Review of Anatomy of the Medial Ulnar Collateral Ligament Complex of the Elbow

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Published online: 27 January 2020

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Abstract

Purpose of Review The importance of both the static and dynamic stabilizers of the medial elbow for the throwing athlete has been demonstrated in recent studies. Furthermore, recent anatomic studies have demonstrated the insertion of the anterior bundle (UCL) to be more distal and elongated, which has implications for surgical reconstruction of the UCL. The purpose of this review is to highlight recent anatomic and biomechanical studies evaluating the anatomy and reconstructions of the medial elbow.

Recent Findings Recent literature has highlighted the crucial role of the dynamic stabilizers in resisting valgus force, especially during the throwing motion. The dynamic stabilizers of the medial elbow include the flexor pronator mass, specifically the flexor carpi ulnaris (FCU) and flexor digitorum superficialis (FDS). The clinical importance of these findings cannot be understated, as unrecognized dynamic stabilizer injury can lead to increased stress on a native or reconstructed UCL in the throwing athlete.

Summary The medial ulnar collateral ligament complex of the elbow has a crucial role in providing both static and dynamic elbow stability. Most notably, the anterior bundle (UCL) provides the primary resistance to valgus and rotational stresses, especially during throwing motion. An understanding of the humeral and ulnar footprints and their relationships with surrounding structures is necessary to restore the native isometry of the medial complex of the elbow during UCL reconstruction. The flexor pronator musculature plays an essential role in dynamic stability, and the intimate relationship of the FCU and FDS with the ulnar insertion of the UCL should be considered to optimize recovery and outcomes with repair or reconstruction.

Keywords Elbow · Medial ulnar collateral ligament · Anterior bundle · UCL reconstruction · Valgus stability · Biomechanics

Introduction

The medial elbow is composed of both static and dynamic stabilizers that provide restraint to valgus stress, especially during the throwing motion. The static osseous stabilizers include the radiocapitellar (RC) and ulnohumeral (UH) articulations. These bony articulations provide stability under 20° and greater than 120° of elbow flexion and provide up to 2° of rotatory stability (RC). The medial ligamentous complex of the elbow is composed of the medial ulnar collateral ligament which is composed of

anterior, posterior and oblique bundles. The anterior bundle (also known as the ulnar collateral ligament [UCL]) is the primary restraint to valgus force at the medial elbow and is composed of two separate bands: the anterior band, which is tight in extension, and the posterior band, which is tight in flexion.

Historically, the dynamic stabilizers of the medial elbow have been less well studied than the static stabilizers. However, recent literature has highlighted the crucial role of the dynamic stabilizers in resisting valgus force, especially during the throwing motion [1•, 2, 3]. The dynamic stabilizers of the medial elbow include the flexor pronator mass, specifically the flexor carpi ulnaris (FCU) and flexor digitorum superficialis (FDS) [4, 5•, 6, 7]. These structures have been shown to be concomitantly injured in throwing athletes who have UCL injuries. The clinical importance of these findings cannot be understated, as unrecognized dynamic stabilizer injury can lead to increased stress on a native or reconstructed UCL in the throwing athlete.

This article is part of the Topical Collection on *Injuries in Overhead Athletes*

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Anatomy of the Medial Elbow Complex Static Stabilizers

The medial elbow collateral ligament complex is composed of three bundles, the anterior bundle, posterior bundle, and oblique bundle. The UCL is the primary static stabilizer to valgus stress on the medial elbow. It primarily acts to resist valgus and extension stress from 70 to 120° of elbow flexion. The posterior and oblique bundles have limited contribution to throwing elbow stability.

Figure 1 demonstrates the 3 bundles of the medial UCL complex and its musculotendinous relationships (Fig. 1).

