



Ulnar Collateral Ligament Reconstruction

RICHARD LEHMAN, MD

Ulnar collateral ligament reconstruction, which is commonly known as Tommy John surgery, was first performed on Tommy John who was a pitcher for the Los Angeles Dodgers by Dr Frank Jobe in 1974. He returned to playing baseball in 1976, and the procedure was described in 1986.

First awareness of problems with the ulnar collateral ligament was in 1941 when Dr Waris described rupture of the ulnar collateral ligament in 17 javelin throwers. Physicians became aware of problems with pain on the medial aspect of the elbow and dysfunction with repetitive use and repetitive throwing. This repetitive use could be pitching, throwing a javelin, hitting a tennis ball, et cetera. The ulnar collateral ligament is the most commonly injured ligament in the elbow and has become a topic for sports radio, television and the internet. It is feared by the athletic teams, and it is a common ligament that is injured and reconstructed.

ELBOW ANATOMY

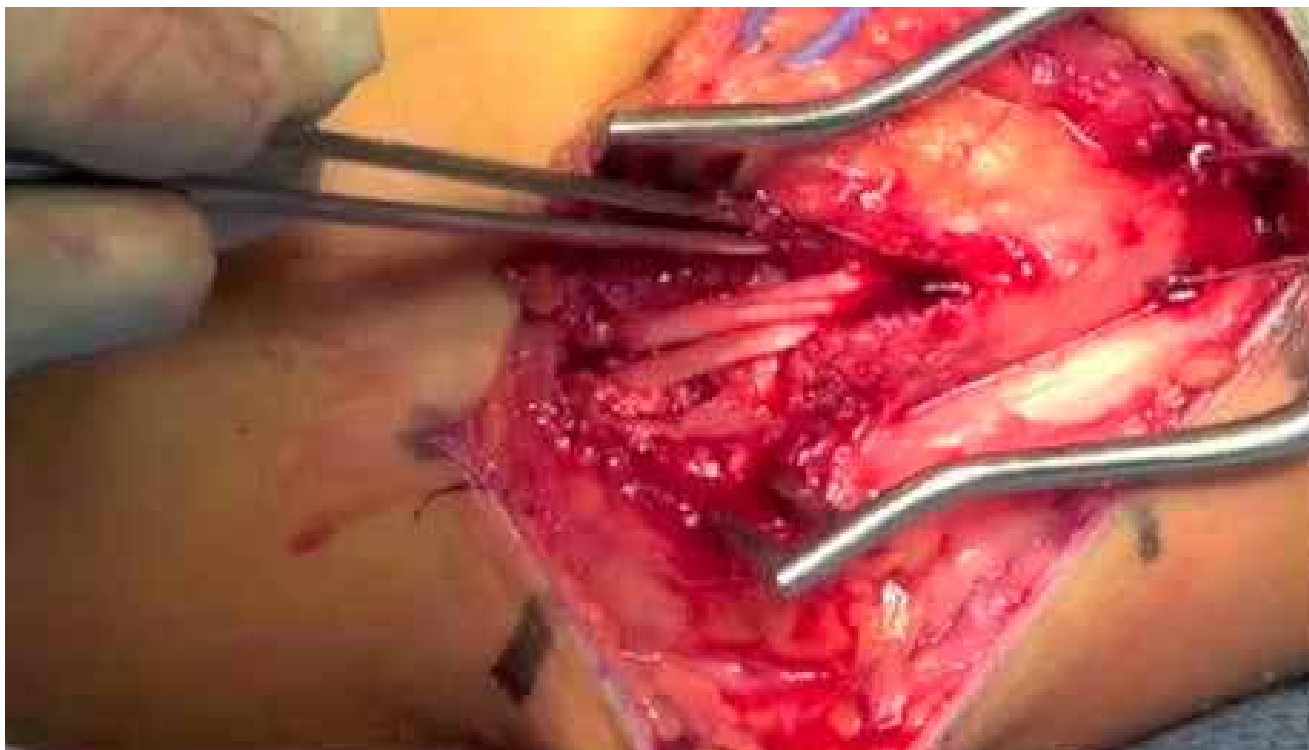
The three main bones of the elbow are the humerus, the ulna, and the radial. The medial collateral ligament or ulnar collateral ligament is a ligament that spans the humerus attaching to the ulna. There are three separate bands of the ulnar collateral ligament which are the

