

Return to Football and Long-Term Clinical Outcomes After Thumb Ulnar Collateral Ligament Suture Anchor Repair in Collegiate Athletes

Brian C. Werner, MD, Michael M. Hadeed, BS, Matthew L. Lyons, MD, Joshua S. Gluck, MD, David R. Diduch, MD, A. Bobby Chhabra, MD

Purpose To evaluate return to play after complete thumb ulnar collateral ligament (UCL) injury treated with suture anchor repair for both skill position and non-skill position collegiate football athletes and report minimum 2-year clinical outcomes in this population.

Methods For this retrospective study, inclusion criteria were complete rupture of the thumb UCL and suture anchor repair in a collegiate football athlete performed by a single surgeon who used an identical technique for all patients. Data collection included chart review, determination of return to play, and Quick Disabilities of the Arm, Shoulder, and Hand (*QuickDASH*) outcomes.

Results A total of 18 collegiate football athletes were identified, all of whom were evaluated for follow-up by telephone, e-mail, or regular mail at an average 6-year follow-up. Nine were skill position players; the remaining 9 played in nonskill positions. All players returned to at least the same level of play. The average *QuickDASH* score for the entire cohort was 1 out of 100; *QuickDASH* work score, 0 out of 100; and sport score, 1 out of 100. Average time to surgery for skill position players was 12 days compared with 43 for non-skill position players. Average return to play for skill position players was 7 weeks postoperatively compared with 4 weeks for non-skill position players. There was no difference in average *QuickDASH* overall scores or subgroup scores between cohorts.

Conclusions Collegiate football athletes treated for thumb UCL injuries with suture anchor repair had quick return to play, reliable return to the same level of activity, and excellent long-term clinical outcomes. Skill position players had surgery sooner after injury and returned to play later than non-skill position players, with no differences in final level of play or clinical outcomes. Management of thumb UCL injuries in collegiate football athletes can be safely and effectively tailored according to the demands of the player's football position. (*J Hand Surg Am.* 2014;39(10):1992–1998. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Therapeutic IV.

Key words Thumb ulnar collateral ligament, gamekeeper's thumb, collegiate football athlete, suture anchor repair, return to play.

From the Department of Orthopaedic Surgery, University of Virginia Health System, Charlottesville, VA.

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Corresponding author: A. Bobby Chhabra, MD, Department of Orthopaedic Surgery, University of Virginia Health System, 400 Ray C Hunt Drive, Suite 330, Charlottesville, VA 22903; e-mail: AC2H@hscmail.mcc.virginia.edu.

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ACUTE THUMB ULNAR COLLATERAL ligament (UCL) rupture is typically caused by sporting injuries or falls onto an outstretched hand.^{1–12} The mechanism of injury generally involves hyperabduction or hyperextension of the thumb metacarpophalangeal (MCP) joint.^{2,4,5,8,12–15} Complete disruption of the thumb UCL can result in decreased pinch strength, pain, instability, and ultimately symptomatic osteoarthritis.¹⁶

Complete thumb UCL injuries occur at a notably higher frequency in elite athletes, related to increasing speed and power in sports.^{4,14} Whereas incomplete injuries may be treated with a trial of cast immobilization, nonsurgical management in the case of complete UCL rupture has not yielded consistently successful outcomes, particularly when the adductor aponeurosis becomes interposed between the ruptured UCL and its insertion site on the proximal phalanx. Thus, surgical repair is advocated to allow return to competitive play.^{4,7,8,16,17}

Most available clinical outcomes studies have heterogeneous patient populations, are in notably older patients, and involve more typical mechanisms including skiing or include laborers or chronic injuries.^{2,3,7–9,11,15,16,18–21} A recent systematic review identified one study that reported return to sport status after acute thumb UCL injury.^{16,22}

Collegiate football athletes represent a young, demanding patient population at considerable risk for thumb UCL injuries. Such an injury can have a major impact on the short-term collegiate careers and potential long-term professional careers of these elite athletes. The goals of this study were to characterize typical complete thumb UCL injury patterns in a cohort of collegiate football athletes playing at skill and nonskill positions, evaluate return to play after suture anchor repair, report minimum 2-year clinical outcomes, and validate a treatment protocol based on preinjury football position demands.

