

Suprascapular and Interscalene Nerve Block as Analgesia After Arthroscopic Rotator Cuff Repair: a Retrospective Comparative Cohort Study

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ABSTRACT

Introduction: This study aimed to compare the efficacy of interscalene block (ISB) and suprascapular nerve block (SSNB), individually and in combination (ISB+SSNB), used as postoperative analgesia within the first 3 hours after arthroscopic rotator cuff repair. **Materials and Methods:** Retrospective comparative cohort study, conducted between 2019 and 2021. The primary endpoint was shoulder pain score in the immediate postoperative period as reported on a visual analog scale (VAS) by the patient. Secondary endpoints were opioid use in the recovery room (first 3 hours) and locoregional anesthesia complications. **Results:** 175 patients were included; 13 in the ISB group, 61 in the ISB+ SSNB group, and 101 in the SSNB group. The ISB group and the ISB+ SSNB group had significantly less pain in the recovery room than the SSNB group ($p = 0.001$ and $p < 0.001$, respectively). The percentage of patients who required at least one dose of opioid and the total number of opioids consumed in milligrams of morphine equivalent were significantly lower for the ISB and ISB+ SSNB groups than for the SSNB group ($p < 0.001$). There were no significant differences in pain or opioid use between ISB alone or combined with SSNB (ISB+SSNB). **Conclusions:** In this retrospective comparative study, ISB was more effective in relieving pain and reducing opioid use in the recovery room after arthroscopic rotator cuff repair than SSNB. The ISB+SSNB combination did not increase effectiveness, and therefore it is suggested not to combine these two techniques.

Keywords: Rotator cuff tear; interscalene block; suprascapular nerve block; arthroscopic repair.

Level of Evidence: III

Bloqueos supraescapular e interescalénico como analgesia después de la reparación artroscópica del manguito rotador: estudio de cohorte comparativo retrospectivo

RESUMEN

Introducción: El objetivo de este estudio fue comparar la eficacia de los bloqueos interescalénico y supraescapular, solos y combinados, como analgesia posoperatoria en las primeras 3 horas tras la reparación artroscópica del manguito rotador. **Materiales y Métodos:** Estudio de cohorte comparativo retrospectivo, realizado entre 2019 y 2021. El criterio de valoración principal fue el puntaje del dolor de hombro en la sala de recuperación evaluado con una escala analógica visual por el paciente. Los criterios de valoración secundarios fueron el consumo de opioides en la sala de recuperación y las complicaciones de la anestesia locorreional. **Resultados:** Se incluyó a 175 pacientes, 13 en el grupo de bloqueo interescalénico, 61 en el grupo de bloqueos interescalénico más supraescapular y 101 en el grupo de bloqueo supraescapular. Los grupos de bloqueo interescalénico y de bloqueo interescalénico más supraescapular tuvieron significativamente menos dolor en la sala de recuperación y una tasa total menor de opioides consumidos en miligramos equivalentes de morfina que el grupo de bloqueo supraescapular ($p = 0,001$ y $p < 0,01$, respectivamente). No hubo diferencias significativas en el dolor ni el consumo de opioides entre el bloqueo interescalénico solo o combinado con bloqueo supraescapular. **Conclusiones:** El bloqueo interescalénico fue más eficaz que el bloqueo supraescapu-

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lar para aliviar el dolor y disminuir el consumo de opioides en la sala de recuperación tras la reparación artroscópica del manguito rotador. La combinación de bloqueo interescalénico más bloqueo supraescapular no resultó en un incremento en la eficacia, y se sugiere no combinar estas dos técnicas.

Palabras clave: Rotura del manguito rotador; bloqueo interescalénico; bloqueo supraescapular; reparación artroscópica.

Nivel de Evidencia: III

INTRODUCTION

Arthroscopic rotator cuff surgery is a minimally invasive procedure that is currently conducted primarily on an outpatient basis.¹ However, arthroscopic rotator cuff repair is associated with moderate or severe postoperative pain, and adequate pain management is key to successful outpatient surgery.¹⁻⁴

Multiple strategies have been proposed to treat pain after rotator cuff repair surgery that decrease opioid use, such as cryotherapy, intralesional anesthesia, nerve block, continuous nerve block with catheters, and multimodal analgesia.² Interscalene block (ISB) has been shown to be an optimal analgesic option in arthroscopic shoulder surgery, with success rates of 87% to 100%.⁵ However, it can be associated with potentially serious adverse effects and there are relative contraindications in patients with severe chronic obstructive pulmonary disease due to the almost inevitable diaphragmatic paralysis it causes.⁶

For this reason, peripheral blocks have been considered to reduce these risks, such as suprascapular nerve block (SSNB). The efficacy and safety of SSNB has been proven to control pain and reduce the need for opioids after rotator cuff repair surgery.⁷ Multiple studies compared the efficacy of ISB versus SSNB.^{2,5,8-10} Although, in some, the ISB is reported to be superior in controlling postoperative pain,² in others, the non-inferiority of SSNB was demonstrated.⁷

