Agri 2017;29(3):127–131
doi: 10.5505/agri.2017.67984

ORIGINAL ARTICLE

Postoperative analgesia after arthroscopic shoulder surgery: A comparison between single-shot interscalene block and single-shot supraclavicular block

Artroskopik omuz cerrahisinde postoperatif analjezi: Tek doz interskalen blok ile tek doz supraklavikular blok karşılaştırılması

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Summary

Objectives: In arthroscopic rotator cuff surgery for postoperative analgesia opioids, nonsteroid analgesics, and local anesthetics can be used. This study aimed to compare the effectiveness, additional analgesic requirements, patients satisfaction, and complications of single-shot interscalene and supraclavicular blocks.

Methods: After obtaining the ethics committee's approval and informed consent, 50 ASA I-II patients were randomized to either the interscalene (GISB) or supraclavicular (GSCB) group. Preoperatively, patients received an ultrasonography-guided block using 30 ml of 0.5% bupivacaine. In the postoperative period, morphine patient-controlled analgesia was administered as a 0.3-mg/h basal dose and 1-mg bolus dose, with a 20-min lockout time. Postoperative visual analog scale (VAS; 0–10 cm) scores of the patients were evaluated at 4, 8, 12, and 24 h postoperatively; additional analgesic requirements, adverse effects, and complications were recorded. Patient satisfaction (PS) scores were evaluated after 24 h.

Results: VAS scores at 4 h were lower in the GSCB group than in the GISB group, and the VAS scores at 8, 12, and 24 h were lower in the GISB group than in the GSCB group, with no statistical significance. Additional analgesic requirements was 28% in the GISB group and 68% in the GSCB group ($p < 0.05$). Total morphine consumption was lower in the GISB group than in the GSCB group (18.95±9.2 mg vs. 30.6 ± 9.6 mg; $p < 0.001$). PS scores were higher in the GISB group than in the GSCB group (7.0±1.0 vs. 6.1±0.9; $p < 0.01$). Adverse effects and complication rates were similar in both the groups. In GISB group, seven patients (28%) had nausea/vomiting, whereas in the GSCB group, 12 patients (48%) had nausea/vomiting. This difference was statistically insignificant.

Conclusion: Supraclavicular block can be considered as an alternative to interscalene block for arthroscopic shoulder surgery.

Keywords: shoulder surgery, interscalene block, supraclavicular block, postoperative analgesia

Özet

Amaç: Artroskopik omuz cerrahisi hastalarında postoperatif analjezik olarak opioidler, nonsteroid analjezikler ve lokal anestetikler kullanılabilir. Çalışmamızda tek doz interskalen blokla tek doz supraklavikular bloğun postoperatif analjezik etkinliklerini karşılaştırılması amaçlandı.

Gereç ve Yöntem: Etik kurul ve hastalardan izin alındıktan sonra interskalen (GİSB) veya supraklavikular blok (GSKB) uygulanması için kontrendikasyonu bulunmayan ASA I–II 50 hasta randomize olarak ikiye ayrıldı. İki gruba da preoperatif dönemde ultrason eşliğinde blok yapılarak 30 ml %0.5 bupivakain uygulandı. Postoperatif dönemde intravenöz morfin 0.3 mgr/saat infüzyon, 1 mgr bolus doz ve kilitli kalma süresi 20 dakika olacak şekilde hasta kontrollü analjezi uygulandı. Hastaların postoperatif vizuel analog skala (VAS: 0–10 cm) değerleri 4., 8., 12. ve 24. saatlerde sorgulandı, ek analjezik ihtiyaçları ve tekniğe bağlı yan etki ve komplikasyonlar kaydedildi. 24 saat sonunda hasta memnuniyeti (HM) sorgulandı.

Bulgular: VAS değerlerine bakıldığında 4. saat VAS değeri GSKB'ta daha düşüktü ve 8, 12 ve 24. saat VAS değerleri GİSB'ta daha düşüktü ancak istatistiksel olarak gruplar arasında fark yoktu. İSB grubunda %28 hastaya ek analjezik verilirken SKB grubundaki %68 hastaya ek analjezik verildi ($p<0.05$). İSB grubundaki hastaların morfin tüketimi daha düşüktü (18.95±9.2 mg vs 30.6±9.6 mg, $p<0.001$). İSB grubundaki hastaların HM değeri anlamlı olarak daha yüksekti (7±1.0 vs 6.1±0.9; $p<0.01$). Yan etki açısından gruplar arasında fark yoktu. GİSB'ta yedi hasta bulantı-kusma görülürken (%28) GSKB'ta on iki hastada (%48) bulantı-kusma vardı. Bu açıdan da iki grup arasında istatistiksel açıdan fark yoktu.

