

With spring comes the start of baseball season—and, for thousands of athletes, from youth baseball organizations through professional leagues—the promise of a winning season or the hope for personal achievement on the field. Unfortunately, along with that promise and hope come increasingly familiar reports of pitchers lost to throwing-arm injuries, often requiring surgical reconstruction (including the well-known Tommy John surgery that cost former Minnesota Twins' reliever Joe Nathan a season).

The anterior band of the ulnar collateral ligament (UCL) is the primary static restraint to valgus force in the elbow from 30 to 120 degrees of flexion. This ligament courses from the medial epicondyle of the humerus to the sublime tubercle of the ulna along the medial aspect of the elbow. In the overhead throwing motion, valgus torque across the elbow can exceed the ultimate tensile strength of the UCL, resulting in tears of the ligament and signifi-

## A pitch for prevention

*Ulnar collateral ligament injuries are on the increase in younger athletes*

By Steven W. Meisterling, MD

cant elbow injury in the overhead athlete. This injury has become commonplace in collegiate and professional baseball pitchers and often requires surgical reconstruction. These types of elbow injuries are also becoming more common in younger baseball players. UCL tears can also occur, though less commonly, in athletes involved in other overhead sports such as tennis, football, gymnastics, and javelin throwing. This article focuses on the symptoms and risk factors associated with UCL injuries, as well as the diagnosis, prevention, and treatment of these injuries.

### Symptoms

Overhead athletes with injuries to the ulnar collateral ligament will present to their coach,

trainer, physical therapist, or doctor with a variety of symptoms. Some will develop symptoms from chronic overuse and attenuation of the ulnar collateral ligament, while others will report with more acute pain from a single event.

Athletes with chronic overuse injuries will typically present with elbow pain, neurologic symptoms, and/or complaints related to decreased performance. These injuries are often partial tears of the UCL. The pain is usually located about the medial aspect of the elbow at the site of the ulnar collateral ligament. Pain is most commonly experienced during the acceleration phase of the throwing motion and often occurs following a game or performance.

Neurologic symptoms con-

sistent with ulnar neuritis or cubital tunnel syndrome are often associated with UCL injuries. These symptoms include numbness and tingling located about the ulnar one and a half digits or pain about the ulnar nerve within the cubital tunnel. Loss of athletic performance is often experienced as a decrease in throwing velocity and accuracy as well as a pitcher's lost ability to effectively throw and control his or her usual variety of pitches.

Acute injuries are often the end result of chronic UCL tears. These events are frequently preceded by complaints related to chronic overuse as outlined above. The acute injury is heralded by sudden and often severe medial elbow pain during the throwing motion. Pitchers often report feeling or even hearing a "pop." Ulnar nerve irritation is also common at the time of injury.

### Risk factors and prevention

Overhead athletes of all ages are at risk for UCL injury. Those at

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particular risk include baseball pitchers and catchers, especially those that play both positions. Professional pitchers that throw at a higher velocity may have additional risk for UCL injury. Recently, research has focused on identifying risk factors in an effort to prevent injury in younger athletes.

Adolescent athletes have begun focusing on a single sport and/or a single position at younger ages. This early sports specialization has been implicated as a factor in the rise in adolescent athletic overuse injuries. The true risk of serious injuries to youth overhead athletes is unknown, and the risk factors leading to these injuries are unproven, though several risk factors have been associated with significant elbow injury. The factors with the strongest associations with injury are overuse and fatigue. Overuse and fatigue can occur on a daily, seasonal, or annual basis. Also associated with adolescent elbow injuries are increased weight and height; number of

pitches thrown during a season, game, or week; satisfaction with performance; and playing outside of the athlete's primary league. High pitch velocity and participation in showcases are also associated with increased risk for injury. Other risk factors include participation in a single sport year round, throwing at maximum velocity for a radar gun, and improper throwing mechanics.

The consequences of throwing breaking pitches and curve balls at the youth level are unknown. Debate and controversy continue to surround this subject. Since the 1970s, sports medicine experts have warned that prepubescent athletes should not throw curve balls because of increased risk of elbow injuries. There has been little clinical data to support this warning to date. In fact, biomechanical data has shown that a throwing a curve ball may create less elbow varus moment compared to a fastball. Nonetheless, throwing curve balls prior to skeletal maturity continues to be considered a risk factor for

elbow injuries by most sports medicine experts.

