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Emergency medicine physicians success rate in reducing anterior shoulder dislocations: a retrospective observational study

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ABSTRACT

Background: Shoulder dislocations are common occurrences, with anterior shoulder dislocations being the most prevalent. Various reduction techniques are employed, but success rates and influencing factors remain variable. This study aims to evaluate the success rate of anterior shoulder reductions performed by emergency physicians, as well as factors contributing to reduction failure and extended emergency department (ED) stay.

Methods: A retrospective cross-sectional study was conducted at King Abdulaziz Medical City from 2019 to 2022, focusing on patients presenting with closed anterior shoulder dislocation. Data collected from medical records included patient demographics, mechanism of injury, method of reduction, and length of stay in the ED. Statistical analyses explored associations and relationships between variables.

Results: A total of 179 patients were included. The mean age was 32 years. Most patients had normal BMIs (34.6%), and the right shoulder was more frequently affected (56.4%). Falls (38.0%) and daily activities (33.5%) were common mechanisms of injury. Patients presenting within 3 hours had a mean ED stay of 3 hours and 54 minutes, compared to 6 hours and 43 minutes for those presenting later ($p < 0.001$). The success rate was 94.8% for early presenters and 84.3% for late presenters. Orthopedic involvement resulted in longer ED stays (8 hours and 48 minutes ± 5 hours and 20 minutes), while those without orthopedic referral had shorter stays (4 hours and 40 minutes ± 3 hours and 17 minutes). The waiting time for outpatient appointments was significantly shorter for patients with orthopedic involvement (8 days) compared to those without (39 days, $p < 0.001$).

Conclusion: Emergency medicine physicians achieved a high success rate in reducing anterior shoulder dislocations. The study underscores the importance of early presentation to the ED and orthopedic involvement in achieving favorable outcomes. The findings contribute to enhancing the understanding and management of closed anterior shoulder dislocations in emergency medicine.

Keywords: Anterior shoulder dislocation, emergency medicine physicians, orthopedic involvement.

Introduction

The shoulder joint is the most common major joint dislocated, and it accounts for 50% of all dislocations [1-3]. This can be attributed to the wide range of motions the glenohumeral joint is capable of. Shoulder dislocations can be anterior, posterior, or inferior. Of those, anterior shoulder dislocation remains to have the highest incidence of all shoulder dislocations at 95%-97% [4]. One study done in Oslo found the incidence to be 56.3

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per 100,000 persons per year [5]. The age group from 15 years old to 29 years old has the highest incidence with 46.8% [2]. Mechanisms causing anterior dislocations are mostly attributed to an impact on the arm while abducted, externally rotated, and extended. The impact from the posterior humerus or fall on the outstretched hand can cause anterior shoulder dislocations but are less common [6,7]. Damage to the glenohumeral ligament happens in 55% of cases while damage to the rotator cuff happens more commonly in the elderly (35%-85%) [5].

Reduction techniques are many and no method has proven to be superior to the other. Practitioners may try multiple times to reduce a dislocated shoulder with the same technique, but generally, two attempts are enough to determine if a method is successful or not [8]. Reduction techniques can be divided into three categories: traction, leverage, and scapular manipulation. The most common techniques used in the ED are scapular manipulation with a success rate ranging from 80% to 98.2% followed by external rotation technique with a success rate ranging from 80% to 90% and FARES technique with a success rate of 88.7% [9,10]. In regards to the capability of an emergency physician to reduce an anterior shoulder dislocation, a recent retrospective cohort study found the success rate of anterior shoulder reductions by emergency physicians to be 92.2%. It also showed that the failure rate of anterior shoulder reduction by an emergency physician is higher in the older population and in those who had falls as the mechanism of injury [1]. Other studies have proposed that a longer interval time to reduction and associated fractures as risk factors for failure [11,12]. On the other hand, successful rates were higher in those where relaxation of the muscles was achieved either by sedation, analgesia, or intra-articular anesthesia [3].