The origin of the UCL attaches 8.5 mm distal and 7.8 mm anterior to the medial epicondyle of the humerus [5•]. The surface area has been reported between 17.0 and 45.5 mm² respectively [8•, 9•, 10]. This variation in footprint size may be attributed to differences in measurement technique, with the latter of the three studies measuring the footprint in the context of humeral tunnel placement during UCL reconstruction. The anterior position relative to the medial epicondyle is important to understand when considering UCL reconstruction, as posterior tunnel position is a common error and can decrease graft isometry and result in a graft which is overly tight in flexion [11•]. The insertion of the UCL, commonly referred to as the ulnar footprint, was historically thought insert directly on the sublime tubercle without distal extension

Fig. 1 Medial view of an elbow, demonstrating the 3 bundles of the medial ulnar collateral ligament complex. The relationships between the three bundles and the pronator teres (purple) and brachialis (yellow) muscles are also demonstrated. ABUCL (UCL) anterior bundle, FCU ulnar carpi ulnaris, FDS flexor digitorum superficialis, OBUCL oblique bundle, PBUCL posterior bundle

[12]. However, more recent evidence has demonstrated an elongated, tapered insertion distally along the ulnar ridge [5•, 8•, 9•, 13•]. Based on the most recent studies, the mean surface area of the ulnar insertion of the UCL is 127.2 mm² (range, 66.4–187.6 mm²) [4, 5•, 10, 12•, 14, 15•, 16•, 17]. The center of the footprint, which was historically thought to be at the apex of the sublime tubercle, has been demonstrated in recent studies to be distal to the center of the sublime tubercle, and average of 5.3 mm (1.5–7.6 mm) [5•, 8•], along the ulnar ridge, which is important to consider as we advance reconstruction techniques in attempt to reproduce native anatomy. (Fig. 2).

There is significant heterogeneity in the literature regarding the true dimensions of the UCL. Based on the most recent studies, the mean length and width of the UCL are 31.9 mm (range, 21.1–53.9 mm) and 5.95 mm (range, 4.5–7.6 mm), respectively [4, 5•, 9•, 12, 14, 15•, 17, 18]. It should be highlighted that many of the reported lengths were measured from center of the humeral origin to the sublime tubercle, whereas more recent studies have measured total length from the humeral insertion to the more distal, tapered insertion along the ulnar ridge. The differences in total length and ulnar insertion surface area are likely due to the newly accepted more elongated, distal humeral insertion (Fig. 3).

It must also be highlighted that the above lengths were obtained with the elbow in a static position. However, the UCL is not an isometric stabilizer but changes length throughout progressive elbow flexion. Studies have demonstrated a change of 2.8–4.8 mm as the elbow progresses from extension to full flexion [12, 19, 20].

Fig. 2 The UCL humeral footprint is 15/3 mm from the joint line, while its ulnar footprint is 5.8–7.8 mm from the joint line. The center of the ulnar footprint is 1.5–7.6 mm distal to the center of the sublime tubercle. The center to center length is 22–27 mm, with the overall length of the anterior band measuring 51–53 mm

Fig. 3 Medial view of elbow demonstrating the more distal and elongated insertion of the UCL. More recent studies have demonstrated the ulnar footprint to be 29–30 mm in length and a surface area between 324 and 421 mm²

Biomechanics of the Medial Elbow Complex Static Stabilizers

The primary biomechanical role of the UCL is to provide valgus stability of the elbow, especially in overhead throwing athletes. Morrey et al. [21] demonstrated that with an intact radial head, the UCL provides 31% and 54% of valgus stability at 0° and 90° of elbow flexion, respectively [12]. Moreover, the authors noted that an intact UCL allowed for only 3° of valgus opening in full extension and 2° of valgus opening in full flexion. Similar findings have been reported in a number of other studies, which have demonstrated 2 to 8° of valgus laxity with an intact UCL [4, 12, 18, 20, 21]. To quantify when the UCL has the most laxity with a loaded elbow, Safran et al. analyzed 12 cadaveric specimens with 2 Nm load applied to the elbow in 30° of flexion and reported 10.7° of valgus laxity with the forearm in neutral rotation [22•]. Callaway et al. expanded on these findings by loading the elbow with 2 Nm at 30° and 90° of flexion and reported a valgus laxity of 3.6° [23]. The former of these two studies did not quantify the amount of inherent valgus laxity specimens had prior to testing, which makes direct comparison of the two studies challenging. However, it is thought the amount of UCL valgus laxity is greatest at 30° of flexion [22•].

