Operative Techniques in
Sports Medicine

Elbow Arthritis in the Athlete

Julia Lee, MD, and Scott P. Steinmann, MD

The physical demands of an athlete on the elbow joint can stress the native kinematics of the elbow joint leading to injury, aberrant mechanics, or osteoarthritis. Understanding the athletic demands and pathomechanics are paramount in diagnosing and treating this condition since painful motion and pathologic loss of function can be physically, as well as psychologically, devastating in this population. Accurate diagnosis can be achieved with physical exam and advanced imaging including computed tomography with three-dimensional reconstruction. After failure of conservative treatment, surgical intervention for elbow osteoarthritis in an athletic population includes open and arthroscopic debridement with total elbow arthroplasty as a salvage, activity-ending option. Arthroscopic treatment for arthritis is preferred as this limits soft tissue trauma, which may allow for quicker recovery and decreases associated morbidity. Preoperative planning and systematic arthroscopic technique facilitate understanding of elbow pathology and technical efficacy of elbow arthroscopy. Outcomes of debridement have shown improvements in range of motion, pain relief, and return to sport.
Oper Tech Sports Med ∎:∎∎∎-∎∎∎

KEYWORDS elbow arthritis, elbow debridement, elbow injuries in athletes, elbow arthroscopy

Introduction

The demands that an athlete puts on the elbow joint can test the limits of human mechanics. As an individual that hits harder, lifts heavier, and stretches further than the general population, these actions may stress the native kinematics of the elbow joint. Ability to maintain range of motion and strength is imperative for the swinging, throwing, and climbing that athletes do. Elbow arthritis can be devastating in this population, with painful motion as well as pathologic loss of motion. This chapter will address elbow anatomy and mechanics, elbow pathology affecting athletes, physical exam, radiology, treatment, and outcomes.

Elbow Anatomy

The elbow is a ginglymus joint, with inherent stability in its bony structure. This joint is comprised of the distal humerus, the proximal ulna, and the proximal radius. The intimate articulation of the ulnohumeral joint, specifically the coronoid, accounts for the majority of the primary static stability of the elbow.[1] In addition to the ulnohumeral articulation, the anterior bundle of the medial collateral ligament and the lateral collateral ligament are the other 2 primary static stabilizers of the elbow joint. Secondary stabilizers of the joint include the radiocapitellar joint, the common flexor tendon, the common extensor tendon, and the joint capsule.[2] The surrounding muscle envelope acts as a dynamic stabilizer of the joint with the stabilizing effect more prominent along the medial aspect of the elbow.

Full range of motion of the elbow is defined as 0°-145° of extension-flexion, 80° of pronation, and 90° of supination. A functional arc of motion for routine activities of daily living is defined as 30°-130° of extension-flexion, 55° of pronation, and 65° of supination.[3] In athletes, however, there is oftentimes a need for full terminal extension to 0° rather than functional extension to 30.[4-6]

The medial collateral ligament originates on the medial epicondyle and is comprised of 3 parts: the anterior band, the posterior band, and the transverse band. The anterior band inserts onto the sublime tubercle and is the primary stabilizer to valgus stress.[3] The posterior band inserts onto the olecranon and can play a role in elbow stiffness, particularly with elbow flexion.[7]

Department of Orthopedic Surgery, Mayo Clinic, Rochester, MN.
Address reprint requests to Scott P. Steinmann, MD, Department of Orthopedic Surgery, Mayo Clinic, 200 1st St SW, Rochester, MN 559050. E-mail: lee.julia@gmail.com

http://dx.doi.org/10.1053/j.otsm.2017.08.007
1060-1872//

The lateral collateral ligament consists of the radial collateral ligament, lateral ulnar collateral ligament (LUCL), and annular ligament, all of which work to stabilize the elbow against varus stress.[2]

Elbow Mechanics

Stability and transition of joint forces through elbow depends on the position of the elbow. In full extension, 60% of the axial load through the wrist is transmitted through the radiocapitellar joint and 40% through the ulnohumeral joint. In flexion, however, there is approximately equal force through the trochlea and capitellum. In extension the anterior capsule provides 85% of the resistance to distraction while in flexion the ulnar collateral ligament provides 80% of resistance to valgus stress.[8]

