Chapter 25
Shoulder and Elbow Disorders in the Athlete
Joseph Bernstein, MD Matthew Pepe, MD Lee Kaplan, MD

Shoulder Disorders

The throwing athlete is at increased risk for injury to the shoulder because of the large and repetitive forces generated during the throwing motion. Injuries may occur from a single supraphysiologic load or from repeated subthreshold loads that cumulatively damage the tissue.

The act of throwing has been classified, with some variation, into five stages: windup, early cocking, late cocking, acceleration, and deceleration with follow-through. This classification centers on the essential physical challenge of each phase (Figure 1). In the late cocking phase, the throwing arm is externally rotated with the arm abducted; the greater this external rotation, the greater the velocity that can be obtained from the internal rotator muscles in the acceleration phase. At the completion of the throwing motion, the arm has been internally rotated through an arc of approximately 180°. This arc is traversed at speeds approaching 7,000° per second, with great forces applied to both accelerate and decelerate the arm. As such, the arm is structurally challenged to move within a wide arc while maintaining the location of the humeral head within the glenoid fossa.

The needed range of motion is attained by allowing just enough soft-tissue laxity, and the humeral location is maintained by the action of both static and dynamic stabilizers. Static stability is provided by the capsule and ligaments, and dynamic stability is conferred by the eccentric contraction of the rotator cuff muscles. If the capsule and ligaments are insufficiently lax, the forces of throwing applied to these tight tissues may damage them. Likewise, if the capsule and ligaments are too loose or if the rotator cuff does not hold the humeral head in contact against the glenoid, forceful abutment between the articular surfaces may lead to injury. The cuff itself is subject to repetitive microtrauma with every throw as it eccentrically contracts to stabilize the humeral head in the glenoid.

Clinical Evaluation

The clinical evaluation of a throwing athlete begins with careful consideration of the shoulder symptoms. Although some throwers may report nonspecific symptoms, such as constant pain or a “dead arm,” others may describe focal complaints that localize the pathology, either in terms of the anatomic structure or the phase of throwing that induces the symptoms. A general history, to exclude a cause not associated with throwing, must also be obtained.

The physical examination includes palpation of all of the bony and soft-tissue landmarks. Range of motion should be assessed, with particular attention to the total arc of motion. It should be remembered that the shoulders of throwing athletes may undergo adaptive changes that begin during early adolescence. As such, throwers may have decreased internal rotation and increased external rotation in the abducted arm. Likewise, the coracohumeral ligament and the anterior band of the inferior glenohumeral ligament, which restrain external rotation in the abducted arm, can become lax in the throwing shoulder. The main osseous change is increased retroversion of the proximal humerus, which enables the throwing shoulder to achieve additional external rotation while keeping the glenohumeral joint located. The examiner must also remember that laxity of the medial collateral ligament of the elbow (either symptomatic or asymptomatic) may increase apparent external rotation of the shoulder by valgus gapping of the elbow. Close attention to scapular dynamic is also important. Although the scapula and surrounding muscles may not be painful, poor scapular dynamics may predispose the arm to a compensatory injury in the glenohumeral joint.

Special and eponymous physical examination maneuvers for specific lesions have been developed, but the hallmark of preoperative anatomic diagnosis is MRI, typically enhanced with an injection of contrast material. The limitations of MRI are its inability to
portray the dynamic relationship between structures and its inability to identify specifically the source of symptoms (as opposed to simply identifying structures that are incidentally abnormal in appearance). An overreliance on MRI and excessive focus on every anatomic perturbation may lead to diagnostic excess, overtreatment, and an increase in iatrogenic complications.

**Instability and Laxity**

The term shoulder instability typically refers to subluxation or dislocation, with the patient often describing a sensation indicating excessive humeral head translation on the glenoid. This sensation is rarely reported by the throwing athlete. Rather, the throwing athlete will present with what has been termed subtle or microinstability—a form of pathologic laxity that predisposes the shoulder to secondary injury; that is, the athlete will report pain with throwing or loss of mechanical effectiveness whose occult cause is instability. The thrower may also report paresthesias in the arm because of possible traction on the nerves about the shoulder girdle caused by the glenohumeral instability. A sense of subluxation or frank dislocation is atypical.

