Biomechanical Evaluation of a Modified Internal Brace Construct for the Treatment of Ulnar Collateral Ligament Injuries

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Background: Ulnar collateral ligament (UCL) repair augmented with the "internal brace" construct for the management of acute UCL injuries has recently garnered increasing interest from the sports medicine community. One concern with this technique is excessive bone loss at the sublime tubercle, should revision UCL reconstruction be required. In an effort to preserve the bony architecture of the sublime tubercle, an alternative internal brace construct is proposed and biomechanically compared with the gold standard UCL reconstruction.

Hypothesis: The internal brace repair construct will restore valgus laxity and rotation to its native state and demonstrate comparable load-to-failure characteristics with the 3-strand reconstruction technique.

Study Design: Controlled laboratory study.

Methods: For this study, 8 matched pairs of fresh-frozen cadaveric elbows were randomized to undergo either UCL reconstruction with the 3-ply docking technique or UCL repair with a novel internal brace construct focused on augmenting the posterior band of the anterior bundle of the ligament (modified repair-IB technique). Valgus laxity and rotation measurements were quantified through use of a MicroScribe 3DLX digitizer at various flexion angles of the native ligament, transected ligament, and repaired or reconstructed ligament. Laxity testing was performed from maximum extension to 120° of flexion. Each specimen was then loaded to failure, and the method of failure was recorded.

Results: Valgus laxity was restored to the intact state at all degrees of elbow flexion with the modified repair-IB technique, and rotation was restored to the intact state at both full extension and 30°. In the reconstruction group, valgus laxity was not restored to the intact state at either full extension or 30° of flexion ($P < .001$ and $P = .004$, respectively). Laxity was restored at 60° of flexion, but the elbow was overconstrained at 90° and 120° of flexion ($P = .027$ and $P = .003$, respectively). In load-to-failure testing, the reconstruction group demonstrated significantly greater yield torque (19.1 vs 9.0 N·m; $P < .005$), yield angle (10.2° vs 5.4°; $P = .007$), and ultimate torque (23.9 vs 17.6 N·m; $P = .039$).

Conclusion: UCL repair with posterior band internal bracing was able to restore valgus laxity and rotation to the native state. The construct exhibited lower load-to-failure characteristics when compared with the reconstruction technique.

Clinical Relevance: In selected patients with acute, avulsion-type UCL injuries, ligament repair with posterior band internal bracing is a viable alternative surgical option that, by preserving bone at the sublime tubercle, may decrease the complexity of future revision procedures.

Keywords: Tommy John surgery; ulnar collateral ligament repair; ulnar collateral ligament; elbow; biomechanics; internal brace

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Elbow ulnar collateral ligament (UCL) reconstruction, or "Tommy John surgery," was introduced by Jobe et al[14] in 1986. The original 3-ply construct featured a palmaris longus autograft tendon passed in a figure-of-8 configuration through convergent tunnels in the ulna and divergent tunnels in the humerus. Since the original procedure 30 years ago, numerous variations of the constructs have been described. Throughout this evolution, the overarching belief has remained that ligament reconstruction is the gold standard for managing UCL injuries in athletes.

Since its introduction, UCL reconstruction has remained in the spotlight, and the frequency of the procedure performed at all levels of competition has steadily increased.[4,9,16] In addition, recent epidemiologic data suggest that the sports medicine community is witnessing the emergence of a new, much younger patient group. In 2015,

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Erickson and colleagues[9] reported that of 790 athletes who underwent UCL reconstruction between 2007 and 2011, 56.8% were between the ages of 15 and 19 years. This rate was significantly higher than that of any other age group. Furthermore, the authors reported a yearly 9.2% increase in UCL reconstructions performed in this young cohort. Conte and colleagues[4] reported on UCL reconstruction prevalence in professional baseball players and found that among the minor league pitchers surveyed, 61% had undergone the procedure in either high school or college.

As the number of primary UCL reconstructions increases, so does the frequency of patients requiring revision procedures. Recent literature suggests that revision rates for failed UCL reconstructions range from 3.9% to 13.2%, and this number increases every year.[9,16] Outcomes following revision surgery are less encouraging than those of primary UCL reconstructions, with reported rates of successful return to play (RTP) ranging from 33% to 65%.[5,17] These data indicate that in today's sport-specialized youth, players are exposed to the risk of a potentially career-ending UCL reconstruction reinjury much earlier than previous generations of athletes.

