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Review article

Lateral elbow instability

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Abstract

Lateral elbow stability utilises a combination of bony and soft tissue constraints. Lateral elbow instability is usually associated with an episode of elbow dislocation. Isolated lateral ligament complex insufficiency results in posterolateral rotatory instability (PLRI), The most common presentation is lateral elbow discomfort and a sensation of instability, without recurrent dislocation. The lateral pivot shift test is unreliable for diagnosing PLRI when the patient is awake due to significant apprehension. Stress radiographs, fluoroscopy, computed tomography and arthroscopy are all useful investigations to confirm the diagnosis of lateral instability. Surgical treatment is indicated for functional instability. All associated fractures need to be addressed. In severe cases, the medial structures and the posterolateral capsule may also require reconstruction.

Keywords: Elbow instability; Elbow dislocation; Ligament reconstruction; Posterolateral rotatory instability

Introduction

Simple elbow dislocation is relatively common, accounting for 11−28% of all elbow injuries.[1] The most common direction of instability is posterior and postero-radial.[2] The majority of patients have good results from closed reduction and non operative management, but up to 35% will have recurrent lateral elbow instability symptoms.[1,3] This recurrent instability can be a debilitating problem for the patient.[4]

This article will describe: (1) the relevant anatomy of the stabilising structures about the elbow, (2) the pathological processes involved in acute and recurrent lateral elbow instability, (3) the common presentation of patients with this condition, (4) the relevant investigations required to confirm the diagnosis and (5) treatment options.

Anatomy

The inherent stability of the elbow relies on a combination of bony articulations and soft tissue restraints. There are three separate articulations in the elbow joint: the ulnotrochlear, radiocapitellar and proximal radioulnar joints.[5] The soft tissue restraints consist of joint capsule, the collateral ligaments and the musculotendinous complexes that span the elbow joint.

Coronoid

The coronoid is the most important stabiliser to anterior and posterior translation. It forms a buttress against posterior dislocation of the ulna on the humerus and it is the attachment point of the anterior MCL band, the middle third of the anterior capsule and the deep head of the brachialis.

Lateral collateral ligament

The lateral collateral ligament (LCL) complex arises from the lateral epicondyle at the isometric point of the elbow. The

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complex had four components: the lateral ulnar collateral ligament (LUCL), the lateral radial collateral ligament (LRCL), the accessory lateral collateral ligament and the annular ligament. (Fig. 1). The LUCL inserts on tubercle of the supinator crest of the ulna. It is the primary restraint to ulna supination on the humerus. The LRCL inserts into the annular ligament, stabilising that ligament and providing varus restraint.

Medial collateral ligament

The medial collateral ligament (MCL) complex has three components: the anterior, the posterior and transverse bands. The anterior and posterior bands arise from the anterior-inferior aspect of the medial epicondyle. The anterior band inserts onto the sublime tubercule into the anteromedial aspect of the coronoid process and the posterior band into the medial margin of the greater sigmoid notch. The anterior band is the most important restraint to elbow valgus and the posterior band is the primary restraint to pronation of the ulna on the humerus.[6] The transverse bundle does not have a role in elbow stability.[7]

Elbow stability

The structures that stabilise the elbow can be classified as primary, secondary and dynamic stabilisers. The *primary stabilisers* include the ulnotrochlear articulation, MCL complex and LCL complex.[8] The *secondary stabilisers* augment stability and become particularly important when there is insufficiency of the primary stabilisers. They are the radiocapitellar articulation, the anterior and posterior capsule and the common flexor and extensor muscle origins. In addition there are *dynamic stabilisers* consisting of the brachialis, anconeus, biceps and triceps muscles.[8]

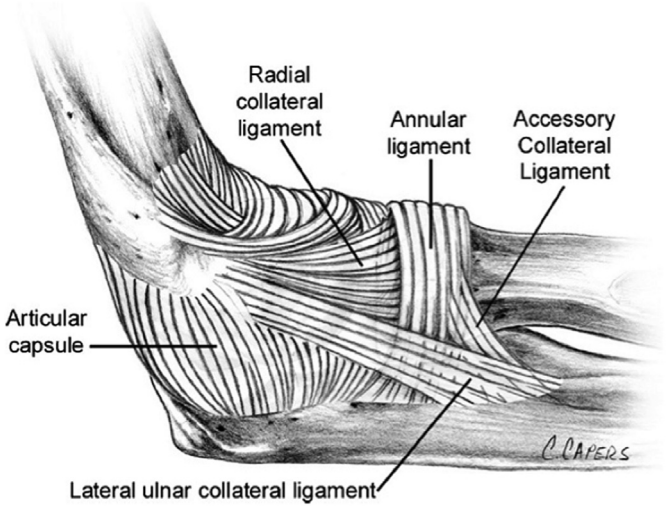

Fig. 1. Lateral collateral ligament complex. Figure used with permission from Bain GI, Mehta JA. Anatomy of the elbow joint and surgical approaches. In: Baker CL Jr, Plancher KD, eds. *Operative Treatment of Elbow Injuries.* New York, NY: Springer-Verlag;2001:1–27.

The anconeus and the deep head of brachialis span the lateral aspect of the elbow joint, parallel to the lateral ulnar collateral ligament (LUCL). The anconeus is posterior to the lateral epicondyle and the deep head of brachialis is anterior. This dynamic muscular sling helps protect the LUCL when subjected to a forced supination of the ulna on the humerus.[9]

Pathoanatomy

Osborne and Cotterill[10] described the mechanism of injury and pathoanatomy of both simple and recurrent elbow dislocation in 1966. They reported that the lateral ligament is stripped superiorly and the posterolateral capsule is torn, allowing the head to rotate posteriorly from the Capitellar surface. The essential defect in recurrent instability was the failure of the lateral structures to become reattached to the humerus.[10]

O'Driscoll et al. proposed that in an elbow dislocation, there is a three-stage sequence of soft tissue disruption,[11] also referred to as the Circle of Horii.[12] Disruption of the LCL complex (particularly the LUCL) results in posterolateral rotatory subluxation of the elbow. As the injury progresses, the anterior and posterior capsules are disrupted, then finally the MCL is ruptured. When the lateral and medial soft tissues are disrupted, the joint can dislocate even with immobilization of the elbow in 90° of flexion.

Although a dislocation usually involves injury to both medial and lateral structures, residual instability is more common on the lateral side. Most activities of daily living place a varus stress across the elbow, which stresses the lateral structures.[4]

To manage lateral elbow instability effectively, the surgeon must be aware of the pattern of instability and the structures that are likely to be deficient. Elbow instability can be classified according to the direction of the instability episode and the associated injury to the different stabilising components.

Posterolateral rotatory instability (PLRI)

This is the most common pattern of instability. When the LCL complex fails, it avulses as a sheet along with the capsule and the common extensor origin on the humerus. With persistent subluxation of the joint it displaces distally to lie over the articular surface of the capitellum, to which it is unable to heal.[13] The loss of this restraint allows the radial head to subluxate posteriorly on the capitellum.

In O'Driscoll et al.'s[14] classical description of PLRI, the LUCL was the key structure responsible for maintaining stability. However, this model has since been called into question. Recent literature has suggested that the components of the lateral ligament complex act in combination to prevent PLRI, rather than the LUCL acting in isolation.[15]

Varus instability

This occurs when the LCL is disrupted, either after an acute dislocation or in a chronic case where the ligament complex