Ulnar Collateral Ligament Repair: An Old Idea With a New Wrinkle

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Abstract

At our practice, we have successfully treated thousands of overhead athletes with the modified Jobe technique of ulnar collateral ligament (UCL) repair. We used this technique regardless of the amount and location of the pathology encountered at the time of surgery. We asked whether the availability of modern anchor and suture technology, vast clinical experience with these injuries and their outcomes, and even biologic additives could be applied to some of these patients to achieve an equal or superior outcome in less time. This led us to create a construct that could be used to not only repair the torn native UCL tissue to bone, but also span the anatomic native ligament from its origin to its insertion. This construct includes an ultra-strong collagen coated tape attached at the anatomic insertions of the ligament using two 3.5-mm nonabsorbable PEEK corkscrew anchors and a suture through the eyelet of one of the anchors.

Repair of the ulnar collateral ligament (UCL) was first reported by Norwood and colleagues[1] in a group of athletes who sustained acute UCL ruptures. Of the 4 athletes in their cohort who underwent direct UCL repair, none were noted to have any residual instability 2 years after the surgery. However, none of these 4 were overhead throwing athletes. Jobe and colleagues[2] first published Jobe's technique of UCL reconstruction in 1986, but it was Conway and colleagus'[3] 1992 publication describing Jobe's experience with UCL injury and surgical treatment in throwing athletes that set the early standard for management in that population. Since those landmark studies, there has been a tremendous increase in attention to this near-epidemic clinical problem.

Although these studies were the first to describe the surgical procedure that is now often referred to as "Tommy John surgery," named after Jobe's initial patient in 1974, Conway and colleagues[3] also reported on Jobe's early experience with UCL repair. In fact, of the 70 patients reported in the Conway and colleagues'[3] article, 14 were treated with repair of the ligament. Only 7 of the 14 (50%) of those who underwent UCL repair were able to return to the same level of play, and only 2 of the 7 (29%) of Major League Baseball (MLB) players who underwent UCL repair were able to return to competition at the MLB level. This compared very poorly with the nearly 75% rate of return to competition in patients who underwent UCL reconstructions in the same cohort. In Azar and colleagues'[4] 2000 report on Dr. James Andrews' experience with UCL injury and treatment in male college and professional baseball players, UCL repair again did poorly when compared to UCL reconstruction, with only 5 of the 8 (63%) of UCL repair patients returning to the same level of play compared to 41 of the 51 (81%) of UCL reconstructions using a modification of Jobe's original technique.

Since the mid-1990s, numerous new techniques have been described and shown to have acceptable and largely successful outcomes in treating UCL injuries.[5-9] All of them involve placing or anchoring a spanning piece of tendon graft from the native origin on the medial epicondyle of the humerus to the native insertion on the sublime tubercle of the ulna. These palpable and visible anatomic landmarks are important to the UCL surgeon due to the need to place the graft or repair the torn ligament tissue to its normal anatomic

Author's Disclosure Statement: Dr. Dugas reports he is a paid consultant for Arthrex and receives a royalty related to the technique described in this article.

origin and/or insertion.[10] Regardless of whether the graft is sewn, docked, tunneled, or anchored, these types of procedures have demonstrated rates of return to competition at the same or higher level of play in the 75% to 92% range.[3,4,7,11-13] In the largest published series of 1281 UCL reconstructions by Cain and colleagues[7] at American Sports Medicine Institute (Birmingham, AL), the rate of return to play at the same or higher level was 84%, with the average time to return to play of 11.4 months. On the basis of these robust clinical studies and numerous basic science studies demonstrating essentially equivalent strength and function among reconstruction techniques, UCL reconstruction now enjoys an acceptance among clinicians, athletes, athletic trainers, coaches, and team management at all levels of overhead sports.

In comparison to UCL reconstruction, relatively little has been published on UCL repair since 2000. Certainly this is in part due to the success of its clinical descendant. UCL repair did not appear on the pages of peer-reviewed literature until 2006, when Argo and colleagues[11] published a report on the outcome of 17 UCL repairs in female athletes using a variety of techniques, including plication, anchor-to-bone, and drill holes. Although there was only 1 pitcher in the group, 16 of the 17 (94%) returned to the same or higher level of competition at an average of only 3 months after surgery.[11]

Savoie and colleagues[13] followed this in 2008 with a report on 60 UCL repairs in overhead athletes. Of the 51 patients in this study in which the ligament was repaired to bone using suture anchors, 93% returned to the same or higher level of play at an average of only 6 months after surgery. Including Jobe's original group, there have been less than 100 patients ever reported to have had a UCL repair performed. In comparison to the thousands of UCL reconstructions that have been reported over the last 20 years, it is not surprising that UCL repair has not gained great popularity among surgeons and patients. It is also important to remember that suture and anchor technology has come a long way since the 1970s, and our overall knowledge of the injury and its treatments and rehabilitation have grown tremendously since that time.

A New Technique for UCL Repair

Since we began data collection in Birmingham, Alabama in the mid 1990s, our practice has successfully treated thousands of overhead athletes of all types with the modified Jobe technique of UCL reconstruction, using either a palmaris longus tendon or a gracilis tendon graft.[7] Until August 2013, this technique was exclusively utilized regardless of the amount and location of pathology encountered at the time of surgery. The range of pathology, from partial undersurface tearing to complete disruption of the ligament tissue, was treated by placing a graft at the anatomic insertion points of the native ligament. While the success of this experience

cannot be overlooked, we also realized that we were treating a broad spectrum of pathology and injury with the same operation.