In response to the current trends in UCL reconstruction, UCL repair has gained increasing popularity in the past decade. In 2008, Savoie and colleagues[22] demonstrated a 97% RTP rate in their cohort of young athletes undergoing primary UCL repair. More recently, a systematic review of the literature reported an 87% RTP rate in 92 athletes undergoing primary UCL repair.[8] Drawing upon the newfound popularity of the "internal brace" concept for ligamentous repair, Dugas[6] introduced an augmented UCL repair construct featuring an internal brace in 2016. Biomechanical analysis performed by Dugas et al[7] suggested that the new repair construct is as strong as the classic modified Jobe reconstruction technique and better at preventing gap formation. The repair technique proposed by Dugas involves placing a single 3.5-mm SwiveLock (Arthrex Inc) into the center of the ulnar footprint and another one into the humeral epicondyle, creating a suture bridge that protects the primary repair. Although this technique is conceptually promising, one concern is the bone loss caused by the anchor placed directly into the middle of the sublime tubercle. This issue becomes especially important in the setting of revision surgery.

The objective of this study was to develop a new UCL internal brace repair construct (referred to here as the "modified repair-IB" technique) that spares the bony ulnar footprint, and then to biomechanically compare it with the 3-strand docking UCL reconstruction technique. We hypothesized that the modified repair-IB construct would restore valgus laxity and rotation to the ligament's native state while demonstrating load-to-failure characteristics comparable with those of UCL reconstruction.

METHODS

In 8 matched pairs of fresh-frozen male cadaveric elbows (average age, 58.5 years; range, 49-67 years), all soft tissue attachments were dissected except the capsule and the medial and lateral collateral ligaments. All cadavers were acquired through the university willed body program. Each specimen's palmaris longus tendon was harvested and preserved for the UCL reconstruction phase of the study. The specimens were stored in a freezer at –20°C and thawed to room temperature for 24 hours prior to testing. Forearms were fixed in neutral rotation with a screw. Forearms and humeri were then potted in polyvinylchloride pipes with plaster of paris. The forearm was potted in neutral rotation. The intact soft tissues were kept moist with saline solution throughout testing. For each pair of matched elbows, 1 specimen was chosen to undergo the modified repair-IB technique while the other specimen underwent UCL reconstruction with a variation of the docking technique described by Rohrbough et al[20] in 2002. Thus, there were 8 specimens in the repair group and 8 in the reconstruction group. In both groups, valgus laxity and forearm rotation were tested in the intact, torn, and reconstructed or repaired states. All specimens were tested to failure after completion of the chosen surgical procedure.

Kinematic Testing

Valgus laxity was tested by use of a 3-dimensional coordinate measurement device (MicroScribe 3DLX; Revware Inc). The potted humerus was fixed to the testing apparatus with the epicondylar axis perpendicular to the testing apparatus. The medial epicondyle was positioned superior to the lateral epicondyle such that the weight of the potted forearm provided a valgus torque of 0.5 N·m on the elbow. This setup permitted the elbow to move freely within its natural flexion-extension arc and the forearm to rotate

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freely in varus-valgus and pronation-supination; however, testing was performed in neutral forearm rotation (Figure 1).

Prior to testing, the specimen was preconditioned by cycling the elbow 5 times through its full natural range of motion. The elbow was then positioned in full extension. The flexion angle was confirmed, and valgus position and rotation were noted. Measurements were then repeated at 30°, 60°, 90°, and 120° of flexion. Two measurements were taken to ensure reproducibility to within 1.5° of the valgus angle and 2° of the flexion angle. The 2 values were then averaged for analysis.

After completion of testing for the native UCL, the ulnar footprint of the anterior bundle was identified on the sublime tubercle and was elevated in a single sheet off the bone. The tissue was then dissected proximally until the ulnotrochlear joint was exposed to mimic a distal avulsion injury of the UCL (Figure 2).

The posterior bundle and remaining capsule were left intact. Valgus laxity and ulnar rotation were again measured at the 5 different elbow flexion angles. The specimen was then left fixed to the apparatus, and the randomly selected UCL procedure was performed. The specimen was preconditioned by cycling the elbow, and laxity and ulnar rotation measurements were again recorded for each of the 5 elbow flexion angles.

Load-to-Failure Testing

After laxity testing, the repaired or reconstructed elbow specimens were mounted on an Instron materials testing machine. The humerus was fixed to the apparatus with 4 cross-screws. The elbow was positioned in 70° of flexion, and the force loading arm of the device was fixed to the forearm 15 cm distal to the medial epicondyle (Figure 3).

The design of this setup allowed for the custom device to apply a force through the Instron machine while maintaining a constant moment arm about the elbow. A valgus preload of 1 N·m was applied, and the specimen was then loaded to failure at a rate of 50 mm/s. Load-displacement characteristics were recorded and plotted, and the yield angular displacement, yield torque, ultimate angular displacement, and ultimate torque were determined. The mode of failure for each specimen was also recorded.

