



# Flexion-adduction-external rotation method for shoulder dislocations

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**Objective:** The aim of this prospective study was to assess the effectiveness of the flexion-adduction-external rotation method in the reduction of acute anterior shoulder dislocations.

**Methods:** The study included 128 patients (98 male, 30 female; mean age: 33, range: 19 to 81) with a history of acute anterior shoulder dislocation treated with the flexion-adduction-external rotation method. Neurovascular examination was performed before and after reduction. Reduction duration and patient responses regarding the reduction method were recorded.

**Results:** First-time dislocation occurred in 92 patients and recurrent dislocation in 36. 111 patients had subcoracoid dislocations and 17 subglenoid dislocations. Fracture of the greater tubercle was present in 13 patients. Reduction was achieved in the first attempt in 104 patients and in the second in 12 patients. Mean reduction time was under 1.5 (range: 0 to 5) minutes. Reduction was unsuccessful in 12 patients and reduction under general anesthesia was performed. No patients experienced neurovascular injury after reduction.

**Conclusion:** The forward flexion-adduction-external rotation method is an effective and comfortable reduction method for the treatment of shoulder dislocation or fracture-dislocation.

**Key words:** Adduction; external rotation; flexion; reduction; shoulder dislocation.

Shoulder dislocation is a common joint injury known for over 3000 years.<sup>[1]</sup> Currently, almost half of dislocations presented to emergency services are shoulder dislocations.<sup>[2]</sup> Approximately 90% of these are anterior dislocations. The most common mechanism of injury is falling on the open hand with the forearm in extension, abduction and external rotation.

Several methods of reduction have been defined for shoulder dislocation. Many of these classical methods are painful and associated with iatrogenic injuries.<sup>[3,4]</sup> Among these injuries, the most common complications

are fracture of the proximal humerus and injury to the plexus brachialis, axillary nerve and/or axillary artery.<sup>[5]</sup> Although a relatively new technique, flexion-external rotation is considered to be more reliable and easily applicable.<sup>[4,6,7]</sup> Mirick et al. reported that reduction was achieved using this method in the first attempt in 80% of patients with anterior shoulder dislocation.<sup>[7]</sup> In 2004, Eachempati et al. modified this method by adding anterior flexion and reported a high rate of success and a low rate of complication.<sup>[8]</sup>

The objective of the current study was to assess the

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ease and reliability of the flexion-adduction-external rotation reduction method for the treatment of anterior shoulder dislocation with or without fracture.

## Patients and methods

The study included 128 patients (98 males, 30 females) presenting to the emergency service with anterior shoulder dislocation with or without fracture of the greater tubercle between 2008 and 2012. Mean age of the patients was 33 (range: 19 to 81) years. Patients with posterior or inferior shoulder dislocations, polytrauma, hemodynamic instability, two or more accompanying segmented fractures of the proximal humerus or intra-articular fractures were excluded. Age, sex, side of dislocation, duration of the dislocation, previous history of dislocation, and results of neurovascular examination were recorded retrospectively.

Anteroposterior shoulder radiograms were taken of patients presenting to the emergency service with complaints of shoulder pain and inability to move the shoulder following trauma. Scapula Y and axillary view radiographs were taken for patients in whom shoulder dislocation was suspected in clinical examination but not confirmed with anteroposterior shoulder radiogram. Neurovascular examination was made prior to reduction. Patients were informed of the treatment and asked to sign a consent form. Closed reduction was performed using the flexion-adduction-external rotation method by orthopedics residents trained previously on the technique. Patients with accompanying fracture did not undergo further maneuvers. No anesthesia or analgesia was applied prior to the reduction. The patient was positioned in the supine position. The physician stood on

the side of the dislocated shoulder and held the patient's wrist with one hand and the elbow in the other (Fig. 1a). The elbow was flexed 90° and the arm was flexed anteriorly 20° from the shoulder joint (Fig. 1b) and adducted until touching the chest (Fig. 1c). In order to achieve reduction, the arm was gently rotated externally until the forearm was parallel to the arm in the coronal plane (Fig. 2). Traction or forced rotation should not be applied during reduction. Clinical examination was made and anteroposterior shoulder radiogram was retaken to confirm reduction.

Patients in whom the first attempt failed received analgesia and underwent a second attempt. For those in whom the second attempt also failed underwent reduction under anesthesia. Vascular and neural examination was performed to assess neurovascular complications. An arm sling was applied to all patients and active exercises were started 10 to 14 days later.

The time between lying on the stretcher and assuming the reduction position and completion of the reduction was recorded as reduction time.

Following reduction, subjects with previous dislocation were asked to compare this method to other methods previously applied. To evaluate patient satisfaction, all patients in which reduction was achieved were asked the question "Would you prefer this method if you had dislocation again?" and responses were recorded.

## Results

Ten patients (6 with fracture of the proximal humerus and 4 polytrauma) were excluded from the study. Mechanisms of dislocation were falling on the hand (68%), minimal trauma during dressing (16%), sport trauma



**Fig. 1.** (a) The physician to perform reduction stands on the side of dislocation and his one hand holds the wrist of the patient and his other hand holds the elbow of the patient. (b) The elbow of the patient is flexed 90° and the arm is flexed anteriorly 20° from the shoulder joint. (c) The arm is adducted until it touches the chest.



**Fig. 2.** (a, b) In order to achieve reduction, the arm is gently rotated externally until the forearm is parallel to the arm in the coronal plane.

(12%) and other mechanisms (4%). Mean time from dislocation to reduction was 2.5 hours (range: 10 minutes to 5 hours). In 4 patients who presented late, reduction time was greater than 24 hours (mean: 30 hours; range: 24 to 42 hours). A second attempt was not made in these patients and they underwent reduction under anesthesia.