In a previous study of our group, we evaluated the efficacy of a multimodal analgesia protocol that included intralesional anesthesia and SSNB, without ISB, in patients undergoing mini-open or arthroscopic rotator cuff repair.¹ The results showed that the protocol was highly effective for pain management after mini-open surgery; however, in the arthroscopic surgery group, the protocol was not optimal, resulting in significantly greater pain averages than in the mini-open surgery group. Based on the results of this study, we consider that the multimodal analgesia protocol that includes only SSNB could be insufficient for pain management after arthroscopic surgery. Therefore, with these results in mind, we decided to add an ISB in patients undergoing arthroscopic rotator cuff repair. The objective was to compare the efficacy of ISB (alone or in combination with SSNB) with that of the multimodal protocol of the historical cohort that included only SSNB as postoperative analgesia within the first three hours of arthroscopic rotator cuff repair. Our hypothesis was that ISB, alone or combined, would be superior to SSNB in managing pain within the first few hours after surgery.

MATERIALS AND METHODS

Patient selection

A retrospective study was carried out with patients who had undergone arthroscopic rotator cuff repair and who were included, prospectively, in the registry of the Rotator Cuff Clinical Care Center at our institution, between January 2019 and April 2021. This study was approved by our institutional ethics committee.

The inclusion criteria were: 1) >18 years old; 2) with complete or partial rotator cuff tears that had undergone arthroscopic repair with associated procedures on the biceps, acromion or acromioclavicular joint, or without procedures; 3) with an SSNB, an ISB, or a combination of both (ISB plus SSNB) for the management of postoperative pain, and 4) with a complete record of pain and analgesia administered during anesthesia and the first three hours in the recovery room. Patients who were administered regional anesthesia other than ISB or SSNB were excluded from the study. Likewise, those with physical or psychological incapacity to assess pain on a visual analog scale (VAS) and with a known allergy to local anesthetics (bupivacaine, lidocaine) were excluded.

Surgical technique

Arthroscopic surgery was performed by only one surgeon (GF). General anesthesia was administered with the patient in the lateral decubitus position with upper limb traction. The repair was performed using bone anchors with the repair configuration selected by the surgeon according to the morphology of the injury.

Anesthetic procedures

All patients underwent surgery under general anesthesia with a combination of inhaled and intravenous anesthetic. An anesthesiologist performed all ISBs under ultrasound guidance (Sonosite M-Turbo or Mindray with a linear transducer of 7.5 to 15 MHz) and a neurostimulator at 0.4 mA. After identifying the anatomical landmarks, 1 ml of 2% lidocaine without epinephrine was infiltrated into the skin and subcutaneous cellular tissue, and then the puncture was carried out using an ultrasound-guided 50-mm Pajunk needle, visualizing its entire journey as it progressed to the proximity of the C5-C6-C7 nerve roots. Using the neurostimulator and avoiding sensory or motor responses at 0.4 mA, after negative aspiration, and with an injection pressure of 15 psi, between 10 and 15 ml of 0.375% levobupivacaine were administered, the adequate distribution of the local anesthetic was observed, and the adequate motor and sensory block was verified.

The SSNB was performed based on specific anatomical landmarks according to the surgeon, after general anesthesia and with the patient in the lateral decubitus, using 10 cc of 0.5% bupivacaine dissolved in 10 cc of saline solution.

Analgesia Protocol

The same analgesic protocol was used for all patients. During anesthesia and before going to the recovery room, all patients received 1 g of paracetamol and a dose of anti-inflammatory drugs (75 mg diclofenac, 30 mg ketorolac or 40 mg parecoxib), intravenously, to prevent pain. In the recovery room, if the pain score on the VAS was >3, the ward staff administered a dose of an opioid that included oxycodone, hydromorphone, or morphine. The pain was evaluated again after 5 minutes. If the score was >3, another dose of opioid was administered.

Endpoints and variables analyzed

The primary endpoint was the postoperative shoulder pain score, evaluated by the patient in the VAS (from 0 to 10). Pain was assessed when the patient woke up in the recovery room (before administering any opioid). The secondary endpoints were: the use of opioids standardized in morphine equivalents until discharge from the recovery room and complications.

The variables analyzed were: 1) demographic data, 2) type of block (ISB, SSNB or a combination of both); 3) pain during recovery according to the VAS; 4) the administration of opioid and non-opioid medications by the anesthesiologist, during surgery and in the recovery room; 5) the dose in mg of each medication administered; 6) the number of doses required to control pain in the recovery room.

To facilitate data analysis, all opioids were converted to milligram equivalents of oral morphine.

