

Tommy John Ligament Repair with Ulnar Collateral Ligament Internal Brace



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Abstract: Ulnar collateral ligament (UCL) injuries commonly occur in overhead athletes as a result of excess valgus stress on the elbow and can be functionally debilitating, requiring surgical intervention. Since the advent of the first initial UCL reconstruction technique pioneered by Dr. Frank Jobe performed on professional baseball player Tommy John, UCL, or Tommy John Ligament reconstruction has successfully returned athletes to sport following injury and shown enhanced clinical outcomes with minimal complication rates. Tommy John surgery continues to evolve with the development of various techniques over recent years. This technical note describes a UCL repair with an internal brace using knotless suture anchors and aims to contribute to the current literature a technique that is efficacious and reproducible and offers satisfactory stability, functionality, and return to play.

Medial ulnar collateral ligament (UCL) tears often occur in overhead athletes mainly as a result of severe valgus stress on the elbow.¹ The amount of valgus force is highest during the late cocking and early acceleration phase of throwing performed by baseball pitchers. During this period, the UCL reaches or even exceeds its failure load.² This repetitive motion causes microtrauma, leading to a rupture of the anterior band of the UCL.³ In 2015, the prevalence of UCL reconstruction among professional baseball pitchers ranges from 15% to 25%.⁴ Additionally, a report done by Hodgins et al. showed a 193% overall annual increase

of UCL reconstruction done in New York State from 2002 to 2011.⁵ Although UCL reconstruction is becoming increasingly common among young athletes, there are usually more adult athletes sustaining UCL injuries. Children are less susceptible to UCL injuries due to their open physes, which allow for more flexibility and better absorption of valgus force. However, young athletes are more prone to medial epicondyle apophysitis or “Little League elbow,” which also results from repetitive valgus stress on the medial elbow.⁶ Overall, numerous studies have published an increase in the frequency of UCL surgery over the years and is becoming more common in young athletes.⁷⁻⁹

The initial UCL reconstruction technique was pioneered by Dr. Frank Jobe, undergone by the professional baseball player Tommy John, thus UCL reconstruction (UCLR) is commonly referred to as Tommy John Ligament Repair.^{10,11} The procedure gained recognition for its ability to elevate career success after surgery.¹ Subsequent to the Jobe technique’s introduction, multiple modifications have been made, leading to enhanced clinical outcomes and return-to-play rates varying from 80% to 90%.¹ Multiple studies have also examined the duration to regain normal level of play. Cain et al. reported an average of 11.6 months recovery length for UCL reconstructions among professional baseball athletes.¹² Additionally, the concept of internal brace, a technique that uses a high-strength suture tape, has led to a renewed interest

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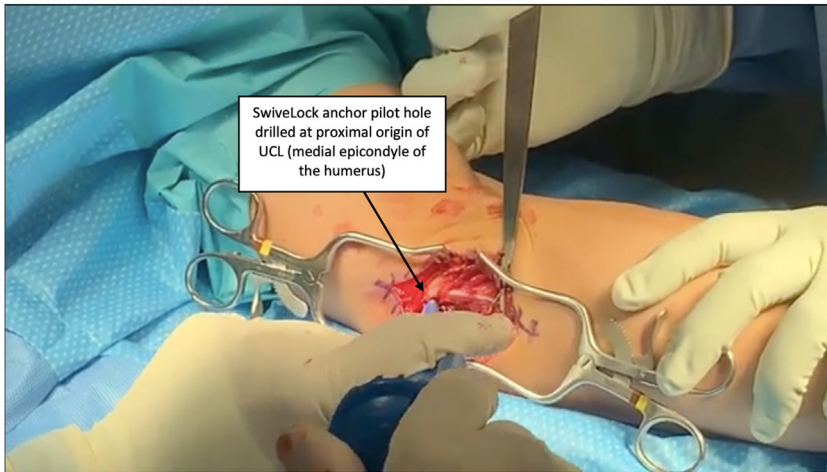