The dislocation involved the dominant side in 82 (64%) patients and the non-dominant side in 46 (36%). One hundred and eleven (86.7%) patients had subcoracoid and 17 patients (13.3%) had subglenoid dislocation. Thirteen patients (10.2%) had fracture of the greater tubercle. Ninety-two (72%) patients had first-time dislocation and 36 (28%) had history of recurring dislocation. No patient had neurological or vascular injury prior to reduction.

Reduction was successful in the first attempt in 104 (81.3%) patients and in the second attempt in 12 (9.4%). Mean reduction time was 1.5 (range: 0 to 5) minutes. Severe pain occurred in 11 (8.6%) patients during reduction and these patients received analgesia. Reduction was not achieved in the emergency service in 12 (9.4%) patients who then underwent reduction under general anesthesia. All of these patients were male. Three had history of recurrent dislocation and 2 had undergone previous reduction under general anesthesia. All of the remaining patients had a first-time subglenoid dislocation. No neurovascular injury was observed following reduction.

Of the 36 patients with recurring dislocations, 32 (89%) reported that the applied method was a less painful and easier one than their previous intervention. Of 116 patients for whom reduction was achieved 108

(93.1%) reported that they would prefer this method in the future.

## Discussion

Several methods for the reduction of shoulder dislocations have been defined over the years.<sup>[8]</sup> Traditionally, the most frequently used methods are those of Kocher and Hippocrates.<sup>[2,8]</sup> The ideal method should be simple, rapid, effective, painless, and free of complication.<sup>[9,10]</sup>

The Kocher method is one of the mostly frequently used methods for shoulder dislocation and is applied as traction-external rotation.<sup>[11]</sup> Although the original method involved only external rotation, traction was later added.<sup>[12]</sup> It has the highest complication rates in the literature. In the present study, the complication rate was lowered because our method relaxes the capsule without traction and achieves reduction using the effects of the surrounding muscles.

Another convenient method with successful results is that reported by Milch.<sup>[13]</sup> Reduction is achieved by supporting the humerus head with the fingers while muscle strength is overcome by moving the axis of the arm parallel to the muscles. Pain increases because the humerus is elevated over the level of the head. Cartilage damage may occur because the humerus head squeezes under the glenoid in this position.<sup>[14]</sup> Our method does not squeeze the humerus head or cause pain as no intervention is applied to the humerus head.

In Matsen's method of traction, the patient should be relaxed absolutely and an additional person should be involved.<sup>[2]</sup> Reduction time is highly variable and may

be long. Conversely, in our method, the physician alone is sufficient and usually no sedation is required prior to reduction because traction is not required.

The Stimson and scapular manipulation methods are relatively painless methods with minimal risk of damage.<sup>[15,16]</sup> In these methods, the patient assumes the prone position and sedation may be dangerous. Additional material is required and reduction time may be highly variable. For our method, no additional requirement is necessary and reduction time is short.

The Spaso and chair methods have been defined as easy and non-traumatic reduction methods and very successful outcomes have been reported.<sup>[17-19]</sup> However, Spaso's technique increases risk of fracture, especially in the elderly patients, because the traction and elevation of the arm above the level of the head increases pain and spasm. Disadvantages of the chair method are the requirement of a chair for completion and that the patient must be conscious.

When first defined, the flexion-external rotation method was favored as a reliable method in which one physician was necessary and with minimal patient discomfort.<sup>[6,7]</sup> As defined by Leidelmeier,<sup>[20]</sup> the difference between this method and the external rotation method is that the arm is flexed. In this position, the capsule relaxes without traction and the long head of the biceps muscle facilitates entry of the humerus head into the joint by making a spring effect. Furthermore, the medially directed contraction of the pectoralis major and subscapularis muscles, the major structures preventing lateral displacement of the humerus head, is neutralized and reduction is achieved with gentle and continuous external rotation.<sup>[21]</sup>

None of our first-time dislocations required sedation. This makes this method effective for patients who cannot undergo anesthesia or when the equipment or setting is not appropriate for anesthesia. In our study, the patient was informed before reduction and we observed that reduction was easier if the trust of the patient could be gained.

Systemic conditions are more frequent in elderly patients and administering general anesthesia poses additional risk during any intervention. Risk of fracture during shoulder reduction is higher in these patients, especially those with osteoporosis. For the reduction method we use, factors that increase fracture occurrence such as pain and spasm are minimized as no traction is applied. The flexion-adduction-external rotation method might provide success without anesthesia in elderly patients.

Currently, the first intervention of patients presenting to the emergency service with shoulder dislocation is performed by emergency service physicians. Although ultimate treatment is performed by an orthopedist upon consultation in training hospitals in which training is given on orthopedics and traumatology, this treatment is performed by emergency medicine specialists in peripheral hospitals. When it was first defined, the flexion-external rotation method was favored as a reliable method in which one physician was sufficient.<sup>[6,7]</sup> Additionally, it may be performed by emergency service physicians who completed their orthopedics rotation because of its low learning curve.

The flexion-adduction-external rotation method has several advantages. The method does not require anesthesia or traction, its use is appropriate for dislocations with fractures and in the unconscious patients and it does not require additional materials. The strengths of the current study are that it is a prospective study and it yielded successful results despite being performed by different physicians. On the other hand, limitations of the study include the lack of a scoring system for pain and evaluation of possible long-term bony and soft tissue pathologies.

In conclusion, for the treatment of shoulder dislocation, the flexion-adduction-external rotation method is a simple, non-traumatic, effective method for which one physician is sufficient. Due to its practical application and low learning curve, it may be used by both orthopedics residents and emergency room physicians. Thus, we believe that this method should be one of the first methods considered for reduction of shoulder dislocations without anesthesia.

**Conflicts of Interest:** No conflicts declared.

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