LEARNING OBJECTIVES

- ▲ Determine what injuries are associated with ulnar collateral ligament reconstruction
- ▲ Review the anatomy of the elbow
- ▲ Examine the elements of the Tommy John procedure
- ▲ Discover what occurs when the ulnar collateral ligament is injured
- ▲ Learn about the ulnar collateral ligament's history regarding injury

anterior oblique ligament, posterior oblique ligament, and transverse ligament. The anterior oblique ligament is divided into the anterior and posterior bands. The anterior band of the anterior oblique ligament is taut in full extension to 85 degrees of flexion. The posterior band of the anterior oblique ligament is taut with flexion beyond 55 degrees. The posterior oblique ligament functions with the elbow flexed to 90 degrees. The anterior oblique ligament originates from the anterior-inferior surface of the medial epicondyle posterior to the axis of the elbow and inserts on the sublime tubercle of the ulna. The posterior oblique ligament is a fan-shaped area of capsular thickening that extends from the medial epicondyle to the semilunar notch of the ulna.

eral ligament injury can be acute where the athlete hears a pop and the ligament fails, or chronic as the ligament fails over a period of time. Generally when the ligament fails over a period of time, the athlete will initially notice a loss of velocity and not have a great deal of pain but over a period of time will lose pitching control, velocity, subsequently experience fatigue, and finally develop pain in the medial aspect of the elbow. Other athletes that can experience ulnar collateral ligament difficulty are javelin throwers, tennis players, quarterbacks, and athletes that recreate the overhead motion. Overhand athletes who injure their ulnar collateral ligament in an acute manner feel a pop, and they may have tingling or numbness in the fourth and fifth



It is a secondary stabilizer of the elbow when the joint is flexed beyond 90 degrees. The transverse bundle bridges the medial olecranon and the inferomedial coronoid process. It does not attach to the humerus and has little or no effect on stability of the elbow. The anterior band is the most important portion of the ulnar collateral ligament to resist valgus stress with the act of throwing.

The ulnar collateral ligament is normally injured when extreme valgus is placed on the elbow, and this occurs during the late cocking and acceleration phase of throwing a baseball. Baseball pitchers are the most common athletes to injure the ulnar collateral

ligament of their hand. Likewise, athletes with chronic ulnar collateral ligament instability may feel dysesthesias in their fingers when they throw. Throwing mechanics create valgus stress in the elbow, and the ulnar collateral ligament is maximally stressed to failure with each throw. If, in fact, there is laxity in the medial aspect of the elbow, and a maximum valgus stress is placed on the elbow during throwing, the instability, or opening in the medial aspect of the elbow, can stretch the ulnar nerve and cause tingling in the fourth and fifth fingers.

Evaluation of the athlete with a potential medial collateral ligament or ulnar collateral ligament injury includes

