

## Original Research Article

# Efficacy of analgesics in patients undergoing arthroscopic repair of rotator cuff at Gujarat Adani institute of medical science, Bhuj, Kutch, Gujarat

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### ABSTRACT

**Background:** To evaluate analgesic efficacy when catheters are positioned with assistance of arthroscope to block suprascapular and axillary nerves in patients undergoing arthroscopic repair of rotator cuff under general anesthesia.

**Methods:** Present study was performed at department of orthopedics, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat. 24 patients who experienced arthroscopic repair of rotator cuff between July 2015 and October 2015 were catheterized to block suprascapular and axillary nerves through shoulder arthroscopy were incorporated in the study. Clinical outcomes were assessed using visual analog scale (VAS) scores preoperatively and at 0 h, 6 h, 12 h, 18 h, 24 h, and postoperative day 2.

**Results:** Preoperative and postoperative 0 h, 6 h, 12 h, 18 h, 24 h, and day 2 mean VAS scores were  $6.37 \pm 0.91$ ,  $0.45 \pm 0.39$ ,  $0.59 \pm 0.40$ ,  $0.62 \pm 0.39$ ,  $0.61 \pm 0.42$ ,  $0.51 \pm 0.35$ , and  $1.54 \pm 0.50$ , respectively. No statistical difference was found among 0 h, 6 h, 12 h, 18 h, and 24 h time points; however, assessment of postoperative day 2 and postoperative 0 h, 6 h, 12 h, 18 h and 24 h VAS scores showed statistically significant difference ( $P < 0.05$ ). All patients were discharged at the end of 24 h with no complication. The mean time (in minutes) required for blocking suprascapular nerve and axillary nerve were  $14.38 \pm 3.21$  and  $3.75 \pm 0.85$ , respectively.

**Conclusions:** These results confirmed that blocking two nerves with arthroscopic approach was an excellent pain management method in postoperative period. Accordingly, patients could recover rapidly and patients' satisfaction could be improved.

**Keywords:** Arthroscopic, Bhuj, Catheters, Visual analog scale

### INTRODUCTION

Postoperative pain management is a demanding circumstance for a surgeon in patients undergoing shoulder arthroscopy. Postoperative pain can persist for 48 h in postoperative course, even if the patient is started on multimodal analgesic agents.<sup>1</sup> For pain management, numerous treatment modalities have been described to date; however, they have some limitations, side effects, and risks. Nonsteroidal anti-inflammatory drugs (NSAIDs) can cause reduced platelet function, prolonged

bleeding time and gastric ulceration.<sup>2</sup> Opioids can lead to nausea, vomiting, sedation, constipation and intestinal ileus. Intraarticular (IA) local anesthetic injections alone might not be enough to reduce pain, and efficiency of IA local anesthetic or morphine remains controversial.<sup>2,3</sup> Although interscalene block (ISB) has been used for intraoperative anesthesia and postoperative pain management, it has serious side effects such as inadvertent epidural and spinal anesthesia, spinal cord injury, brain damage, brachial plexus injury and paralysis of the vagus and laryngeal recurrent nerves as well as

cervical sympathetic nerve and pneumothorax.<sup>4</sup> Recently, suprascapular nerve block (SSNB) and axillary nerve block (ANB) are used for intraoperative anesthesia and postoperative pain management in shoulder arthroscopy, especially for rotator cuff repair; however, the procedure is technically challenging and the success rate varies widely.<sup>5</sup>

Successful ambulatory surgery depends on analgesia and it is effective and has minimal adverse effects. Although various techniques have been described SSNB and ANB, none of them could achieve effective pain management.<sup>6,7</sup> Our technique has allowed blocking nerves and placing catheters as close to the nerve as possible. The aim of this study was to evaluate postoperative analgesic efficacy of suprascapular and ANBs in shoulder arthroscopy for patients undergoing arthroscopic repair of rotator cuff under general anesthesia. Hypothesis of the study was that suprascapular and ANB would alleviate postoperative pain and reduce requirement of analgesic drugs, thus decreasing side effects of medicaments and problems arising out of the technique. Hence, all these benefits would improve patient fulfillment and allow early postoperative shoulder rehabilitation.

