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Original Contribution

A comparison of suprascapular nerve block and procedural sedation analgesia in shoulder dislocation reduction ☆

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ABSTRACT

Objectives: Dislocation of the shoulder joint is one of the most common dislocations. The reduction procedure is a painful procedure. In this study, 2 different treatment groups were compared for pain control during shoulder dislocation reduction. It was aimed to evaluate the differences between the groups in reduction, success, length of hospital stay, complications, side effects, patient-physician satisfaction, and ease of application.

Methods: The study was planned to be prospective and randomized. As procedural sedation analgesia (SA), titration of ketamine 1 to 2 mg/kg was administered intravenously to group 1. Suprascapular nerve block (SNB) was applied under ultrasound guidance (USG) to group 2. Conformity to normal distribution of variables was examined with the Kolmogorov-Smirnov test. The χ^2 test and Fisher test were used to evaluate differences between the groups in categorical variables and the Mann-Whitney *U* test, and a value of $P < .05$ was accepted as statistically significant.

Results: The study comprised a total of 41 patients; 20 in the group 1 and 21 in the group 2. No statistically significant difference was determined between the groups in terms of age ($P = .916$), sex ($P = .972$), reduction success ($P = .540$), and patient-physician satisfaction ($P = .198$). The time spent in the emergency department (ED) by patients in the SA group was signficantly longer compared with the SNB group. No side effects were observed in the SNB group.

Conclusions: Suprascapular nerve block, which can be easily applied under USG in the ED, can be evaluated as a good alternative to SA in the reduction of shoulder dislocations.

1. Introduction

The shoulder joint is one of the joints with the most movement and where dislocations are seen most frequently. Reduction, which is required in the treatment of shoulder dislocation in the early period, is a painful procedure [1]. Kazar and Relovsky [1] determined that shoulder dislocations comprise approximately 45% of all joint dislocations. Anterior dislocations comprise 95% to 97% of all these dislocations [2]. The reduction of a shoulder dislocation is a painful procedure. Various methods have been developed to remove or reduce the pain during reduction [3,4]. Procedural sedation analgesia (SA) suppresses the patient's consciousness, whereas continuing cardiopulmonary functions using sedative and dissociative agents together during a medical procedure to block or at least reduce the patient's response and remembrance of the event [5].

Procedural sedation and analgesia procedure can be performed in the emergency department (ED) by a physician experienced with the appropriate equipment and the management of complications, which may arise associated with the agents used. The other method is suprascapular nerve block (SNB) under ultrasonography. The suprascapular nerve, which is rooted from the superior branch of the brachial plexus (C5 and C6), provides sensory innervation to the glenohumeral joint and acromioclavicular joint. It also provides motor innervation to the supraspinatus and infraspinatus muscles [6].

Suprascapular nerve block was first described by Milowsky and Rovenstine [7] in 1941 and has been widely used by anethetists since then in various situations such as adhesive capsulitis and for pain control after shoulder arthroscopy. Harmon and Hearty [8] described it as a technique, which can be easily learned and can be applied by emergency physicians with the support of ultrasound. In this study, it was aimed to compare the effectiveness of procedural SA and SNB

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under ultrasound guidance (USG) on hospital stay and the success of reduction in shoulder dislocation, which is a very painful procedure.

2. Material and methods

This single-center, prospective, randomized, controlled, clinical study aimed to compare 2 different treatment groups to which procedural SA and SNB were applied in the ED during the reduction of shoulder dislocation. Approval for the study was granted by the local ethics committee.

2.1. Patient selection

The study comprised patients diagnosed with a shoulder dislocation as a result of examination in the ED. Informed consent was obtained from all the patients or their parents.

Exclusion criteria:

(1) Patients from whom informed consent could not be obtained
(2) Patients with systolic blood pressure less than 90 mm Hg or pulse less than 60 per minute
(3) Patients outside the American Society of Anesthesiology 1 to 2 criteria
(4) Patients who did not agree to participate in the study
(5) Patients with known chronic renal or liver failure
(6) Patients allergic to the medications to be used
(7) Patients younger than the age of 18 years
(8) Patients diagnosed with a fracture together with the dislocation

2.2. Study protocol

A simple randomization table was used to allocate patients to the groups. Numbers, starting from 1, were written on the previously completed patient consent forms and patient evaluation forms. For each patient who agreed to participate in the study, the protocol was applied by the physician responsible according to the number on the form. For each patient, the vital signs, oxygen saturation, blood pressure, and respiratory count were monitored from the time of the application of the medication until recovery.