a history (years pitching, prior pain, when the pain starts in the throwing motion, alteration of velocity, location of pain, neurologic symptoms, and swelling), a physical exam, x-rays, and an MR arthrogram. When the athlete presents to the office, the history is very important. An acute pop, tingling and numbness in the fourth and fifth fingers, or excruciating pain on the medial aspect of the elbow denotes acute trauma to the ulnar collateral ligament. The athlete will be very tender over the course of the ulnar collateral ligament, and a test called a dynamic stress test, which is a test that stresses the elbow recreating the throwing position, is indicative of failure of the ulnar collateral ligament. X-rays are generally normal, and the test that is the most important, is an MR arthrogram. Dye is placed in the elbow, and the patient subsequently put in an MRI where pictures are taken. In a chronic situation, the athlete will come in and may have complaints of fatigue in the elbow. There may be significant pain or there may be no pain. There may be simply a loss of velocity or a lack of accuracy. Physical examination is similar where function of the ulnar nerve is tested, areas of tenderness are tested, and a dynamic stress test is completed. It should be noted that although the athlete may not experience pain when they are throwing, the ulnar collateral ligament is generally very tender in these athletes, and the dynamic stress test is positive. These athletes may also have mild pain in the postero-medial aspect of the elbow, but the majority of the pain is directly over the ulnar collateral ligament with direct pressure and stress to the ulnar collateral ligament. In all cases, an MR arthrogram is necessitated for corroboration of the diagnosis. This is not a diagnosis made by only testing for instability. The MR arthrogram is very important in determining if there is a partial or complete tear of the ulnar collateral ligament. In cases where there is an incomplete tear of the ulnar collateral ligament, nonoperative treatment include rest, ice, anti-inflammatories and a physical therapy program to help strengthen the elbow and posterior shoulder are instituted. When the athlete returns to throwing, an interval throwing program is also instituted to progress the athlete slowly back to his normal throwing mechanics. If the athlete fails and is unsuccessful in returning to throwing, surgery should be considered.

When the procedure was initially described, it was prior to elbow arthroscopy, and the technique was completed

detaching the flexor pronator mass, transposing the ulnar nerve, drilling a hole in the ulna and medial epicondyle, and weaving the patient's palmaris longus tendon through the holes recreating the course of the ulnar collateral ligament. Many modifications have been made on Dr Jobe's initial technique. The modifications include using palmaris longus or other graft choices such as hamstring tendon. Also, using a technique called the docking technique where one hole is made in the medial epicondyle with two small holes to tension the sutures differentially tying the sutures over a bone bridge. With the advent of interference screws, a single band can be used for the ulnar collateral ligament, and there are a number of ways to anchor the ulnar collateral ligament to the ulnar side. We currently use a suspension technique called a zip loop on the ulnar side, and a docking technique on the humeral side. It is imperative to document ulnar collateral ligament instability prior to the reconstruction, and this is done by elbow arthroscopy. The elbow is arthroscoped using standard arthroscopic portals, and the posterior elbow is evaluated for spurring as well as any type of posterior impingement. The elbow is valgus stress tested to determine if, in fact, the ulnar collateral ligament is deficient, and if the ligament is deficient, the reconstruction is undertaken. Any loose bodies or joint damage, including synovitis, are also addressed arthroscopically.