The proposed causes of the pathologic laxity include repetitive microtrauma to the anterior capsule (as the arm is maximally externally rotated) or contracture of the posterior capsule, causing secondary damage to the anterior structures. Repeated forceful loading of the humeral head may create primary laxity of the anterior stabilizing soft tissues; conversely, a tight posterior capsule that shifts the humeral head forward may result in excessive stresses on the anterior structures. A combination of factors may be involved.

If instability is considered, the shoulder examination should attempt to measure anterior translation and the presence of apprehension when the arm is abducted and externally rotated. A positive relocation test, defined as relief of the pain or apprehension when a posterior force is applied, can be helpful. Tightness of the posterior capsule should be ascertained by measuring the arc of rotation with the patient supine (or by other means that hold the scapula fixed) and the arm abducted.

Treatment of pathologic laxity depends on the severity of the laxity and the presence of concomitant abnormalities. Most throwers with evidence of pathologic laxity without labral detachment can be treated by a program of rehabilitation. Particular emphasis should be placed on stretching (to minimize any capsular contractures) and on strengthening the rotator cuff (to increase dynamic stability of the glenohumeral joint). Surgery is reserved for patients who have not been successfully treated with nonsurgical care. The precise surgical plan is defined by the physical findings. Any frank tissue damage, such as a Bankart lesion, should be repaired. Labral repairs, capsular repair shifts and plication, and rotator interval closures have been recommended, but excellent results are not uniformly obtained. If a tight posterior capsule contributes to the instability, a release may be indicated.

**Superior Labrum Anterior Posterior Tears**

Superior labrum anterior posterior (SLAP) tears are common injuries in the throwing athlete, causing pain with throwing and loss of velocity. SLAP tears have been categorized into various types, but the main dis-
tinction is whether the biceps anchor and capsule are intact (Figure 2). The most common variant is a tear with the biceps anchor detached. These injuries are believed to result from a peelback mechanism, namely, when the shoulder is abducted and maximally externally rotated and the distal part of the biceps anchor becomes avulsed from the posterior-superior glenoid rim.1

The throwing athlete with a SLAP tear often reports decreased throwing velocity and pain in the late cocking phase of the throwing motion. Mechanical symptoms, such as catching or locking, may be reported. Many physical examination maneuvers have been proposed for detecting SLAP tears, but these maneuvers might be too unreliable for clinical use.9 A SLAP tear is best diagnosed visually on imaging studies or arthroscopically. Correlating the patient's symptoms with radiographic and intraoperative findings is often challenging.

The initial treatment for a patient with a suspected SLAP tear is strengthening and stretching of the shoulder with physical therapy; surgery is indicated if nonsurgical treatments fail. Surgical treatment consists of débriding frayed tissue and stabilizing the biceps anchor and labrum back to the glenoid. Range-of-motion exercises for the elbow, wrist, and fingers should be started just after surgery; however, the shoulder should be immobilized for 2 weeks and external rotation should be avoided for 4 weeks. A recent study showed that arthroscopic repair of SLAP tears in throwing athletes allowed 70% to 80% of patients to return to a preinjury level of performance.10 The most common complication seen after a type II SLAP repair is overtightening of the repair causing postoperative stiffness and loss of motion.11 Although controversial, biceps tenotomy or tenodesis can be considered in nonthrowing athletes.

Internal Impingement
Partial, articular-sided, rotator cuff tears are common in the throwing athlete. In throwing athletes, these tears are believed to be caused by either a tensile or compressive failure of the tendon. Tensile failure results from repetitive eccentric contractions.12 Compressive failure is believed to occur when the cuff is compressed in a position of arm abduction and external rotation between the greater tuberosity of the humeral head and the posterior glenoid. This produces internal impingement of the articular side of the rotator cuff.13 The term internal impingement is used to contrast this condition with subacromial (external) impingement on the bursal surface of the cuff (Figure 3).