The Steward Recovery Score was used for discharge criteria. Titration of ketamine was administered intravenously at a dosage of 1 to 2 mg/kg. The depth of sedation was evaluated using a 3-step sedation scale. When necessary, up to one-half to one-third of the initial dose was repeated. When sedation was achieved, the reduction procedure was applied.

For the SNB, the technique described in the study by Herring et al [9] was used. A 5 to 10 MHz linear probe of the USG device (M-Turbo; Sonosite, Inc., 21919, 30th Drive SE, Bothell, WA, USA) was placed parallel over the spina scapula (Fig.). The suprascapular nerve and artery were hyperechoically visualized in the scapular notch below the ligamentum transversum at a depth of 3 to 4 cm. Because of the doppler properties of USG, the artery and nerve were able to be differentiated from each other. The skin was entered 2 to 3 mm medially with the injector probe with a 22G needle with Priloc (PrilocR, 2% injection, 20 mL/400 mg prilocaine, VEM Pharmaceutical Inc., Istanbul, Turkey) solution and was advanced toward the scapular notch from medial to lateral. After passing the transverse ligament, 5 mL Priloc was injected. The success of the injection was confirmed with upward movement of the transverse ligament. After the injection, 5 to 10 minutes were waited, anesthesia was checked, then the reduction procedure was applied. In both groups, the modified Kocher method was used for reduction. In cases of unsuccessful reduction, the choice of second technique was left to the attending physician. Patient-physician satisfaction was evaluated by a 5-step classification (very good, good, satisfactory, poor, and very poor).

To determine the success of the procedure, changes in vital signs (oxygen saturation, arterial blood pressure, and pulse on arrival and at sedation 0, 5,10, 30, 60, 90, and 120 minutes), whether there was any need for oxygen or intubation, sedation depth, developing complications, or side effects (nausea, vomiting, hallucination, and agitation) were recorded through the recovery and discharge periods.

2.3. Data collection and statistical methods

All the data were transferred to computer, and statistical analysis was made using SPSS version 15.0 (SPSS, Chicago, IL). Conformity of variables to normal distribution was examined with the Kolmogorov-

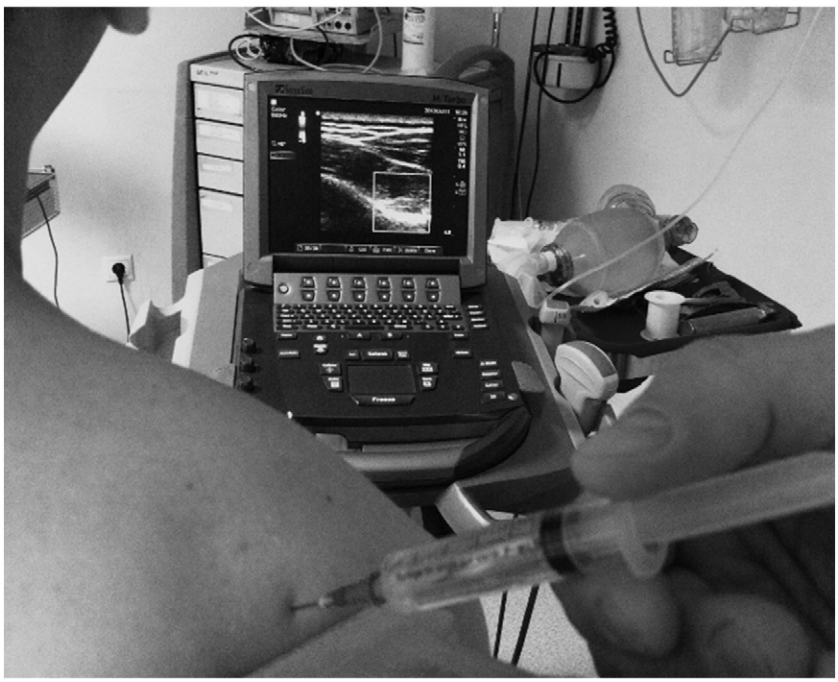

Fig. The figure showed that SNB with USG.

