

The Management of Elbow Dislocations and Associated Lesions: A Review Article

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Abstract

Dislocations around the elbow joint can be isolated (termed a simple elbow dislocation), or occur with concurrent ligamentous and/or bony injuries. In cases of a simple elbow dislocation, surgery is rarely required. Patients should be evaluated radiographically for a concentric reduction, immobilized for 7-10 days, and begin early range of motion activities. In patients who return for follow-up with no bony injuries but a loss of concentric reduction, surgical treatment is recommended. This may consist of static or dynamic external/internal fixation or direct repair of the damaged ligamentous structures. Fractures associated with elbow dislocations may be difficult to identify and require computed tomography (CT) scans to characterize. A terrible triad injury consists of a radial head fracture, coronoid fracture, and ulnohumeral dislocation. This may be associated with lateral collateral ligament (LCL) and/or medial collateral ligament (MCL) injuries. These injuries require operative treatment with open reduction and internal fixation of the coronoid, fixation or replacement of the radial head, and repair of damaged ligamentous structures, depending on the specific injuries.

Keywords: Elbow Joint; Upper Extremity; Joint Dislocations; Surgical Procedures

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Background

The elbow joint is a complex articulation between the distal humerus, proximal ulna, and proximal radius. The distal humerus consists of an arch created by the two condyles, which create a "track" for the trochlea. Anteriorly, the capitellum matches the curvature of the radial head, while the coronoid fossa accommodates the coronoid process in flexion (1).

Soft tissue structures around the elbow are critical for static and dynamic stabilization. On the medial side of the elbow, the medial or ulnar collateral ligament (UCL) complex consists of three discrete components: anterior bundle, posterior bundle, and transverse or oblique component. The anterior bundle is the most significant contributor to elbow stability. It originates from the medial epicondyle and inserts on the sublime tubercle along the anteromedial coronoid facet. On the lateral side of the elbow, the lateral collateral ligament (LCL) complex consists of less discrete structures including the radial collateral ligament (RCL), which originates from the lateral epicondyle and inserts on the supinator crest of the proximal ulna (1, 2).

The muscles around the elbow are also important secondary stabilizers. The common extensors originate on the lateral epicondyle, while the flexor-pronator muscles originate on the medial epicondyle. Both muscle groups provide dynamic compression throughout the elbow range of motion (1).

Simple Elbow Dislocation

The vast majority of elbow dislocations without associated fractures can be treated conservatively (3). Patients typically present with pain, gross deformity, and significantly limited motion of the elbow. Plain radiographs will show a dislocation, which is most

commonly posterolateral (Figure 1).



Figure 1. Anteroposterior and lateral radiographs of an athlete who sustained a posterolateral elbow dislocation during competition

Initial treatment of these injuries consists of a closed reduction in the emergency department. Post-reduction images are carefully evaluated for the presence of associated fractures (Figure 2). Advanced imaging with computed tomography (CT) scan is recommended if there is a concern for associated fractures, especially of the coronoid or radial head (2, 3).

After initial reduction, simple elbow dislocations should be immobilized for comfort for 7 to 10 days. Radiographs should be repeated at that time to ensure reduction is maintained and early passive and active motion is initiated. This is important to help stabilize the elbow with compression around the joint by the periarticular muscles.





Figure 2. Anteroposterior and lateral radiographs of the same patient after closed reduction (Note: there do not appear to be any associated fractures of any significance and the reduction is concentric)

In some cases, radiographs will show subluxation of the joint with the widening of the ulnohumeral joint (the so-called “drop sign”). This is typically due to the lack of active muscle use and often resolves without further intervention once the patient begins mobilizing. If not, surgical stabilization may be indicated (see below) (3).

Isolated Ligamentous Injuries

In some cases, when patients present for initial follow-up, radiographs will show re-dislocation or significant subluxation of the joint. In these cases, surgical management is generally indicated. There are two general approaches to surgical management: indirect approaches include static or dynamic external fixation or cross-pinning of the joint, while direct approaches include open reduction and direct repair of damaged ligamentous structures. The authors prefer open ligamentous repair in these scenarios. The primary benefits of this are the avoidance of a second surgery for hardware removal and the potential for earlier mobilization with decreased postoperative stiffness.