Surgical Technique: Repair With Internal Bracing

After completion of valgus laxity testing, the specimens were prepared for ligament repair. A point centered in the UCL footprint and 5 mm distal to the joint line was marked. A 55° V-drill guide was positioned 1 mm distal to the marked spot and used to identify the starting points for the anterior and posterior anchor tunnels. A 2.9-mm drill with a 12.5-mm drill sleeve was used to make divergent anterior and posterior tunnels for 2.9-mm short PushLock anchors (Arthrex). The anterior anchor was loaded with two No. 2-0 FiberWire sutures (Arthrex). The posterior anchor was loaded with two No. 2-0 nonabsorbable braided sutures and a single 1.3-mm SutureTape (Arthrex) (Figure 4A). The limbs of the nonabsorbable sutures in both anchors were then passed through the avulsed UCL tissue and left untied (Figure 4B).

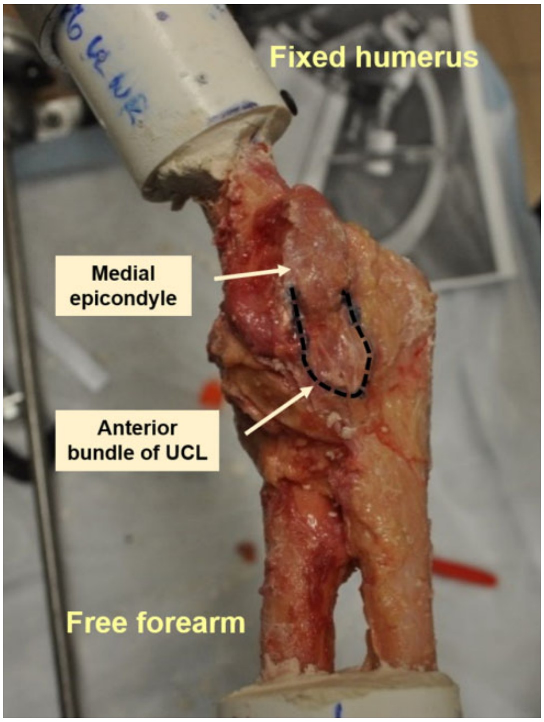

Figure 1. Specimen setup for the kinematic testing. The humerus was fixed and the forearm was allowed to freely rotate about the epicondylar axis. Valgus laxity and rotation data were collected at full extension and at 30°, 60°, 90°, and 120° of flexion. For all testing, the forearm was positioned in neutral rotation. UCL, ulnar collateral ligament.

The UCL footprint on the medial epicondyle was then split longitudinally just enough to allow visualization of the bony attachment site. A 2.9-mm drill with a 15-mm drill sleeve was used to make the tunnel for a 3.5-mm SwiveLock anchor. The tunnel was then tapped with a 3.2-mm tap. The SwiveLock anchor was loaded with the SutureTape from the posterior ulnar anchor. Isometry was confirmed, and the humeral anchor was inserted with the elbow held in 60° of flexion and gentle varus. The nonabsorbable sutures in the distal ligament were then tied to complete the UCL repair (Figures 5 and 6). Specifically, the peripheral limbs were tied to each other, and the central limbs were tied in a cross fashion to the contralateral anchor's limbs (Figure 6).

Surgical Technique: Reconstruction

For the contralateral elbow, a modified 3-ply version of the docking technique originally described by Rohrbough et al[20] was performed. A point 5 mm distal to the ulnotrochlear joint line and centered over the sublime tubercle was again identified. The 55° V-drill guide was used to drill two 3.5-mm convergent tunnels separated by a 6.5-mm bone bridge. The tunnels were connected and dilated through use of small curved curettes. The humeral insertion of the UCL on the medial epicondyle was identified, and a small

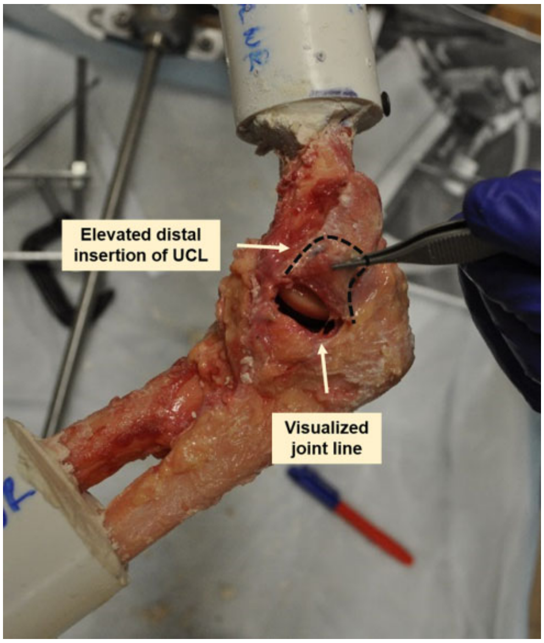

Figure 2. The distal insertion of the ulnar collateral ligament (UCL) was elevated off of the bone in a single sheet and dissected proximally until the joint line was visualized, mimicking a distal avulsion-type injury.

