

Evaluation and Management of Adult Elbow Dislocations in the Emergency Department

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Abstract

In the adult population, the elbow is the second most commonly dislocated major joint in the body. The majority of elbow dislocations without an associated periarticular fracture can be managed with acute closed reduction. However, a dislocation with an associated intraarticular loose body or periarticular fracture may compromise the ability to maintain joint reduction in the initial setting. The purpose of this article is to review the evaluation and management of dislocation of the adult elbow in the emergency department.

Keywords: Adult elbow; Dislocation; Reduction; Acute; Emergency department

Introduction

After the shoulder, the elbow is the most commonly dislocated major joint in the body, with an annual incidence of 6.1 dislocations per 100,000 populations. Elbow dislocations account for 10-25% of all elbow injuries, and approximately 6.8% of fractures or dislocations [1-3]. The majority of elbow dislocations without an associated periarticular fracture can be managed with acute closed reduction [3,4]. However, a dislocation with an associated intraarticular loose body or periarticular fracture can compromise the ability to maintain joint reduction in the initial setting [5]. In some of these instances, an elbow that remains unstable following closed reduction may require surgical intervention in the acute or semi-acute setting.

Although patient outcomes following elbow dislocations are mostly favourable, the rate of residual pain and elbow stiffness is relatively common [5-7]. Anakwe et al. reported residual subjective stiffness of 56% in patients who sustained simple elbow dislocations [5]. Papandrea et al. found that patients with persistent instability following complex elbow fracture-dislocations were more likely to have pain, loss of functional range of motion, and increased onset of early osteoarthritis [6]. Heterotopic ossification, the formation of abnormal ossification in periarticular soft tissue resulting in diminished range of motion, is another known complication of traumatic elbow instability. Factors associated with increased risk of heterotopic ossification include ulnohumeral dislocation, delay of treatment of dislocation, increased number of surgical procedures, and burn injuries [7]. Ultimately, the appropriate early evaluation and treatment of traumatic elbow instability is important to mitigate complications.

Overview

The elbow is a complex joint comprised of two major articulations. The ulnohumeral articulation flexes and extends the forearm, while the radiocapitellar articulation provides forearm rotation. The complex native osseous anatomy of the elbow, along with the medial and lateral collateral ligaments originating on the epicondyles of the humerus and inserting on the ulna, provide intrinsic stability to the articulation.

Elbow dislocations can be grouped into two broad categories. A simple dislocation describes instability with only associated soft tissue disruption, while a complex dislocation refers to a dislocation with an associated periarticular fracture. With any elbow dislocation, the lateral ligamentous structures are almost always disrupted. Depending on the degree of energy at time of injury, soft tissue disruption can also include the MCL, capsule, or crossing myotendinous structures. An

increasing amount of soft tissue disruption can contribute to residual instability following reduction [8].

Complex elbow dislocations result in disruption of the surrounding stabilizing osseous anatomy (Figure 1a and 1b). The resulting loss of the native anatomic structures contributes to an increased rate of residual instability with these injuries. Commonly, complex dislocations are associated with fractures of the coronoid process of the ulna and the radial head, known as “terrible triad” fracture dislocation [9]. The

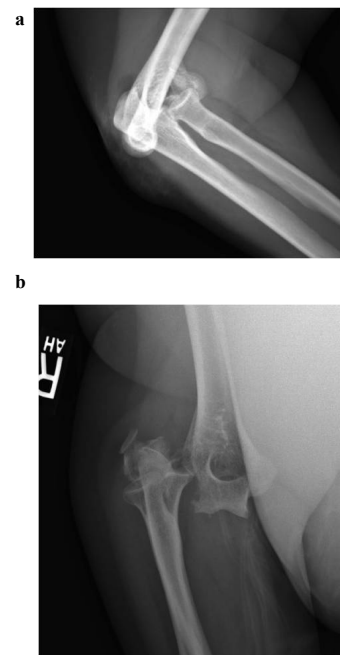


Figure 1: Anterior posterior and lateral radiograph of a complex elbow fracture dislocation.

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coronoid acts as a buttress against posterior translation of the ulna on the humerus. In general, instability increases with the increasing size of the fracture fragment. The radial head provides stability to varus types of forces as well as axial load of the articulation. With loss of structural support from the coronoid, radial head, and lateral ligamentous structures, these injuries are prone for increased incidence of residual instability.