The first-line treatment for patients with a suspected cuff lesion from internal impingement is a physical therapy program dedicated to restoring normal kinematics to the shoulder and stretching to relieve capsular contractures.14 Specific stretches, such as the “sleeper” stretch and the cross-body adduction stretch, can be helpful in eliminating posterior capsule tightness. Subacromial injections and nonsteroidal anti-inflammatory drugs (NSAIDs) can be used judiciously during the initial treatment period. As shoulder motion improves and pain decreases, therapy should focus on strengthening the rotator cuff and periscapular musculature. An interval throwing program can be initiated. If improvement does not occur, surgery may be warranted; however, ar-
Arthroscopic débridement of partial tears has achieved inconsistent results, with some athletes having difficulty in returning to sports participation. Compression between the greater tuberosity and the posterior glenoid in the position of arm abduction and external rotation is also seen in asymptomatic throwers.

**Scapular Dyskinesis**

Scapular dysfunction during throwing disrupts normal throwing biomechanics and places the athlete at risk for injury to the labrum, rotator cuff, and capsule. Overuse and accompanying fatigue of the shoulder complex causes an imbalance of the periscapular musculature. Such power imbalances lead to protraction of the scapula and alterations of the geometric relationship of the glenoid and humeral head. If the scapula fails to retract normally, excessive angulation of the humerus occurs relative to the glenoid and excessive stress is placed on the anterior capsule of the shoulder and posterosuperior labrum.

Throwers with scapular dyskinesis present with a range of symptoms, including anterior shoulder pain, posterosuperior scapular pain, and proximolateral (subacromial) discomfort; a loss of velocity and pain with throwing may also be reported. The affected scapula is usually lower and more protracted than the scapula on the uninjured side, and the inferomedial border of the scapula is prominent. Tenderness in the coracoid region is a common finding. Treatment of scapular dyskinesis begins with strengthening the core musculature. After core stability is corrected and scapular motion is normalized, emphasis is placed on strengthening the periscapular muscles, especially the serratus anterior and lower trapezius. These muscles help hold the scapula in the correct retracted position and can be strengthened with low row, inferior glide, and lawn mower pull exercises. The last phase of rehabilitation, after scapular motion has normalized and periscapular strength has returned, focuses on rotator cuff strengthening, with exercises that emphasize closed kinetic chain strengthening. Successful treatment of scapular dyskinesis requires a 2- to 3-month course of therapy.

**Acromioclavicular Joint Injuries**

Although acromioclavicular (AC) joint injuries are common in contact sports, the AC joint infrequently causes acute pain in the throwing athlete. Over a long career, repetitive throwing can produce inflammation and microtrauma in the AC joint. Some athletes have a hyperemic response in the distal clavicle that results in bone resorption and secondary arthritic changes. Reports of pain with overhead motion and reaching across the body are common. When taking the patient’s history, information on previous trauma should be elicited because low-grade AC joint separations can induce arthritic changes.

Classic physical examination findings include tenderness to palpation over the AC joint and discomfort during the cross-body test. Radiographic analysis of AC joint pathology should include AP, axillary, and Zanca views. The Zanca view is taken with 10° to 15° of cephalic tilt, with the patient in an upright position and without any support to the injured arm. These views may show distal clavicle osteolysis and arthritic changes not seen otherwise. An injection with a combination of steroid and local anesthetic may be helpful for diagnosis as well as initial treatment.

As with many conditions in the throwing athlete, the treatment of AC joint arthrosis begins with NSAIDs and physical therapy, with a program emphasizing strengthening and stretching of the shoulder girdle. A distal clavicle resection may be performed if improvement does not occur with nonsurgical management. If there is any doubt regarding the source of the symptoms, a diagnostic shoulder arthroscopy should be part of the surgical procedure. The most common cause of failed surgery is inadequate posterior-superior resection of bone; however, care should be taken not to resect...
more than 1 cm of clavicle because this can injure the coracoclavicular ligaments and produce instability.\textsuperscript{18} The athlete can usually return to sports 3 months after surgery if motion and strength have been restored.

