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ORIGINAL ARTICLE

Which is the most appropriate anterior glenohumeral dislocation reduction technique among three different techniques? A prospective, randomized clinical trial

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ABSTRACT

Objectives: This study aims to compare three glenohumeral dislocation (GHD) reduction techniques in terms of pain and reduction time and to offer clinicians an idea of the selection of the most appropriate technique.

Patients and methods: This multi-center, prospective, randomized clinical study included a total of 90 patients (55 males, 35 females; median age: 29 years; range, 22 to 41 years) who had isolated anterior GHD without complication between December 2019 and December 2021. The patients were divided into three equal groups (traction-countertraction [TCT], external rotation [ExR], and Cunningham) using the block randomization method, and reductions were performed. Pre-reduction, intra-reduction, and post-reduction Visual Analog Scale (VAS) scores, reduction times, success rates, and complication rates were analyzed.

Results: There was no statistically significant difference among the groups in terms of age (p=0.414), sex (p=0.954), pre-reduction VAS (p=0.175), and post-reduction VAS (p=0.204). The median intra-reduction VAS values in the TCT, the external rotation, and the Cunningham groups were 8 (range, 7 to 9), 5 (range, 4 to 7), and 4 (range, 2.75 to 5), respectively (p<0.001). The median reduction time and IQR were 105 (range, 82.5 to 120) sec for TCT, 270 (range, 232.5 to 300) sec for ExR, and 630 (range, 540 to 780) sec for Cunningham (p=0.001).

Conclusion: The fastest, but most painful technique is TCT, while the longest and the least painful technique is Cunningham. An inverse relationship is found between time and pain. Based on these findings, it seems to be reasonable to leave the choice of the ideal reduction technique to the clinician. The clinician should choose the technique to be used according to the conditions in the emergency department.

Keywords: Cunningham, external rotation, glenohumeral dislocation, reduction, shoulder, traction counter traction.

The glenohumeral joint is a ball-socket joint that comprises of the glenoid fossa of the scapula and the articular surface of the humeral head. Dislocation of the glenohumeral joint, a common joint injury requiring immediate treatment, accounts for over 50% of all major joint dislocations.[1-3] The incidence of glenohumeral dislocation (GHD) ranges from 21.9 to 51.2 per 100,000 population.[1-3] The most common type of GHD is anterior dislocation with a rate of 95 to 97%.[4,5]

Reduction must be performed quickly, as the risk of neurovascular complication increases over time.[6] Many reduction techniques can be used in the treatment of anterior GHD. The most used reduction

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techniques in our practice are traction countertraction (TCT), external rotation (ExR), and Cunningham.

Traction countertraction: With the patient in supine position, the dislocated shoulder is in 900 of abduction, and a sheet is placed around the patient's chest. The clinician grasps the patient's wrist and applies longitudinal traction. While counter traction is applied with the sheet, traction is applied gradually with gentle internal and ExR (Figure 1).[7]

External rotation: With the patient in the supine position, the clinician holds the affected arm in full adduction. The elbow is flexed at 90°, the shoulder is placed in 20° of forward flexion, and the arm is adducted against the side of the chest. The clinician grasps the wrist with one hand and holds the elbow by other hand. The clinician performs intermittent ExR for reduction. Slow movements allow release of the spasm and pain. The clinician achieves reduction before reaching the coronal plane (Figure 2).[7]

Cunningham: The clinician is seated opposite the patient. The patient's arm is adducted, the elbow on the affected side, and the patient places his or her hand on the clinician's shoulder. The hand on the clinician's shoulder helps to get that 20° forward flexion that helps with joint capsule relaxation. The clinician gently rests one arm on the patient's antecubital fossa, while the other hand gently massages the patient's biceps, deltoid, and trapezius muscles to relax them. The patient is instructed to bring the scapulae closer together and keep the back straight while being asked to relax. With this maneuver, the scapula is displaced medially, and reduction is achieved (Figure 3).[8]

In recent years, many reduction techniques have been used in the treatment of anterior GHD. The simplicity of reduction, patient comfort, pain level, complication rate, success rate, and reduction time should be considered while selecting a reduction technique. In the present study, we aimed to compare three GHD reduction techniques in terms of pain and reduction time and to offer clinicians an idea of the selection of the most appropriate technique among three of them.