Several studies have sought to define the contribution of the UCL to valgus stability by sectioning the ligament in cadaveric models at different locations and measuring valgus angles during elbow range of motion. When the UCL is sectioned, the amount of valgus laxity increases until the secondary osseous stabilizers, ulnohumeral and radiocapitellar joints, engage [8•]. It has been

demonstrated that the greatest valgus instability occurs with a deficient UCL and 90° of elbow flexion [23]. Furthermore, Callaway et al. demonstrated that there is a gradual increase in valgus laxity with progressive flexion through 30°, 60°, 90°, and 120° of flexion from 1.5 mm, 2.8 mm, 3.2 mm, and 3.0 mm, respectively [23]. Similar studies have reported a 150% increase in valgus instability following sectioning the UCL compared to elbows with an intact ligament [24]. Other studies have demonstrated the greatest valgus laxity to occur at 50 and 70° of flexion with sectioning of the mUCL [18, 25]. Taken together, these results demonstrate the vital role the UCL plays in providing valgus stability of the elbow, most notably in elbow flexion of at least 50°.

Anatomy of the Medial Elbow Complex Dynamic Stabilizers

The dynamic stabilizers of the elbow are made up of the flexor-pronator muscle complex that crosses the elbow joint. Specifically, the flexor digitorum superficialis (FDS), flexor carpi ulnaris (FCU), pronator teres (PT), and brachialis make up what is often referred to as the flexor-pronator mass. (Fig. 4).

Of these structures, the FDS and FCU have been reported to play the most important roles in dynamic medial elbow stability [5•, 6, 7, 20]. The FDS inserts proximally on the humerus as part of the common flexor insertion, 4.4 mm posterior to the medial epicondyle [5•]. The common flexor insertion has been reported have a surface area of 127.9 mm² (range, 89.5–166.3 mm²) [5•, 8•]. The FDS ulnar tendinous insertion is closely related to the UCL and has been reported to be overlapped with the UCL insertion for 46% of its total footprint, inserting 6.8 mm distal to the sublime tubercle of the ulna [5•]. The FCU inserts proximally at the common flexor insertion and has a similar ulnar insertion. The FCU ulnar insertion has been reported to be 1.9 mm posterior and 1.3 mm proximal the sublime tubercle and overlaps 21% of its total footprint on the UCL ulnar insertion [5•]. The FCU has been reported to have an ulnar insertion surface area of 20.2 mm² [5•] (Fig. 5).

The pronator teres inserts just proximal to the common flexor humeral insertion, 9.4 mm proximal from the medial epicondyle. The footprint of this humeral insertion has been reported to be 40.1 mm² (range, 33–47 mm²) [5•]. The PT then courses distally to insert 14.5 mm distal to the sublime tubercle, which is 24.5 mm distal to the joint line. It should be highlighted the PT ulna insertion a thin tendinous structure that runs between the brachialis muscle and the anterior bundle of the UCL.

Fig. 4 **a** Cadaveric image demonstrating the contents and relationships of the flexor pronator mass. **b** Purple: pronator teres, two distinct attachments proximal to central flexor origin (CFO) and into CFO. Yellow: FCR inserts at the CFO. Blue: FDS attachment spans the anteromedial capsule and inserts at CFO. Red: Palmaris inserts at the CFO. Green: Humeral head of the FCU inserts at CFO

Biomechanics of the Medial Elbow Complex Dynamic Stabilizers

The biomechanics of the medial elbow dynamic stabilizers have been less well studied than the static stabilizers, but their importance for valgus stability, especially for the throwing athlete, has come to the forefront with more recent research. Morrey et al. was one of the earliest studies to describe the dynamic stabilizers of the medial elbow, when they demonstrated the importance of the anterior capsule in providing dynamic restraint to valgus instability [21]. More recent studies have performed cadaveric sectioning studies to characterize the roles of the FCU and FDS on dynamic elbow stability. Park et al. [7] used six cadaveric specimens with simulated complete mUCL tears. Elbows were tested at 30° and 90° of flexion and contraction of the FCU and FDS were observed.