## METHODS

Present study was performed at department of orthopedics, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat. Ethical clearance was taken from the institutional ethics board and informed consent was obtained from all the participants. Twenty four consecutive patients who were diagnosed with medium or large cuff tear with retraction <2 cm were treated by shoulder arthroscopy with arthroscopy guided suprascapular and axillary nerve blocks between July 2015 and October 2015. The inclusion criteria were as follows: (1) Substantial pain (no posterior pain) and functional limitation, (2) retraction <2 cm, (3) history of more than 6 months and (4) failure of nonsurgical treatment modalities. Exclusion Criteria were: (1) Patients with neurological disorders, (2) Retraction  $\geq$  2 cm, (3) Who were not willing to participate. Informed consent was obtained from all the patients. Patients were evaluated with visual analog scale (VAS) preoperatively and at postoperative 0 h, 6 h, 12 h, 18 h, 24 h, and day 2. (0 = no pain, 10 = severe pain).

### *Operative procedure*

Surgeries were carried out under general anesthesia in the beach chair position by orthopedic surgeon. The arthroscopy was achieved using standard posterior "soft spot," lateral and anterolateral portals for evaluating glenohumeral joint and subacromial space. After joints were explored, an 18-gauge epidural needle was advanced from the rotator interval to joint, with outside-in technique, and directed toward anterior part of inferior middle glenohumeral ligament and advanced 5 mm into the joint capsule for ANB and catheter was advanced

through the needle. After location, the catheter was verified with arthroscopic approach half portion of prepared solutions given, which were composed of 10 cc of 0.5% bupivacaine hydrochloride, for ANB. After glenohumeral joint was explored and axillary nerve (AN) was blocked through the posterior portal, the arthroscope was introduced into the subacromial space through the posterior portal. An arthroscopic technique was used to block suprascapular nerve (SSN), for releasing entrapment of SSN at the suprascapular notch with arthroscopic method. According to this technique after anteromedial bursa was removed to provide access to the suprascapular notch using shaver and radiofrequency (RF), the scope was introduced into the subacromial space through the lateral portal and shaver and RF device was introduced through the anterolateral portal to complete removal of bursal tissue. This step was done first owing to swelling; subacromial decompression, biceps tenotomy or tenodesis, and rotator cuff repair were done after SSNB. First, coracoacromial ligament was identified, and its trace was followed down the base of the coracoid. Next, coracoclavicular ligaments were identified with posterior and medial dissection. Medial border of those ligaments at the base of the coracoid defined lateral insertion of the superior transverse scapular ligament (TSL). The TSL was recognized as the medial continuity of the conoid ligament above the scapular notch. Once TSL was adequately visualized, an 18-gauge epidural needle was advanced below the TSL and through medial border of transverse scapular notch to place the catheter for blocking SSN. When the epidural needle was oriented correctly, the catheter was advanced into the needle and the needle was drawn back slowly and catheter position was visualized immediately below the TSL and medial border of the coracoid.

After the catheter was arthroscopically established to be in the accurate location, we gave half portion of prepared solutions, which were composed of 10 cc of 0.5% bupivacaine hydrochloride, for SSNB. After blocking of the two nerves, the rotator cuff tear was mobilized and repaired using suture anchors. All patients tears were repaired double row anchor techniques and four biceps tenotomy and two biceps tenodesis were performed. All patients have performed subacromial decompression because of fraying of coracoacromial ligament and impingement. To complete the procedure, the portals were closed with an absorbable subcutaneous suture. Eventually, residual portions of prepared solutions were given through the catheters, which were located for blocking of SSN and AN. Lastly, a velpeau bandage was used.

### *Postoperative management*

We give 5 cc of 0.5% bupivacaine hydrochloride through both catheters 6 hourly up to end 24 h in postoperative period. At the end of 24 h, we gave the last dose of 0.5% bupivacaine hydrochloride with 40 mg of methylprednisolone acetate and catheters were removed at the

end of 24 h. We evaluated patients' satisfaction using VAS before additional bupivacaine hydrochloride doses were given. Before patients were discharged, we prescribed NSAID for pain management, but no patient required drug for pain reduction. All patients were mobilized at postoperative first 3 h.