**Neurovascular Injuries**

Although neurovascular injuries are rare in throwers, such injuries have been described in overhead athletes and should be considered in the differential diagnosis of the painful shoulder. The theme common to these conditions is extrinsic pressure on nerves or adjacent blood vessels. For example, the suprascapular nerve can be compressed at the suprascapular and spinoglenoid notches and can mimic intrinsic rotator cuff disease. Entrapment at the suprascapular notch will affect the supraspinatus and infraspinatus, whereas compression at the spinoglenoid notch will weaken the infraspinatus. Injuries to the suprascapular nerve are well described in volleyball players, but the exact incidence of these injuries in baseball players is unknown. The extremes of arm positioning and the forces generated by the throwing motion have been postulated to cause stretching and compression of the suprascapular nerve, causing a type II SLAP tear and the development of paralabral cysts. Overhead athletes with suprascapular nerve injuries present with poorly localized pain in the posterolateral shoulder, weakness, and pain that may radiate down the arm. In the later stages of the injury, examination of the shoulder may show atrophy of the supraspinatus and/or infraspinatus. On examination, significant weakness is usually revealed when testing external rotation, with a presentation that may be very similar to rotator cuff tendinitis. Magnetic resonance arthrography is useful in identifying labral cysts or a hypertrophied scapular ligament, in quantifying the degree of atrophy of the muscles, and in assessing the integrity of the rotator cuff tendons. Electromyography can be helpful in making the diagnosis and in providing information regarding the severity and location of the compression.

Treatment for a suprascapular nerve injury depends on the underlying etiology. For patients without anatomic cause for the compression, activity modification is the best initial treatment, along with NSAIDs and strengthening exercises for the rotator cuff, deltoid, and scapula. Most patients respond positively to this treatment protocol. Athletes with evidence of early muscle atrophy, anatomic compression, or those in whom nonsurgical management fails are candidates for surgery. If the nerve compression is located at the suprascapular notch, open or arthroscopic release of the transverse scapular ligament using a superior approach may be needed. Paralabral cysts can be treated with arthroscopic repair of the labrum, with anchors and indirect decompression of the cyst. Spinoglenoid cysts usually respond to arthroscopic treatment, although successful open treatment has been reported.\textsuperscript{19}

Quadrilateral space syndrome is a compression neuropathy of the axillary nerve within the four-sided area bounded by the teres minor superiorly, the teres major inferiorly, the long head of the triceps medially, and the proximal humerus laterally. As is the case with many other conditions affecting the throwing athlete, the compression of the structures within the quadrilateral space appears to be greatest in the late cocking phase of throwing. Symptoms of quadrilateral space syndrome are initially vague. Athletes may report mild discomfort and weakness with throwing activities. There may be associated night pain and lateral arm paresthesias. Physical findings may include weakness with abduction, loss of sensation in the axillary nerve distribution, and atrophy of the deltoid muscle. Tenderness over the quadrilateral space has been suggested as a reliable physical examination finding in the throwing athlete.\textsuperscript{20}

Arteriography is the study of choice for diagnosing quadrilateral space syndrome; however, for maximal accuracy the dye must be injected with the arm at the side and in the late cocking phase position of abduction and external rotation. The diagnosis is made when the artery is occluded in the abduction-external rotation position and relieved when the arm is brought down to the side. Nonsurgical management, consisting of rest, NSAIDs, and physical therapy focused on stretching and strengthening the posterior shoulder, is the preferred initial treatment option. If success is not achieved after 6 months of nonsurgical treatment, decompression has been shown to be a beneficial option.