The authors reported that the largest correction in valgus angle was observed when the FCU and FDS contracted together at 30 and 60° of elbow flexion. In isolation, the FCU was observed to produce the greatest valgus correction angle, followed by isolated FDS contraction [7].

Lin et al. [6] performed a study with 8 cadaveric specimens to examine the contributions to valgus stability of each flexor-pronator mass muscle with a stress applied to the elbow. The authors reported that the FCU and FDS provided significant restraint to valgus stress at 45° and 90° of elbow flexion, with the FCU being the strongest restraint. The authors found that the PT did not provide significant restraint to valgus instability at any elbow flexion angles [6]. In a later study by Udall et al. [3], the authors not only reported similar findings with respect to the flexor-pronator mass decreasing valgus angles in UCL deficient elbows but also noted that the PT provided additional

Fig. 5 **a** Illustration and **b** cadaveric view of relationship of ulnar insertion of abUCL and the ulnar footprints of the FCU and FDS

restraint to valgus stress [3]. Finally, Remaley [26] et al. performed a surface EMG and high-speed videography study of 10 female collegiate pitchers to evaluate the activation pattern of forearm musculature during a throwing motion. The authors reported that during the release of the ball, with the arm in approximately the 6'o clock position, the FCU had the highest levels of activation compared to all other forearm muscles.

Taken together, the growing body of literature of the dynamic stabilizers of the medial elbow highlights the crucial roles of the FCU and FDS play in providing valgus stability in both the UCL intact and deficit elbow and the attention that should be directed towards the flexor-pronator mass during surgical intervention and/or rehabilitation.

Conclusion

The medial ulnar collateral ligament complex of the elbow has a crucial role in providing both static and dynamic elbow stabilities. Most notably, the anterior bundle (UCL) provides the primary resistance to valgus and rotational stresses, especially during throwing motion. An understanding of the humeral and ulnar footprints and their relationships with surrounding structures is necessary to restore the native isometry of the medial complex of the elbow during UCL reconstruction. The flexor pronator musculature plays an essential role in dynamic stability, and the intimate relationship of the FCU and FDS with the ulnar insertion of the UCL should be considered to optimize recovery and outcomes with repair or reconstruction.

Compliance with Ethical Standards

Conflict of Interest Mark E Cinque MD, MS declares he has no conflict of interest.

Mark Schickendantz MD declares he has no conflict of interest.

Salvatore Frangiamore MD, MS declares he has no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

- 1.•• Camp CL, Tubbs TG, Fleisig GS, Dines JS, Dines DM, Altchek DW, et al. The relationship of throwing arm mechanics and elbow varus torque: Within-Subject Variation for Professional Baseball

Pitchers Across 82,000 Throws. *Am J Sports Med.* 2017;45:3030–5 **Purpose:** To describe the within-subject relationship between elbow varus torque and arm slot and arm rotation in professional baseball pitchers. **Methods:** A total of 81 professional pitchers performed 82,000 throws while wearing a motusBASEBALL sensor and sleeve. These throws represented a combination of throw types, such as warm-up/catch, structured long-toss, bullpen throwing from a mound, and live game activity. Variables recorded for each throw included arm slot (angle of the forearm relative to the ground at ball release), arm speed (maximal rotational velocity of the forearm), arm rotation (maximal external rotation of the throwing arm relative to the ground), and elbow varus torque. Linear mixed-effects models and likelihood ratio tests were used to estimate the relationship between elbow varus torque and arm slot, arm speed, and arm rotation within individual pitchers. **Results:** All 3 metrics—arm slot ($\chi^2 = 428$, $P < .001$), arm speed ($\chi^2 = 57,683$, $P < .001$), and arm rotation ($\chi^2 = 1392$, $P < .001$)—were found to have a significant relationship with elbow varus torque. Within individual athletes, a 1-N m increase in elbow varus torque was associated with a 13° decrease in arm slot, a 116°/s increase in arm speed, and an 8° increase in arm rotation. **Conclusion:** Elbow varus torque increased significantly as pitchers increased their arm rotation during the arm cocking phase, increased the rotational velocity of their arm during the arm acceleration phase of throwing, and decreased arm slot at ball release. Thus, shoulder flexibility, arm speed, and elbow varus torque (and likely injury risk) are interrelated and should be considered collectively when treating pitchers.