In figure 3, a case is shown of a patient who had a non-concentric reduction at the time of the first clinic follow-up after a simple elbow dislocation. The patient was taken to the operating room and found to have “bare spots” on both epicondyles from proximal avulsions of both collateral ligament complexes.

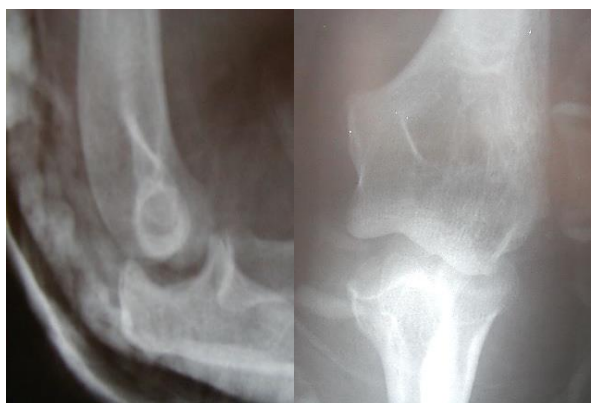


Figure 3. Anteroposterior and lateral radiographs of a patient who presented to the clinic with a non-concentric reduction after an initial elbow dislocation without associated fractures

On the lateral side, the injury included the common extensor origin. Postoperative radiographs demonstrated concentric reduction after the repair of the soft tissue structures (Figure 4).

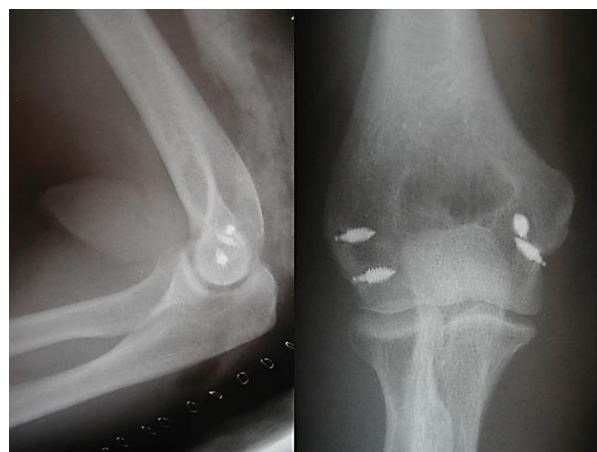


Figure 4. Anteroposterior and lateral radiographs of the same patient after open reduction and soft-tissue repair with suture anchors demonstrating a concentric joint space

Elbow Fracture-Dislocation

Elbow dislocations may occur in conjunction with a fracture of the radial head, coronoid, or both. The “terrible triad” of the elbow refers to a dislocation of the ulnohumeral joint with associated radial head and coronoid fractures. These are challenging injuries with a high rate of complications, most commonly elbow stiffness and recurrent instability (4). Figure 5 demonstrates a terrible triad injury before and after the initial closed reduction.

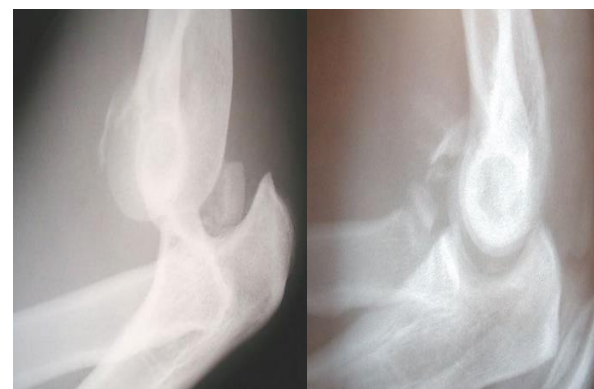


Figure 5. Lateral radiographs of a terrible triad injury showing coronoid and radial head fractures before and after a closed reduction in the emergency department

Terrible triad injuries should be treated surgically with open reduction and internal fixation versus replacement of the radial head, open reduction and internal fixation of the coronoid versus anterior capsular repair, and primary repair of the LCL, with medial collateral ligament (MCL) repair as needed.

