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Medial Collateral Ligament Tears in the Overhead Athlete: Surgical Indications and Reconstruction Technique

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The medial collateral ligament (MCL) of the elbow is commonly injured in competitive overhead athletes. Our understanding of the functional anatomy and biomechanics of the MCL, as well as our surgical indications and techniques, has evolved over time. In addition, refinement of our physical examination skills and imaging modalities has improved early diagnosis and allows easy recognition of pathologies that coexist with an MCL injury. With the many treatment options available, MCL injuries are treated with encouraging results. This article reviews the clinical presentation and evaluation of MCL injuries, surgical indications, and operative techniques for MCL reconstruction.
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Introduction

Elbow medial collateral ligament (MCL) injury was first reported in javelin throwers in 1946[1]; now, it is a well-recognized problem in overhead athletes, particularly baseball pitchers. Throwing creates an extreme valgus stress at the elbow, which is resisted primarily by the anterior bundle of the MCL.[2] The anterior bundle is subdivided into 2 bands, the anterior and posterior bands. The anterior band is active at lesser degrees of flexion up to 90°, whereas the posterior band is most active from 60° to higher degrees of flexion.[3-5] In addition to the MCL complex, the flexor-pronator mass, triceps, and anconeus provide dynamic valgus elbow stability.[6-8] Repetitive throwing can cause both acute tearing and cumulative microtrauma to the MCL. These injuries can then lead to secondary valgus instability, posterior olecranon osteophyte formation, ulnohumeral chondral damage, and ulnar neuritis.

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Clinical Evaluation

History

An MCL injury can present along a spectrum, from an athlete experiencing a sudden pop with acute pain to insidious onset of vague discomfort, tightness, and loss of accuracy and velocity. Treatment recommendations are formulated based on these and many other factors, including patient characteristics, history, and physical examination. Key patient features include age, sport, position, competitive level, and future aspirations. Important injury factors include prior surgery (especially arthroscopic posteromedial decompression or olecranon stress fracture fixation) or recent change in activity, such as modification in pitching mechanics. Kinetic chain dysfunction such as leg, hip, and core weakness or inflexibility should be ascertained. In addition, information regarding the duration of symptoms, prior episodes of symptoms, the precise location of pain or discomfort, ulnar nerve symptoms, and any symptoms related to posterior impingement needs to be established.

Physical Examination

The medial elbow is first palpated for tenderness along the course of the MCL and its insertion sites. Pain elicited with resisted wrist flexion and pronation suggests flexor-pronator injury. Ulnar nerve provocative maneuvers should be

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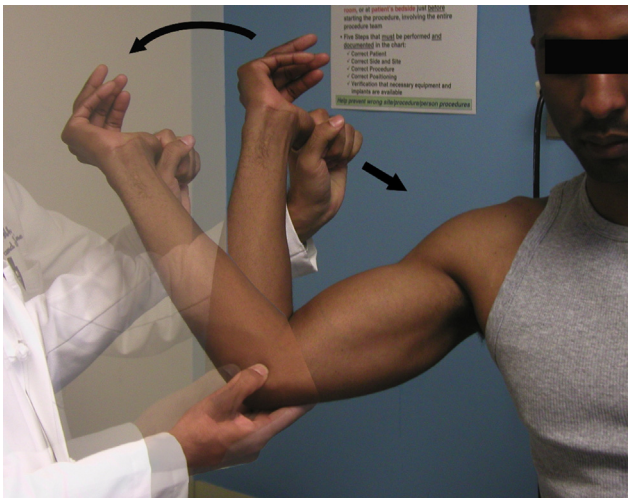

Figure 1 The moving valgus stress test is performed by the examiner applying valgus torque, while the elbow is flexed and extended. The test is considered positive if the elbow pain is reproduced at the MCL and is most severe between 70° and 120° of elbow flexion. (Image courtesy of Columbia University Center for Shoulder, Elbow and Sports Medicine.) (Color version of figure is available online.)

performed, including direct palpation along the course of the ulnar nerve, the Tinel test over the cubital tunnel, and the elbow flexion test. In addition, the presence or absence of ulnar nerve subluxation should be evaluated during range of motion. The moving valgus stress test is the most sensitive and specific for MCL pathology and is performed by the examiner applying valgus torque while the elbow is flexed and extended (Fig. 1).[9] The test is considered positive if elbow pain is reproduced at the MCL and is most severe between 70° and 120° of elbow flexion.