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- 5.•• Frangiamore SJ, Moatshe G, Kruckeberg BM, Civitarese DM, Muckenhim KJ, Chahla J, et al. Qualitative and quantitative analyses of the dynamic and static stabilizers of the medial elbow: an anatomic study. *The American Journal of Sports Medicine.* 2018;46:687–94 **Purpose:** To perform qualitative and quantitative anatomic evaluations of the medial elbow-UCL complex with specific attention to pertinent osseous and soft tissue landmarks. **Methods:** Ten nonpaired, fresh-frozen human cadaveric elbows (mean age, 54.1 years [range, 42–64 years]; all male) were utilized for this study. Quantitative analysis was performed with a 3-dimensional coordinate measuring device to quantify the location of pertinent bony landmarks and tendon and ligament footprints on the humerus, ulna, and radius. **Results:** The anterior bundle of the UCL attached 8.5 mm (95% CI, 6.9–10.0) distal and 7.8 mm (95% CI, 6.6–9.1) lateral to the medial epicondyle, 1.5 mm (95% CI, 0.5–2.5) distal to the sublime tubercle, and 7.3 mm (95% CI, 6.1–8.5) distal to the joint line on the ulna along the ulnar ridge. The flexor digitorum superficialis (FDS) ulnar tendinous insertion was closely related and interposed within the anterior bundle of the UCL, overlapping with 45.6% (95% CI, 38.1–53.6) of the length of the anterior bundle of the UCL. The flexor carpi ulnaris (FCU) attached 1.9 mm (95% CI, 0.8–2.9) posterior and 1.3 mm (95% CI, 0.6–3.2) proximal to the sublime tubercle and overlapped with 20.9% (95% CI, 7.2–34.5) of the area of the distal footprint of the anterior bundle of the UCL. **Conclusion:** The anterior bundle of the UCL had consistent attachment points relative to the medial epicondyle and