Injury prevention has become an important focus within the sports medicine community. Proper warm-up and stretching exercises should occur prior to any athletic activity. Overuse and fatigue should be avoided. USA Baseball has published recommendations in an effort to reduce the risk of injury and maximize the younger player's ability to perform and advance to higher levels. These recommendations include limiting pitch counts and discouraging excessive throwing for the young athlete. Throwing curve balls is also discouraged. Early development of proper mechanics is emphasized, and coaches and parents should listen and react appropriately to an athlete when he or she complains of pain. The specific recommendations are available at [www.usabaseball.com](http://www.usabaseball.com).

### Diagnosis

The diagnosis of UCL injury is made with a careful history and clinical examination as well as

appropriate imaging studies. Concomitant pathology must also be identified. The examiner must be careful to identify the status of the UCL when focusing on other elbow pathology, as loss of elbow stability due to UCL insufficiency can lead to other pathology.

Important points in the history include asking about those symptoms mentioned above. The athlete should also be questioned about his or her seasonal situation and career goals and desire to continue to compete in overhead athletics. The physical exam should evaluate upper extremity strength and range of motion, neurovascular status, and swelling, and specific points of tenderness should be identified. Elbow stability can be evaluated by placing a valgus stress about the elbow. This test will elicit pain by subjecting the injured UCL to stretch.

Standard elbow radiographs are an important part of elbow evaluation. Anterior to posterior valgus stress x-rays may demonstrate increased medial joint

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space opening and are helpful in identified medial laxity and UCL injury. MRI arthrogram is the radiographic gold standard to identify a UCL tear; it is the study of choice to verify the diagnosis and can help identify other pathology.

### Treatment

The treatment for UCL injuries depends on many factors, including the extent of UCL tearing, patient desires and athletic goals, seasonal timing, and response to prior treatments. Nonoperative treatment is a good option for partial UCL tears, though often UCL reconstruction is required in order for an athlete to return to competition.

Nonoperative programs include a period of "active rest" and should be initiated immediately upon injury to the UCL. This period lasts from two to six weeks depending on the severity of the tear. During this time of rehab, the athlete should refrain from all throwing activities and any other activities that recreate

the patient's pain. Core strengthening as well as a shoulder and elbow rehab program should be instituted during this time. Patients are encouraged to be as active as possible, provided such activities do not elicit elbow pain. An interval throwing program is initiated after the active rest period and proper mechanics are emphasized. Return to play is allowed provided the patient remains asymptomatic.

Surgery is the preferred treatment for athletes who have a complete UCL tear and wish to continue to compete in overhead activities. Surgery is also indicated for those who have a partial tear and have failed to respond to a nonoperative program. Ulnar collateral reconstruction (Tommy John reconstruction) is the treatment of choice for most UCL injuries requiring surgery. This surgery is done via a medial elbow incision to expose the injured UCL. The ulnar nerve is identified within the operative field and must be carefully managed. An anterior subcutaneous ulnar nerve transposition is often per-

formed, depending on preoperative symptoms and surgeon preference. The UCL is then identified and drill holes are placed at the site of UCL attachment at both the ulna and the humerus. Next, the native UCL is repaired prior to graft placement. Graft selection is a matter of availability and surgeon preference. The most common grafts used are the palmaris longus and the gracilis tendons. The graft is passed through the bone tunnels and overlies the repaired ligament. Finally, the graft is appropriately tensioned and secured with the elbow at 30 degrees of flexion.

Postoperatively, the elbow is splinted for one to two weeks before initiation of elbow range of motion. Full range of motion is expected at six weeks. Shoulder and core strengthening are an important aspect of rehab and these exercises are begun soon after surgery. Overhead throwing is not permitted until four months after surgery, at which time an interval throwing program is initiated. Expected return to play for a baseball

pitcher is approximately one year following surgery, though overhead athletes with less demanding positions may return to play several months earlier.

### Goals: Reducing UCL injuries, improving treatment

Injuries to the UCL are common in overhead athletes, with baseball pitchers at greatest risk for this injury. Recently, efforts have been made to identify risk factors and prevention strategies to prevent elbow injuries, particularly in adolescent athletes.

Many patients with partial UCL tears can be successfully treated conservatively. UCL reconstruction is a good option for athletes who do not respond to nonoperative care or those with complete UCL tears. Future research efforts will continue in an effort to decrease the incidence of this injury as well as to improve treatment options. ▣

**Steven W. Meisterling, MD**, is an orthopedic surgeon and fellowship-trained sports medicine physician in practice with St. Croix Orthopaedics, PA.



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