The reasons for emergency physicians' failure to reduce anterior shoulder dislocations have not been well studied in our region; thus, we aim to assess the success rate of anterior shoulder reductions done by emergency physicians and, as a secondary objective, to study the factors that lead to failure of reduction.

Methods

This retrospective cross-sectional study was conducted at King Abdulaziz Medical City to investigate the characteristics and outcomes of patients with closed anterior shoulder dislocation presenting to the adult emergency department (ED) between January 1, 2019, and December 31, 2022. The study population consisted of all eligible patients who visited the Adult ED during the specified period with a diagnosis of closed anterior shoulder dislocation. Data were retrieved from the ED registry of all visits to the adult ED between 2019 and 2022. Patients aged between 18 and 65 years, presenting with isolated closed anterior shoulder dislocation, were included in the study, while those with open shoulder dislocation, multiple trauma, associated fracture, neurovascular deficits, or those requiring admission were excluded. The sample size comprised all patients who met the inclusion criteria during the study period.

Data were collected from the hospital medical records using a structured data collection form. The form included several sections, such as patient demographic data (age, gender, and weight), as well as other variables related to the study objectives (e.g., BMI, mechanism of injury, main complaint, history of shoulder dislocation, method of reduction). Moreover, the duration of the dislocation was collected, patients were categorized as early shoulder dislocation if they presented to the ED in the first 3 hours of the dislocation, and were labeled as late if they presented after 3 hours of the dislocation. Descriptive statistics was used to summarize the baseline characteristics of the study population, including means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Further statistical analyses, such as chi-square tests, Analysis of Variance (ANOVA), or *t*-tests, were conducted to explore associations and relationships between variables, as appropriate. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS Statistics) v26. at a significance level of $p < 0.05$.

Ethical approval for this study was obtained from the King Abdullah International Medical Research Center. Patient confidentiality and data privacy were strictly maintained throughout the study.

Results

A total of 179 patients with anterior shoulder dislocation were included in the study. Table 1 shows the baseline characteristics of the patients. The mean age of the patients was 32 years, with a standard deviation of 13 years. The distribution of patients across different BMI classes showed that the majority of patients had a normal BMI (34.6%), followed by overweight (34.1%), and obese class I (11.2%). The least represented BMI class was morbidly obese (3.4%), while a small percentage fell into the obese class II (6.1%), underweight (8.4%), or had missing BMI data (2.2%).

Regarding the distribution by the site of shoulder dislocation, 56.4% of patients experienced dislocation on the right side, while 43.6% had it on the left side. The most frequently reported mechanisms of injury were falls (38.0%) and dislocation during daily activities (33.5%). Other notable mechanisms included sports-related injuries (11.2%), trauma (5.6%), and motor vehicle accidents (3.9%).

Upon presentation, the majority of patients (58.1%) sought medical attention in the early phase following shoulder dislocation, while 34.6% presented in the late phase. In some cases, the timing of the presentation was unknown (7.3%). The main complaints reported by patients included shoulder pain (96.1%), restricted range of motion (3.4%), and weakness (0.6%). Regarding the history of shoulder dislocations, 43.6% of patients experienced their first anterior shoulder dislocation, while 29.6% had recurrent dislocations. A smaller proportion reported second (13.4%) or third (7.8%) dislocations and the history was unknown in some cases (5.6%).