### Statistical analysis

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. Descriptive statistics included computation of percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively. Statistical analysis was performed using Mann–Whitney U-test.

## RESULTS

No specific difficulty secondary to nerve block procedure was postoperatively found in patients. In the postoperative period, no patient complained of or showed motor deficits, vomiting, or nausea. Preoperative and postoperative 0 h, 6 h, 12 h, 18 h, 24 h, and day 2 mean VAS scores were  $6.37\pm0.91$ ,  $0.45\pm0.39$ ,  $0.59\pm0.40$ ,  $0.62\pm0.39$ ,  $0.61\pm0.42$ ,  $0.51\pm0.35$ , and  $1.54\pm0.50$ , respectively as given in Table 1.

**Table 1: Visual analog scale scores of the participants in the interval of 6 hours.**

Time (in hours)	Score (Mean $\pm$ SD)
<b>Preoperative</b>	$6.37\pm0.91$
<b>0</b>	$0.45\pm0.39$
<b>6</b>	$0.59\pm0.40$
<b>12</b>	$0.62\pm0.39$
<b>18</b>	$0.61\pm0.42$
<b>24</b>	$0.51\pm0.35$
<b>Day 2</b>	$1.54\pm0.50$

**Table 2: Relationship between VAS scores and time using Mann–Whitney U-test.**

Visual analog scale scores (in hours)	P value
<b>Day 2-0</b>	0.01*
<b>Day 2-6</b>	0.001*
<b>Day 2-12</b>	0.03*
<b>Day 2-18</b>	0.02*
<b>Day 2-24</b>	0.001*

\* indicates statistical significance at  $p\leq0.05$ .

No statistical difference was found among postoperative 0 h, 6 h, 12 h, 18 h, and 24 h scores. However, comparison of postoperative day 2 and postoperative 0 h, 6 h, 12 h, 18 h, and 24 h VAS scores showed a statistically significant difference ( $P < 0.05$ ) as shown in Table 2. These results display that intraoperative blockage of two nerves provided outstanding pain relief

in postoperative period. All patients were discharged without any complication at the end of 24 h. And they were seen on postoperative day 2 to change dressing and to evaluate pain with VAS scores. The mean time (minutes) of suprascapular and ANBs was  $14.38\pm3.21$  and  $3.75\pm0.85$ , respectively.

## DISCUSSION

Postoperative pain management is the majority important part of the shoulder surgery to facilitate convalescence, cut down hospital stay and start rehabilitation exercise earlier.<sup>8,9</sup> After rotator cuff surgery, Boss et al stress that severe postoperative pain was seen within first 48 h.<sup>2</sup> NSAIDs, opiate analgesic drugs, patient-controlled analgesia (PCA), IA injections of morphine or local anesthetics, and nerve blocks such as ISB, SSNB, or ANB are commonly used for reducing postoperative pain. These behavior modalities can be used alone or in combination. Recently, regional nerve blocks have been a more popular technique than NSAIDs, opiate analgesic drugs, PCA and IA injections. Blocks reduce both intraoperative and postoperative pain efficiently in arthroscopic shoulder surgery. Complications such as vomiting, nausea, sedation, or unsatisfactory analgesic effects cannot be observed.<sup>10,11</sup>

The ISB has turned into a preferred technique for intraoperative anesthesia and postoperative analgesia worldwide. However, this technique has been associated with potential side effects and complications, such as rebound pain, phrenic nerve palsy respiratory distress, or diaphragmatic paresis.<sup>12-14</sup> The combination of SSNB and ANB has been also used effectively for anesthesia in shoulder arthroscopy and these blocks have provided safe analgesia in intraoperative and early postoperative periods.<sup>6</sup>

The philosophy of regional nerve blocks is that the local anesthetic should be infiltrated close to the nerve to the maximum extent. Therefore; the landmarks of the nerves should be identified precisely. Shoulder is innervated by SSN, AN, and lateral pectoral nerve. Posterior and superior parts of joint capsule are innervated by SSN. Anteroinferior part of joint capsule is innervated by AN. Anterosuperior part of joint is innervated by lateral pectoral nerve. The SSN and AN carries almost all sensorial impulses to and from shoulder. Hence, contribution of lateral pectoral nerves might remain unnoticed for rotator cuff surgery.<sup>15-18</sup> Anatomies and traces of nerves and location of sensorial branches of the SSN and AN should be well known to carry out block anesthesia in intra- and postoperative pain management.