- sublime tubercle. The ulnar limb of the FDS and FCU tendons demonstrated consistent insertions onto the ulnar attachment of the anterior bundle of the UCL. These anatomic relationships are important to consider when evaluating distal UCL tears both operatively and nonoperatively. Excessive stripping of the sublime tubercle should be avoided during UCL reconstruction to prevent violation of these tendinous attachments.
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 - 8.●● Camp CL, Jahandar H, Sinatro AM, Imhauser CW, Altchek DW, Dines JS. Quantitative anatomic analysis of the medial ulnar collateral ligament complex of the elbow. *Orthop J Sports Med.* 2018;6: 2325967118762751 **Purpose:** To quantify the anatomy of the MUCCLC, including the anterior bundle (AB), posterior bundle (PB), and transverse ligament (TL). **Methods:** Ten unpaired, fresh-frozen cadaveric elbows underwent 3-dimensional (3D) digitization and computed tomography with 3D reconstruction. Ligament footprint areas and geometries, distances to key bony landmarks, and isometry were determined. A surgeon digitized the visual center of each footprint, and this location was compared with the geometric centroid calculated from the outline of the digitized footprint. **Results:** The mean surface area of the AB was 324.2 mm², with an origin footprint of 32.3 mm² and an elongated insertional footprint of 187.6 mm² (length, 29.7 mm). The mean area of the PB was 116.6 mm² (origin, 25.9 mm²; insertion, 15.8 mm²), and the mean surface area of the TL was 134.5 mm² (origin, 21.2 mm²; insertion, 16.7 mm²). The geometric centroids of all footprints could be predicted within 0.8 to 1.3 mm, with the exception of the AB insertion centroid, which was 7.6 mm distal to the perceived center at the apex of the sublime tubercle. While the PB remained relatively isometric from 0° to 90° of flexion ($P=.606$), the AB lengthened by 2.2 mm ($P<.001$). **Conclusions:** Contrary to several historical reports, the insertional footprint of the AB was larger, elongated, and tapered. The TL demonstrated a previously unrecognized expansive soft tissue insertion directly onto the AB, and additional analysis of the biomechanical contribution of this structure is needed.
 - 9.● Dugas JR, Ostrander RV, Cain EL, Kingsley D, Andrews JR. Anatomy of the anterior bundle of the ulnar collateral ligament. *J Shoulder Elbow Surg.* 2007;16:657–60 **The purpose of this project** was to study the anatomy of the anterior bundle of the ulnar collateral ligament and provide anatomic measurements not previously described. Thirteen fresh-frozen cadaver elbows were dissected. A 3-dimensional, electromagnetic, digitizing device was used to measure several anatomic parameters of the anterior bundle of the ulnar collateral ligament. The width of the ligament was not uniform, increasing distally toward the insertion. The average area of the origin was 45.5 mm², and the average area of the insertion was 127.8 mm². The edge of the insertion was separated from the ulna articular margin by an average of 2.8 mm. The study provides quantitative data describing the anatomy of the anterior bundle of the ulnar collateral ligament. This information may prove useful in surgical techniques designed to reproduce the anatomy and biomechanics of the elbow after injury.
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 - 11.●● Lall AC, Beason DP, Dugas JR, Cain EL Jr. The effect of humeral and ulnar bone tunnel placement on achieving ulnar collateral ligament graft isometry: A Cadaveric Study. *Arthroscopy.* 2019;35:2029–34 **Purpose:** To assess simulated ulnar collateral ligament (UCL) graft length change, using surgically dissected anatomic landmarks, between multiple combinations of humeral and ulnar bone tunnels. **Methods:** Three equidistant humeral and ulnar tunnels were created at each UCL footprint of 10 cadaveric elbows. Suture was passed between 9 possible tunnel combinations for each elbow and affixed to an isometry gauge. Each elbow was moved through an arc of 0, 30, 60, 90, and 120 for each tunnel combination. Changes in isometry gauge spring displacement (and, in effect, tension) were recorded. **Results:** There was an overall significant effect ($P<.0001$) of tunnel placement at all degrees of flexion. Pairwise comparisons revealed increases in displacement between the central and posterior tunnel positions of the medial epicondyle, with significant differences ($P>.0009$) occurring when paired with both the central and posterior aspect of the sublime tubercle. Significant differences ($P<.0001$) were noted between the anterior and posterior humeral tunnel positions. **Conclusions:** Simulated UCL graft isometry is dependent upon optimal bone tunnel placement. No significant differences were noted between ulnar tunnel locations when paired with any given humeral tunnel. Conversely, deviation anterior or posterior from the centroid of the UCL footprint on the medial epicondyle significantly affected isometry at all degrees of flexion recorded with the greatest amount of displacement occurring with pairing of posterior tunnels on both the humeral and ulnar footprints.
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 - 13.●● Erickson BJ, Fu M, Meyers K, Camp CL, Altchek DW, Coleman SH, et al. The middle and distal aspects of the ulnar footprint of the medial ulnar collateral ligament of the elbow do not provide significant resistance to valgus stress: a biomechanical study. *Orthop J Sports Med.* 2019;7, 2325967118825294 **Purpose:** The purpose of this study was to determine the contribution of each part of the UCL footprint to the elbow valgus stability provided by the UCL. It was hypothesized that the distal two-thirds of the ulnar UCL footprint would not contribute significantly to valgus stability provided by the UCL. **Methods:** Fifteen cadaveric arms were dissected to the capsuloligamentous elbow structures and potted. A servohydraulic load frame was used to place 5 N m of valgus stress on the intact elbow at 30°, 60°, 90°, and 120° of flexion. The UCL insertional footprint was measured and divided into thirds (proximal, middle, and distal). One-third of the UCL footprint was elevated off the bone (leaving the ligament in continuity), and the elbow was retested at the same degrees of flexion. This was repeated until the entire UCL footprint on the ulna was sectioned. Each elbow was randomized for how the UCL would be sectioned (sectioning the proximal, then middle, and then distal third or sectioning the distal, then middle, and then proximal third). Ulnohumeral joint gapping (millimeters) was recorded with a 3-dimensional motion capture system using physical and virtual markers. Two-group comparisons were made between each sectioned status versus the intact condition for each flexion angle. **Results:** When the UCL was sectioned from distal to proximal, none of the ligaments failed prior to complete sectioning. When the UCL was sectioned from proximal to distal, 3 of the 6 ligaments failed after sectioning of the proximal third, while 2 more failed after the proximal and middle thirds were sectioned. Of the specimens with the distal third of the ligament sectioned first, no significant differences were found between intact, distal third cut, and distal plus middle thirds cut at all flexion angles. **Conclusion:** The middle and distal thirds of the insertional footprint of the UCL on the ulna did not significantly contribute to