split in the ligament was made to expose the insertion site on the bone. A 4.5-mm drill was used to make a 15-mm humeral socket. Two exit tunnels were made by use of an adjustable C-drill guide, connecting to the humeral socket. The larger, 3.5-mm tunnel was positioned on the superior aspect of the medial epicondyle in line with the epicondylar ridge. A 2.0-mm drill was used to make the smaller, anterior tunnel, with care taken to maintain a 10-mm bone bridge between the 2 tunnels.

For all specimens undergoing reconstruction, the previously harvested palmaris longus tendon was used for the graft. Each graft was pretensioned at 4.5 kg for 10 minutes prior to implantation. A No. 2 FiberLoop (Arthrex) was used to whipstitch one end of the graft, and the graft was passed through the ulnar tunnel with the whipstitched end exiting through the anterior tunnel. The anterior limb of the graft was then docked into the humeral tunnel, and the suture limbs were passed through the anterior humeral exit hole. The posterior limb of the graft was then approximated to the epicondyle and marked at 10 mm proximal to the aperture of the humeral socket, leaving 5 mm within the socket for graft tensioning. The elbow was cycled to confirm graft isometry. Another No. 2 whipstitch was placed at the marked spot, leaving the distal tail of the graft free. The limbs of the suture were passed through the posterior exit tunnel, docking the posterior limb in the socket. As the posterior limb was docked, the graft doubled over on itself, creating the third limb of the 3-ply graft. With the elbow held in 60° of flexion and gentle varus, the suture ends of the 2 graft limbs were tensioned and tied over the bone bridge. Finally, the doubled free edge of the posterior limb of the graft was tagged with a No. 2-0 nonabsorbable whipstitch, passed through the ulnar tunnel posterior to anterior, and sutured to the anterior limb of the graft. To complete the construct, 3 figure-of-8 cerclage stitches were placed around all 3 limbs of the graft by use of No. 2-0 nonabsorbable suture (Figure 7).

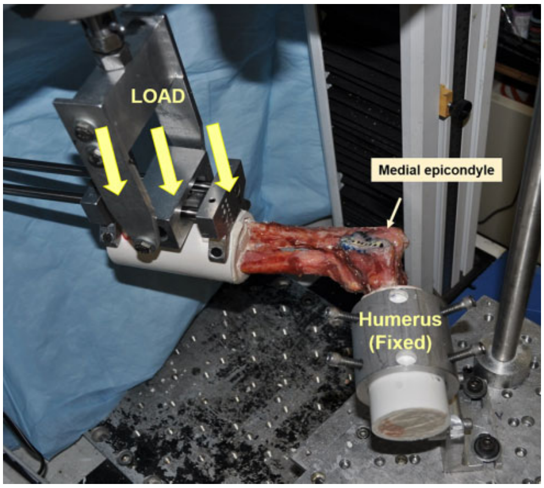

Figure 3. Setup for load-to-failure testing. The humerus was fixed to the apparatus. The loading arm of the machine was secured 15 cm distal to the medial epicondyle. The elbow was secured in 70° of flexion.

Statistical Analysis

For valgus laxity and forearm rotation testing, a repeated-measures analysis of variance (ANOVA) with a Tukey post hoc test was used to compare the 3 ligament conditions: intact, torn, and repaired or reconstructed. A repeated-measures ANOVA with Tukey post hoc test was also used to compare the difference between the intact and surgically treated elbows across flexion angles. For the load-to-failure biomechanical parameters, a 2-tailed paired t test was used to compare the repair and reconstruction techniques, with significance defined as $P < .05$.

RESULTS

Valgus Laxity

A significant difference in valgus laxity was found between the intact and torn states for all specimens in the repair and reconstruction groups ($P < .05$) (Figure 8). In the reconstruction group, valgus laxity was restored to the intact state at 60° of flexion. The elbow was overconstrained at 90° and 120° of flexion ($P = .027$ and $P = .003$, respectively) (Figure 8A). The reconstruction construct failed to restore valgus laxity to the intact state at both full extension and 30° of flexion ($P < .001$ and $P = .004$, respectively) (Figure 8A). In the modified repair-IB group, valgus laxity