MATERIALS AND METHODS

Subjects

After we obtained institutional review board approval, we completed a retrospective chart review of all patients with operative thumb UCL repair (Current Procedural Terminology codes 26540 to 26542) from January 2004 to December 2011 performed by the senior author (A.B.C.) at a single institution. Inclusion criteria were acute complete rupture of the thumb MCP joint UCL in a collegiate football player with subsequent suture anchor repair, and a minimum 2-year follow-up. Patients were excluded if additional thumb injuries were present, such as a radial

collateral ligament tear or fracture other than a bony avulsion from the thumb proximal phalanx, if there were documented previous injuries to the thumb, or if records were unavailable for review.

Diagnosis

The senior author established the diagnosis of acute complete rupture of the thumb UCL. Patients were deemed to have a complete rupture of the UCL if they presented with pain and tenderness over the ulnar aspect of the thumb MCP joint with an absence of a solid end point with passive stress testing of the UCL at full MCP joint extension and at 30° MCP joint flexion.²³ Surgical reports were reviewed to determine whether a Stener lesion was present.²⁴ Stress radiography compared with the uninjured side was used to supplement the diagnosis in many but not all cases.

Operative timing

All collegiate football athletes at our institution with complete thumb UCL tears were advised to have surgical repair. In general, the timing of surgery was determined by football position. Patients were considered to be skill position and non-skill position players based on the use of the hands to catch or throw the football. Skill position players, including quarterback, running back, wide receiver, and tight end, were scheduled for surgery immediately. Non-skill position players, including offensive linemen, defensive linemen, and linebackers, were typically protected for play with either a cast or rigid orthosis until the end of the season or training period and then underwent repair.

Surgical technique

Surgical repair of the thumb UCL by the senior author using a suture anchor was consistent throughout the entire study period and was similar to the method described by Zeman et al,¹¹ Jarrett et al,²⁵ Lee and Carlson,¹⁴ and Katolik et al,¹⁸ and others. A dorsoulnar approach to the thumb MCP joint with a curvilinear incision was created. Care was taken to leave the adductor aponeurosis and capsule as independent layers available for repair. The ligament stump was visualized and the insertion was scraped bare using a small curette. In most cases, the ligament tear involved a bony or soft tissue avulsion from the proximal phalanx, similar to the findings of other authors.²⁶ In 3 cases, an interligamentous tear with a small stump remaining on the proximal phalanx was noted (Table 1), although this did not change surgical management. A Minilok (Depuy Mitek, Inc, Raynham,

TABLE 1. Patient Characteristics and Surgical Details for All Study Patients

Subject	Age	Dominant Hand	Position	TTS, d	Phone Follow-up, y	In-Person Follow-up, y	Mechanism of Injury
Skill position							
1	19	No	WR	21	8.0	3.2	Thumb hyperextension while tackling in game
2	22	Yes	WR	3	7.0	3.8	Thumb hyperextension injury during practice
3	18	Yes	WR	2	6.1	4.5	Thumb hyperextension injury during practice
4	18	No	WR	21	5.5	3.4	Thumb caught in pads during game—hyperextension injury
5	20	Yes	RB	5	5.2	1.1	Thumb hyperextension abduction injury in practice
6	20	No	TE	14	4.9	1.9	Thumb hyperextension injury during practice
7	19	Yes	WR	6	4.7	2.2	Fall during game
8	20	Yes	TE	26	2.9	2.7	Thumb hyperextension while tackling in game
9	19	Yes	TE	7	2.5	1.8	Thumb hyperextension injury during practice
Non-skill position							
1	20	No	OL	38	9.4	2.6	Fall during game
2	21	No	DL	90	8.7	8.2	Thumb hyperextension abduction injury in game
3	19	Yes	DE	10	7.2	3.3	Thumb hyperextension injury during practice
4	19	No	LB	10	7.1	4.4	Thumb hyperextension while tackling in game
5	20	No	DL	21	7.0	0.9	Thumb hyperextension abduction injury in practice
6	20	Yes	OL	70	6.9	1.1	Thumb hyperextension injury during game
7	20	Yes	LB	105	5.8	1.1	Thumb hyperextension while tackling in game
8	20	No	LB	14	5.7	1.7	Thumb hyperextension injury during bowl game
9	21	Yes	DL	25	2.5	2.2	Thumb injury falling onto football during practice