Statistical Analysis

The patients were divided into three groups: 1) ISB only, 2) ISB plus SSNB, and 3) SSNB only. Demographic variables and surgical variables were compared between groups using analysis of variance for continuous variables and the chi-squared test or Fisher's exact test for categorical variables. A one-way analysis of variance (one-way ANOVA) was performed to compare pain and opioid use between groups with *post-hoc* tests comparing all groups with each other and correcting the p-value for multiple comparisons using the Bonferroni method. All statistical tests were bilateral and the significance was set at $\alpha = 0.05$.

The analyses were carried out with the Stata 14 program (StataCorp. 2015. Stata Statistical Software: version 14. College Station, TX: StataCorp LP).

RESULTS

Study population

After applying the eligibility criteria, data from 175 patients were analyzed. It included 94 women and 81 men, with an average age of 59 ± 9.7 years, who were divided into three groups: 13 in the ISB group, 61 in the ISB plus SSNB group and 101 in the SSNB group. The demographic characteristics and surgical variables of the three groups are detailed in the [Table](#).

Table. Demographic information, characteristics of the injury and surgical variables

| | ISB Group (n = 13) | ISB + SSNB group (n = 61) | SSNB Group (n = 101) | p |
|---|-----------------------|------------------------------|-------------------------|------|
| Demographics | | | | |
| Age | 60 ± 9.1 | 58 ± 10 | 59 ± 9.6 | 0.79 |
| Sex (female) | 8 (61) | 30 (49) | 56 (55) | 0.62 |
| Characteristics of the injury | | | | |
| Operated side: right, n (%) | 12 (92) | 46 (75) | 82 (81) | 0.35 |
| Pre-surgical ASES score | 48.7 ± 15.5 | 42.3 ± 16.7 | 39.4 ± 18.3 | 0.26 |
| Size of the anteroposterior injury (mm) | 24.8 ± 13.9 | 20.5 ± 10.9 | 24.2 ± 12.5 | 0.23 |
| Size of the mediolateral injury (mm) | 25.3 ± 15.2 | 20.2 ± 11 | 23.5 ± 13.7 | 0.29 |
| Intraoperative variables | | | | |
| Surgical time (min) | 93.6 ± 56.3 | 90.8 ± 40.2 | 88.8 ± 51.8 | 0.93 |
| Number of anchors (range) | 2 (1-4) | 2 (1-5) | 2 (1-4) | 0.84 |
| Associated procedures[†] | | | | |
| Biceps | | | | 0.27 |
| Tenotomy | 3 (30) | 9 (17) | 33 (35) | |
| Tenotomy and tenodesis | 5 (50) | 28 (54) | 42 (44) | |
| Resection of the distal end of the clavicle | 0 (0) | 9 (17) | 5 (5.3) | 0.05 |
| Other Procedures [‡] | 2 (20) | 3 (5.8%) | 4 (4.2%) | 0.13 |

Data are expressed as number, number (%), or mean ± standard deviation, unless otherwise indicated.

[†]Data on associated procedures were missing in 3 patients in the ISB group, 9 in the ISB plus SSNB group, and 6 in the SSNB group.

[‡]Other procedures include superior capsular reconstruction with biceps or subacromial balloon spacer.

ISB = interscalene block; SSNB = subscapular nerve block; ASES = American Shoulder and Elbow Surgeons Score.

Pain and opioid use

The ISB group had significantly less pain in the recovery room than the SSNB group (0.9 ± 2.1 for ISB vs. 4.8 ± 3.8 for SSNB, $p = 0.001$). Similarly, the ISB plus SSNB group suffered significantly less pain than the SSNB group (1.3 ± 2.8 for ISB plus SSNB vs. 4.8 ± 3.8 for SSNB, $p < 0.001$). There was no significant difference in pain between the ISB group and the ISB plus SSNB group (0.9 ± 2.1 for ISB vs. 1.3 ± 2.8 for ISB plus SSNB, $p = 1.0$).

The percentage of patients requiring at least one dose of opioids in the recovery room was significantly higher in the SSNB group (54%) than in the ISB (7.7%) and ISB plus SSNB (13%) groups ($p < 0.001$). Among patients who required at least one dose of opioids, the SSNB group had a significantly higher consumption of equivalent milligrams of morphine than the ISB group (8.9 ± 6 for SSNB vs. 2.4 ± 3.4 for ISB, $p = 0.04$). Although it did

not reach statistical significance, opioid consumption in milligrams equivalent of morphine was also higher in the SSNB group than in the ISB plus SSNB group (8.9 ± 6 for SSNB vs. 4.9 ± 4 for ISB plus SSNB, $p = 0.125$). Opioid use, both in terms of the percentage of patients requiring at least one dose, and in equivalent milligrams of morphine, was similar in the ISB and ISB plus SSNB groups.

