Elbow Dislocations in Contact Sports

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KEYWORDS

• Elbow dislocation • Contact sports • Athlete • Lateral ulnar collateral ligament

KEY POINTS

- Elbow dislocations are more common in athletes than in the general population.
- Simple elbow dislocations should be managed with early range of motion. Most simple elbow dislocations do not require surgery.
- Surgical management after simple elbow dislocation is indicated when the elbow remains unstable.
- The lateral ulnar collateral ligament (LUCL) is the most critical structure to repair or reconstruct.
- An athlete can safely return to play if there is no instability and he or she has a painless range of elbow motion.

EPIDEMIOLOGY

The elbow joint is the second most commonly dislocated large joint in the human body after the shoulder. Elbow dislocations occur in 5.1 per 100,000 people in the general population every year in the United States.[1] In a study using the National Electronic Injury Surveillance System database, approximately 44.5% of elbow dislocations were found to be sustained during sports.[1] Elbow dislocations in the National Football League (NFL) are reported to occur in 0.21 per 100,000 athlete exposures,[2] and represent 17.6% of all elbow injuries in NFL players.[3] Adolescent boys are at the highest risk for elbow dislocation (8.91 per 100,000 person-years in boys age 10–19). In high school athletes, 91.3% of dislocations are found in boys, most commonly in wrestling (46.1% of dislocations) and football (37.4% of dislocations).[4] In girls, gymnastics and skating are the most common sports resulting in elbow dislocations. Dislocations are more common in games than in practice in high school and NFL athletes.[3,4] The mechanism is most commonly contact with another person (46.9%), followed by contact with the ground (46.0%). More than half (52%) of elbow dislocations in high school football players occur on running plays, with running backs being the most frequently the injured player (23.8%).[4]

With the rise in popularity of snowboarding, there has been an increase in elbow injuries. Elbow dislocations are significantly more common in snowboarders than skiers. Twenty-six percent of elbow injuries in snowboarders are dislocations, compared with 5.3% in skiers ($P<.001$). This is believed to be caused by fixed position of snowboarders' feet, as opposed to skiers who have independent movement of their lower extremities, which in turn results in more impact to upper extremities than lower.[5]

PATHOANATOMY

Osteoarticular and Ligamentous Anatomy

The elbow joint is a ginglymoid (hinged) joint and a trochoid (rotary motion) joint, consisting of the

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distal humerus, proximal ulna, and radial head.[6] The olecranon and coronoid processes of the ulna articulate with the trochlea of the humerus. The concave radial head articulates with the convex capitellum of the humerus as an important secondary stabilizer.[7]

The coronoid process is the insertion point for the anterior capsule and the anterior band of the ulnar collateral ligament (UCL), also known as medial collateral ligament complex (MCL). The MCL is composed of anterior, posterior, and transverse bands. The anterior band is the primary static constraint for valgus instability. The anterior band originates from the anteroinferior medial epicondyle and inserts on the sublime tubercle of the coronoid process.[8]

The lateral collateral ligament (LCL) complex is made up of four components: (1) the radial collateral ligament, (2) the lateral ulnar collateral ligament (LUCL), (3) the annular ligament, and (4) the accessory collateral ligament.[9] The LCL complex origin is at the inferior lateral epicondyle. The radial collateral ligament inserts on the annular ligament and stabilizes the radial head. The LUCL inserts on the supinator crest of the ulna. It is a primary static stabilizer of the elbow, providing varus and posterolateral rotatory stability.[10] The annular ligament inserts on the anterior and posterior margins of the lesser sigmoid notch. The radial collateral ligament or the LUCL can be ruptured without resulting in posterolateral rotatory instability when the annular ligament is intact.[11] The accessory collateral ligament inserts on the annular ligament and the on the supinator crest.

The primary stabilizers of the elbow are the ulnotrochlear joint, MCL, and LCL complex. The secondary stabilizers include the radial head, the anterior and posterior joint capsule, and the common flexor and extensor muscle origins. In addition, there are also dynamic stabilizers of the elbow joint. These include the anconeus, biceps, brachialis, and the triceps muscles.

Simple dislocations are defined as dissociation of the ulnohumeral joint without fracture. Complex dislocations are those that are associated with a fracture. Associated fractures include radial head and neck, coronoid, and medial and lateral epicondyles. Most elbow dislocations are simple and posterior in direction.[12]

O'Driscoll and coworkers[10] proposed the term posterolateral rotatory instability to describe the sequence of events that results in an elbow dislocation. Posterolateral rotatory instability results from a fall on an outstretched arm, combined with a rotation of the body on a fixed hand. This results in progressive ligamentous and capsular injury with four consecutive stages:

- Stage I: LUCL disruption, and possible injury to radial collateral ligament and posterolateral capsule.
- Stage II: Ulna (coronoid) perches on the distal humerus. There is disruption of the anterior and posterior capsule. Such an elbow would have a positive lateral pivot-shift test, varus instability, but maintained stability to valgus stress (because the anterior band of the UCL is intact).
- Stage IIIa: Further disruption of the posterior UCL with increased external rotation. Posterior dislocation occurs with axial compression. The coronoid slips under the trochlea and comes to rest posterior to it. The anterior band of the UCL is still intact, so valgus stability is maintained.
- Stage IIIb: Disruption of the anterior band of the UCL.

Although this has historically been the accepted mechanism of posterolateral rotatory instability, others have suggested that at times, dislocation may start medially.[13] Nonetheless, posterior elbow dislocations result in various degrees of ligamentous injuries on the lateral aspect of the elbow. On a much rare form of this injury, the elbow may dislocate posteriorly as a result of an anteriorly directed force. In this rate injury pattern, all anterior structures including anterior portion of the UCL, joint capsule, and brachialis muscle are ruptured (**Figs. 1** and **2**).

EVALUATION OF PATIENT WITH A DISLOCATED ELBOW

Examination

Deformity is usually obvious in the acute setting. Neurovascular examination is important before and after reduction. The ulnar nerve is the most frequently injured nerve; however, both median and radial nerve injuries have been reported.[14–16] Arterial injuries occur in 0.3% to 6% of closed elbow dislocations and in up to 33% of open elbow dislocations.[17–19]

Imaging

Some authors advocate immediate reduction at the sporting event,[20] whereas others argue for radiographs before reduction to identify any associated fractures and to assess the congruency of the joint.[21] We recommend anteroposterior (AP) and lateral radiographs of the elbow before and after reduction. On the lateral radiograph, an ulnohumeral distance (measured from the trochlear sulcus to the olecranon) of greater than or equal to 4 mm is referred to as a positive "drop sign," and