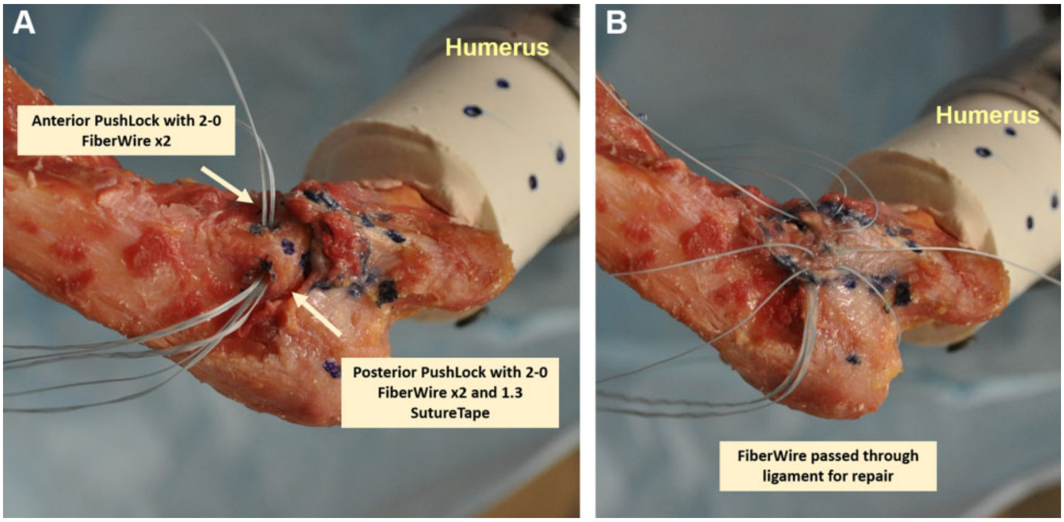

Figure 4. (A) Divergent anterior and posterior ulnar anchors are placed in the 2 spots where tunnels would be drilled for a standard reconstruction. (B) The FiberWire sutures from each anchor are passed through the avulsed ligament in preparation for repair.

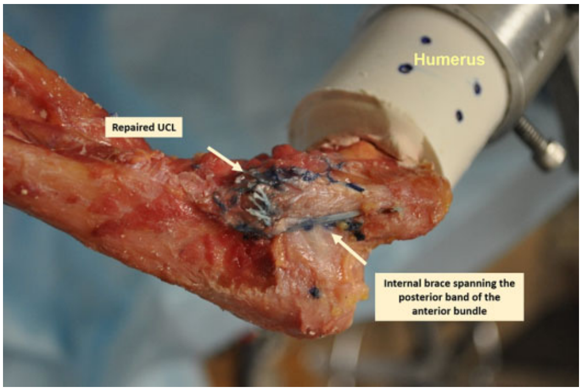

Figure 5. The final modified repair-IB construct. UCL, ulnar collateral ligament.

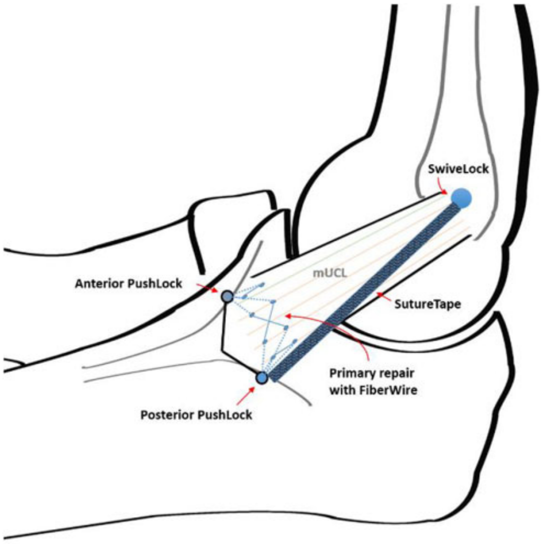

Figure 6. Schema of the modified repair-IB construct. mUCL, medial ulnar collateral ligament.

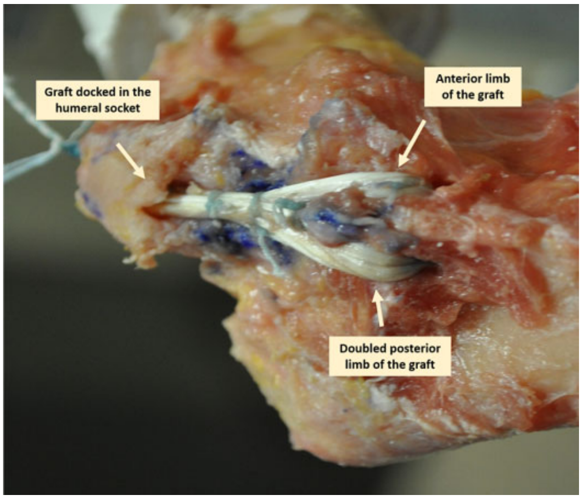

Figure 7. The final construct of the docking reconstruction technique. The posterior band of the graft is doubled over to create a 3-ply reconstruction.

was restored to the intact state for all angles of elbow flexion (Figure 8B).