DE, defensive end; DL, defensive line; LB, linebacker; OL, offensive line; RB, running back; TE, tight end; TTS, time to surgery; WR, wide receiver.

TABLE 1. Patient Characteristics and Surgical Details for All Study Patients (Continued)

Stener Lesion?	Intraoperative Findings				
	UCL Appearance	UCL Mobility	Volar Plate	Dorsal Capsule	Chondral Injury
No	Avulsed from base of proximal phalanx	Mobile	Not documented	Marked disruption	None
Yes	Avulsed from base of proximal phalanx	Mobile	No detachment noted	Small tear	None
No	Avulsed from base of proximal phalanx	Mobile	No detachment noted	No disruption noted	Slight scuffing, no loose bodies
Yes	Avulsed from base of proximal phalanx	Mobile	Partial detachment noted	Disruption noted on ulnar side of MCP joint	None
Yes	Avulsed from base of proximal phalanx	Mobile	Complete detachment from volar plate	Marked disruption	None
Yes	Intraligamentous tear with stump at proximal phalanx	Mobile	No detachment noted	No disruption noted	None
No	Avulsed from base of proximal phalanx	Mobile	No detachment noted	No disruption noted	None
No	Avulsed from base of proximal phalanx	Slight scarring requiring dissection for mobilization	No detachment noted	No disruption noted	None
No	Avulsed from base of proximal phalanx	Mobile	Partial detachment noted	Small tear	None
No	Avulsed from base of proximal phalanx	Moderate scar, required release	No detachment noted	No disruption noted	None
No	Intraligamentous tear with stump at proximal phalanx	Scarring proximal to adductor aponeurosis	No detachment noted	No disruption noted	None
Yes	Avulsed from base of proximal phalanx	Retracted above adductor aponeurosis	Complete detachment from volar plate	Small tear	None
No	Avulsed from base of proximal phalanx	Mobile	No detachment noted	Marked disruption	None
No	Avulsed from base of proximal phalanx	Required dissection to mobilize proximal end	Partial detachment noted	Small tear	None
Yes	Avulsed from base of proximal phalanx	Moderate scar, retracted, required release	No detachment noted	No disruption noted	Slight scuffing at base of proximal phalanx
Yes	Avulsed from base of proximal phalanx	Notable scarring	No detachment noted	No disruption noted	None
Yes	Intraligamentous tear with stump at proximal phalanx	Mobile	No detachment noted	Transverse disruption at ulnar side of MCP joint	None
No	Avulsed from base of proximal phalanx	Mobile	No detachment noted	Small tear	None

MA) suture anchor with 2-0 braided polyester suture was placed into the UCL insertion site on the proximal phalanx aiming away from the joint surface. This was followed by insertion of a second, smaller Microfix (Depuy Mitek, Inc) suture anchor with 4-0 braided polyester suture adjacent to the first anchor. These sutures were used to secure the UCL stump to its insertion. The repair was performed with the joint held in a reduced position. Any torn volar plate or volar soft tissue was incorporated using the anchored sutures to augment the repair. (Fig. 1) Finally, the repair was secured to surrounding soft tissue including the capsuloligamentous flap created during the surgical approach. In patients who underwent subacute or delayed repair, it was often challenging to identify the UCL discretely. In these instances (Table 1), the UCL was typically scarred into the capsule and a capsuloligamentous flap was advanced to the proximal phalanx. The adductor aponeurosis was then repaired. After closure, a thumb spica orthosis was placed.

