaluate postoperative pain levels after arthroscopic elbow surgery under general anesthesia and to determine whether an axillary nerve block provides additional pain management benefits compared with a portal site injection of local anesthetic.
Methods: Thirty-six patients undergoing arthroscopic elbow surgery under general anesthesia were randomized to either a study group receiving axillary nerve block (Ax group) or a control group receiving portal site injections of local anesthetic (Lo group). During the first 48 hours after surgery, pain visual analog scale (VAS) scores (0-100), total amount of oral analgesics required, and patient satisfaction were assessed.
Results: Among all 36 patients, mean pain VAS scores at rest were 37, 18, and 9 for the first 12-hour period and at 24 and 48 hours after surgery, respectively. The mean pain VAS scores during physiotherapy were 47 and 33 at 24 and 48 hours postoperatively, respectively. No intergroup differences were observed between the Ax and Lo groups at any time point after surgery (P value range, .41 to .87). The mean number of loxoprofen tablets required during the 48-hour study period was 5.1 in the Ax group and 4.5 in the Lo group ($P = .90$). The Ax and Lo groups had mean overall patient satisfaction scores of 91 and 91, respectively ($P = .98$).
Conclusions: Postoperative pain levels after arthroscopic elbow surgery could be well managed with oral analgesics and local anesthetic. An axillary nerve block was not found to provide any postoperative pain control benefits.
Level of evidence: Level I, Randomized Controlled Trial, Treatment Study.

Keywords: Elbow arthroscopy; general anesthesia; postoperative pain; axillary nerve block; oral analgesics; local anesthetic

Improved instrumentation and more precise surgical techniques have made elbow arthroscopy a more common procedure and one that is now a safe and effective modality for elbow disease.[18] Arthroscopic elbow surgery enables motion exercises to be undertaken early after surgery, which might be beneficial for early functional recovery.

This study was approved by the Institutional Review Board of Sapporo Medical University (IRB study number: (21-27) 21-307) and was registered with the UMIN Clinical Trial Registry (UMIN000002275).

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With regard to anesthesia, general anesthesia is usually preferred for patients as it provides complete muscle relaxation throughout the procedure and allows the use of a tourniquet without discomfort.[18] However, the disadvantage is the potential for greater postoperative pain,[10] which can discourage the early initiation of exercise, decrease patient satisfaction, and result in poor clinical outcomes because of delayed rehabilitation.[13]

Arthroscopic shoulder surgery under general anesthesia is often associated with severe postoperative pain.[22] Regional anesthesia techniques, including single-injection or continuous interscalene block and subacromial or intra-articular infiltration analgesia, have been used for postoperative pain control.[11] Single-injection interscalene block is the most commonly used technique and provides better analgesia and reduced opioid-related side effects relative to control groups.[2,4] However, whether this is superior to other modalities remains controversial.[15,20,22] On the other hand, very few studies have been conducted on pain level or pain control after arthroscopic elbow surgery.[9]

The purpose of this prospective randomized clinical study was to evaluate early postoperative pain levels after arthroscopic elbow surgery under general anesthesia and to determine whether an axillary nerve block provides additional pain management benefits compared with portal site injections with local anesthetic. We hypothesized that an axillary nerve block with a long-acting anesthetic might provide additional pain management benefits.

Materials and methods

The study enrolled 41 patients who were older than 20 years and scheduled for arthroscopic surgery of the elbow under general anesthesia. The study design was a prospective, randomized clinical trial conducted from October 2009 through April 2012. Exclusion criteria included previous elbow surgery, allergy to local anesthetics, peripheral neuropathy, proven opioid dependency, laboratory evidence of a coagulopathy, and dementia (as assessed by a lack of orientation to person, place, and time).

The patients in this study were routinely admitted to our hospital for 4 days in accordance with the usual practice pattern of the authors' health care system, in which admission cost is relatively low and patients generally tend to remain hospitalized for longer. One day before surgery, the patients were randomly allocated to 1 of 2 additive local analgesia treatment groups by the anesthesiologist, according to a computer-generated randomization schedule.

All patients received general anesthesia. Study group (Ax group) patients were assigned to receive a supplementary one-time preoperative axillary nerve block administered by anesthesia staff skilled and experienced in the technique. Under general anesthesia, axillary nerve block was performed under real-time ultrasound guidance with nerve stimulation. A short axial view of the target nerves (median nerve, radial nerve, ulnar nerve, and musculocutaneous nerve) surrounded by the axillary artery was visualized by ultrasound imaging (Vivid *i*; GE Healthcare, Norwalk, CT, USA) for confirming locations of vessels around the nerves by color Doppler mode. A 50-mm 22-gauge insulated needle (Stimuplex; B-Braun/McGaw Medical, Bethlehem, PA, USA) was gently introduced by an in-plane approach toward the edge of each nerve. The needle was connected to a constant voltage nerve stimulator (Stimuplex DIG; B-Braun/McGaw Medical) that was set at 2 Hz with pulse width of 100 milliseconds and current of 0.8 mA. The needle position was considered acceptable if an evoked motor response as a twitch muscle contraction in the affected region was elicited between 0.5 and 0.8 mA. After careful aspiration to exclude intravascular injection, 4 mL of 0.75% ropivacaine was injected for each nerve. The same needle manipulation and injection were performed for every target nerve, and a total of 16 mL of ropivacaine was injected. The expected duration of the block was approximately 12 to 24 hours.

Control group (Lo group) patients were assigned to receive local anesthetic injections for each portal. Under general anesthesia, after positioning and draping, a surgeon injected 1.5 mL of 0.75% ropivacaine into the subcutaneous tissue of each portal before the tourniquet was inflated.[14]

Operative technique

The patient was placed in the lateral decubitus position with the operative side up. A tourniquet was placed on the arm at the midhumeral level and an arm holder was positioned underneath the arm, allowing the elbow to move from 90° of flexion to full extension. Arthroscopic portals, including proximal anteromedial, anterolateral, proximal anterolateral, posterolateral, posterocentral, and soft spot portals, were drawn on the elbow along with the surgical landmarks. The arm was sterilely prepared and draped. The elbow joint was inflated with 15 to 25 mL of normal sterile saline solution through the soft spot portal. For lateral epicondylitis, the joint capsule and pathologic extensor carpi radialis brevis tendon were resected at the lateral epicondyle. A radiocapitellar joint plica impinged into the joint was resected from the anterior and posterior compartments.[21] For osteoarthritis, we used anterior removal of loose bodies and removal of osteophytes from the coronoid process, radial fossa, and coronoid fossa, followed by posterior removal of loose bodies and removal of osteophytes from the posterior olecranon and olecranon fossa as well as the posterior radiocapitellar compartment. If motion was still limited, a capsular release was performed.[1] For rheumatoid arthritis, total synovectomy of the elbow was performed using multiple portals and dividing the elbow into anterior, posterior, and radiocapitellar compartments.[12] For radiocapitellar plica, the anterior portion of the plica was removed through the anterolateral and proximal lateral portals. The remaining plica and localized synovitis were then resected through the posterolateral and soft spot portals.[3]

In both groups of patients, postoperative splints were not used. One day after surgery, elbow range of motion was initiated under the supervision of therapists. Each patient was enrolled in a postoperative rehabilitation regimen appropriate to surgery types.

Outcome measures

In the Ax group, sensory and motor function were evaluated at 2, 12, and 24 hours after surgery. The intensity of the sensory block was assessed at the level of the forearm and hand for the median, ulnar, radial, and musculoskeletal nerves with the use of cold touch with alcohol and a cotton swab. The median, ulnar, radial, and musculoskeletal motor nerve blocks were evaluated by