The main stem of the SSN traverses underneath the TSL into the suprascapular fossa and releases the main muscular branch to the supraspinatus muscle shortly after this passage, which takes off medially. During arthroscopy, we placed the epidural needle underneath the TSL and advanced catheter into the needle near the

SSN, so blocking was achieved. The AN originates from the spinal cord at the C5 and C6 level with occasional contribution from the C4 position. Along its course across the subscapular muscle, the AN releases its first articular branch, which slowly separates itself from the main stem as it runs to the inferior-anterior joint capsule.<sup>19</sup>

According to Uno et al the AN stayed in the middle third of the “capsular hammock” between the glenoid and humeral neck and it has an intimate relation with the shoulder capsule between the 5 and 7 o’clock (right shoulder) positions.<sup>20</sup> Eakin et al reported that the nerve was closest to the glenoid at the 4:30 O’clock position.<sup>21</sup> Price et al reported that AN lies closest to the glenoid at the 6 o’clock position, and the AN travels at a fixed distance from the inferior glenohumeral ligament throughout its course, and its average distance from the inferior glenohumeral ligament is 2.5 mm.<sup>22</sup> The study of Bryan et al showed that AN average distance from the inferior glenohumeral ligament is 3.2 mm.<sup>23</sup> According to these anatomic descriptions, anterior shoulder capsule between the 4:30 and 7 o’clock (right shoulder) positions is optimal place for blocking AN because of the initial point of separation of sensorial braches of joint. During arthroscopy, we placed the epidural needle to the anterior joint capsule between 4:30 and 6 o’clock position and advanced the needle 5 mm through the joint capsule and then advanced catheter into the needle to block AN.

In this study, TSL was not resected because of having no retraced rotator cuff tears more than 2 cm and no posterior shoulder pain with special test described by Sahu et al.<sup>24</sup> Yamakado reported that rotator cuff repair with placed pain catheter adjacent to the SSN via arthroscopically was highly effective in controlling postoperative pain.<sup>1</sup> In that study, TSL release was performed on each patient during the surgery. Checcucci et al report that 20 consecutive patients underwent arthroscopic procedures for shoulder cuff diseases were performed combined SSNB and ANB using the identified landmarks; however, general anesthesia was not performed on any patients.<sup>4</sup> According to this study, combined blocks were adequate for intraoperative anesthesia and postoperative analgesia for certain procedures of shoulder arthroscopic surgery. Our VAS results were similar in this study; however, our VAS score was lower. As emphasized in literature the outcomes performed combined block of SSN and AN provide good pain relief for postoperative periods.<sup>9,18</sup> Patient satisfaction is increased by this way. We performed blocking of SSN an AN during surgery by monitoring, so regional nerve blocks philosophy were performed as close to nerve as possible. In the literature, there is no accord about used kinds, mixtures and combination of local anesthetic agents and combinations with other drugs such as cortisone.<sup>25,26</sup> First, we used 10 cc of 0.5% bupivacaine hydrochloride for blocking SSN and AN in shoulder arthroscopy, after that we used 5 cc of 0.5% bupivacaine hydrochloride in each catheter

respectively during 6 h intervals up to 24 h. At the end of the 24 h, we used last doses with combined 40 mg methylprednisolone acetate and we removed the catheters. These mixtures and combinations of local anesthetic agent with cortisone provide effective analgesia after shoulder surgery. We did not need to give additional analgesic drugs such as NSAIDs, opioids or PCA. Our study has some limitations such as small case number and no control or comparison groups. We think that blocks should be done at the beginning of the surgery because of swelling of tissue.

## CONCLUSION

Present study obtained good analogous results with the literature about lessening of postoperative pain and provided quick revival and healing.

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