Postoperative care

Patients returned for a wound check within a week and were placed into a thumb spica cast for 4 weeks. Non-skill position athletes were allowed to practice and play wearing this thumb spica cast as pain allowed. Skill position athletes were not permitted to return to play or practice while wearing the spica cast owing to the position demands. We removed the cast after 4 weeks and placed a hand-based thermoplastic thumb spica orthosis for the following 4 weeks, during which range of motion therapy was started. Skill position athletes were permitted to return to play either fabricated in an orthosis or taped during this period as pain, range of motion, and thumb function improved. After the orthosis fabrication interval, players were instructed to wean from the thermoplastic orthosis and continue to have supportive tape placed for play for an additional 4 weeks.

Study procedures

We completed a retrospective chart review for all included patients to determine patient- and injury-related variables. Surgical reports were reviewed to determine the presence of a Stener lesion. Patient charts and trainer's records were reviewed to confirm player position and determine actual return to play for each athlete. Return to play was defined as when both the senior author and trainer released the patient to return to game play (when in season) or practice (when out of season).

All patients were contacted via telephone, e-mail, or mail to administer a Quick Disabilities of the Arm, Shoulder, and Hand (*QuickDASH*) outcomes

measure questionnaire including both the work and sport modules. Patients were also asked to confirm the postoperative and final levels of play achieved. We then calculated *QuickDASH* scores using metrics provided by the Institute for Work and Health.²⁷ The date of *QuickDASH* and telephone survey administration was used to calculate the length of final patient follow-up.

To compare the skill position and non-skill position cohorts, we completed statistical analysis of continuous variables (eg, time to surgery, return to play, average follow-up, *QuickDash* scores) using Student *t* test; chi-square analysis was used for categorical variables (eg, level of play on return, presence of a Stener lesion). For all statistical tests, $P < .050$ was considered significant.

Cohort description

In the 8-year study period, 18 Division I collegiate football athletes were treated with suture anchor repair for a complete thumb UCL injury. Because all collegiate athletes with complete UCL rupture are managed surgically at our institution, this represents an incidence of 2.3 complete thumb UCL injuries per year for a Division I collegiate football program. All 18 patients were available for evaluation at an average 6-year follow-up (range, 2.5–9.5 y). Nine players were skill position players; the remaining 9 were non-skill positions. Average age was 20 years (range, 18–22 y). Eight patients (44%) had Stener lesions. Six patients had preoperative stress radiography when comparing the injured thumb with the noninjured side.

RESULTS

Overall cohort

All players returned to at least the same level of play as preoperatively (collegiate). Six players eventually played professional football. The average *QuickDASH* score for the entire cohort was 1 out of 100 (95% confidence interval [CI], 0.4–2.3). Average *QuickDASH* work score was 0 out of 100 (95% CI, 0.0–0.0) and average *QuickDASH* sport score was 1 out of 100 (95% CI, 0.0–1.9). No players reported recurrent injuries or required revision surgery.

No postoperative complications were noted either in chart review or at the time of last in-person follow-up (Table 1), including sensory disturbances, stiffness, and infection.