PATIENTS AND METHODS

This multi-center, prospective, randomized clinical study was conducted at Emergency Departments of three tertiary centers between December 2019 and December 2021. A total of 90 patients (55 males, 35 females; median age: 29 years; range, 22 to 41 years) who had isolated anterior GHD without complication were included in the study. Anteroposterior radiograph of the shoulder and a Y-view radiograph of the scapula were performed. All patients were evaluated for anterior GHD and its complications such as fracture or neurovascular damage. The patients were divided into three groups according to the block randomization method, which was used

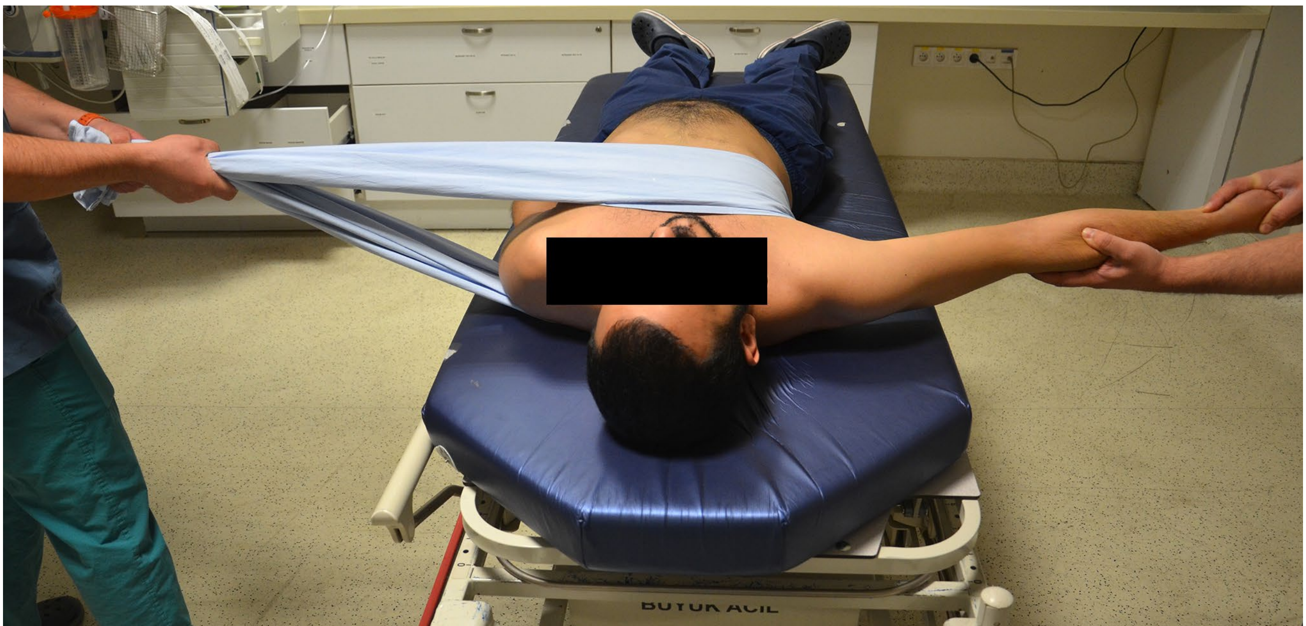

FIGURE 1. Traction countertraction technique.

FIGURE 2. External rotation technique.

FIGURE 3. Cunningham technique.

to eliminate selection bias and keep the number of subjects in the groups equal. One of the three techniques (TCT, ExR, Cunningham) previously determined by randomization was performed. When the patient agreed to take part in the study, clinicians learned the assigned technique to that patient from the other investigator who would not be involved in reduction procedure. In this way, allocation concealment was ensured.

Three clinicians took part in the study. All clinicians had at least five years of experience. They applied each technique at least 10 times during their previous experience. All clinicians were informed about the reduction techniques in the preliminary meetings.