Sonuç: Artroskopik omuz cerrahisinde supraklavikular bloğun interskalen bloğa iyi bir alternatif olabileceği kanaatine varıldı.

Anahtar sözcükler: Interskalen blok; omuz cerrahisi; postoperatif analjezi; supraklavikular blok.

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Submitted *(Başvuru tarihi)* **25.02.2017 Accepted after revision** *(Düzeltme sonrası kabul tarihi)* **25.07.2017 Available online date** *(Online yayımlanma tarihi)* **04.10.2017**

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Introduction

Arthroscopic Rotator Cuff Surgery (ARCS) is a useful surgical procedure when the conservative treatment fails and the number of this operation has increased dramatically over the last decade.[1] Although this surgical technique is accepted as minimally invasive by the surgeons it still can cause significant postoperative pain. Continuous or single shot interscalene block, intramuscular injection of analgesics, intraarticular injection of morphine and bupivacaine,[2,3] patient-controlled analgesia (PCA) using intravenous injection,[4] and continuous-flow cold therapy[5] are some of the postoperative analgesia techniques that are used for postoperative analgesia after ARCS.

The aim of this prospective, randomized study was to compare the effectiveness, the additional analgesic requirements, patient satisfaction, and complications of single shot interscalene block with single shot supraclavicular block after ARCS.

Material and Methods

Patients scheduled for arthroscopic rotator cuff surgery classified as ASA physical status I–III, and aged 18 years or older participated in this study. All patients gave written informed consent for the study, which was approved by the local research ethics committee. Patient exclusion criteria included chronic opioid use, morbid obesity or contraindications to regional anesthesia and patients' refusal.

After an 18-gauge intravenous (iv) cannula was inserted in the forearm, midazolam 0.05 mg/kg iv was given as premedication, and standard monitors were placed, including noninvasive arterial blood pressure, heart rate, and pulse oximetry. Patients were then randomized using a computer generated sequence of numbers to one of two groups: 1) single shot interscalene group (ISB; n=25) 2) single shot supraclavicular group (SCB; n=25).

After local skin infiltration with 20 mg of 2% lidocaine all patients received an ultrasonography guided block. For the interscalene block, hypoechoic nerve roots on short-axis view in between anterior scalene muscle and middle scalene muscle were visualized in a round-oval honeycomb form using a 5–12 MHz linear probe. The best point of view for C5–C7 roots was determined. A 50 mm, 22 G peripheral nerve block needle was connected to the nerve stimulator and inserted with in-plane method. The needle tip was directed into the C5–C6 roots. After successful needle tip placement and verification using nerve stimulation the patients received an interscalene brachial plexus block with 30 mL 0.5% bupivacaine preoperatively. For the supraclavicular blocks the ultrasound probe was placed on the supraclavicular fossa to obtain a cross-sectional view of the brachial plexus, subclavian artery, first rib and parietal pleura. An in-plane technique was used to perform a medial-to-lateral approach towards the divisions of the plexus. The best point of view of the plexus was determined and a 50 mm, 22 G peripheral nerve block needle was connected to the nerve stimulator. After successful needle tip placement and verification using nerve stimulation the patients received a supraclavicular brachial plexus block with 30 mL 0.5% bupivacaine preoperatively.

General anesthesia was induced in all patients with 1–2 µg/kg fentanyl, 2–2.5 mg/kg propofol, and 0.5 mg/kg atracurium iv. The trachea was intubated, and controlled ventilation was started. Anesthesia was maintained with a mixture of nitrous oxide (60%) and sevoflurane 1–3% in oxygen. All patients received an antiemetic prophylaxis with dexamethasone 4 mg iv.

Patient controlled iv analgesia was started 4 h after the initial block and continued during the first 24 h postoperatively. All patients received, a continuous iv infusion of 0.3 mg/h of morphine, a bolus of 1 mg iv morphine with a 20 minutes lockout time.

Pain intensity was assessed with a 10 cm visual analog scale (VAS) (0 cm=no pain; 10 cm=worst possible pain) while asking the patients to move the hand and flex the elbow joint.

If pain was not adequately controlled (pain score >3 on the visual analog scale [VAS; ranging from 0=no pain to 10=worst pain imaginable]), patients received 20 mg of iv tenoxicam followed by 0.05 mg/kg iv morphine, if pain remained unchanged after 30 minutes. The number of patients who required iv tenoxicam, the number of patients who required iv bolus morphine, total number of morphine boluses, and overall morphine consumption were recorded.