Thoracic outlet syndrome is a rare (and controversial) cause of neurovascular disorders in throwing athletes. In thoracic outlet syndrome, anomalous bands of the pectoralis minor,\textsuperscript{21} an anomalous first rib, or extremes of arm positioning (for example, the late cocking phase of throwing) are believed to compress the neurovascular structures as they exit the thoracic cavity. Symptoms caused by the ischemia include arm heaviness, fatigue, cold intolerance, paresthesias, and coolness and numbness in the fingers. During the physical examination, the radial pulse should be checked with the arm at the side and then with the shoulder in the abducted, externally rotated position (the Wright test). Surgical options for thoracic outlet syndrome that is recalcitrant to rest and therapy include first rib resection, release of anomalous bands of fascia, scalenectomy, and pectoralis minor tenotomy.

**Elbow Disorders**

**Elbow Instability**

During the late cocking and acceleration phases of throwing, the elbow is rapidly extended more than 90° and is exposed to high valgus stresses. These forces can lead to attenuation, partial tears, or even complete rupture of the medial ligament complex. Because throwing creates tension on the medial side specifically, the lateral ligament complex is not typically injured in the throwing athlete.

Valgus instability usually manifests as pain occurring in the medial epicondyle region during the late cocking/early acceleration phase of throwing. Ulnar nerve
symptoms can be induced by traction (secondary to instability) or from direct mechanical irritation of the nerve by the ligament. Arthrosis of the elbow joint occurs as a secondary adaptation to the stress, with osteophyte formation along the posteromedial olecranon and calcification in the ligament. Posterior medial impingement will typically cause pain in a more posterior location at or near the terminal extension.

A thorough history and physical examination is the key to diagnosing ulnar collateral ligament injuries in a throwing athlete. It is important to elicit information about previous symptoms or injuries. Throwers may report having experienced an acute “pop” or sharp medial elbow pain. Some throwers have an insidious onset of pain without a specific inciting event; throwing velocity, command, and control are affected. Mechanical symptoms may signal the presence of loose bodies. In younger pitchers, it is important to obtain information on pitch counts and the types of pitches thrown because elevated pitch counts and curveballs and sliders have been associated with pain.22 More recent studies have shown that the type of pitch has substantially less effect on shoulder and elbow loads than the absolute number of pitches thrown and that throwing a fastball causes higher elbow loads than throwing a curveball.23 Discussions with coaches and athletic trainers also can be beneficial because correct pitching mechanics lower valgus elbow loads and increase pitching efficiency.24

The physical examination of the thrower with medial elbow pain involves evaluating the entire extremity. It is important to exclude pathology in the shoulder and scapula because problems there can produce referred elbow pain or induce a secondary injury at the elbow (by abnormal mechanics). Particular attention should be paid to examining the shoulder for a posterior capsular contracture as a cause of medial elbow pain. A substantial percentage of throwers with an ulnar collateral ligament injury have a glenohumeral internal rotation deficit when compared with asymptomatic pitchers.25 The cervical spine also should be examined in any thrower with neurologic symptoms because cervical nerve root pathology can mimic ulnar neuropathy at the elbow. The range of motion of the affected elbow in flexion and extension and in pronation and supination should be measured with a goniometer and compared with the contralateral side. It is common for even asymptomatic pitchers to have a flexion contracture of the elbow. Measurements taken before and after pitching show a significant decrease in elbow extension both immediately and 24 hours after throwing.26

Valgus stress testing is performed at both 0° and 30° to evaluate the medial collateral ligament. Asymptomatic throwers typically have a degree of development laxity of the medial restraints of the injured elbow when compared with the contralateral side.27 A dynamic valgus stress test is believed to be sensitive and specific for ulnar collateral ligament tears. In this test, a constant valgus load is applied to the maximally flexed elbow as it is brought rapidly into extension. A positive finding occurs when medial pain is reproduced between the arcs of 120° and 70°.28 Tenderness in valgus extension overload occurs along the posteromedial olecranon. Pain is reproduced with valgus and forced extension of the elbow. Flexor pronator tendinitis may also manifest as medial-sided elbow pain. Tenderness is noted at or just distal to the medial epicondyle, and pain is reproduced with resisted wrist flexion and forearm pronation. The ulnar nerve is palpated for tenderness and instability. Tinel and cubital tunnel compression tests can be used to check for ulnar nerve irritability, which can occur in isolation or concomitant with ulnar collateral insufficiency.