Ninety patients, 30 in each group, were enrolled in this study. Pre-reduction, intra-reduction, and post-reduction Visual Analog Scale (VAS) scores, reduction time, and success rates were analyzed. Factors that could alter pain perception, such as pain threshold and personal characteristics, were minimized by repeated VAS assessments.

Exclusion criteria were a contraindication to fentanyl use, prior surgery for shoulder dislocation, alcohol or drugs usage that impair the perception of pain, and the presence of a concomitant bone fracture or neurovascular damage findings.

Interventions

The patients were medicated with 1 µg/kg of fentanyl for analgesia before reduction. The technique was started 2 min after medication for the onset of analgesic effect. Any additional medication was not provided during reduction. Sedation was not applied to any of the patients. As one of the parameters to be analyzed was intra-reduction VAS.

Measurements

The VAS is a measurement tool that attempts to measure a characteristic or attitude that is thought to span a continuum of values and cannot be readily measured directly. This scale was used to quantify pain complaints. It includes a scoring system ranging from 0 to 10 and delimited between "none" and “extremely severe pain”.[9]

The VAS scores were obtained by a healthcare professional except the clinicians who reduced the shoulder. The intra-reduction VAS was scored at the end of the technique. Sedation was not performed for any of the patients to enable assessment of intra-reduction VAS. The time from the beginning of technique to the time of reduction was recorded. Time was not reset in multiple attempts. No time limit was set for failure, if the patient was consented. Multiple attempts of a technique were not considered failure. Crossover between techniques was not permitted. The success of reduction was investigated with physical examination and radiography after reduction. The patient's unwillingness to continue the reduction, and the presence of a fracture or a locking in which the reduction was not sustainable were considered as unsuccessful reduction.

Outcomes

The primary outcome of our study was intra-reduction VAS. The secondary outcomes were pre-reduction VAS, post-reduction VAS, and reduction time.

Statistical analysis

Statistical analysis was performed using the IBM SPSS for Windows version 23.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in mean ± standard deviation (SD) or median (interquartile range [IQR]) for continuous variables and in number and frequency for categorical variables. The distribution of continuous variables was analyzed using the Shapiro-Wilk tests. The distributions did not conform to the pattern of normal distribution. For multiple group comparisons, the continuous variables were analyzed using the Kruskal-Wallis, and the categorical variables were analyzed using Pearson chi-square test and Fisher exact test. When significant differences were found in multiple group comparisons, post-hoc analyses of continuous variables were performed with the Mann-Whitney U test. A p value of <0.05 was considered statistically significant.

RESULTS

A total of 90 patients were included in the study. All reductions were successful in each group.

The study was conducted by three clinicians. The number of patients treated by each clinician was 23, 41, and 26, respectively. The reduction time, intra-reduction VAS, and post-reduction VAS among the clinicians were analyzed, and no statistically significant difference was found (p=0.946, p=0.487, and p=0.285, respectively). The techniques used by each clinician were analyzed, and no statistically significant difference was found (p=0.879) (Table I).

Patients included in the study were divided into three groups. There was no statistically significant difference among the groups in terms of age and sex distribution (p=0.414 and p=0.954, respectively). The median intra-reduction VAS values in the TCT, the ExR, and the Cunningham were 8 (range, 7 to 9), 5 (range, 4 to 7), and 4 (range, 2.75 to 5), respectively (Figure 4). The pre-reduction VAS values for these three groups were 4 (range, 3 to 4.25), 5 (range, 3 to 6.25), and 4 (range, 3 to 5), while the post-reduction VAS values were 2 (range, 2 to 3), 2 (range, 1.75 to 3), and 2 (range, 1 to 3), respectively. There was no statistically significant difference among the groups in terms of pre-reduction VAS and post-reduction VAS (p=0.175 and p=0.204, respectively). However, a statistically significant difference was found in the intra-reduction VAS (p<0.001) (Table II). In the post-hoc analyses of intra-reduction VAS, TCT-ExR (p<0.001), TCT-Cunningham (p<0.001), and ExR-Cunningham (p=0.001) groups had a statistically significant difference. The partial $\eta 2$ for intra-reduction VAS was 0.733 and power was 100%.