Smirnov test. Descriptive statistics were given as frequency, percentage, median, and maximum-minimum values. Differences between groups in categorical variables were analyzed using the χ^2 test and Fisher test, and in numerical variables the Mann-Whitney *U* test and Wilcoxon test were used. A value of $P < .05$ was accepted as statistically significant.

3. Results

The study comprised 41 patients. No statistically significant difference was determined between the groups in respect of age and sex ($P = .916$, $P = .072$). The mean Visual Analog Scale (VAS) score on arrival was 89 (range, 72-95) in the SA group and 85 (range, 70-98) in the SNB group. No statistically significant difference was determined between the groups ($P = .290$) (Table 1).

3.1. VAS score after block

The mean VAS score of the 21 patients to whom SNB was applied was observed to be statistically significantly lower after the block compared with the mean VAS score on arrival ($P < .001$) (Table 2).

3.2. Success of reduction

Successful reduction has been established in 90.5% (n = 19) in the first attempt, 4.75% (n = 1) in the second attempt, and 4.75% (n = 1) in the third attempt for SNB group. On the other hand, successful reduction has been established in 80% of patients (n = 16) in the first attempt, 15% (n = 3) in the second attempt, and 5% (n = 1) in the third attempt for SA group. No statistically significant difference was determined between the SA group and the SNB group in respect of the success of the reduction ($P = .540$) (Table 3). In the event of failed reduction, reduction attempt was continued, but the technique of anesthesia was not changed. This was a completely seperate use of sedation/analgesia. The reduction technique was left to the physician. At the end of the case studies, the same technique has recurred for reduction by the physicians.

3.3. Side effects and complications

Although no side effects developed in any patient in the SNB group, in the SA group, nausea-vomiting was observed in 15% (n = 3), hypoxia in response to short-term oxygen therapy in 10% (n = 2), and agitation on recovery in 15% (n = 3) ($P = .01$).

3.4. Time to discharge

The mean time from beginning of the procedure to hospital discharge was 125 minutes (range, 120-138 minutes) in the SA group and mean 25 minutes (range, 21-36 minutes) in the SNB group. A statistically significant difference was determined between the groups according to the Mann-Whitney *U* test ($P < .001$).

Table 1
Descriptive data

Characteristic	SA	SNB	*P*
	n = 20	n = 21	
Mean age (y)/min-max	23.5 (21-85)	24 (21-73)	.916 [a]
Sex			.972 [b]
Male (n) (%)	19 (95%)	20 (95.2%)	
Female (n) (%)	1 (5%)	1 (4.8%)	
Mean VAS score on arrival/min-max	89 (72-95)	85 (70-98)	.290[a]

Abbreviations: min, minimum; max, maximum.
[a] Mann-Whitney *U* test.
[b] χ^2 test.

Table 2
VAS score after block

Mean VAS score on arrival/min-max	Mean VAS after block/min-max	*P*
85 (70-98)	45 (33-55)	<.001[a]

[a] Wilcoxon test.

3.5. Patient-physician satisfaction

In the evaluation of patient satisfaction according to the χ^2 test, no statistically significant difference was determined between the SA group and the SNB group ($P = .198$). In the evaluation of physician satisfaction according to the χ^2 test, no statistically sigificant difference was determined between the SA group and the SNB group ($P = 731$) (Table 4).

4. Discussion

Many different techniques can be used in the procedure of dislocated shoulder reduction [10]. The Kocher technique is the most well known among physicians [10]. In 2011, randomized, controlled studies by Sahin et al [11] comparing scapular manipulation and the Kocher technique in the reduction of shoulder disclocations and by Beattie et al [12] comparing the Milch and Kocher techniques, determined the modified Kocher technique to have higher rates of successful reduction. Reduction is a painful procedure, and decreasing this pain is accepted as both an ethical necessity and a legal right [13,14]. Procedural SA is routinely used currently in EDs [13-15]. Opiod analgesics such as fentanyl, etomidate, and propofol are used in combination for SA. Ketamine has a wide margin of safety as it protects the respiratory reflexes without cardiovascular suppression [5,16]. In a randomized, controlled study in 2000 by Wathen et al [17] comparing ketamine and a ketamine-midazolam combination, recovery agitation was determined in 7.1% of the ketamine group and in 6.2% of the ketamine-midazolam group, but this difference was not accepted as statistically significant. However, in the patient group aged older than 10 years, recovery agitation was determined at 35.7% and the side effect of vomiting at 19.4% in the ketamine group. In a randomized, controlled study by Sener et al [18] comparing the side effects of ketamine and ketamine-midazolam combination in adult patients, recovery agitation was reported in 22%, nausea in 18%, and vomiting in 9% of the intravenous ketamine group. Compared with these 2 studies, the rate of recovery agitation observed in the current study is low. This may be due to the lower mean age of the patients in our study.