Ulnar Rotation

Rotation was significantly increased in the injured specimens at full extension and 30° of flexion in the modified repair-IB and reconstruction groups (Figure 9). The modified repair-IB construct successfully restored rotation to the intact state in both flexion angles (Figure 9B).

The 3-ply reconstruction construct restored rotation to the intact state at full extension but underrotated the ulna at 30° of flexion ($P = .002$). Additionally, the reconstruction construct overrotated the ulna at 90° of rotation ($P = .02$) (Figure 10).

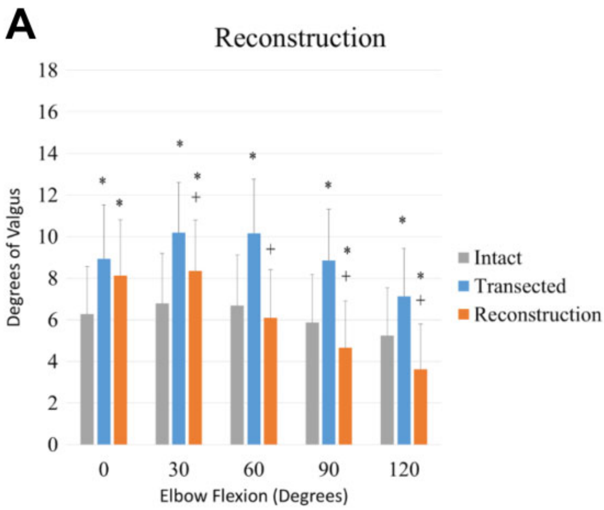

Figure 8. (A) Valgus laxity for the reconstruction group in the intact, torn, and reconstructed states. (B) Valgus laxity for the modified repair-IB group in the intact, torn, and repaired states. *$P < .05$ compared with the intact state. $^+P < .05$ compared with the torn state.

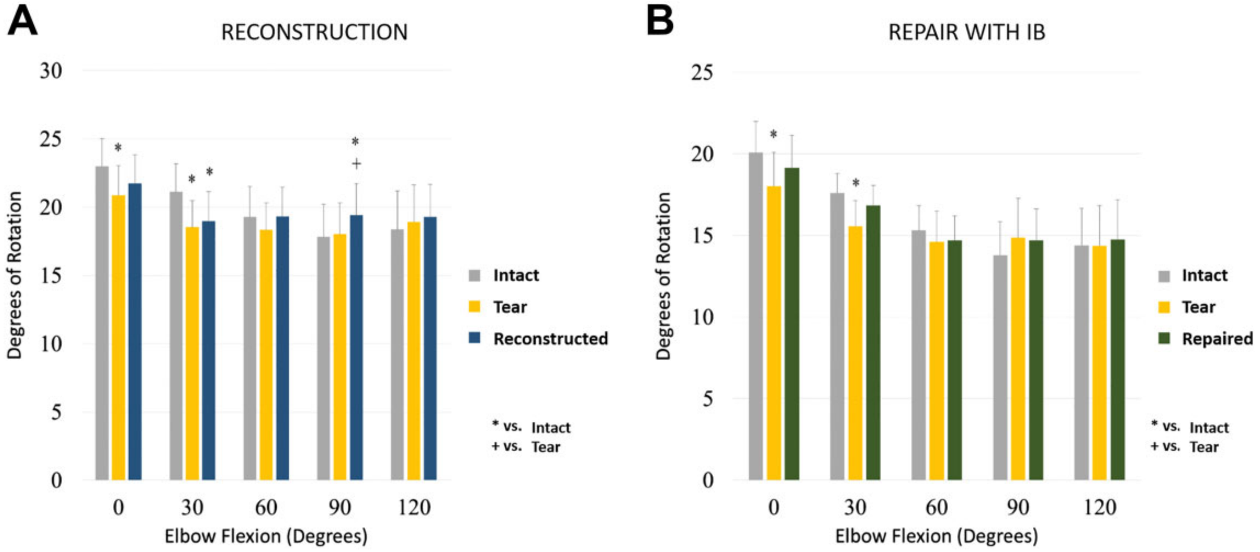

Figure 9. (A) Ulnar rotation for the reconstruction group in the intact, torn, and reconstructed states. (B) Ulnar rotation for the modified repair-IB group in the intact, torn, and repaired states. *$P <.05$ compared with the intact state. $^+P < .05$ compared with the torn state.