Delta values between pre-reduction and intra-reduction VAS were -4 (range, -5 to -3) in the TCT, -1 (range, -1 to 0) in the ExR, and 0 (range, 0 to 1) in the Cunningham group. In the post-hoc analyses of delta VAS, all groups had statistically significant differences. Delta values between intra-reduction and post-reduction VAS were 5 (range, 4 to 7) in the TCT, 3 (range, 2 to 4) in the ExR, and 2 (range, 0 to 1) in the Cunningham. In the post-hoc analyses, all groups showed statistically significant differences (Table II).

TABLE I
Characteristics of patients in groups formed among clinicians

	Practitioner												
	A				B				C				
	n	%	Median	Q1-Q3	n	%	Median	Q1-Q3	n	%	Median	Q1-Q3	*p*
Patient	23	25.5			41	45.6			26	28.9			
Time (sec)			210	210-480			270	120-540			285	90-615	0.946*
Intra-reduction VAS			6	4-9			5	4-7			6.5	4-7	0.487*
Post-reduction VAS			2	1-2			2	1-3			3	2-3	0.285*
Reduction technique													0.879†
TCT	9	39.1			14	34.1			7	26.9			
External rotation	8	34.8			13	31.8			9	34.6			
Cunningham	6	26.1			14	34.1			10	38.5			
Total	23	100			41	100			26	100			

VAS: Visual Analog Scale; TCT: Traction-counter traction; Q: Quartile; * Kruskal-Wallis; † Pearson chi-square.

TABLE II
The characteristics of patients among reduction groups

	Practitioner												
	A				B				C				
	n	%	Median	Q1-Q3	n	%	Median	Q1-Q3	n	%	Median	Q1-Q3	*p**
Age (year)			28	21.75-38			28	22-42			32.5	22.5-45	0.414
Sex													0.954
Female	12	40			12	4			11	36.7			
Male	18	60			18	60			19	63.3			
Pre-reduction VAS			4	3/4.25			5	3/6.25			4	3/5	0.175
Intra-reduction VAS			8	7/9			5	4/7			4	2.75/5	<0.001
Post-reduction VAS			2	2/3			2	1.75/3			2	1/3	0.204
Delta VAS pre-reduction-intra-reduction			-4	-5/-3			-1	-1/0			0	0/1	<0.001
Delta VAS intra-reduction-post-reduction			5	4/7			3	2/4			2	0/1	<0.001
Time (sec)			105	82.5/120			270	232.5/300			630	540/780	<0.001

TCT: Traction countertraction; VAS: Visual Analog Scale; * Kruskal-Wallis.

The reduction times were analyzed for each technique. The median reduction time were 105 (range, 82.5 to 120) sec for TCT, 270 (range, 232.5 to 300) sec for ExR, and 630 (range, 540 to 780) sec for Cunningham (Figure 5). A statistically significant difference was found among the groups in terms of the reduction time (p<0.001) (Table II). A statistically significant difference was found among all groups in the post-hoc analysis of the reduction time. The partial η^2 for reduction time was 0.542 and power was 100%.

DISCUSSION

In recent years, numerous reduction techniques have been used in the treatment of anterior GHD. The simplicity of reduction, patient comfort, pain level, complication rate, success rate, and reduction time should be considered in the selection of the shoulder reduction technique. In addition, the proficiency and training level of the clinician is also important in choosing a reduction technique. There are few studies in the literature comparing techniques with respect to these characteristics.[10]

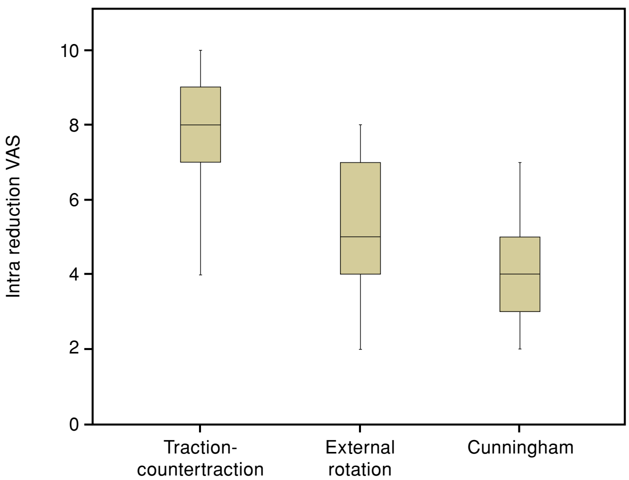

FIGURE 4. The box plot graphic of intra-reduction VAS.
VAS: Visual Analog Scale.