Kinetic chain dysfunction is assessed with single leg squats. The scapula should be assessed for periscapular muscle tone and bulk, as well as normal scapulothoracic rhythm during physiological shoulder motion. Scapular dysfunction is commonly found in throwing athletes and should be addressed during rehabilitation.[10] Glenohumeral internal rotation deficit (GIRD) and a lack of external rotation have been identified as risk factors for subsequent MCL injuries.[11]

Imaging

Plain anteroposterior, lateral, and oblique radiographs of the elbow are obtained to assess ossification of the MCL, loose bodies, osteophytes on the posterior olecranon tip suggesting impingement, bone deficiency at the sublime tubercle or medial epicondyle from prior fracture, abnormal epicondylar morphology, or enthesopathy at the sublime tubercle. These findings could influence treatment. Stress radiographs may assist in diagnosis if the history and findings of the physical examination are ambiguous. Three millimeters or greater of medial joint space widening on valgus stress radiographs is considered pathologic, but laxity can be found in asymptomatic patients.[3,12,13]

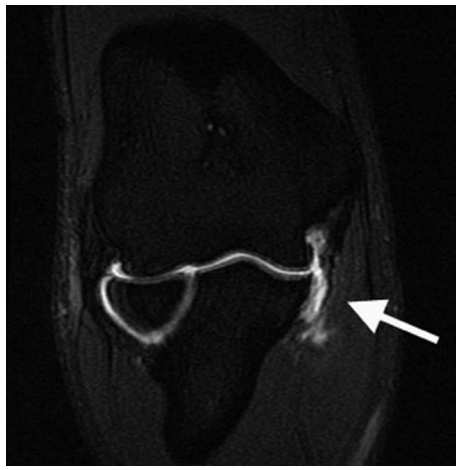

Figure 2 T2-weighted MR image with gadolinium contrast enhancement shows a torn medial collateral ligament (arrow). MR, magnetic resonance. (Image courtesy of Columbia University Center for Shoulder, Elbow and Sports Medicine.)

Suspected MCL injury is evaluated with magnetic resonance imaging. Magnetic resonance arthrography improves the diagnosis of partial undersurface tears; therefore, enhancement with intra-articular gadolinium contrast agent is a preferred technique (Fig. 2).[14,15] In addition, magnetic resonance imaging can identify coexisting pathology, such as loose bodies, flexor-pronator tendinopathy, and posteromedial ulnohumeral chondromalacia.[16]

Nonoperative Treatment

Treatment recommendations take into account numerous factors including the patient's athletic demands, expectations, and the degree of MCL injury. Nonthrowing athletes and low-demand recreational athletes are generally treated successfully with nonoperative management. High-demand athletes that have injury features favorable for healing are indicated for a trial of nonoperative treatment, these features include absence of long-term changes to the ligament, partial tears, and tears localized to the proximal insertion. Inability to participate in an upcoming season should be considered and discussed with the athlete when considering nonoperative treatment. Patient features such as young age, modifiable weaknesses in the kinetic chain, and ability to improve throwing mechanics also favor a trial of nonoperative management. Patients willing to change their sport or their position to decrease throwing demands do well with nonoperative treatment.

Coexisting ulnohumeral or radiocapitellar arthritis, flexor-pronator tears, bone deficiency at the sublime tubercle, prior elbow surgery, high-school athletes, and failure of prior ligament reconstruction negatively affect outcome following surgical reconstruction. Patients considering surgery with these coexisting pathologies should be informed of the potential for inferior results. Patient education is also essential for younger throwing athletes with unrealistic expectations of surgical treatment. High rates of misperception among young players, coaches, and parents have been identified regarding the risks,