Table 1. Age, sex, ASA status and operation durations of groups

	GISB (G1) Mean±SD	GSCB (G2) Mean±SD	p
Age (years)	48.8±11.2	52.2±9.8	NS
Sex (F/M)	17/8	16/9	NS
ASA status (I/II/III)	13/10/2	12/12/1	NS
Operation duration (min)	143.9±29.3	140.3±27.3	NS

SD: Standard deviation; GISB: Group interscalene block GSCB: Group supraclavicular block; NS: Not significant.

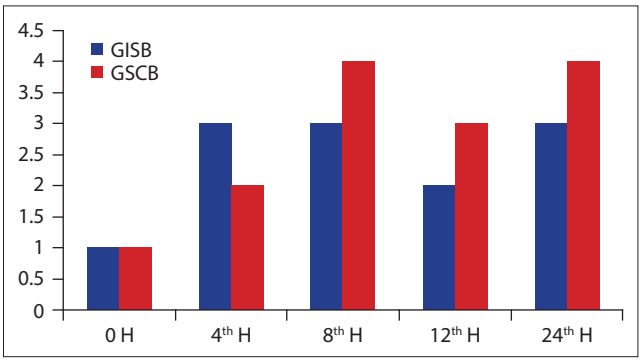

Figure 1. VAS scores of groups (median values). GISB: Group interscalene block; GSCB: Group supraclavicular block.

To detect a difference of 25% in the VAS scores accepting an α error of 5% and a β error of 10%, the required study size was 22 samples. To compensate for possible dropouts we recruited 25 patients per group. Statistical analyses used an ordinary ANOVA test for intragroup differences with Dunn's post-hoc test when $p<0.05$ and Mann-Whitney U test for intergroup differences. Differences in group demographic characteristics were tested by Student's t-test or contingency-table chi-square test for categorical measures. A p value <0.05 was considered significant.

Results

No differences in demographic variables as well as duration of surgical procedure were reported between the two groups (Table 1).

On arrival to the PACU, median VAS scores were 1 (range: 0–3) in group ISB, and, 1 (range: 1–4) in group SCB indicating the effectiveness of the initial block in all of the patients. In the early postoperative period (4 h), median VAS scores were comparable in both of the groups: median VAS scores were 3 (range: 0–6) in group ISB, and 2 (range: 2–10) in group SCB. At 8, 12, and 24 h postoperatively. The median VAS values in group ISB were lower than group SCB patients; but these differences were not significan (3 (range: 0–5) vs 4 (range: 0–8), 2 (range: 0–5) vs 3 (range: 0–7), and 3 (range:0–5) vs 4 (range: 0–9) for group ISB and group SCB for the 8th, 12th, and 24th hours respectively) (Fig. 1).

Table 2. The number and percentage of patients given rescue analgesic, Patients' Satisfaction Scores and the number and percentage of patients with nausea and vomiting

	GISB (G1)		GSCB (G2)		p
	n	%	n	%	
Patients given rescue analgesic	7	28	17	68	<0.05
Patients' Satisfaction Score (Mean±SD)	7±1		6.1±0.9		<0.01
Patients with nausea and vomiting	7	28	12	48	NS

SD: Standard deviation; GISB: Group interscalene block GSCB: Group supraclavicular block; NS: Not significant.

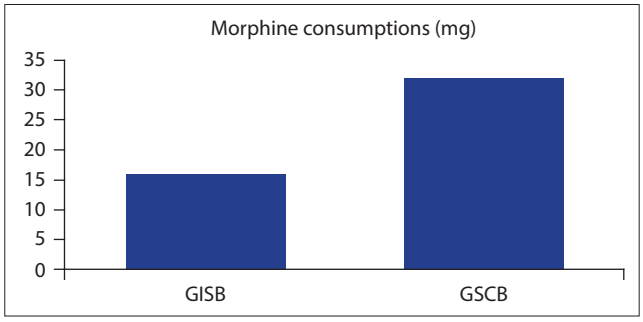

Figure 2. Morphine consumptions groups (median values). GISB: Group interscalene block; GSCB: Group supraclavicular block.

Rescue analgesics were given in 7 patients of the interscalene group (28%) and 17 patients (68%) in group SCB ($p<0.05$, Table 2). In 14 of the 17 patients of the supraclavicular group tenoxicam application was adequate and only 3 of the patients' required additional intravenous morphine while 7 patients of the interscalene group required only intravenous tenoxicam. The total morphine consumption of the interscalene group was 18.95±9.2 mg (median value 16 mg, min-max 11–40 mg) and the total morphine consumption of the supraclavicular group was 30.6±9.6 mg (median value 32 mg, min-max 15–50 mg) ($p<0.001$, Fig. 2).

Patients' satisfaction scores of groups were 7±1 in

group ISB, and 6.1±0.9 in group SCB ($p<0.01$, Table 2). The number of patients with nausea and vomiting was higher in patients in group SCB than the other group (48% vs 28%); but the difference was not statistically significant; and the overall incidence nausea and vomiting of all the patients was 38%.