Complications

There were no early complications in any of the three groups. No patient with an ISB had serious complications, such as pneumothorax.

DISCUSSION

Adequate pain management after rotator cuff repair is a key aspect of achieving successful outpatient surgery. To this end, locoregional anesthesia is a method that has been used in recent decades with the aim of reducing pain and opioid use.^{2,6} Among locoregional anesthesia options, ISB is considered the gold standard given its effectiveness for pain management in shoulder surgery.² However, the application of ISB requires trained personnel and can be associated with complications, such as diaphragmatic paralysis, vertebral artery injection, pneumothorax, brachial plexus injury, dysphonia, dysphonia, dyspnea, Horner syndrome, among others.^{2,6} For this reason, other alternatives have been considered that have similar efficacy, are easy to apply and pose a lower risk of complications, such as SSNB. SSNB is an effective alternative for controlling pain after rotator cuff surgery considering that the suprascapular nerve provides sensory fibers to around 70% of the shoulder joint and directly innervates the supraspinatus and infraspinatus muscles.^{6,10} The surgeon performed the SSNB based on anatomical landmarks because this is the procedure widely utilized in clinical practice for this type of block. In addition, there are anatomical studies that demonstrate the efficacy of SSNB performed blindly, guided by anatomical landmarks.¹¹ Therefore, we do not consider it necessary for the block to be in the hands of an anesthesiologist or guided by ultrasound.

The efficacy of SSNB versus ISB has been addressed, as well as whether these two locoregional anesthetic procedures provide equivalent analgesia and safety.^{2,5,7-9} Koga et al. compared SSNB and ISB after rotator cuff repair and reported that they did not find significant differences between these two methods in terms of the duration of analgesia and pain in VAS. In a randomized controlled clinical trial, on the other hand, it was determined that SSNB was as effective as ISB for pain control in the first 24 hours after surgery, but ISB was more successful in managing pain in the immediate postoperative period.⁸ In addition, according to a meta-analysis, patients with SSNB consumed more opioids than those with ISB in the immediate postoperative period.²

Postoperative pain control in the group of patients undergoing arthroscopic repair was not optimal in a previous study by our group that evaluated the efficacy of a multimodal analgesia protocol with local anesthesia and SSNB, with pain averages in the VAS significantly higher than in patients undergoing mini-open surgery.¹ Although the direct causes for this difference cannot be established, we consider that the hydration and edema of the soft tissues that occur after arthroscopic surgery could play an important role that can condition pain that is difficult to manage with local anesthesia and SSNB because of its extension to areas distant from the glenohumeral joint. For this reason, after these results, we decided to use ISB in patients undergoing arthroscopic rotator cuff surgery and the objective of this study was to compare the efficacy of the ISB and the SSNB used in the multimodal protocol of the historical cohort.

The findings of this study show that ISB was more effective than SSNB in controlling post-operative pain during the first three hours in the recovery room, with a significant decrease in opioid use. None of the patients with ISB suffered serious early complications. In one of the groups evaluated, a combination of ISB plus SSNB was used to determine if there was an additive effect on the effectiveness of these blocks. Our results show that the combination of the two blocks does not seem to offer a significant increase in efficacy and, therefore, we do not recommend the combined use of these blocks. Based on these results, we have changed our practice and routinely use ISB for post-operative pain management in patients undergoing arthroscopic rotator cuff repair.

This study has several limitations and the results presented should be viewed in light of these limitations. First, this is a retrospective study and the assignment to the type of block was not random. This retrospective study,

on the other hand, is integrated in a prospective cohort as part of a clinical care facility where data is collected prospectively and standardized surgical, anesthetic, and analgesic procedures are performed. This allows for a reasonable comparison between patients with ISB and the historical cohort treated with the multimodal SSNB protocol. Likewise, there were no significant differences in the demographic, preoperative and intraoperative variables between the three groups. Second, although pain management was standardized, the type of anti-inflammatory and opioid medications administered was variable. However, the analgesic potency of the anti-inflammatory drugs administered was similar and opioid consumption was standardized to equivalent milligrams of morphine during the analysis to make the comparisons more valid. Third, the number of patients included, especially in some of the groups, is not large and this may affect the estimates, and could explain the absence of complications. Because ISB complications are rare, a considerable sample size is required to accurately estimate their frequency. Finally, our study only assessed pain and opioid use during the first three hours in the recovery room and, therefore, it is not possible to discuss whether the superiority of ISB extends beyond the immediate postoperative period.

CONCLUSIONS

In this retrospective comparative study, ISB was more effective than SSNB in relieving pain and reducing opioid use in the recovery room after arthroscopic rotator cuff repair. The combination of ISB plus SSNB did not increase efficacy and, therefore, it is not considered necessary to combine these two techniques.

Conflict of interest: The authors declare no conflicts of interest.

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