Table 1. *Baseline characteristic.*

Variables		(Mean ± SD) / *N*(%)
Age (years)		32 ± 13
	Underweight	15 (8.4%)
	Normal	62 (34.6%)
BMI classification	Overweight	61 (34.1%)
	Obese I	20 (11.2%)
	Obese II	11 (6.1%)
	Morbid obese	6 (3.4%)
	Missing	4 (2.2%)
Site	Right	101 (56.4%)
	Left	78 (43.6%)
	Fall down	68 (38%)
	During daily activity	60 (33.5%)
Mechanism	Sport	20 (11.2%)
	Trauma	10 (5.6%)
	Motor-vehicle-accident	7 (3.9%)
	Unknown	14 (7.8%)
	Early <3 hours	104 (58.1%)
Duration of the dislocation	Late >3 hours	62 (34.6%)
	Unknown	13 (7.3%)
	Shoulder pain	172 (96.1%)
Chief complaint	Restricted range of motion	6 (3.4%)
	Weakness	1 (0.6%)
	One episode	78 (43.6%)
	Two Episodes	24 (13.4%)
History of dislocation	Three episodes	14 (7.8%)
	Recurrent	53 (29.6%)
	Unknown	10 (5.6%)
Who did the reduction	Case was referred directly to orthopedics	18 (10.1%)
	Failed trial by ER, orthopedic joined	14 (7.8%)
	ER (EM discharged the patient with follow-up with ortho)	73 (40.8%)
	ER (EM discharged the patient without follow-up with ortho)	71 (39.7%)
	DA/absconded	3 (1.7%)
In which trial does reduction was achieved	First	78 (43.6%)
	Second	5 (2.8%)
	Third	3 (1.7%)
	Fourth	3 (1.75)
	Unknown	90 (50.3%)

The majority of reductions were performed by emergency physicians, with 40.8% of patients discharged with a follow-up appointment with the orthopedic department. In other cases, patients were discharged from the ED without a follow-up (39.7%), either referred directly to orthopedics (10.1%) or had a failed trial by the ED, resulting in the involvement of an orthopedic specialist (7.8%). The trial in which reduction was achieved varied among the patients, with 43.6% achieving reduction on the first trial. The percentage decreased for subsequent trials, with 2.8% on the second trial, 1.7% on the third and fourth trials, and the trial information was lacking for 50.3% of patients.

Table 2. *Association between variables and ED length of stay (LOS).*

Variables		Mean (hour:min)	STD (hour:min)	*p*-value
	Underweight	5:09	2:12	
	Normal	5:03	3:16	
BMI classification	Overweight	5:26	3:53	0.09
	Obese I	4:55	1:48	
	Obese II	8:06	5:49	
	Morbid Obese	6:47	3:04	
	Total	5:22	3:51	
Duration of the dislocation	Early <3 hours	3:54	2:52	<0.001
	Late >3 hours	6:43	3:37	
	Case was referred directly to orthopedics	8:48	5:20	
	Failed trial by ER, orthopedic joined	6:59	3:17	
Who did the reduction	ER (EM discharged the patient with follow-up with ortho)	4:56	2:43	<0.001
	ER (EM discharged the patient without follow-up with ortho)	4:40	3:17	
	DA/absconded	3:45	1:01	
	Total	5:22	3:51	
Orthopedic involvement	Yes	8:00	4:58	<0.001
	No	4:47	2:58	
	Conscious sedation	5:52	2:56	
	IV analgesic	4:59	4:16	
Types of analgesia	Intra-articular analgesic	3:56	2:29	0.13
	None	4:58	2:41	
	Total	5:22	3:51	

Table 2 presents the association between different variables and the LOS in the ED. The mean LOS for the entire study population was 5 hours and 22 minutes, with a standard deviation of 3 hours and 51 minutes. The analysis showed that the duration of the dislocation was significantly associated with the LOS, with patients presenting early (less than 3 hours) having a mean stay of 3 hours and 54 minutes, while those presenting late (more than 3 hours) had a longer mean stay of 6 hours and 43 minutes ($p < 0.001$). In addition, a statistically significant difference was observed between the groups, as indicated by a one-way ANOVA analysis ($p < 0.001$). Notably, there were significant differences in the LOS in the ED based on who performed the reduction. Patients directly referred to orthopedic surgeons experienced a prolonged ER LOS (8 hours and 48 minutes ± 5 hours and 20 minutes) compared to cases where the reduction was performed by the ER

Table 3. *Association between waiting time for outpatient department appointment and orthopedic involvement.*

Variables		Mean (by days)	STD (by days)	*p*-value
Orthopedic involvement	Yes	8	5.7	
	No	39	48	<0.001
	Total	30.8	43.3	

with orthopedic referral (4 hours and 56 minutes ± 2 hours and 43 minutes, $p < 0.001$) or without orthopedic referral (4 hours and 40 minutes ± 3 hours and 17 minutes, $p < 0.001$). However, there were no statistically significant differences between direct referral to orthopedics and consultation with orthopedics after failed attempts by the emergency physicians ($p > 0.5$).