No severe complications were reported in all of the groups, Horner's syndrome (16%), and hoarseness (4%) were reported only after the interscalene block; but the difference was not statistically significant.

Discussion

The main finding of the present study is that the single shot supraclavicular block and iv morphine PCA provided equivalent postoperative analgesia compared to single shot interscalene block and iv morphine PCA after arthroscopic rotator cuff surgery.

There are several studies comparing single shot interscalene block with continuous interscalene block and other postoperative analgesia modalities such as subacromial continuous infusions.[6–8]

In the two pioneer studies on this topic Borgeat et al. found that patient-controlled interscalene analgesia provided better pain control, lesser side effects, and higher patients' satisfaction scores than iv patient-controlled analgesia; although the latter was quite successful in achieving VAS scores ≤4 for most of the study period of 48 hours in both of the studies.[6,7] These results are quite similar to the results of the present study (both interscalene and supraclavicular blocks had median VAS scores of 1–4 through the study period).

The question of equivalency of the two blocks for shoulder surgery can be asked. In a recent review Conroy and Awad concluded that ultrasound guided interscalene and supraclavicular blocks are effective for shoulder surgery.[9] In a study performed after this review Kim et al. compared the analgesic efficacy and side effects of interscalene and supraclavicular blocks for shoulder surgery using 20 ml of 0.375% ropivaciane and found no difference in postoperative analgesia duration, pain scores; and supplemental analgesia.[10] Ryu et al.,[11] compared the anesthetic properties of these two blocks using 12.5 ml 1% mepivacaine, and 12.5 ml of 7.5% ropivacaine for similar shoulder surgery procedures and concluded that ultrasound guided supraclavicular blocks can be performed as an alternative to ultrasound guided interscalene blocks in patients undergoing arthroscopic shoulder surgery. Although focused more on the incidence of phrenic palsy in the PHRENICUS trial Wiesmann et al.,[12] found that the postoperative analgesic quality and additional analgesic requirements of continuous supraclavicular blockade using patient-controlled ropivacaine was similar to interscalene group.

In the present study there was a statistically significant difference in total morphine consumption and additional analgesic requirements which is contrary to the literature.[11,12] For example in the PHERICUS trial the additional analgesic requirements of the supraclavicular and interscalene block groups were similar, but this is probably due to analgesic protocol differences between the studies.[11,12]

The total morphine consumption of the interscalene group in the present study was 18.95±9.2 mg which quite similar to the value found by Aksu et al.[13] Although they used lower doses and concentrations of bupivacaine (20 ml 0.25%) the patients in their interscalene group consumed 16.3±7.8 mg of morphine, we believe that this difference may be due to operation type differences and the use of different PCA protocols.

Patients' satisfaction scores of both groups are quite low. In a previous study we have found higher scores of patient satisfaction in patients using patient-controlled interscalene analgesia, and patient-controlled subacromial analgesia.[8] In one study Borgeat et al. found patients' satisfaction score of 7.5±2.4 for iv PCA patients which is also lower than interscalene group and in a recent study comparing multimodal shoulder injection with intravenous patient-controlled analgesia after arthroscopic rotator cuff repair Han et al. found a patients' satisfaction score of 6.9±0.8 for iv PCA patients.[7,14] We believe that additional analgesic requirements and patient satisfaction scores are inversely proportional to each other.

The most frequent side effect of intravenous opioid analgesia is nausea and vomiting. In one study Borgeat et al. give a 30% of nausea and a 25% vom-

iting rate, and in another study the PCA group had a 46.6% nausea rate (14 patients out of 30) and a 26.6% vomiting rate (8 patients out of 30).[6,7] In the presents study nausea and vomiting evaluated simultaneously and the rate of nausea and vomiting is 28% and 48% for group ISB, and group SCB respectively and these are quite similar to the findings of Borgeat et al.[6,7]

The present study has several limitations: the patients were evaluated for only 24 hours which is quite short and also we did not evaluate the physiotherapy performances of the patients. We did not compare the patients after interscalene or supraclavicular catheter insertion; this may be quite interesting as patient controlled interscalene analgesia is generally accepted as the gold standard of care for pain treatment after arthroscopic shoulder surgery.

In conclusion, after arthroscopic shoulder surgery, single shot supraclavicular block and intravenous morphine PCA provided equivalent postoperative analgesia compared to single shot interscalene block and intravenous morphine PCA for pain control. So supraclavicular block could be considered as an alternative in case of contraindication of interscalene block after arthroscopic shoulder surgery.

Conflict-of-interest issues regarding the authorship or article: None declared.

Peer-rewiew: Externally peer-reviewed.

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