The Journal of Emergency Medicine, Vol. ■, No. ■, pp. 1–6, 2018

0736-4679/$ - see front matter

https://doi.org/10.1016/j.jemermed.2018.02.011

Techniques and Procedures

ELBOW DISLOCATIONS IN THE EMERGENCY DEPARTMENT: A REVIEW OF REDUCTION TECHNIQUES

Michael Gottlieb, MD and Jessen Schiebout, MD

Department of Emergency Medicine, Rush University Medical Center, Chicago, Illinois
Corresponding Address: Michael Gottlieb, MD, Department of Emergency Medicine, Rush University Medical Center, 1750 West Harrison Street, Suite 108 Kellogg, Chicago, IL 60612

☐ **Abstract—Background: Elbow dislocations are one of the most common large joint dislocations and they require urgent reduction in the emergency department. Posterior dislocations are the most common type, with anterior dislocations occurring in rare cases. Discussion: Reduction techniques include traction–countertraction, patient-assisted countertraction, the leverage approach, and the modified Stimson technique. Complications can include nerve injury, vascular injury, and compartment syndrome. Conclusions: It is important for emergency physicians to be familiar with several different reduction techniques for elbow dislocations in case the initial reduction attempt is unsuccessful. This article reviews the current evidence for reduction of elbow dislocations and any variations on these approaches.** © 2018 Elsevier Inc. All rights reserved.

☐ **Keywords—dislocation; elbow; reduction; relocation**

INTRODUCTION

The elbow is one of the most common large joint dislocations in adults and the most common in children, responsible for 10% to 25% of all elbow injuries with a reported incidence ranging from 2.7 to 6.1 per 100,000 people (1–7). This injury affects men more frequently than women, typically occurring on the nondominant side, and is most common in the 30-year-old age group (8–17). Dislocations occur most frequently from falls, followed by sports, assault, and motor vehicle collisions (7,15–20). Wrestling, football, and gymnastics are the most common sports associated with this injury (7,15–20).

The elbow includes 3 articulations: the ulno-trochlear, the proximal radio-ulnar, and the radio-capitellar joints (19). The articular surfaces are highly congruent and, therefore, inherently stable (10,21–23). Further stability is provided by the static restraints, comprised of the medial collateral ligament (MCL), lateral collateral ligament (LCL), and the joint capsule. Muscles crossing the elbow joint provide additional dynamic stabilization (11–13,24,25).

Typically, elbow dislocations occur when falling on an outstretched arm. As the hand contacts an immobile surface, axial force is directed toward a flexed elbow in supination (20,21,25–29). The first stage of dislocation involves disruption of the LCL (2,24,30–33). Stage 2 involves subluxation of the coronoid over the trochlea (2,24,30–33). The final stage involves damage to the MCL, resulting in full dislocation of the radius and ulna (2,24,30–33).

A dislocation is considered complex when it is associated with a fracture and simple when no fractures are present (4). Between 50% and 80% of adult dislocations are simple, while the majority of pediatric elbow dislocations are complex (12,34–38). Dislocations are also classified by forearm location in relation to the humerus, with

Reprints are not available from the authors.

Received: 16 November 2017; Final submission received: 4 February 2018;
Accepted: 7 February 2018

90% of dislocations occurring in a posterior or posterolateral direction and only 1% to 2% displacing anteriorly (1,12,33,37–40). Divergent dislocations are rare and occur when the humerus is forced between the radius and ulna (35,41). A complex dislocation with fractures of the coronoid process, radial head, and MCL is referred to as the "terrible triad" of the elbow because of frequent problems with instability, stiffness, and degenerative changes (31,42,43).

When dislocated, the elbow will appear deformed, with the forearm shortened and flexed at 45° degrees, and the olecranon will be prominent (24,25). The mechanism, time of injury, and hand dominance should be noted along with any lacerations. A detailed neurovascular and ipsilateral full extremity examination is warranted, as shoulder and wrist injuries may be found in up to 10% to 15% of cases (10,28,31–33).

DISCUSSION

Reduction Techniques

Before the reduction attempt, the forearm should be placed in a supinated position. This allows the coronoid process to disengage and relaxes the biceps tendon, thereby facilitating the reduction. There are several elbow reduction techniques that have been described in the literature.

The most commonly described technique is traction–countertraction. For this approach, 2 providers are often needed. One provider will apply longitudinal traction on the forearm, while a second provider applies countertraction at the distal humerus (Figure 1) (2,33,44,45). A folded bedsheet may be used to facilitate the countertraction (44). While providing traction with one arm, the other hand may be used to directly manipulate the olecranon to facilitate the reduction (2). When performing this technique, slow and steady pressure should be used to reduce muscle spasm and the risk of injury. Slight elbow flexion or downward flexion on the forearm may be necessary to disengage the coronoid process and facilitate the reduction. It is important to avoid applying pressure directly into the antecubital fossa because the nerves and vessels are more exposed in this area, which can increase the risk of iatrogenic injury. As a result, countertraction is best applied at the middle or distal humerus.

Kumar and Ahmed have suggested that countertraction may be effectively performed by the patient, reducing the risk of muscle spasm or the need for an assistant (46). With this approach, the provider places the supine patient's arm across the chest toward the opposite side, so that the olecranon points upward (Figure 2). The provider then applies in-line traction on the forearm with one hand while the other hand manipulates the olecranon process. The patient's chest wall maintains the flexed position of the elbow joint, while traction is performed.

The leverage technique is an alternate, single-provider approach first described by Hankin in 1984 (47). This technique involves using the provider's forearm as a fulcrum to assist with the reduction in a slow, controlled manner (Figure 3) (44,47). The provider begins by gently supinating the patient's forearm. Then, the provider interlocks his or her fingers with the patient's fingers in a clasping grip. Next, the provider places his or her elbow against the distal portion of the patient's biceps muscle. The provider slowly draws the patient's wrist into flexion using the provider's elbow as a fulcrum. If the patient has a longer forearm length, the provider may grasp the patient's wrist instead of the fingers. During this technique, the provider can use his or her other hand to apply lateral or medial pressure for medial or lateral reductions, respectively. One small

Figure 1. Traction–countertraction technique.

Figure 2. Patient-assisted countertraction technique.