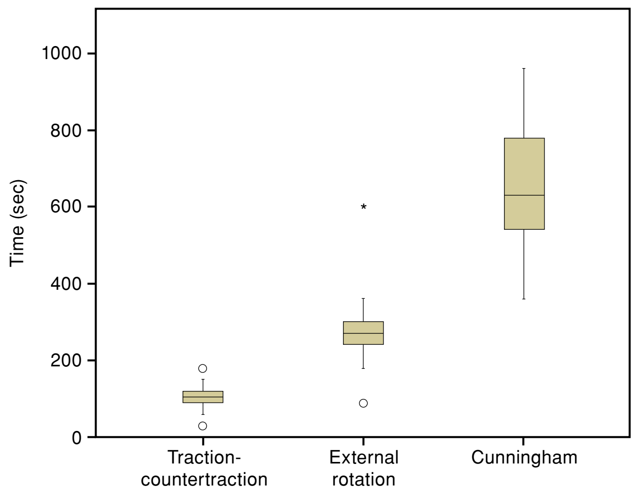

FIGURE 5. The box plot graphic of reduction time.
* An outlier value caused by the patient's noncompliance with the required directives.

The sex distribution of patients in our study is consistent with the literature. The frequent occurrence of anterior GHD at the age 20 to 30 explains the right-sided skewness in the age distribution.[2,11]

Three clinicians attended to our study. There was no significant difference among the clinicians in terms of reduction time, intra-reduction VAS, and post-reduction VAS. Also, there was no significant difference between clinicians in terms of distribution of reduction techniques. As a result, the biases, such as learning-curve bias, were able to be prevented. Amar et al.[12] evaluated two different techniques in terms of success, reduction time, and VAS. They reported that the clinicians involved in this study were experienced and performed the techniques adequately. Sayegh et al.[13] used three different techniques by multiple clinicians in a prospective, randomized study of 173 patients. It was not clear whether it achieved a similar distribution in terms of the techniques used by the clinicians in both studies. In addition, the use of experienced technique by clinicians and differences in their skill levels are limitations to these studies. Ghane et al.[14] compared two different techniques (TCT vs. modified scapular manipulation) used by a single clinician. In this study, reductions performed by a single clinician caused various limitations and biases.

The block randomization method was used in this study. Therefore, the number of patients was equal in all groups. There was no significant difference in age and sex distributions among the groups. Thus, the possibility of bias and confounding in terms of age and sex was eliminated.

The TCT, ExR, and Cunningham techniques were compared in our study. These are commonly used techniques in Türkiye. To the best of our knowledge, there is no study comparing these techniques in the literature. In the current study, the median pre-reduction and post-reduction VAS were similar among the three groups. However, the median reduction VAS was the highest in TCT and least in Cunningham. Among the techniques, the most painful technique was TCT, followed by ExR. The technique that was the least painful was Cunningham. In our study, we also compared reduction times. The median reduction time of TCT was the shortest. The Cunningham technique had the longest reduction time. The results obtained were predictable. This is because, in the Cunningham, muscle relaxation should be provided in the appropriate position and the reduction should be completed. In addition, patients cannot handle pain while sitting and cannot stay in the appropriate position. It takes a long time to complete this procedure under the reduction conditions.[7,15] Therefore, this technique is expected to take a long time compared to a technique that uses a high amount of power, such as TCT. The TCT requires more force in contraction and usually requires sedation.[16-18] The higher power for reduction may cause reduction to be more painful. There are too many reduction techniques currently used worldwide. Sayegh et al.[13] compared the techniques of FARES, Hippocratic, and Kocher. They found that shoulder reductions could be performed in less time with the FARES technique compared to the Kocher and Hippocratic techniques ($p<0.001$). The mean VAS in the FARES technique was lower than in the other two techniques ($p<0.001$). The FARES technique was also less painful than the other two techniques. Puha et al.[19] compared the techniques of Kocher, Mothes, TCT, and Cunningham in their study. The mean reduction time of the Hippocratic was shorter than the other three techniques (69.91±15.8 sec). The mean reduction time for the Cunningham technique was 287.9±126.4 sec, and it had the longest reduction time. There was no significant difference among the four groups in terms of pain levels.