Fig 1. The patient is positioned supine with left elbow on a hand table. Intraoperative image demonstrates exposed medial joint ligament capsule complex, while a pilot hole is drilled at the proximal origin of the ulnar collateral ligament for insertion of SwiveLock anchor.

in UCL repair.¹³ The internal brace reinforces the repaired ligament by offloading stress and providing additional stability and assistance to the UCL during the healing process.¹⁴ Moreover, in a study that included amateur-level athletes, Dugas et al. documented a mean return-to-play time of 6.7 months after a UCL repair with internal brace augmentation.¹³

This technical note describes a Tommy John Ligament repair with the ulnar collateral ligament internal brace. With this technical note, we aim to contribute to the current literature a reproducible, efficacious technique for Tommy John Ligament repair offering satisfactory functional results and return to play after surgery.

Surgical Technique

Preoperative Evaluation

The diagnosis of UCL tear is established using a combination of patient history, clinical presentation, and diagnostic imaging studies. Patients with a UCL tear

typically present with pain, swelling, and valgus instability of the affected elbow that limits their range of motion, function, and physical activity level. Plain film radiographs of the elbow may reveal osseous abnormalities, such as posteromedial osteophytes due to valgus extension overload and avulsion fractures of the medial epicondyle. Furthermore, manual stress radiographs of the affected elbow may show medial joint-line opening >3 mm, which is diagnostic for UCL injury.¹⁵ Advanced imaging, such as magnetic resonance imaging (MRI), are needed to definitively diagnose injury to the UCL and surrounding soft tissue structures. In the case of this patient, MRI revealed a near full-thickness tear of the proximal anterior UCL bundle with mild distal retraction. The posterior UCL bundle and common flexor tendon were intact. Surgical intervention is indicated mainly for high-level athletes who want to return to sport and regain full functionality of the affected elbow. Patients with partial-thickness tears may elect for conservative

Fig 2. The patient is positioned supine with left elbow on a hand table. Intraoperative image of exposed medial joint ligament capsule complex demonstrates suture repair of avulsed UCL at proximal origin.

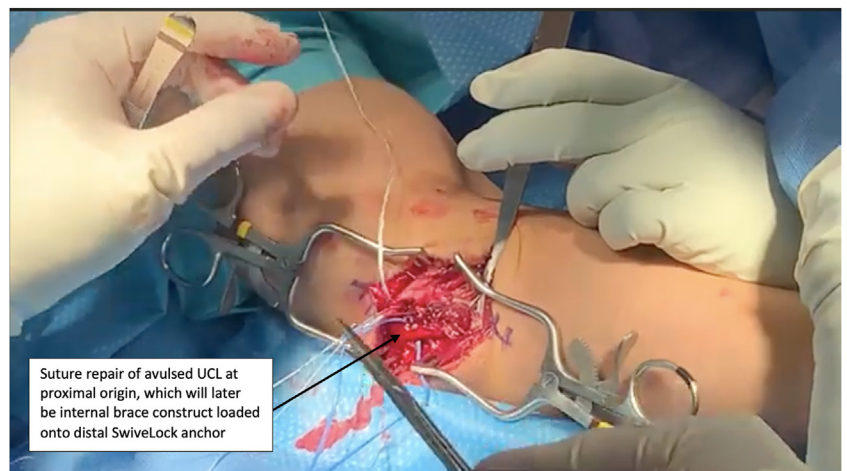
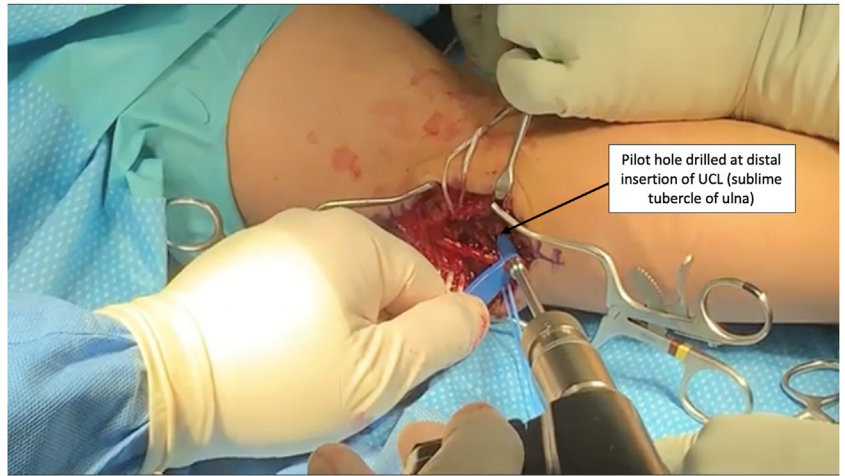