- gap resistance at 5 N m of valgus load. The proximal third of the footprint is the primary resistor of valgus load.**
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 16. • Farrow LD, Mahoney AJ, Stefancin JJ, Taljanovic MS, Sheppard JE, Schickendantz MS. Quantitative analysis of the medial ulnar collateral ligament ulnar footprint and its relationship to the ulnar sublime tubercle. *Am J Sports Med.* 2011;39:1936–41 **Background:** The medial ulnar collateral ligament is the major soft tissue restraint to valgus displacement of the elbow. Currently, little has been published regarding the medial ulnar collateral ligament's ulnar footprint. **Hypothesis:** The medial ulnar collateral ligament has a long attachment onto the ulna and the anatomy of the footprint is consistent. **Methods:** The authors studied the morphologic characteristics of the ulnar footprint of the medial ulnar collateral ligament in 10 fresh-frozen cadaveric specimens, 100 osseous specimens, and with 3-dimensional computed tomography in an additional 10 osseous specimens. They measured the length of the anterior band's ulnar attachment and the entire ligament length. They also measured the length of the osseous ridge, which extends distally from the sublime tubercle in both osseous specimens and on computed tomography. **Results:** The mean length of the medial ulnar collateral ligament was 53.9 mm and the mean length of the ulnar soft tissue footprint was 29.2 mm. The authors identified an osseous ridge that extended distally from the sublime tubercle to just medial to the ulnar insertion of the brachialis muscle tendon. This osseous ridge was present in all osseous and fresh-frozen cadaveric specimens. The mean length of this osseous ridge was 24.5 mm. **Conclusion:** The medial ulnar collateral ligament has a long attachment along the proximal ulna. The ligament attaches to a previously undescribed ridge of bone located on the medial aspect of the proximal ulna, the medial ulnar collateral ligament ridge. This ridge is present in all skeletal specimens.
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 22. •• Safran M, Ahmad CS, Elattrache NS. Ulnar collateral ligament of the elbow. *Arthroscopy.* 2005;21:1381–95 **Recent advances in the diagnosis and treatment of the overhead athlete's elbow has led the medical community to understand that the ulnar collateral ligament (UCL) of the elbow is more commonly injured than originally thought. Injury can result in secondary symptoms and problems in other regions of the elbow. Sports requiring an overhead motion, such as throwing a ball, hitting a ball overhead, or serving a tennis ball, impart a valgus stress on the elbow that is resisted by the UCL. Throwing sidearm or hitting a forehand in tennis, squash, or racquetball may also impart a valgus stress to the elbow. Repeated or excessive valgus stress places a force on the UCL that may result in injury to the ligament. Injury to the UCL may result in problems in other areas of the elbow, including the ulnar nerve, the flexor-pronator musculotendinous unit, the radiocapitellar joint and the posterior compartment of the elbow, in addition to being a cause of loose bodies within the elbow. This article reviews the anatomy, biomechanics, and pathophysiology of injury to the UCL and injuries to the other structures that result from UCL injury. Also reviewed are patient history, examination techniques, tests that help confirm the diagnosis of UCL injury, and treatment of the injured UCL.**
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