In our study, the success rate for each technique was 100%. All clinicians had at least five years of experience. They all applied each technique numerous times. Increased experience may explain the success rate of reductions. Gottlieb[7] published a review recently that evaluated the success rates of techniques used in the treatment of GHD. Success rates for the TCT ranged from 91.5 to 100%.[13,20,21] In case series evaluating the Cunningham, the success rate was 100%.[8,14] Similarly, the success rate for the ExR ranged from 78 to 100%.[22,23]

Nonetheless, this study has some limitations. First, the patients with habitual GHD were included in the study. We could have obtained more reliable results from a study group that had a GHD for the first time. Second, short- and long-term follow-up after reduction was unable to be performed. Therefore, possible complication rates could not be evaluated. Third, patient comfort should also be considered while choosing the most appropriate technique. However, no evaluation was made to score patient comfort in the study. Finally, certain variables such as patient weight and body mass index that may affect the shoulder reduction process were unable to be evaluated.

In conclusion, it is difficult to choose the ideal technique for GHD. In the light of this study, we believe that it is appropriate to leave the choice of the ideal reduction technique to the clinician. In high-volume emergencies, clinicians may prefer techniques that can be performed in less time. However, in low-volume emergencies with adequate time for examination and treatment per patient, techniques that are less painful but can be performed in a longer time can be preferred. Based on these findings, an inverse relationship between time and pain is evident. The clinician must balance the clinical status of the emergency department with the goal of minimizing the pain experienced by the patient in the process of reducing an anterior GHD.

Ethics Committee Approval: The study protocol was approved by the Erzurum Regional Training and Research Hospital Ethics Committee (date: 02.12.2019, no: 2019/15-146). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from each patient.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, design: A,B,, Ş,A,, A,K.; Control/supervision, analysis and/or interpretation: A.B., V.A.; Data Collection and/or processing: A.B., M.Ç.E., A.K., V.A., Ş.A.; Literature review: A.B., V.A., M.Ç.E.; Writing the article: A.B., Ş.A., M.Ç.E.; Critical review: A.B., V.A., Ş.A.; References and fundings: A.B.; Materials: A.B., V.A., Ş.A., M.Ç.E., A.K.

