CQ HAND + UPPER LIMB
SPECIALIST ORTHOPAEDIC SURGEON

EVIDENCE SUMMARY

Golfer's Elbow Release

Anatomy & Pathophysiology

BONY ANATOMY

- The elbow is a trocho-ginglymoid joint consisting of medial and lateral articulations that provide bony stability [3].
- The medial articulation involves the trochlea and the ulna within the greater sigmoid notch, forming the ulnohumeral hinged portion [3].
- The ulnohumeral joint exhibits highly congruent anatomy through almost 180° of articular contact, with the exception of a bare area on the greater sigmoid notch devoid of cartilage [3].
- The coronoid process possesses medial and lateral facets that buttress the trochlea anteriorly [3].
- The sublime tubercle is located just distal and medial to the coronoid and serves as the attachment site for the anterior bundle of the medial ulnar collateral ligament [3].
- The medial epicondyle serves as the attachment site for the origins of the flexor pronator mass and is larger and more posteriorly oriented than the lateral epicondyle [3].
- The lateral articulation involves the capitellum and radial head, forming the radiocapitellar joint [3].
- The radius is held in close approximation to the ulna at the proximal radioulnar joint by the annular ligament [3].
- The area of the ulna that articulates with the margin of the radial head at the proximal radioulnar joint is known as the lesser sigmoid notch [3].
- The radial head is a concave elliptical structure covered with articular cartilage along the radiocapitellar joint and approximately 270° of the articular margin [3].
- The radial head articulates with both the capitellum and the lesser sigmoid notch [3].
- The lateral epicondyle is the origin of the lateral extensor musculature [3].
- The origin of the lateral ulnar collateral ligamentous complex is located just distal to the lateral epicondyle at the geometric center of the radiocapitellar articulation [3].
- The distal humeral articulation is angled 30° from the longitudinal axis [3].
- The anterior humeral line should pass through the center of the axis of rotation [3].

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- The axis of rotation is angulated 5° to 7° in the coronal plane relative to the epicondylar axis, with the medial side more distal than the lateral side [3].
- The angulation of the distal humeral articulation accounts for the change from a valgus carrying angle to a more varus position as the elbow is flexed [3].
- There is a high correlation between the size of the radius and capitellum on the left and right sides within the same individual [3].
- The olecranon provides a broad attachment site for the triceps [3].
- The ulna bends approximately 8° medially at 8 cm from the tip of the olecranon [3].
- The articulation to the tip of the coronoid is approximately 30° from the long axis of the ulna in the sagittal plane [3].

LIGAMENTS & STABILITY

- Elbow stability is determined by primary and secondary stabilizers [1].
- The three primary stabilizers of the elbow are the ulnohumeral articulation, the medial ulnar collateral ligament, and the lateral ulnar collateral ligament complex [1].
- Secondary stabilizers include the radiocapitellar articulation, the common flexor tendon, the common extensor tendon, and the joint capsule [1].
- The medial ulnar collateral ligament is the primary valgus stabilizer of the elbow [4].
- The anterior bundle of the medial ulnar collateral ligament is the most important component for stability [4].
- The posterior bundle of the medial ulnar collateral ligament exhibits the greatest change in length and becomes taut at flexion beyond 120 degrees [4].
- The lateral ulnar collateral ligament acts as a posterolateral stabilizer [4].
- Osborne's ligament stabilizes the ulnar nerve in the cubital tunnel [4].
- The ligament of Struthers is a variant anatomy arising from the supracondylar process to attach to the medial epicondyle and is a potential site of median nerve compression [4].
- Tensile forces are present at the medial elbow, while compressive forces are present at the lateral elbow [4].
- The joint capsule allows maximum distension at approximately 70 to 80 degrees of flexion [4].
- The anterior capsule attaches at a point approximately 6 mm distal to the tip of the coronoid [4].
- The coronoid tip is an intraarticular structure that is visualized during elbow arthroscopy [4].

MUSCLES & TENDONS

- The brachialis is the strongest elbow flexor and attaches to the coronoid 11 mm distal to the tip [4].
- The biceps brachii inserts at the ulnar margin of the radial tuberosity, with the long head inserting proximally and the short head distally [4].
- The biceps brachii is a powerful supinator of the forearm [4].
- The triceps is the primary elbow extensor and inserts on the olecranon process [4].

