Assessment of Pain Relief Provided by Interscalene Regional Block and Infusion Pump After Arthroscopic Shoulder Surgery

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Purpose: This study was performed to evaluate the efficacy of interscalene regional blocks and infusion pumps for postoperative pain control after arthroscopic subacromial decompression with or without arthroscopic rotator cuff repair. **Methods:** Seventy-six patients were included in the prospective study. Participants were randomized into 4 treatment groups: (1) interscalene regional block, (2) infusion pump with 0.5% bupivacaine, (3) interscalene block combined with an infusion pump containing 0.5% bupivacaine, and (4) interscalene block combined with an infusion pump containing 0.9% saline solution. The interscalene regional block was performed with a nerve stimulator. Infusion pump catheters were positioned in the subacromial space. Visual analog scale (VAS) data were collected preoperatively, at 1 and 2 hours postoperatively, and daily for an additional 6 days postoperatively. An analysis of variance with a Student-Newman-Keuls post hoc test was used to identify statistically significant ($P < .05$) differences in VAS scores between the groups at each time point. Percentages of patients who took medication for pain management in the recovery room were compared between the 4 groups by use of χ^2 analysis. **Results:** Significant differences were noted in VAS scores postoperatively. Group 2 (pump only) had significantly higher scores than all other groups for the first 2 hours. Furthermore, group 4 (block and pump filled with saline solution) had significantly lower VAS scores than group 1 (block only) at 1 hour. This difference was no longer significant by the second hour. The percentage of patients who required oral narcotics or intravenous pain medication was significantly larger for group 2 than for the other groups. **Conclusions:** The interscalene regional block provided more pain relief than infusion pumps immediately after arthroscopic shoulder surgery. Infusion pumps did not significantly reduce pain levels after the blocks wore off. **Level of Evidence:** Level II, prospective comparative therapeutic study. **Key Words:** Pain—Interscalene block—Infusion pump—Shoulder arthroscopy.

Advances in arthroscopic shoulder technology allow some shoulder procedures that once required hospitalization to be performed on an outpatient basis. However, even arthroscopic procedures can be associated with significant postoperative pain.[1,2] Therefore, effective pain relief in an outpatient setting is mandated. Two of the more common contemporary methods of pain management are interscalene regional block and infusion pain pumps. As compared with general anesthesia alone, regional anesthesia with only an interscalene regional block reduces postoperative nausea and vomiting and eases postoperative recovery.[3] The interscalene block also provides effective pain relief immediately postoperatively, although pain management only lasts for approximately 8 to 10 hours.[3-6] Application of the block is an invasive procedure that requires anesthesiologists trained in the technique. Interscalene blocks have been associated with multiple complications, including phrenic nerve injuries with respiratory distress,[6,7] anesthetic toxicity leading to cardiac arrest,[8,9] seizures,[10] and permanent

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nerve injury.[11] Infusion pumps are an alternative to interscalene blocks for treating postoperative pain. The pumps deliver a controlled flow of anesthetic from an external reservoir through a catheter that can be inserted into the shoulder to directly address the area of surgery. The controlled flow can last for up to 48 hours, which could potentially provide longer-lasting pain management than an interscalene block. However, pain control is limited to the anatomic region where the catheter is placed. Multiple studies have indicated that infusion pumps reduce postoperative pain, as compared with placebo,[12,13] although one study indicated that infusion pumps do not effectively reduce pain.[14]

This study was initiated to investigate the efficacy of interscalene regional blocks and infusion pumps after outpatient shoulder arthroscopy. A previous study directly compared interscalene blocks with infusion pumps.[4] Pain levels tended to be lower with the infusion pumps for the first 2 days after surgery, although no statistically significant differences were identified. Pain levels were not recorded immediately postoperatively. This study was performed to evaluate the efficacy of interscalene regional blocks and infusion pumps for postoperative pain control after arthroscopic subacromial decompression with or without arthroscopic rotator cuff repair. We hypothesized that interscalene blocks would be more effective for pain management immediately after arthroscopic shoulder surgery but that infusion pumps would provide longer-lasting pain control.

METHODS

A prospective randomized study was performed with patients undergoing outpatient shoulder arthroscopy. The institutional review board gave approval for the study, and written, informed consent was obtained from each participant. Patients aged 21 years or older undergoing unilateral shoulder arthroscopy with subacromial decompression and possible rotator cuff repair were eligible for inclusion. Exclusion criteria included a history of shoulder injury, daily pain medication for problems not associated with the shoulder, and medical contraindications to regional anesthesia. Because catheters for the pain pumps were inserted into the subacromial space, patients were disqualified postoperatively if procedures other than arthroscopic subacromial decompression with or without a rotator cuff repair were performed.

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Anesthesiologists experienced in regional anesthesia administered the blocks preoperatively using a standard protocol. All interscalene blocks were administered via a nerve stimulator with a 22-gauge, 2-inch insulated needle (B. Braun Medical, Bethlehem, PA) while patients were under light sedation. A localizing motor response was initiated with the lowest achievable current (<0.5 mA) and 30 mL of 0.3% ropivacaine was injected. Patients randomized to the pump groups received a disposable balloon infusion pump (Accufuser; McKinley Medical, Wheat Ridge, CO). Catheters were inserted into the subacromial space under arthroscopic visualization. Pumps were filled with a 48-hour supply of either 0.5% bupivacaine or 0.9% saline solution. The catheter was used to inject 20 mL of the contents of the pump into the subacromial space immediately after insertion. A basal rate of 5 mL/h with an available 1-mL bolus and a 1-hour lockout was used. To relieve pain, patients were asked to try the bolus option first and take medication only if no relief was felt after 15 minutes. Pumps were removed at 48 hours by the patient or a family member.

General anesthesia was used for the operative procedures. Anesthesia was induced with propofol and maintained with either desflurane or sevoflurane. Any breakthrough pain was treated with intravenous fentanyl. The outpatient arthroscopic surgeries were performed by 3 fellowship-trained shoulder surgeons. Two surgeons positioned the patients in the lateral decubitus position, whereas one used the beach-chair position. For each patient, the coracoacromial ligament was released and subacromial decompression was performed to achieve a smooth undersurface of the acromion. The bursal surface of the rotator cuff was visualized and examined. When identified, rotator cuff tears were lightly debrided to expose healthy tissue. Both single-row and dual-row anchor tech-