Standard AP, lateral, and oblique radiographs are routinely obtained and may show calcification within the ligament as well as posterior compartment osteophytes. MRI is a useful tool in evaluating the soft tissues of the elbow, including the collateral ligaments, articular surface, and ulnar nerve. Noncontrast MRI can identify full-thickness tears of the ulnar collateral ligament, hypertrophy, or tears of the flexor pronator origin. Consideration must be given, however, to the very high rate of abnormal findings in the asymptomatic high-level thrower.29,30 In a study that evaluated the elbows of professional pitchers with plain radiographs, a significant number of radiographic abnormalities were reported; however, the pathologic findings did not correlate with impairment.30 The pathologic findings did correlate with activity (the number of innings pitched professionally). Using contrast material adds to the sensitivity of the MRI study, particularly for partial-thickness tears; however, the instillation of this fluid may cause discomfort that may interfere with athletic performance for several days. Dynamic ultrasound has been used to evaluate the medial collateral ligament but produces a high rate of abnormal findings in the asymptomatic major league pitcher.31,32 Ultrasound also has been shown to have high accuracy in diagnosing medial epicondylitis.33 The accuracy of ultrasound may be dependent on the skill of the examiner.

Nonsurgical treatment is the preferred first step in treating medial-sided elbow pain. Rest, coupled with stretching and strengthening exercises, should be prescribed. Corticosteroid injections may offer short-term relief in the patient with refractory medial elbow pain but have not been shown to be better than placebo. Platelet-rich plasma injections may avoid the possible adverse side effects of corticosteroid injections, but they too may rely on a placebo effect.34 The authors of one study reported that nonsurgical treatment of an ulnar collateral ligament injury in a pitcher has a success rate of 42%,35 with success defined as a return to the same or a higher level of competition. No factors from either the patient's history or physical examination could predict a successful outcome.

Direct repair of the ulnar collateral ligament is possible if rupture occurs at the proximal or distal end and if the remaining ligament tissue is adequate. This scenario is more typical in younger, adolescent athletes who have not experienced much wear and tear. A preoperative MRI or ultrasound will define the location of the tear and the quality of the remaining tissue and
plan the treatment, though final treatment decisions are made intraoperatively, based on visualization of the ligament. The repair is best performed using suture anchors with braided nonabsorbable suture. In one study, nearly all the athletes achieved a good to excellent result and returned to the same level of competition. Various techniques have been described for reconstruction, including the traditional Jobe technique, the docking procedure, and interference screw fixation (Figure 4). When performed by an experienced surgeon, ligament reconstruction of the anterior band of the ulnar collateral ligament (without ulnar nerve transposition) offers athletes a good chance for successful return to their preinjury level of competition.

**Medial Epicondylitis**

Medial epicondylitis is a syndrome characterized by medial elbow pain and is associated with degeneration of the flexor pronator origin. It may also be associated with ulnar collateral ligament insufficiency or ulnar nerve symptoms. Physical examination findings include tenderness over the anterior aspect of the medial epicondyle and pain that is reproduced with resisted pronation and wrist flexion. It is important to rule out concomitant medial instability in the throwing athlete. Although nonsurgical management has a very high success rate, the condition may take several months for overall resolution. Surgical treatment involves excising the area of tendinopathy. The ulnar nerve may be transposed if there is also cubital tunnel compression.