Evaluation and Treatment

The most common mechanism of elbow dislocation is a fall onto an outstretched hand with the shoulder abducted and the elbow extended. This type of injury is commonly seen in sporting activities, motor vehicle collisions or fall from height. Patients with suspected elbow dislocations should undergo careful evaluation of the neurovascular structures as neuropraxia has been reported in up to 20% of elbow dislocations and typically involves either the Anterior Interosseous (AIN) branch of the median nerve or the ulnar nerve [8,10]. The AIN is purely a motor nerve that innervates the flexor pollicis longus muscle which is responsible for thumb interphalangeal flexion. The ulnar nerve provides sensation to the small finger and ulnar half of the ring finger, as well as motor function to the intrinsic muscles of the hand which can be tested by evaluating abduction of the digits (dorsal interossei). These nerve injuries almost always resolve following reduction of the articulation [10].

Following the exam, appropriate imaging should be obtained consisting of standard anterior posterior and lateral views of the elbow. Initial radiographs are important for confirming the dislocation, evaluating for periarticular fractures, and determining the direction of the forearm displacement. If assessment of a periarticular fracture is difficult, or if bony fragments are present, a CT scan should be obtained to assess for associated fractures or intraarticular loose bodies following reduction.

Elbow dislocations are described according to the position of the radius and ulna in relation to the humerus. Although this includes posterior, anterior, lateral and medial, posterior and lateral are the most common (Figure 2). Closed reduction of dislocated elbows can be improved with the use of conscious sedation and muscle relaxation. Posterior or posterior lateral dislocations are ideally reduced with the patient in the semi-lateral position. With the forearm in supination,



Figure 2: Posterior elbow dislocation. In this case there is an associated fracture of the radial head with a loose fracture fragment in the anterior aspect of the elbow.



Figure 3: Irreducible simple elbow dislocation. This patient was brought to the operating room in the acute setting for an irreducible elbow dislocation in the emergency department. During time of surgery, an incarcerated osteochondral fragment was found and removed (Figure 3c). When this was removed, the elbow was easily reducible (Figure 3d).

pressure is applied to the olecranon tip in a distal and posterior direction and the elbow is gently flexed. Gentle longitudinal traction may be helpful as the elbow is flexed. Typically, the elbow will reduce with a clunk and visual resolution of the deformity.

Following reduction, the elbow should be taken through a gentle range of motion to assess joint stability and determine optimal position for immobilizing the extremity. Most simple elbow dislocations are more stable in elbow flexion and forearm pronation [6]. Typically the elbow can be adequately immobilized in 90 degrees of flexion and full pronation. A posterior mold splint with side supports (sugar tong) to maintain forearm pronation should be employed and post-reduction radiographs taken to confirm reduction. Most simple dislocations should not be immobilized for more than 5-7 days. At that time, if there is concern for persistent instability, patients can be placed into a hinged elbow brace with an extension block (typically 30°). This allows patients to work on active motion exercises, which promotes dynamic stability from crossing myotendinous structures.

Residual Instability Following Reduction

Following reduction, radiographs should be taken to examine joint congruency. Persistent widening of the ulnohumeral articulation may occur as a result of extensive disruption of soft tissue structures or atony of the crossing muscle units. In these cases, if there are no associated fractures, the subluxation will likely resolve with active exercises in the weeks following injury. Typically these exercises can be initiated within several days following injury when soft tissue swelling has improved. However, it is important to recognize an elbow that remains dislocated, or near dislocated, as a result of periarticular fracture or incarcerated loose bodies (fracture fragments) (Figure 3a-3d). In these cases, acute surgical intervention may be necessary to resolve residual instability

that can lead to soft tissue or cartilage injury. Subsequent CT imaging will often help in making these diagnoses.

Complex elbow fracture dislocations are commonly associated with residual instability. Treatment for these injuries typically involves surgical repair of the coronoid fracture with screws or a plate, along with fixation or replacement of the radial head fracture. The lateral collateral ligament is also repaired directly to its origin on the lateral epicondyle. In rare cases, residual instability persists despite anatomic fixation of the osseous anatomy and lateral ligamentous repair. In these cases, the medial collateral ligament may require repair or the elbow can be placed into a spanning external fixator for 3-4 weeks in order to allow for soft tissue healing in concentric alignment.

Conclusion

Acute elbow dislocations are a relatively common injury in the adult trauma patient. Typically, these injuries can be treated with immediate reduction in the emergency department and temporary immobilization in elbow flexion to 90 degrees and forearm pronation. For elbows with an associated fracture or persistent instability following attempted reduction, further imaging with a CT scan should be obtained and some of these injuries may need to be surgically stabilized in the acute setting.

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