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- The mobile wad consists of the brachioradialis, extensor carpi radialis longus, and extensor carpi radialis brevis [4].
- The flexor-pronator mass consists of the pronator teres, flexor carpi radialis, palmaris longus, flexor carpi ulnaris, and flexor digitorum superficialis [4].
- The common origin of the extensor muscles is attached to the lateral condylar fragment [6].
- The common origin of the extensor muscles can be separated from the lateral epicondyle with a thin flake of bone or divided just distal to the lateral epicondyle [6].

BIOMECHANICS & MOTION

- The normal elbow has a range of motion from 0° to 140° from extension to flexion [1].
- The normal elbow has a range of motion of 75° in pronation and 85° in supination [1].
- A functional arc for the elbow is 100° for flexion and extension [1].
- A functional arc for the elbow is 100° for forearm rotation [1].

Investigations

HISTORY AND PHYSICAL EXAMINATION

- The physical examination of the elbow is directed by the history and the location of the patient's pain in the anterior, posterior, medial, or lateral aspect of the elbow [1].
- The normal elbow has a range of motion of 75° and 85° in pronation and supination, respectively [1].
- A functional arc for the elbow is 100° for flexion and extension and forearm rotation [1].
- Elbow stability is determined by primary stabilizers, which include the ulnohumeral articulation, the medial ulnar collateral ligament (MUCL), and the lateral ulnar collateral ligament (LUCL) complex [1].
- Secondary stabilizers of the elbow include the radiocapitellar articulation, the common flexor tendon, the common extensor tendon, and the joint capsule [1].
- The ulnar nerve is of utmost importance in the physical examination due to its anatomic proximity to the elbow [9].
- The posterior bundle of the medial collateral ligament (MCL) forms the floor of the cubital tunnel along the course of the ulnar nerve [9].
- Electromyography and nerve conduction velocity studies should be performed if there is any question about neurologic dysfunction [9].
- An assessment for ulnar nerve subluxation should be performed during the physical examination [9].
- Subluxation of the ulnar nerve is a relative contraindication for an arthroscopic procedure secondary to possible iatrogenic nerve injury [9].
- If the elbow has less than 90° to 100° of flexion, the posterior bundle of the medial collateral ligament (MCL) is contracted and must be released to restore flexion [9].

- Pain during the mid-arc of range of motion is more common with intrinsic disease and may not improve with contracture release alone [9].

IMAGING

- Plain radiographs remain the hallmark and the best screening test for elbow evaluation [1].
- Standard radiographic views for the elbow include AP, lateral, and oblique views [9].
- Serial radiography is used as follow-up when heterotopic ossification is present [9].
- Primary bony landmarks identified on radiographs include the ulnohumeral joint, coronoid process, radial head, capitellum, radiocapitellar joint, olecranon tip, coronoid/olecranon fossae, and trochlear ridge [9].
- CT is helpful when assessing for malunion architecture and the location and pattern of osteophytes and/or loose bodies [9].
- Three-dimensional CT is used to check for heterotopic ossification [9].
- CT is not necessary when the stiffness is entirely soft-tissue related [9].
- CT is beneficial if any joint incongruity or abnormal bony anatomy is present [9].
- MRI can be used to evaluate ligaments and tendons, but it is rarely indicated for elbow stiffness [9].
- AP, lateral, oblique, and axillary views of the elbow may reveal posteromedial olecranon osteophytes and/or loose bodies in valgus extension overload syndrome [11].
- CT with two-dimensional reconstruction and three-dimensional surface rendering best visualizes the pathology of valgus extension overload syndrome [11].
- MRI may be most helpful in evaluating associated injuries including partial or complete tears of the medial collateral ligament (MCL) in valgus extension overload syndrome [11].
- Radiographic evaluations are essential when diagnosing an osteochondritis dissecans (OCD) lesion of the elbow [12].
- Important aspects of OCD lesions may be better seen with MRI [12].
- Standard AP and lateral radiographs should be obtained for the evaluation of elbow osteoarthritis [13].
- Radiographs for elbow osteoarthritis typically show osteophyte formation at the coronoid process, coronoid fossa, radial fossa, radial head, olecranon tip, and olecranon fossa [13].
- Joint spaces at the ulnohumeral joint are usually preserved in elbow osteoarthritis [13].
- Joint spaces at the radiocapitellar joint are mildly narrowed in elbow osteoarthritis [13].
- Loose bodies may be evident on radiographs, which typically underestimate the number present [13].
- CT may be useful for surgical planning of elbow osteoarthritis, allowing a detailed assessment of osteophytes and the presence of loose bodies [13].

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