**Valgus Extension Overload**

Posteromedial impingement of the olecranon against the medial wall of the olecranon fossa is believed to result from valgus loads placed on the elbow in the early acceleration phase of throwing (Figure 5). This stress...
causes reactive osteophyte formation along the posteromedial wall of the olecranon, a spur that causes impingement in extension. Pain is typically located posteromedially and is reported in the deceleration phase of throwing. The pain may be mild at first, but progression over the course of the game is common. An axial view of the olecranon with the elbow flexed to 110°, MRI, or CT will define the osteophyte and identify any loose bodies if present. Nonsurgical treatment, which is always attempted first, typically has a poor prognosis if a posteromedial osteophyte is present.

Surgical treatment of isolated posteromedial impingement involves excision of the posterior and medial olecranon osteophytes, either arthroscopically or through a miniopen approach. Care must be taken not to remove more than 3 mm of the normal olecranon because greater resection will cause a substantial increase in the strain in the anterior band of the medial collateral ligament. In patients with signs and symptoms of valgus instability in addition to impingement, resection of the posteromedial osteophyte alone is not indicated. Because the olecranon osteophytes were likely caused by elbow instability, the athlete will continue to have instability pain postoperatively if the primary cause of the instability is not treated. In such cases, the ulnar collateral ligament should be reconstructed and the osteophytes should be removed.

### Annotated References


A current concepts review of pathologic conditions affecting the shoulder of the throwing athlete is presented along with associated treatment options. The authors emphasize the importance of physical therapy and rehabilitation as the initial treatment for most throwing-related conditions. Level of evidence: V.


A review of the current literature with epidemiologic methodology was performed. The authors concluded that physical examination maneuvers to detect SLAP lesions are not valid or reliable. Level of evidence: I.


The authors discuss the results of type II SLAP lesions treated with arthroscopic suture anchor fixation. Thirty-four of 47 patients were throwing athletes. With a minimum 2-year follow-up, 25 of the athletes (74%) returned to sports. The major complication with this procedure was postoperative stiffness, which occurred in four patients. Level of evidence: IV.


A comprehensive review on internal impingement is presented. The authors discuss the clinical presentation and physical examination and imaging findings seen with this condition and review treatment options. A treatment algorithm for internal impingement is included. Level of evidence: V.

14. Matava MJ, Purcell DB, Rudzki JR: Partial-thickness


The authors describe a technique to treat AC instability after excessive distal clavicle resection. Level of evidence: IV.


This study reports on quadrilateral space syndrome in four overhead throwing athletes who required surgical decompression. The cause was fibrous bands in three patients and venous dilatation in one. All athletes returned to full activity by 3 months. Level of evidence: IV.


The authors studied the kinetics of the fastball, curveball, and change-up baseball pitches in youth pitchers and determined that the curveball may not be more harmful than the fastball. Recent epidemiologic research indicates that amount of pitching is a stronger risk factor for injury than type of pitches thrown.


The authors performed a descriptive laboratory study and determined that proper pitching mechanics may help prevent pain and injuries to the shoulder and elbow in youth pitchers.


The authors studied throwers with ulnar collateral ligament insufficiency and determined that pathologic glenohumeral internal rotation deficit may be associated with elbow valgus instability. Level of evidence: III.


In a controlled laboratory study, the authors noted a substantial decrease in passive range of motion immediately after baseball pitching that is present 24 hours after throwing. These results may suggest a newly defined mechanism to adaptations in range of motion resulting from acute musculoskeletal and potential osseous and capsular adaptations.


The authors found that degenerative changes in the dominant shoulder and elbow of professional pitchers develop over time because of chronic repetitive stresses across joints. Level of evidence: IV.


In a prospective, single-blind study, the authors attempted to determine the value of ultrasonography as a diagnostic tool for detecting clinical medial epicondylitis.


The authors concluded that primary repair of proximal and distal injuries of the medial ulnar collateral ligament is an acceptable treatment option in young athletes. Level of evidence: IV.


The authors studied 22 athletes over a 3-year period and determined that the use of the DANE TJ technique for ulnar collateral ligament reconstruction led to favorable results. Level of evidence: IV.