In recent years, one of the most important problem of EDs has been the waiting time and the prolonged time spent in the ED [19]. The application of procedural SA extends the time spent in hospital with an increased burden on the nursing staff as close follow-up and continued monitoring of the patient is required [20]. Experienced personnel are required for close follow-up and continued monitoring of the patient, and these procedures take time, needing a longer stay in hospital, and thus resulting in a greater burden on the ED. This

Table 3
Success of reduction

No. of attempts	SA	SNB	*P*
1	16-80%	19-90.5%	.540[a]
2	3-15%	1-4.75%	
3	1-5%	1-4.75%	

[a] χ^2 test.

Table 4
Patient-physician satisfaction

		SA	SNB	*P*
Physician satisfaction	Very good	3	4	.731[a]
	Good	17	17	
	Satisfactory	0	0	
	Poor	0	0	
	Very poor	0	0	
Patient satisfaction	Very good	12	17	.198[a]
	Good	6	4	
	Satisfactory	2	0	
	Poor	0	0	
	Very poor	0	0	

[a] χ^2 test.

situation has driven ED physicians to seek alternative methods of SA. In the reduction of dislocated shoulders, regional block methods such as SNB [21], interscalene brachial plexus block [22], and intraarticular lidocaine injection [21] are used.

Currently, there is increasing use of USG for regional nerve blocks in EDs [23,24]. In a prospective study by Stone et al [25] comparing brachial plexus block with USG and procedural SA in shoulder dislocation reduction, although no difference was determined in terms of reduction success and patient-physician satisfaction, the time spent in hospital by the patients who underwent brachial plexus block was much shorter than that of the patients in the SA group. Blaivas et al [22] compared procedural SA and interscalene nerve block with USG in a prospective study of dislocated shoulder reduction, and it was reported that despite no significant difference between the 2 techniques in terms of reduction success and patient-physician satisfaction, a significant difference was determined in terms of time spent in hospital. As shown by these 2 studies, regional nerve block applied together with USG decreases the time spent in hospital. In the current study, a statistically significant difference was determined between the SA group and the SNB group in terms of time spent in hospital. The mean VAS scores of the 21 patients in the current study who underwent SNB were 85 (range, 70-98) on arrival and 45 (33-53) after the block, and this difference was considered to be statistically significant. According to these results, it can be considered that reduction of pain by a significant degree was provided by SNB. In a prospective study by Gleeson et al [21] comparing lidocaine injection and SNB in dislocated shoulder reduction, a decrease in the mean VAS score from 8.7 to 6 ($P < .001$) was determined in the SNB group. The reason for this being relatively low compared with the current study can be considered to be that the procedure was performed blind rather than with the use of USG.

No side effects including hematoma, nerve damage, and intravascular injection were observed in the SNB group of the current study. Similarly, in the previously mentioned study by Gleeson et al [21], no side effects were observed in the SNB group. In studies comparing procedural SA and regional nerve block applied with USG, no complications have been determined in peripheral nerve block groups [22,25]. According to these results, it can be stated that SNB is an extremely safe application in terms of complications.

The limitations of this study are that the study period was short, the number of cases was relatively low, the choice of technique for attempts at second and third reductions after a failed first attempt was left to the physician, the experience and capabilities of the physicians varied, and long-term complications were not included in the evaluation.

In the current study, it was observed that less time was spent in the ED by patients in the SNB group than those in the SA group for reduction of a dislocated shoulder. No difference was determined between the groups in terms of reduction success and patient-physician satisfaction. Complications were seen to develop at a higher rate in the SA group. In the light of these results, SNB with USG can be considered an important alternative to procedural SA as it can be applied easily in the ED; it is just as successful as SA, it has the advantage of a shorter stay in hospital, and is extremely safe in terms of complications.