Table 3 demonstrates the association between the waiting time for outpatient department appointments and the involvement of orthopedics. The mean waiting time for patients with orthopedic involvement was 8 days, with a standard deviation of 5.7 days, whereas patients without orthopedic involvement had a significantly longer mean waiting time of 39 days ($p < 0.001$).

Discussion

This is the first paper done in a large ED in Saudi Arabia to assess the success rate of emergency medicine physicians in reducing anterior shoulder dislocation and to evaluate factors that lead to failure of reductions or longer stays in the ED.

In our study, the success rate of anterior shoulder reductions by an emergency physician was 80.5%, which is similar to the success rate of a randomized control trial carried out in Turkey [13]. However, it is lower than that of a retrospective cohort study in which their success rate was found to be 92.2%, but it is important to signify that the mentioned study had a larger sample size [1]. Another study showed the success rate for scapular manipulation was 97%. It also found the "Fast, Reliable, and Safe" (FARES) method to have a success rate of 92% while the traction-countertraction technique success rate was 95% [14]. Moreover, a few studies were done to assess the success rate of external rotation and they found the first-attempt success rate of anterior shoulder dislocation to be between 78% and 81%, similar to the success rate in our study [15,16]. Differences in success rates might be attributed to factors such as sample size, variation in reduction techniques, and individual physician skills.

In our study, of those 80.5% successful reductions by an emergency physician, 40.8% were discharged with a follow-up appointment with orthopedics in comparison to 39.7% who were discharged without a follow-up appointment. The reasons behind this were unclear in our study. Of those 10.1% who were referred directly to orthopedics, data did not show justification for that but overcrowded ED rooms could be the reason. The percentage of failure at anterior shoulder reductions by an emergency physician resulting in orthopedics involvement in our study was only 7.8% which is similar to a study published in 2022 [1].

Our study showed that patients with isolated anterior shoulder dislocation who presented early (less than 3 hours from injury) had the shortest mean stay in the ED of nearly 3 hours and 54 minutes with a success rate of 94.8%. On the contrary, patients who presented late (more than 3 hours from the injury) had a mean stay of 6 hours and 43 minutes with a success rate of 84.3%, signifying the importance of early presentation to the ED after the injury. In addition, patients who had no orthopedics involvement had the shortest LOS (4 hours and 40 minutes ± 3 hours and 17 minutes) in comparison to those who had orthopedics involvement (8 hours and 48 minutes ± 5 hours and 20 minutes). A retrospective database and chart review study showed that the interval from the injury to ED presentation and the interval from ED presentation to the first reduction attempt were both independent factors of failed reductions. In addition, their results showed that the percentage of reduction failure increases with every 10-minute delay which supports the findings in our study [12]. LOS was measured in a study comparing the method of analgesia/sedation used during the reduction, LOS was highest in procedural (median: 139 minutes) compared to only analgesia (median: 99 minutes) [17]. In addition, waiting times for outpatient appointments were significantly higher when there was no orthopedics involvement compared to those who had orthopedics involvement, which highlights the necessity to establish a good OPD referral system.

Limitations

Our study had multiple limitations. First, it is a single-center study. Second, documentation of the reason behind the referral of isolated anterior shoulder dislocations directly to orthopedics was lacking. Third, documentation of the maneuver method used was another lacking point in documentation.

Conclusion

Our study showed that emergency medicine physicians have a high success rate (80.5%) in reducing isolated anterior shoulder dislocations. It also assessed associations between variables such as duration of dislocation, orthopedic involvement, LOS in the ED, and waiting time for OPD appointments. These findings provide valuable insights into the management and outcomes of patients with closed anterior shoulder dislocation.

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Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent to participate
Not applicable as the manuscript did not contain any individual personal data.

Ethical approval
Ethical approval was obtained from the local institutional Review Board (King Abdullah International Medical Research Center, IRB/0681/23, dated 19 March 2023.

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