Either a direct lateral (and separate medial, if necessary) or posterior approach can be utilized. The lateral side should be evaluated first. Typically, the LCL complex is avulsed from the distal humerus, leaving a bare spot; the surgeon should take advantage of this defect which is incorporated into the surgical approach. There may additionally be disruption of the common extensor origin. These structures are tagged for later repair and then retracted from the field. Bony and soft tissue structures should be fixed in a deep to superficial (medial to lateral) direction: coronoid/anterior capsule, radial head, and lateral ligament complex. The medial ligament

complex can be repaired as well in certain situations (5).

The coronoid is addressed first. Radial head fragments can be excised if the plan is for arthroplasty due to comminution (seen in 60-70 percent of cases). This improves visualization of the coronoid fragments (Figure 6-a). The treatment of coronoid fractures depends on fracture characteristics. Small fractures of the coronoid tip can be treated with suture repair of the anterior capsule through drill holes. Larger fragments can be fixed with Kirschner wires (K-wires) provisionally (Figure 6-b), followed by cannulated screw fixation. In comminuted fractures, the largest fragment possible should be fixed to restore the anterior buttress. A separate medial approach and plate fixation may be required for large anteromedial facet fractures.

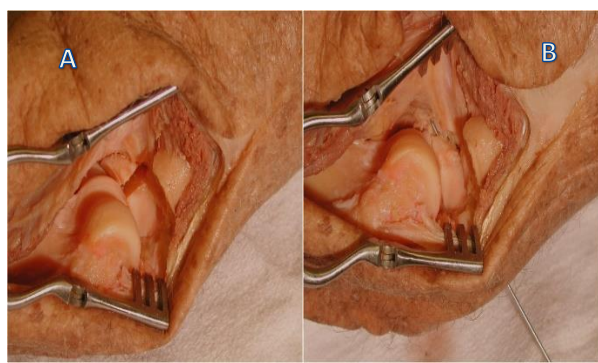


Figure 6. a) Lateral exposure with excision of radial head fragments demonstrating excellent visualization of coronoid fracture, also demonstrating the bare spot on the distal humerus; b) Subsequent image demonstrating reduction and temporary stabilization of coronoid fragment with a Kirschner wire (K-wire)

The radial head is then treated with either open reduction and internal fixation or radial head arthroplasty (Figure 7). Arthroplasty is recommended in the presence of 3 or more comminuted fragments. Care must be taken to ensure the appropriate sizing of an artificial radial head and to avoid overstuffing. It is critical to take the elbow through a full range of flexion-extension and pronation-supination intraoperatively to ensure appropriate sizing of the implant.



Figure 7. a) Postoperative radiograph demonstrating fixation of a radial head fracture with countersunk screws; b) Postoperative radiograph demonstrating radial head arthroplasty performed in the setting of a comminuted radial head fracture

After fixing the bony injuries, the LCL complex should be repaired with high-strength non-absorbable sutures. Care should be taken to ensure reattachment of the

ligament to the isometric center of the ulnohumeral joint with either suture anchors or drill holes through the bone. Mid-substance tears and tears of the common extensor origin should be repaired primarily with high-strength non-absorbable suture.

At this point, the stability of the elbow should be reassessed. If there is residual posterior or posterolateral instability, consideration should be given to re-evaluation of fracture reduction, repair of the MCL complex, or application of a hinged fixator. If the elbow is stable, the patient can be placed in a posterior long-arm splint for no longer than 10 days. Depending on strength of fixation and repair, the early range of motion can begin within 10 days of surgery.

This protocol was evaluated retrospectively in thirty-six elbows at two institutions. At an average of thirty-four months postoperatively, patients had a mean flexion-extension arc of 112° with forearm rotation of 136°. The mean Mayo Elbow Performance Score (MEPS) was 88. Eight patients (23.5%) required re-operation, of which one was for recurrent instability (6).

Conclusion

Simple elbow dislocations can generally be treated with non-operative management and early range of motion. In cases of residual instability without fracture, ligamentous structures may need to be repaired. For complex elbow dislocation, a standardized approach should be used for the fixation of associated fractures and soft tissue injuries.

Conflict of Interest

The authors declare no conflict of interest in this study.

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