

Techniques and Procedures



THE ELBOW TECHNIQUE: A NOVEL REDUCTION TECHNIQUE FOR ANTERIOR SHOULDER DISLOCATIONS

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Abstract—Background: Anterior dislocation of the glenohumeral joint is a common upper extremity injury in orthopedic and emergency medicine. The aim of this study was to introduce a novel reduction technique, “elbow technique,” for anterior shoulder dislocations. **Discussion:** This study included 26 patients with anterior shoulder dislocation who were treated using the elbow technique in our hospital’s emergency department between October 2014 and December 2015. One orthopedic physician performed the reduction maneuver and the vast majority of the patients were sedated. Patients who presented with posterior shoulder dislocation, remained dislocated for more than 7 days, who had Neer three or four parts proximal humerus fractures, and who had received previous shoulder surgery were excluded from this study.

Twenty-one dislocations (80% of the patients) were primary. Six patients (23% of the dislocations) had associated fractures of the greater tuberosity. All of the patients were successfully reduced with the elbow technique. Mean time for reduction was 5 s (range 3–69 s). No iatrogenic fractures or neurovascular injuries were noted after the reductions. **Conclusions:** The elbow technique involves traction, leverage, pulsion, and can be performed by a single operator. The elbow technique is a safe, elegant, simple, effective, fast, and gentle reduction procedure for anterior shoulder dislocations in the emergency department. © 2018 Elsevier Inc. All rights reserved.

Keywords—humerus; orthopaedic; shoulder dislocations; shoulder injury

INTRODUCTION

Anterior dislocation of the glenohumeral joint is a common upper extremity injury in orthopedic and emergency medicine. Shoulder dislocations account for 43–50% of major joint dislocations in the body, with >96% of these shoulder dislocations being anterior dislocations (1,2). Looking back at the history of reduction methods for shoulder dislocations, we find that back in 460 BC (before Christ), Hippocrates reduced dislocated shoulders by placing both hands on the patient’s wrist for traction and putting his foot in the armpit for counter-traction (2). Despite the numerous techniques that have been introduced over the past centuries, all have been based on the same principles: traction-countertraction, rotation, leverage, manipulation, and pulsion (3). The overall success rate for shoulder dislocation reductions ranges from 68% to 90% (4). However, all reduction techniques showed some applied limitations and associated complications without establishing standard reduction procedure.

A simple, safe, time-preserving, effective, and unassisted reduction technique for all orthopedists and emergency physicians to perform was needed. The aim of this

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prospective study was to evaluate the reduction effectiveness of the new reduction technique, “elbow technique,” performed primarily with the operator’s elbow.

DISCUSSION

This study included 26 patients with anterior shoulder dislocation who were treated using the elbow technique in our hospital’s emergency department (ED) between October 2014 and December 2015. Informed consent was obtained from each patient, and the study was approved by our hospital’s Institutional Review Board (KMUH-IRB-20140037). Clinical diagnosis of dislocation was made on the basis of physical examination and confirmed by standard anteroposterior radiographs of the shoulder and via Y-view of the scapula. Physical and neurologic examinations were performed before and after the reduction, and any neurovascular deficits were recorded. All of the reductions were performed by two of our orthopedic residents.

Exclusion criteria were posterior dislocation, dislocated for more than 7 days, Neer three or four parts proximal humerus fractures, concomitant humeral neck fractures, and previous shoulder surgery.

The reduction was performed in the following manner: The patients were placed in supine position. While facing the patient, the operator stood on the side of the dislocated shoulder. The operator held the patient’s wrist with the operator’s outer hand and applied a gentle traction force to keep the elbow straight. The arm was lifted to 45 degrees of forward flexion and abduction (Figures 1A and 1B). Next, with the lateral surface of the operator’s elbow, force is exerted on the midshaft of the patient’s humerus (Figure 1C and 1D and Video 1). The direction of the applied force could be posteriorly, superiorly, and laterally (Figure 1E). Normally, a “clunk” sound could be heard when reduction was achieved. If greater traction

was necessary in more obese or muscular patients, traction could be increased by using both hands to hold the wrist.

After reduction, the radiographs were obtained to check the congruency of glenohumeral joint and intact of humerus bone. Any neurovascular deficit and iatrogenic bony injury after reduction were recorded. The shoulder sling was routinely applied to the patients for 2 weeks after reduction was achieved. All patients were followed up in our clinic at least once.

During the period of study, 26 patients came to our ED who presented with anterior shoulder dislocations. Mean patient age was 56.2 years old (range 19–88 years old), and 58% (n = 15) of patients were men. The right shoulder was involved in 69% (n = 18) of the dislocations, and 31% (n = 8) involved the left shoulder. Twenty-one dislocations (80% of the patients) were primary. Six patients (23% of the dislocations) had associated fractures of the greater tuberosity. All of the tuberosity fractures were associated with primary dislocations (Figure 2).