Load-to-Failure

Both constructs demonstrated similar stiffness and ultimate angle characteristics (Table 1). Yield torque for the reconstruction technique (19.1 ± 1.4 N·m) was significantly greater than that of the modified repair-IB method (9.0 ± 1.4 N·m; $P < .005$). The yield angle for the reconstruction group was 10.2°, which was found to be significantly greater than that of the repair group (5.4°; $P = .0072$). Finally, ultimate torque was significantly higher in the reconstruction group compared with the repair group (23.9 vs 17.6 N·m; $P = .039$).

Mode of Failure

In the modified repair-IB group, 4 of the 8 specimens failed at the epicondyle due to suture slippage. A further 2 specimens failed at the sublime tubercle with the posterior anchor pulling out. The remaining 2 specimens failed by sublime tubercle fracture. In the reconstruction group, 6 of the 8 reconstruction constructs failed at the sublime tubercle with bone bridge fracture. One reconstruction failed due to knot failure at the epicondyle and 1 due to failure at the suture-tendon interface.

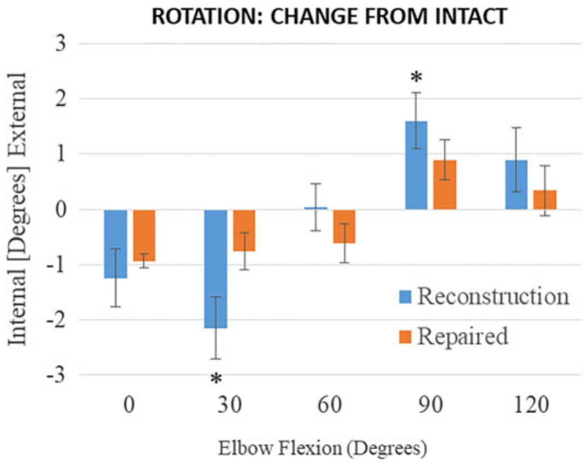

Figure 10. Ulnar rotation seen with each construct compared with the intact state. Reconstruction underrotated the ulna at 30° (*$P = .002$) and overrotated the ulna at 90° (*$P = .02$). No difference in rotation was found between the intact and repaired states at any angle.

TABLE 1
Load-to-Failure Properties for the Ulnar Collateral Reconstruction and Repair Techniques[a]

	Reconstruction	Repair	*P* Value
Stiffness, N·m/deg	2.0 ± 0.2	1.6 ± 0.2	.25
Yield torque, N·m	19.1 ± 1.4	9.0 ± 1.4	<**.005**
Yield angle, deg	10.2 ± 1.0	5.4 ± 0.6	**.0072**
Ultimate angle, deg	14.0 ± 1.0	12.8 ± 0.7	.20
Ultimate torque, N·m	23.9 ± 2.2	17.6 ± 1.7	**.039**

[a] Values are expressed as mean ± SD. Boldface indicates significant difference between groups ($P < .05$).

DISCUSSION

This study presents a modified UCL repair construct that incorporates the internal brace concept to augment the posterior band of the anterior bundle of the ligament. We chose to specifically address the posterior band of the anterior bundle because this structure has been shown to be the most vulnerable in elbow flexion.[2] Although the anterior band has previously been established as the primary valgus stabilizer in the elbow, recent data indicate that the posterior band sees a linear increase in strain with increasing elbow flexion, while the strain pattern for the anterior band remains isometric throughout the flexion arc.[13] Furthermore, the amount of strain experienced by the posterior band surpasses that of the anterior band at 70° of flexion, indicating that the role of the posterior band in valgus stability becomes more important at higher flexion angles. This concept is especially important when considering UCL injuries in baseball pitchers. It is well established that the medial elbow is exposed to the highest loads during the late cocking–early acceleration phase of throwing.[11] This phase occurs just prior to front foot plant and is associated with elbow flexion angles ranging from 60° to 90°.[10,19]

Our data support the hypothesis that the modified repair-IB construct effectively restores elbow valgus laxity, ulnar rotation, and thus normal elbow kinematics. Our results indicate that the modified repair-IB technique may achieve elbow kinematics more reliably and consistently than the 3-strand reconstruction method. Our findings fail to support the hypothesis that the modified repair-IB construct exhibits load-to-failure characteristics similar to those of the reconstruction construct. Although important to report, this finding does not detract from the clinical applicability of the modified repair-IB technique. The ultimate theoretical goal of the internal brace construct is to protect the repaired ligament as it heals. In the clinical setting, this is a period during which the ligament is not exposed to the high loads exerted on it during biomechanical testing. Once the ligament has healed, the strength of the native ligament is restored and the internal brace becomes obsolete. This concept also explains the lower yield angle and yield strength exhibited by the modified repair-IB model. When the repair was performed, great care was taken to ensure that the internal brace did not overconstrain the elbow by overtightening the internal brace—an error that would lead to permanent UCL stress shielding. As such, when the construct was loaded to failure, the first structure to reach its yield point was the repaired ligament. Prior to repair failure, however, the load was transferred to the internal brace, which allowed testing to continue to the much higher ultimate failure load.