Fig 3. The patient is positioned supine with left elbow on a hand table. The intraoperative image of exposed medial joint ligament capsule complex depicts a pilot hole drilling at distal insertion of UCL after identification of the sublime tubercle.



management first with treatment options ranging from physical therapy to biologic augmentation with platelet-rich plasma (PRP).¹⁶

Patient Positioning

A peripheral nerve block and perioperative antibiotics are administered, and the patient is then placed under general anesthesia. The patient is placed in a supine position with a hand table. A tourniquet is placed on the operative arm. The operative extremity is prepped and draped in usual sterile fashion. Anatomic landmarks, the proximal UCL insertion onto the medial epicondyle of the humerus and the distal UCL insertion onto the sublime tubercle of the ulna, are palpated and marked on the operative elbow.

Medial Approach

A no. 15 blade is used to create a 7-cm curvilinear incision centered over the posterior aspect of the medial epicondyle. Tenotomy scissors are used to dissect the subcutaneous tissue down to the superficial fascia. The

medial antebrachial cutaneous nerve is identified and protected during the entirety of the procedure. The ulnar nerve is identified and isolated throughout the length of the incision, proximally at the Arcade of Struthers and distally at the flexor pronator mass. Once the ulnar nerve is mobilized, the underlying ulnar collateral ligament is exposed, and a key elevator is used to push off of the sublime tubercle. The common flexor pronator mass is then carefully incised, and a Hohmann retractor is used to retract the muscles anteriorly, exposing the ulnar collateral ligament, where the tear is identified near the proximal origin of the ligament.

UCL Ligament Repair with Internal Brace

The proximal origin of the UCL is identified, and the first pilot hole is drilled (Fig 1). A SwiveLock anchor (Arthrex, Naples, FL) is subsequently inserted at the base of the medial epicondyle, and the stay sutures of the SwiveLock anchor suture are used to suture the proximal origin of the UCL, thus repairing the avulsed

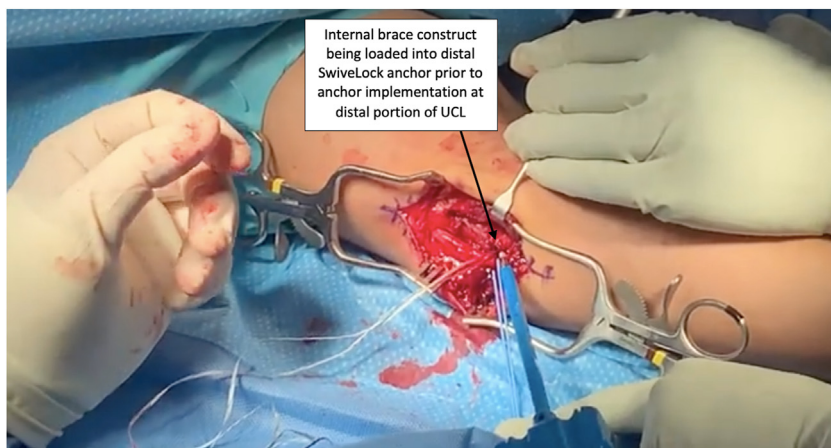


Fig 4. The patient positioned supine with the left elbow on a hand table. The intraoperative image of exposed medial joint ligament capsule complex depicts internal brace portion of construct being loaded into SwiveLock anchor (Arthrex, Naples, FL) at distal portion of ulnar collateral ligament.