Elbow mechanics and specific requirements of the upper extremity kinetic chain for different sports have been reported, oftentimes involving the core, shoulder, hip, and legs.[9] In overhead throwing, forces on the elbow include lateral-side compression, posterior shear, and medial-side tension.[6,8] In tennis, efficiency of energy transmission through the elbow joint has been shown to positively correlate with competition level and negatively correlate with injury.[10] Gender and competition-level differences in golf swing mechanics and subsequent injury patterns have also been shown.[11,12] Recent literature has suggested that mechanical forces on a joint, whether acute or chronic, can lead to post-traumatic osteoarthritis.[13,14] Additionally abnormal joint kinematics secondary to ligamentous instability may lead to degenerative changes.[15]

Conditions that Affect Athletes

Numerous conditions may affect athletes and a careful history and exam is needed for an accurate diagnosis. With younger athletes, a physeal injury or a dislocated radial head must also be ruled out. In younger adolescent patients who exhibit chronic shear stresses on the elbow, like baseball pitchers, the diagnosis of osteochondritis dissecans (OCD) may be considered. Although the exact mechanism of pathology is unknown, microtrauma, ischemia, and shear stresses are believed to play a role in OCD.[16] This disease process can lead to fragmentation of the cartilaginous surface, resulting in loose bodies within the joint and eventual collapse of the capitellar joint surface.

In skeletally mature athletes, the diagnosis of a stress fracture must be considered and correlated with clinical history and exam. Patients with pain in extension may have a olecranon traction spur, or synovial impingement. Impingement can result from synovitis and spurring from chronic ligament laxity in the joint.[17,18] Blocks in pronation-supination may indicate a radioulnar synostosis.[18] Arthritis can also present with decreased range of motion and pain throughout the arc of motion.

Physical Exam

The diagnosis of elbow arthritis can range in severity and a thorough history is important for guide treatment direction.

Examination should include active range of motion in flexion, extension, pronation, and supination with comparison to the contralateral side. A decrease in range of motion is one of the first signs of elbow osteoarthritis. Pain with forced flexion or extension on exam is also common in elbow arthritis.[19] The quality of the endpoint of range of motion needs to be assessed as a soft endpoint indicates a soft tissue pathology including synovitis or capsular contracture whereas a firm endpoint lends more to osseous impingement.[20] Blocks to range of motion can indicate different areas of pathology where an extension block may indicate osteophytes in the olecranon fossa and a flexion block may indicate osteophytes in the coronoid fossa, both involving the ulnohumeral joint. Blocks in pronation and supination may indicate pathology in the radiocapitellar joint.[15] There may also be crepitus with passive or active range of motion.

Location of pain is important for differential diagnosis. Pain along the lateral aspect of the joint may indicate radiocapitellar arthritis but the presence of posterolateral instability, lateral plica, posterior interosseous neuropathy, and lateral epicondylitis must be ruled out. Similarly, pain along the medial aspect of the elbow may indicate ulnohumeral pathology but ulnar neuropathy, ulnar collateral ligament insufficiency, and snapping triceps must be ruled out. Pain in the posterior aspect of the elbow can be related to loose bodies, plica, or triceps pathology[21] (Fig. 1).

Neurovascular status should be examined with careful attention to nerve pathology. A neurogenic contracture can also be a reason for decreased range of motion and the underlying nerve pathology must be addressed in addition to a contracture release.

Radiology

Plain radiographs are helpful in determining the diagnosis. Standard imaging should include 2 orthogonal views such as an AP and lateral of the elbow. These images can show joint space narrowing, osteophyte formation, and loose bodies[22] (Fig. 2). Rettig et al describe a classification system of osteoarthritis based off of radiographic images. Based off of the lateral radiograph, class I is defined as a normal radiocapitellar joint and degenerative changes in the ulnohumeral joint with coronoid or olecranon spurring. Class II is defined as mild joint space narrowing within the RC joint in addition to ulnotrochlear arthrosis. Class III includes the previous 2 classes in addition to radiocapitellar subluxation.[19] Osteophytes are found mostly at the olecranon followed by the coronoid process and radial head.[22]

A CT scan with 3D reconstruction is additionally helpful as it offers significant bony detail (Fig. 2). Understanding the bony detail can be helpful in preoperatively planning in bony morphology, osteophyte removal, and loose body location. Lim et al[23] used 3D CT scans to report on 22 consecutive patients with elbow osteoarthritis and noted that 95% had ulnohumeral joint osteophytes and 59% had radiohumeral joint osteophytes.