Twenty-six patients were successfully reduced with the elbow technique. The mean time for reduction was 5 s (range 3–69 s). No iatrogenic fractures or neurovascular injuries were noted after the reductions.

Twenty-four (92%) patients received sedation with thiamylal sodium 500 mg/20 mL/vial (Citosol; Shinlin Singen Pharmaceutical, Taiwan) before reduction. The protocol of our hospital is 1–5 mg/kg. Two (8%) patients were reduced without sedation or analgesics due to unstable physical condition. The pre-reduction neurologic examinations revealed mild sensory deficit in the axillary nerve distribution in 4 (15%) patients, but all of these patients recovered during follow-up. There were no brachial plexus or vascular injuries noted. Mean duration from injury to reduction was 3 h (range 1–37 h).

Demographic features of the patients, number of previous dislocations, side of the dislocation, time interval

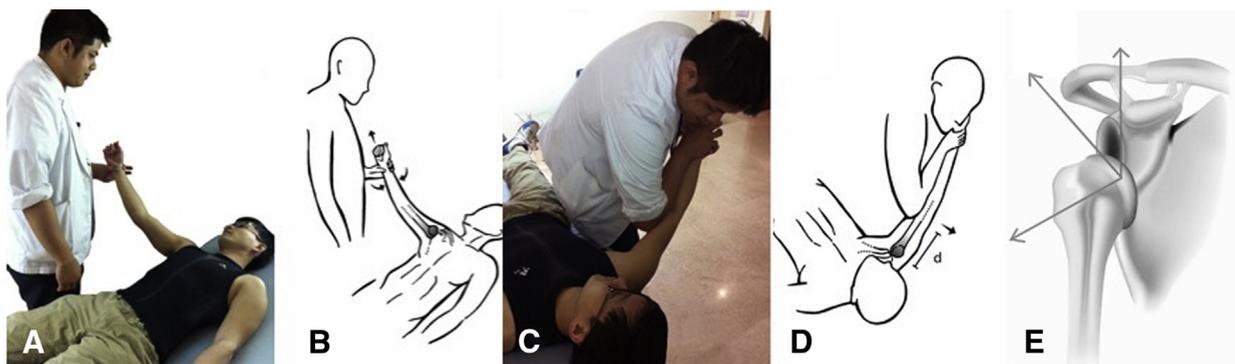


Figure 1. The elbow technique. (A, B) The operator holds the wrist of the patient with his outer hand and applies a gentle traction force to keep the elbow straight (straight arrow). A rotation force may be achieved by twisting the wrist of the patient, resulting in rotation of the forearm and shoulder (curved arrow). (C, D) With the lateral surface of the operator’s elbow, a force exerts on the shaft of the patient’s humerus (straight arrow). By lengthening the lever arm (D), the force moment is increased, allowing the humeral head to glide back into the glenoid fossa more easily. (E) The reduction force can push the humeral head posteriorly, superiorly, and laterally into the glenoid.

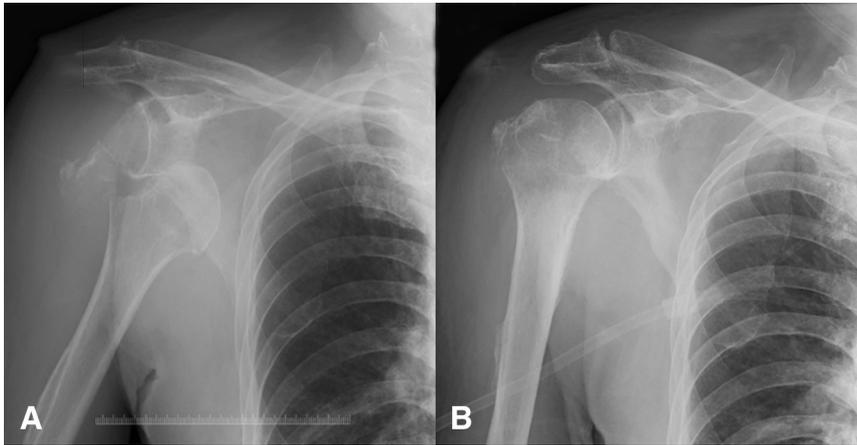


Figure 2. The dislocated and post reduction radiographies in elderly patient with greater tuberosity avulsion fracture-dislocation. (A) The radiography showed humeral head anterior dislocation and greater tuberosity avulsion fracture with osteoporotic bone. (B) After the elbow technique reduction, the humeral head reduced into the glenoid and the greater tuberosity reattached to the humeral head.

from injury to reduction, and duration of reduction were recorded (Table 1).

In this study, we evaluated the effectiveness of elbow technique to reduce anterior shoulder dislocation with or without the fracture fragments. The study result revealed successful reduction without neurovascular complications in all patients, including 6 patients that presented with greater tuberosity avulsion fragments and 2 patients who we were unable to sedate. All reduction procedures can be performed by one operator without assistance, with a mean performance time of 5 s. The elbow technique can reduce anterior shoulder dislocation safely, effectively, and quickly by a single operator in the ED.