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REFERENCES

1. Utkan A, Ağar A, Fakıoğlu RC, Köse CC, Özkurt B. Ipsilateral simultaneous inferior shoulder dislocation and posterior elbow dislocation: A case report. Jt Dis Relat Surg 2020;31:614-8. doi: 10.5606/ehc.2020.74939.
2. Shah A, Judge A, Delmestri A, Edwards K, Arden NK, Prieto-Alhambra D, et al. Incidence of shoulder dislocations in the UK, 1995-2015: A population-based cohort study. BMJ Open 2017;7:e016112. doi: 10.1136/bmjopen-2017-016112.
3. Leroux T, Wasserstein D, Veillette C, Khoshbin A, Henry P, Chahal J, et al. Epidemiology of primary anterior shoulder dislocation requiring closed reduction in Ontario, Canada. Am J Sports Med 2014;42:442-50. doi: 10.1177/0363546513510391.
4. Khiami F, Gérometta A, Loriaut P. Management of recent first-time anterior shoulder dislocations. Orthop Traumatol Surg Res 2015;101(1 Suppl):S51-7. doi: 10.1016/j.otsr.2014.06.027.
5. Robinson CM, Howes J, Murdoch H, Will E, Graham C. Functional outcome and risk of recurrent instability after primary traumatic anterior shoulder dislocation in young patients. J Bone Joint Surg [Am] 2006;88:2326-36. doi: 10.2106/JBJS.E.01327.
6. Gutkowska O, Martynkiewicz J, Urban M, Gosk J. Brachial plexus injury after shoulder dislocation: A literature review. Neurosurg Rev 2020;43:407-23. doi: 10.1007/s10143-018-1001-x.
7. Gottlieb M. Shoulder dislocations in the emergency department: A comprehensive review of reduction techniques. J Emerg Med 2020;58:647-66. doi: 10.1016/j.jemermed.2019.11.031.
8. Cunningham N. A new drug free technique for reducing anterior shoulder dislocations. Emerg Med (Fremantle) 2003;15:521-4. doi: 10.1046/j.1442-2026.2003.00512.x.
9. Williamson A, Hoggart B. Pain: A review of three commonly used pain rating scales. J Clin Nurs 2005;14:798-804. doi: 10.1111/j.1365-2702.2005.01121.x.
10. Atik OŞ. Which articles do the editors prefer to publish? Jt Dis Relat Surg 2022;33:1-2. doi: 10.52312/jdrs.2022.57903.
11. Krøner K, Lind T, Jensen J. The epidemiology of shoulder dislocations. Arch Orthop Trauma Surg 1989;108:288-90. doi: 10.1007/BF00932317.
12. Amar E, Maman E, Khashan M, Kauffman E, Rath E, Chechik O. Milch versus Stimson technique for nonsedated reduction of anterior shoulder dislocation: A prospective randomized trial and analysis of factors affecting success. J Shoulder Elbow Surg 2012;21:1443-9. doi: 10.1016/j.jse.2012.01.004.
13. Sayegh FE, Kenanidis EI, Papavasiliou KA, Potoupnis ME, Kirkos JM, Kapetanos GA. Reduction of acute anterior dislocations: A prospective randomized study comparing a new technique with the Hippocratic and Kocher methods. J Bone Joint Surg [Am] 2009;91:2775-82. doi: 10.2106/JBJS.H.01434.
14. Ghane MR, Hoseini SH, Javadzadeh HR, Mahmoudi S, Saburi A. Comparison between traction-countertraction and modified scapular manipulation for reduction of shoulder dislocation. Chin J Traumatol 2014;17:93-8.
15. Walsh R, Harper H, McGrane O, Kang C. Too good to be true? Our experience with the Cunningham method of dislocated shoulder reduction. Am J Emerg Med 2012;30:376-7. doi: 10.1016/j.ajem.2011.09.016.
16. Dong H, Jenner EA, Theivendran K. Closed reduction techniques for acute anterior shoulder dislocation: A systematic review and meta-analysis. Eur J Trauma Emerg Surg 2021;47:407-21. doi: 10.1007/s00068-020-01427-9.
17. Hendey GW. Managing anterior shoulder dislocation. Ann Emerg Med 2016;67:76-80. doi: 10.1016/j.annemergmed.2015.07.496.
18. Uglow MG. Kocher's painless reduction of anterior dislocation of the shoulder: A prospective randomised trial. Injury 1998;29:135-7. doi: 10.1016/s0020-1383(97)00168-x.
19. Puha B, Gheorghevici TS, Veliceasa B, Popescu D, Alexa O. Clasic versus novel in reduction of acute anterior dislocation of the shoulder: A comparison of four reduction techniques. Rev Med Chir Soc Med Nat Iasi 2016;120:311-5.
20. Singh S, Yong CK, Mariapan S. Closed reduction techniques in acute anterior shoulder dislocation: Modified Milch technique compared with traction-countertraction technique. J Shoulder Elbow Surg 2012;21:1706-11. doi: 10.1016/j.jse.2012.04.004.
21. Boger D, Sipsey J, Anderson G. New traction devices to aid reduction of shoulder dislocations. Ann Emerg Med 1984;13:423-5. doi: 10.1016/s0196-0644(84)80004-9.
22. Sapkota K, Shrestha B, Onta PR, Thapa P. Comparison between external rotation method and milch method for reduction of acute anterior dislocation of shoulder. J Clin Diagn Res 2015;9:RC01-3. doi: 10.7860/JCDR/2015/11850.5738.
23. Maity A, Roy DS, Mondal BC. A prospective randomised clinical trial comparing FARES method with the Eachempati external rotation method for reduction of acute anterior dislocation of shoulder. Injury 2012;43:1066-70. doi: 10.1016/j.injury.2012.01.019.