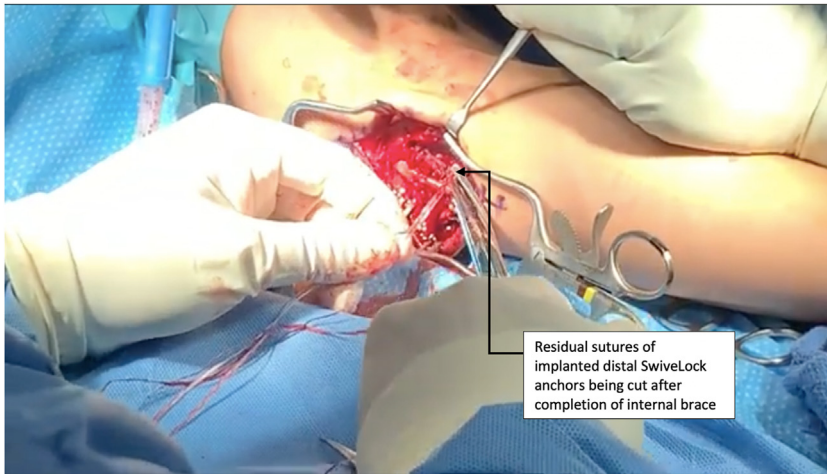


Fig 5. The patient is positioned supine with the left elbow on a hand table. The intraoperative image of exposed medial joint ligament capsule complex demonstrates residual sutures of implanted anchors being cut prior to completion of internal brace repair.

ligament down to its origin (Fig 2). The suture is tied down after being fed through the proximal portion of the ligament, repairing the avulsed humeral side of the UCL. The sublime tubercle is identified and drilled at the distal insertion of the UCL (Fig 3). The Fiber-Tape internal brace portion of the construct is woven through the stay sutures and then loaded through another SwiveLock anchor distally at the sublime tubercle. Fixation is checked to ensure adequate tension and laxity prior to distal SwiveLock anchor implantation (Fig 4). Following anchor implantation, residual sutures are then cut (Fig 5). The UCL internal brace construct is ranged and tested through valgus stress, displaying appropriate tensioning (Fig 6). A complete description of our technique is described in (Video 1).

Final Examination and Postoperative Protocol

The wound is copiously irrigated, and fascia is repaired with 0-Vicryl. Subcutaneous tissue is repaired

with 2-0 Vicryl and 4-0 monocryl. The incision is dressed with xeroform, Steri-Strips, 4 × 4's, and the patient is placed in a posterior slab splint at 90°. The patient is placed in a hinged elbow brace at 2 weeks postoperatively. Physical therapy will begin after the first postoperative visit to ultimately restore the full range of motion and the strength of the operative elbow.

Discussion

Surgical fixation of UCL tears remains a popular option for the active athlete involved in overhead throwing with incidence for UCLR increasing significantly in the 15–19-year-old group and various techniques for UCLR well described in literature.¹¹ The ongoing modifications of techniques for UCLR focus on decreasing surgical complications and increasing return-to-sport rates.¹⁷ There are minimal data that directly compare the clinical outcomes and surgical

Fig 6. The patient is positioned supine with the left elbow on a hand table. The intraoperative image of exposed medial joint ligament capsule complex depicts completed internal brace repair of the ulnar collateral ligament being tested with valgus stress and demonstrating excellent tension.



Table 1. List of Advantages and Disadvantages Associated With Tommy John Ligament Repair With UCL Internal Brace Surgical Technique

Advantages	Disadvantages
Internal bracing with knotless suture anchor enables suture repair of ligamentous defect and avoids complications associated with traditional suture anchors.	Technically complex procedure
Shorter surgical duration, faster recovery time, and less instrumentation versus ulnar collateral ligament (UCL) reconstruction	Because of variable tensioning system of the technique, overtensioning of the internal brace during final construct fixation can result in postoperative stiffness and decreased elbow range of motion.
Risks associated with UCL reconstruction, such as ulnar nerve dysfunction, infection, fracture, and graft failure reduced or eliminated with internal brace.	