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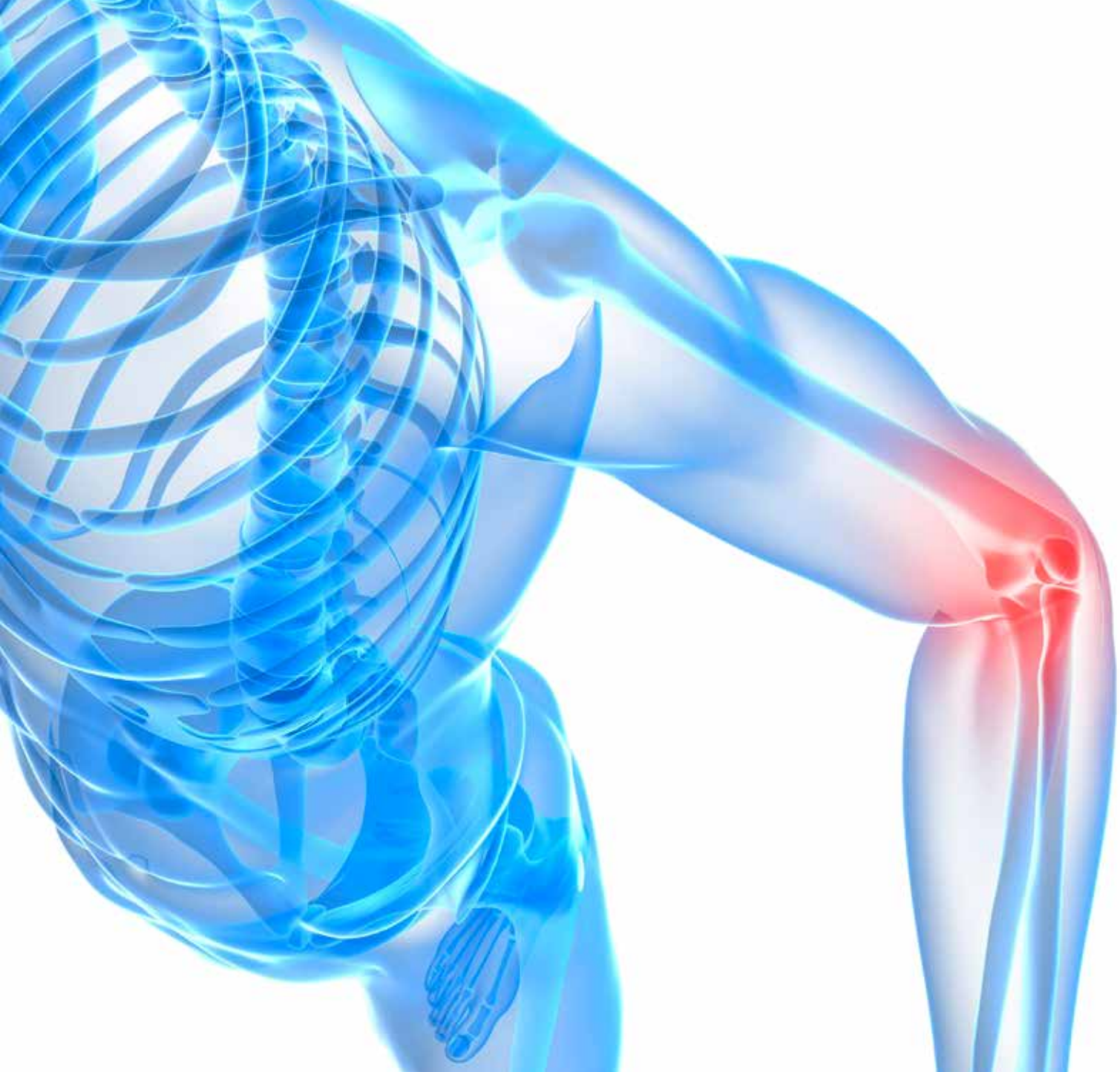
THE SURGICAL PROCEDURE

The elbow is arthroscoped in standard arthroscopic fashion, and once the arthroscopy is completed, the joint is evaluated for loose bodies, spurring, synovitis, chondral breakdown. The ligament is then stress tested. Once it clear that the ligament is deficient, surgery to reconstruct the ligament commences. The patient has an incision over the medial aspect of the elbow along the course of the ulnar nerve. The incision is taken down through the skin and subcutaneous tissue. Dissection of the flexor pronator mass at



the distal insertion of the anterior bundle of the ulnar collateral ligament with retraction anteriorly but no release of the musculature from the medial epicondyle is completed. This allows the muscle to be split. The ulnar nerve is protected but not transposed, and the anatomical position on the ulnar collateral ligament is identified. We are currently using either the palmaris longus or gracilis graft, which is harvested from the patient. Once the graft is harvested using a suspension technique, a K-wire is drilled across the ulna in the anatomical position and exits the skin. Initially, a 4.5-mm drill is used, and a hole is drilled into the whole length of the ulna, and the measurement of the length of the ulnar tunnel is taken. A 7-mm larger reamer is used and a hole is then drilled 15-mm into the ulna, and once this is completed, the graft is placed in the loop of the suspension device, and the ligament and suspension device