The results of this study differ from those reported by Dugas et al[7] in their biomechanical analysis of the internal brace construct in the setting of UCL repair. Dugas et al reported no difference in load-to-failure properties between the repair and modified Jobe reconstruction constructs. In contrast, we found a significant difference in both yield and ultimate load-to-failure properties between the modified repair-IB and 3-ply reconstruction techniques. One explanation for this discrepancy may lie in the different injury models used in the 2 studies. The present study used a complete avulsion injury model in which the entire ulnar footprint was elevated from the surrounding capsular and ligamentous tissues. Dugas et al, in contrast, created a longitudinal split within the ligament and elevated the distal insertion anteriorly and posteriorly off of the sublime tubercle. The anterior and posterior tissues of the ligament, however, remained congruent with the surrounding capsular and ligamentous tissues.

Another reason for the difference in data between studies could lie in the suture used for the internal brace construct. The present study used a coreless, 1.3-mm SutureTape, whereas Dugas et al[7] used the larger, thicker, 2-mm FiberTape (Arthrex). The smaller, smoother SutureTape results in lower friction at the anchor-suture-bone interface, which could have had a significant impact on the load-to-failure characteristics of the construct. Indeed, the most common mode of failure for our modified repair-IB construct was suture pull-out at the epicondylar fixation point. If replicated clinically, this result would be advantageous, because a main goal of the modified repair-IB construct is to minimize bone loss in a revision setting. If the construct fails primarily by suture, the bony architecture of the sublime tubercle is preserved and, consequently, the complexity of a revision procedure is reduced. In contrast, the most common mode of failure for Dugas et al's FiberTape internal brace construct was ulnar screw pull-out, suggesting that the increased friction created by the FiberTape precluded suture slippage at the epicondylar anchor.

Elbow UCL repair is indicated when an acute, avulsion-type injury is suspected. In such cases, the patient often does not have a history of prodromal elbow pain, suggesting that underlying chronic injury to the ligament is unlikely. Anecdotally, in these patients, magnetic resonance imaging will demonstrate a full-thickness avulsion of the ligament without signal change in the midsubstance of the ligament to suggest attritional changes. As demonstrated by Savoie et al,[22] this scenario is often seen in young overhead athletes without a history of elbow pain. Limiting the applicability of ligament repair to this very specific cohort ensures that repair is performed only in situations where the tissue is healthy and robust. This subsequently increases the likelihood of a successful outcome for the patient. The use of an internal brace-type construct as described in the present study provides additional protection to the repair as it heals.

Limitations

This study has several limitations. We did not collect intact ligament load-to-failure data and thus were unable to compare our modified repair-IB and reconstruction constructs with the native UCL. The ultimate strength of native ligament has been documented in the literature to range from 22.7 to 34 N·m, a value affected by various factors, including age and testing method.[1,3,15,18] However, it has also been suggested that the reconstructed ligament is unable to re-create the strength of the native UCL.[3,15] As such, we determined that evaluating differences between the gold standard reconstruction and the modified repair-IB constructs would be the more clinically significant goal. Another limitation of the study was the average age of our specimens: 58.5 years. Although this is well within the age range of specimens used in other published studies (43-68.5 years),[3,7,12,15,18,21] the increased age could have had an especially significant impact on our data. Specifically, the effect of the low-friction SutureTape used in our internal brace construct could have been amplified by the weaker, older cadaveric bone, affecting our load-to-failure data. Finally, because we opted to test load-to-failure as opposed to cyclic loading to failure, we were unable to report true joint gapping data for the 2 constructs. Load-to-failure testing provides better insight into the structural integrity of the construct and also allows comparison with previously published data, as most experimental designs in the literature focus on load-to-failure parameters. Additionally, valgus laxity has been often used in the literature as a marker of joint stability. As such, we believed that evaluating valgus laxity and rotation would provide equally as important insight into the integrity of the tested constructs.

CONCLUSION

UCL repair with posterior band internal bracing consistently restored valgus laxity and forearm rotation to that of the native state. This modified construct was less likely to restrict normal motion while protecting the ligament repair as it healed. The procedure does not require graft harvest and has minimal impact on the bony architecture of the ligament attachment points. As such, it is likely to be associated with lower morbidity and a hypothetically quicker return to sports. Additionally, the proposed repair construct uses the same ulnar fixation points as the standard reconstruction method, which helps reduce the complexity of future revisions. Considering all of these factors, the UCL repair with posterior band internal bracing construct may offer a viable solution for acute UCL injuries in the increasingly younger patient population.

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