References

[1] Kazar B, Relovszky E. Prognosis of primary dislocation of the shoulder. Acta Orthop Scand 1969;40:216–24.
[2] Daya M, Nakamura Y. Shoulder. In: Marx J, Hockberger R, Walls R, editors. Rosen's emergency medicine: concepts and clinical practice. Philadelphia: Mosby Elsevier; 2010. p. 567–90.
[3] Lewis LM, Lasater LC, Brooks CB. Are emergency physicians too stingy with analgesics? South Med J 1994;87:7–9.
[4] Wilson JE, Pendleton JM. Oligoanalgesia in the emergency department. Am J Emerg Med 1989;7(6):620–3.
[5] Godwin SA, Caro DA, Wolf SJ, Jagoda AS, Charles R, Marett BE, et al. Clinical policy: procedural sedation and analgesia in the emergency department. Ann Emerg Med 2005;45:177–96.
[6] Vorster W, Lange CP, Briët RJ, Labuschagne BC, du Toit DF, Muller CJ, et al. The sensory branch distribution of the suprascapular nerve: an anatomic study. J Shoulder Elbow Surg 2008;17(3):500–2.
[7] Milowsky J, Rovenstine EA. Suprascapular nerve block; evaluation in the therapy of shoulder pain. Anesthesiology 1949;10:76–81.
[8] Harmon D, Hearty C. Ultrasound-guided suprascapular nerve block technique. Pain Physician 2007;10:743–6.
[9] Herring AA, Stone MB, Nagdev A. Ultrasound-guided suprascapular nerve block for shoulder reduction and adhesive capsulitis in the ED. Am J Emerg Med 2011;29(8):963.e1–3.
[10] Mattick A, Wyatt JP. From Hippocrates to the Eskimo: a history of techniques used to reduce anterior dislocation of the shoulder. J R Coll Surg Edinb 2000;45:312–6.
[11] Sahin N, et al. A comparison of the scapular manipulation and Kocher's technique for acute anterior dislocation of the shoulder. Eklem Hastalik Cerrahisi 2011;22:28–32.
[12] Beattie TF, et al. A comparison of the Milch and Kocher techniques for acute anterior dislocation of the shoulder. Injury 1986;17:349–52.
[13] Matthews DE, Roberts T. Intraarticular lidocaine versus intravenous analgesic for reduction of acute anterior shoulder dislocations. A prospective randomized study. Am J Sports Med 1995;23:54–8.
[14] Chong M, Karataglis D, Learmonth D. Survey of the management of acute traumatic first-time anterior shoulder dislocation among trauma clinicians in the UK. Ann R Coll Surg Engl 2006;88:454–8.
[15] Orlinsky M, et al. Comparative study of intra-articular lidocaine and intravenous meperidine/diazepam for shoulder dislocations. J Emerg Med 2002;22:241–5.
[16] Green SM, et al. Intramuscular ketamine for pediatric sedation in the emergency department: safety profile in 1,022 cases. Ann Emerg Med 1998;31:688–97.
[17] Wathen JE, et al. Does midazolam alter the clinical effects of intravenous ketamine sedation in children? A double-blind, randomized, controlled, emergency department trial. Ann Emerg Med 2000;36:579–88.
[18] Sener S, et al. Ketamine with and without midazolam for emergency department sedation in adults: a randomized controlled trial. Ann Emerg Med 2011;57:109–114 e2.
[19] Horwitz L, Green IJ, Bradley EH. US emergency department performance on wait time and length of visit. Ann Emerg Med 2010;55:133–41.
[20] Robinson KS, Jagim MM, Ray CE. Nursing workforce issues and trends affecting emergency departments. Nurs Manage 2005;36:46–53.
[21] Gleeson AP, et al. Comparison of intra-articular lignocaine and a suprascapular nerve block for acute anterior shoulder dislocation. Injury 1997;28:141–2.
[22] Blaivas M, Adhikari S, Lander L. A prospective comparison of procedural sedation and ultrasound-guided interscalene nerve block for shoulder reduction in the emergency department. Acad Emerg Med 2011;18:922–7.
[23] Liebmann O, et al. Feasibility of forearm ultrasonography-guided nerve blocks of the radial, ulnar, and median nerves for hand procedures in the emergency department. Ann Emerg Med 2006;48:558–62.
[24] Herring A, et al. Superior cluneal nerve block for treatment of buttock abscesses in the emergency department. J Emerg Med 2010;39:83–5.
[25] Stone MB, Wang R, Price DD. Ultrasound-guided supraclavicular brachial plexus nerve block vs procedural sedation for the treatment of upper extremity emergencies. Am J Emerg Med 2008;26:706–10.