are brought through the 4.5-mm hole into the 7-mm hole. As the suspension device passes through the 4.5-mm hole, it is flipped holding the ligament taut onto the cortex of the ulna. Once this is completed, 15-mm of the ligament is placed into the 7-mm hole using the zip loop technology, and once it is placed in the hole, the graft is then tensioned for the appropriate position on the medial epicondyle. The native ulnar collateral ligament which had previously been split to identify the anatomic positions on the ulna and on the medial epicondyle is closed using interrupted Ethibond suture and a 15-mm hole is then drilled into the medial epicondyle using a 7-mm reamer and two small holes are then drilled into the medial epicondyle to accommodate the suture from the two limbs of the graft. Once this is completed, the main component of the graft is brought into the 7-mm hole and the two limbs with subsequent sutures



are brought into the small holes. These are retrieved with a Hewson suture retriever, and the two limbs are then tied over the bone bridge in the medial epicondyle. Pictures of the reconstruction can be seen below. Initially when the procedure was described by Dr Jobe, a figure-of-eight graft was completed drilling a hole through-and-through dorsal to volar in the ulna and the graft was then weaved through the medial epicondyle. At this juncture, we are using a suspensory ligament on the ulna and a docking technique on the medial epicondyle so that the limbs of the graft can be

appropriately tensioned. The ulnar nerve is not dissected out or transposed, and the split in the flexor is closed as is the fascia.

Once the surgery is completed, the patient is placed in a bulky dressing and a posterior splint. They are then seen in the office on day number four or five and given a light elbow brace that is locked at 90 degrees, and on day five, they start physical therapy. Physical therapy progression includes limited full extension and flexion initially. Range of motion is progressed over the next four to six weeks. Once

full range of motion and strength return, physical therapy culminates in an interval throwing program and strengthening of the posterior shoulder, medial elbow, and core. It is imperative to completely rehabilitate the whole athlete as opposed to just the elbow, paying particular attention to the ipsilateral shoulder. Our expectations are a return to sports at 12 months for pitcher and in six months for position players as noted above. Results currently are quite good with 85 to 90 percent of the pitchers returning to their preinjury status. Initially when Dr Jobe performed the surgery, their success rate was approximately 63 percent, and progression of technique, a better understanding of the biomechanics, and many surgeons doing the procedure on a routine basis have greatly improved the results.

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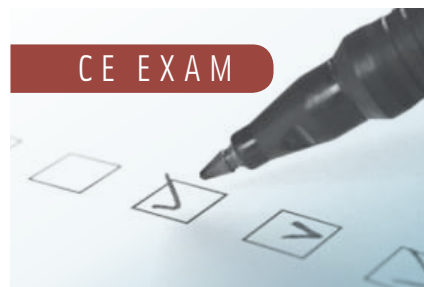
Complications of the surgery can include ulnar nerve symptoms, the graft being too tight or too loose, postoperative infections, and sensory nerve paresthesias. At my clinic, the procedure has become a standard for high-level pitchers and continues to be performed on a routine basis. It is one of the most popular procedures that we perform, in terms of numbers, and has a very high satisfaction rate.



ABOUT THE AUTHOR

Richard Lehman, MD, an orthopedic surgeon, performs work on professional athletes around North America. His main focus is on rehabilitation of knee, shoulder and elbow injuries. He grew up in Miami and trained at Washington University and the University of Pennsylvania. He is a part owner of the National Hockey League Florida Panthers and has been the

team physician for the Florida Panthers, Tampa Bay Lightning and St Louis Blues. He has been a consulting physician for UCLA Track & Field and has covered four Olympic Games, as well as seven Track & Field World Championships. Dr Lehman was inducted into the Missouri Sports Hall of Fame Class of 2012 and is currently on the Board of Directors of the Jackie Joyner-Kersey Youth Foundation, the medical director of Webster Surgery Center and the medical director of the US Center for Sports Medicine. He is on the Board of Governors for the National Hockey League and is on the St Louis Sports Commission. Dr Lehman presented at AST's 43rd National Annual Conference in Washington, DC, where he discussed the procedure for an anterior cruciate ligament reconstruction.



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