Recognizing the valuable contributions of earlier authors who had attempted UCL repair previously, we asked whether we were doing too much of an operation for all of the various pathology we saw at the time of surgery, and whether the availability of modern anchor and suture technology, vast clinical experience with these injuries and their outcomes, and even biologic additives could be applied to some of these patients in order to achieve an equal or superior outcome in less time. In particular, could such a technique be applied to the ever-increasing number of younger athletes with less pathology, who more frequently suffer end-avulsions and partial tears of their UCL?

These thoughts, along with Savoie and colleagues'[13] experience with UCL repair using suture anchors, led us to create a construct that could be used to not only repair the torn native UCL tissue to bone, but also span the anatomic native ligament from its origin to its insertion. The construct includes an ultra-strong collagen coated tape (FiberTape, Arthrex) attached at the anatomic insertions of the ligament using two 3.5-mm non-absorbable PEEK corkscrew anchors (SwiveLock, Arthrex), and a suture through the eyelet of one of the anchors (**Figure 1)**. Using this construct, the native ligament disruption can be repaired directly to bone using the suture through the eyelet of the anchor, and the remainder of the native ligament is augmented with the spanning biologic enhanced tape (**Figures 2A-2C)**. The construct is created by placing one end of the tape through the eyelet of the first anchor, and then placing one end of a No. zero braided permanent suture through the same eyelet. Both ends of the tape are then placed through the eyelet of the second anchor. The first anchor is inserted into a hole drilled at the apex of the insertion of the *torn end* of the native ligament. This anchor is placed first in order to allow for direct repair of the native torn ligament using the free suture through the eyelet of the first anchor. The second hole is then drilled at the insertion of the native ligament on the uninjured end of the native ligament. In order to accommodate the volume of tape in the hole created for the second anchor, a slightly oversized drill and tap were created specifically for this technique (Arthrex).

Figure 1. Complete construct for ulnar collateral ligament repair using two 3.5-mm SwiveLock (Arthrex), and collagen-coated FiberTape (Arthrex).

Before attempting this in vivo, a cadaveric study was carried out in order to ensure that the time-zero function of the construct would be at least as good as the standard UCL reconstruction technique we have used for several decades.[14] The time-zero gap formation under valgus load was less for the repair/augmentation than for the standard reconstruction with palmaris longus, and the ultimate failure strength of the repair was the same as in the reconstruction group, with all failures through bone in the cadaveric specimens. No anchors pulled out of bone, and the tape did not tear in any specimen.

This basic science study has given us confidence to proceed with the use of this technique

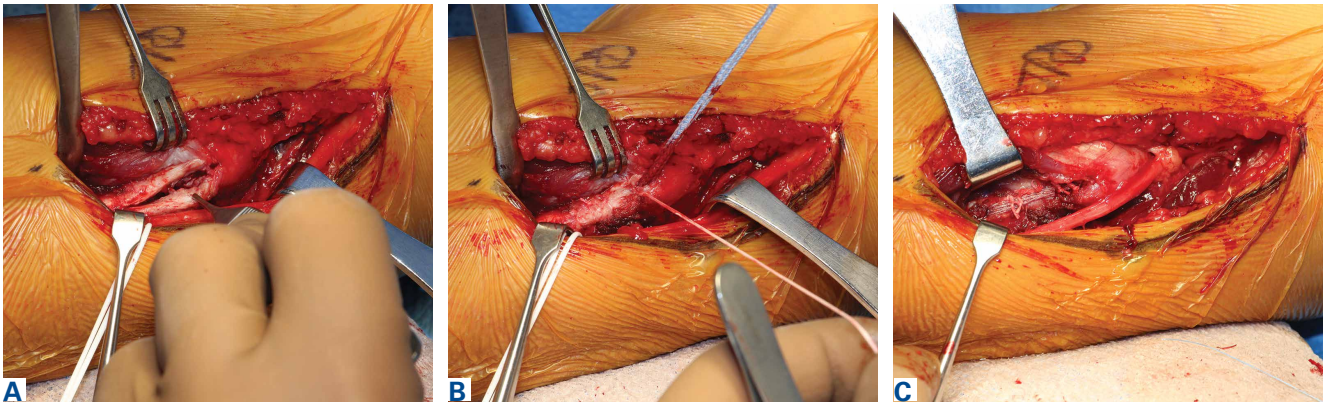

Figure 2. Photograph of completed ulnar collateral ligament repair and augmentation with internal bracing using the construct shown in Figure 1. Note that the longitudinal split in the native ligament has been repaired using side-to-side interrupted permanent braided sutures.

in patients. The first patient was treated with this construct in August 2013. The outcomes of our first series of patients will be presented on Saturday, March 5 at American Orthopaedic Society for Sports Medicine Specialty Day during the 2016 American Academy of Orthopaedic Surgeons annual meeting in Orlando, FL.

We do not feel that this technique is adequate for the treatment of the UCL that has sustained attritional injury and contains poor quality native ligament tissue. Before we do these procedures, we always discuss with the patient the possibility that full reconstruction may be required, and that the decision to proceed with UCL repair is contingent upon the quality and quantity of the native UCL tissue present at the time of surgery. If the quality of the native tissue is poor (chronic degenerative changes, etc), full reconstruction with autograft tendon is recommended. It is our hope that this technique will afford the UCL surgeon another option for treating end-avulsions and partial thickness injuries, with a more rapid and successful return to normal function and competition.

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Am J Orthop. 2016;45(3):124-127.

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