techniques of UCL reconstruction and repair; however, an early comparison study reported 81% (48 of 59) of patients with reconstructions and 63% (5 of 8) of patients with repairs returned to the same or higher level of play.¹⁸ UCL internal bracing continues to evolve as a popular alternative to UCLR in providing surgical fixation of UCL tears, and several techniques have been well reported in the available literature.^{1,19-20} Moreover, UCLR has classically been associated with a longer than desired recovery time and return to sport.^{10,18} A study by Wilk et al. analyzing 350 athletes, who underwent UCL internal bracing over a 3-year period found an average return to play length of 7 months, which is ~5 months shorter than the average return to play length associated with UCLR.²⁰ This finding is consistent with a previous study by Dugas et al. identifying a mean 6.7-month return to sport time following UCL internal brace repair.¹³ These findings suggest that surgical fixation with UCL internal bracing can be a viable option for athletes who need to return to sport faster, although further longitudinal studies are needed to verify the effectiveness and longevity of UCL internal bracing rehabilitation.

In UCLR, a high complication rate associated with graft failure, infection, fracture, and ulnar nerve dysfunction is present.²¹ A major advantage of our UCL internal brace technique is the lower risk of graft failure. The incidence of graft failure has increased

following UCLR because of the increased popularity of UCLR in overhead athletes.²² Internal bracing also decreases the necessity of revision surgery, with rates as UCL revision surgery high as 6.7% in major league baseball players, according to the largest epidemiological study of UCLR to date.²³ Although a rare complication in UCLR, the risk of fracture and need for subsequent surgery of the elbow is also greatly minimized in internal bracing.¹²

In contrast to UCLR, internal bracing also offers a shorter surgical duration time and less total instrumentation, thus reducing the risk of postoperative morbidity and iatrogenic damage. Internal bracing also allows for suture repair of the ligamentous defect, therefore, avoiding complications associated with traditional suture anchors. Another advantage to this technique is the utilization of SwiveLock knotless suture anchors for internal bracing of the UCL, enabling suture repair through the distal portion of the UCL, which may improve both dynamic and static stability UCL.¹⁸ Moreover, the use of knotless suture anchors avoids concerns associated with traditional suture anchors, such as osteolysis, chondrolysis, revision drilling, anchor loosening, fragment fracture, and difficulties acquiring MRI.²⁴⁻²⁸

A considerable disadvantage of this procedure is its technically complex nature, thus requiring a surgeon to have sufficient familiarity with the instrumentation used for internal brace repair of the UCL. Overtensioning of the internal brace during final fixation of UCL construct can result in postoperative stiffness and decreased elbow range of motion. A complete list of advantages and disadvantages is listed in [Table 1](#). Once the surgeon gains familiarity with this technique and the required tools, this procedure can offer greater stability and functionality to patients suffering from UCL injuries who require surgical intervention. Pearls of this technique include making an adequately sized incision for proper visualization of anatomic landmarks and preservation of adjacent neurovasculature by identifying, mobilizing, and protecting both the medial antebrachial cutaneous and ulnar nerve throughout the

Table 2. Pearls and Pitfalls of Tommy John Ligament Repair with UCL Internal Brace surgical technique

Pearls	
Identification, mobilization, and protection of medial antebrachial cutaneous and ulnar nerve throughout duration of procedure	
Adequately sized incision is essential for proper visualization of anatomic landmarks, proper retraction, and protection of adjacent neurovasculature.	
Pitfalls	
Anatomic positioning of the sublime tubercle and medial epicondyle should be carefully identified for proper placement of suture anchors.	
Failure to mobilize and protect the ulnar nerve throughout the duration of the procedure can result in iatrogenic damage.	

duration of the procedure. A complete list of pearls and pitfalls is described in [Table 2](#).

This technical note describes a Tommy John ligament repair with the UCL internal brace using knotless suture anchors in a physically active patient. In contrast to classic UCL reconstruction, our UCL internal brace technique possesses a shorter duration time with less instrumentation, in addition to enabling suture repair of the ligamentous defect, while eliminating risk associated with traditional suture anchors. With this technical note, we propose a reproducible, effective technique for surgical intervention of UCL injuries to return active patients to functionality and sport.

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