Table 1. Baseline Characteristics of Patients Managed With the Elbow Technique

Characteristics	Data
Patients, n	26
Age, y, mean (range)	56.2 (19–88)
Sex, n (%)	
Men	15 (58)
Women	11 (42)
Side of dislocations, n (%)	
Right	18 (69)
Left	8 (31)
Number of dislocations, n (%)	
Primary	21 (80)
Recurrent	5 (20)
Fracture-dislocation, n (%)	
No fracture	20 (77)
Fracture	6 (23)
Time interval, h, mean (range)	3 (1–37)
Sedation, n (%)	
Sedation	24 (92)
No sedation	2 (8)
Reduction result, n (%)	
Success	26 (100)
Failure	0
Reduction time, s, mean (range)	5 (3–69)

In anterior shoulder dislocations, the humeral head usually dislocates anteriorly, inferiorly, and medially to the glenoid. While traction is the only principle used for reduction, both the humeral head and the glenoid would move simultaneously, usually requiring an assistant to counteract the operator's force for the purpose of stabilizing the patient's scapula. However, excessive traction force may cause damage to the axillary nerve, brachial plexus, and the fragile vessels (5). A force to push the head posteriorly, superiorly, and laterally is very important. With the patient lying in supine position, a superior-lateral force may be generated by adjusting the direction of the traction force. However, it is difficult to generate a posteriorly directed force without the use of another hand or the aid of an assistant. For obese, swollen, or muscular patients with bulky soft tissues surrounding the armpit, the humeral head may not always be easily palpated and push back. In the elbow technique, we use the elbow to generate the posterior-superior force on the humeral shaft, while maintaining sufficient lateral traction force with one or both hands (Figure 1E). By producing this posterior-superior force, the traction force necessary for reduction is lowered. The entire process of reduction and the generation of multidirectional force is performed by a single operator.

In dislocations combined with displaced greater tuberosity fractures, the fragment may be trapped inside the glenohumeral joint, especially when the shoulder is abducted $> 90^\circ$. Therefore, in techniques involving rotation (Kocher, external rotation) or abduction $> 90^\circ$ (Milch), the success rate may be reduced (6,7). In the elbow technique, a rotation force may be achieved by twisting the wrist of the patient, resulting in rotation of the forearm and shoulder (Figure 1). The shoulder was abducted only 45° , decreasing the risk of fragment entrapment. Six

patients with fracture-dislocations in our series were reduced as effectively without fragment entrapment.

Iatrogenic fractures pose a hazardous threat for all reduction techniques (8). One major concern with the Kocher technique is that it can result in fractures of the humeral neck and shaft, mainly due to the excessive external rotation involved (5). In the elbow technique, if the humeral head is impinged below the glenoid rim in spite of the traction, applying force to the humeral shaft may generate a bending force that can increase the chance of fracture. Although this complication did not occur in our experience, caution must be taken when performing this technique, especially in patients with severe osteoporosis. Operators can use the following tips to decrease the risk of iatrogenic humeral shaft fractures:

1. Apply traction first before applying the posterior-superior pulsion force.
2. Increase the force applied gradually.
3. Increase the contact area of the force by applying the pulsion force with the entire lateral surface of the elbow instead of the olecranon tip.

The Milch technique and the elbow technique both involve the use of traction, leverage, and pulsion (9). In the elbow technique, instead of applying direct force to the head itself, the force is applied to the shaft; by lengthening the lever arm, the force moment is increased, allowing the humeral head to glide back into the glenoid fossa more easily. Manes introduced a reduction technique for the elderly (10). This technique applies a traction force with one hand while using the other forearm as a fulcrum for leverage, providing superior, posterior, and lateral force. In the elbow technique, the operator is facing the patient instead of standing behind him, as in the Manes technique. A limitation of the Manes technique is that only one hand can be used to generate the traction force, which is one of the reasons why the technique was only recommended in elderly patients with weaker muscle power. In the elbow technique, both hands can be used for the traction force, generating a much greater force compared to the Manes technique, which we believe is a big advantage when performing reduction not limited to elderly.

A limitation of our study is that this technique has yet to be applied to a larger number of patients and to more patients not receiving analgesics or sedation. Further comparison with other methods is also necessary to determine its efficacy and safety.

CONCLUSIONS

The elbow technique is a safe, elegant, simple, effective, fast, and single-operator reduction procedure for anterior shoulder dislocations. The reduction technique allows the orthopedists and emergency physicians to reduce anterior shoulder dislocation smoothly, decreasing unsuccessful reduction rate and iatrogenic complications. However, it is also important to understand the pathoanatomy of shoulder dislocations to ensure the success of every reduction.

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SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.jemermed.2018.10.018>.

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