Subgroup comparison

Nine patients were classified as skill position players; the remaining 9 were non-skilled position

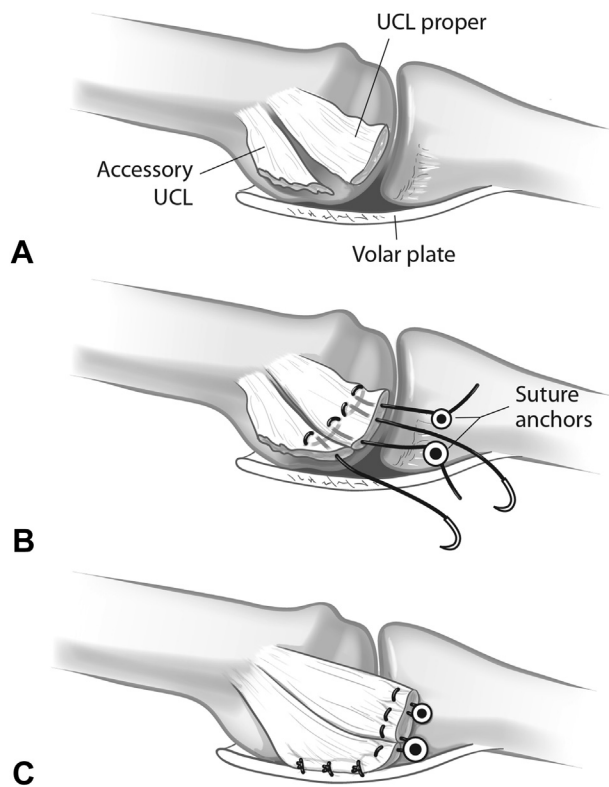


FIGURE 1: Surgical technique depicting dual suture anchor fixation of complete UCL rupture to its insertion on the proximal phalanx. **A** A complete UCL injury of both the proper and accessory portions of the ligament is demonstrated. **B** Two suture anchors are placed on the thumb proximal phalanx and the suture limbs capture the native UCL. **C** The limbs of each suture are tied to reapproximate the UCL to its native insertion on the thumb proximal phalanx.

players. There were 4 Stener lesions in each group. Average time to surgery for skill position players was 12 days (range, 2–26 d) compared with 43 days (range, 10–105 d) for non–skill position players ($P = .025$). Average return to play for skill position players was 7 weeks postoperatively (range, 4–12 wk) compared with 4 weeks (range, 2–8 wk) postoperatively in the non–skill position cohort ($P = .027$). Average *QuickDASH* score for skill position players was 1.51 (95% CI, 0.3–3.2) and for non–skill position players, 0.8 (95% CI, 0.0–2.0) ($P = .423$). Average *QuickDASH* work module score was 0.0 for both subgroups. Average *QuickDASH* sport module score for skill position players was 1.4 (95% CI, 0.0–3.5), and for non–skill position players, 0.0 (95% CI 0.0–0.0) ($P = .179$).

DISCUSSION

Complete tear of the UCL of the thumb MCP joint is a major injury common in Division I football athletes.

The literature supports primary surgical repair of complete UCL tears because conservative management can lead to inconsistent results.^{2,8,9,20,28–31} Despite the noteworthy impact that a thumb UCL injury can have on the short-term collegiate career and potential long-term professional career of elite athletes, little evidence is available regarding acute thumb UCL injuries in this population.¹⁶

A recent systematic review of outcomes after injury to the thumb UCL found 6 studies that reported clinical outcomes after acute UCL repair using a variety of surgical techniques.¹⁶ The included patients, mechanisms of injury, and surgical techniques in these studies were varied. Surgical techniques included Kirschner wire fixation, periosteal soft tissue suture, direct ligament repair, pullout suture, arthroscopic Stener reduction, and suture anchor repair.^{2,7,15,18,22,32} Of these studies, one reported return to sport data but included a variety of sports, nonathletes, and various surgical techniques.²² A recent review of acute thumb UCL injury in athletes provided level V evidence regarding diagnosis, management, and surgical technique but provided no outcomes or return to play data for athletes.⁴

Suture anchor repair of complete thumb UCL ruptures has recently gained popularity over other techniques because cadaveric studies have demonstrated equivalent or improved strength and clinical studies have demonstrated fewer complications and excellent outcomes.^{3,11,18,20,25,33,34} Our management protocol allowed a different pathway for skill position and non–skill position players. Skill position players had surgery earlier after injury and returned to play later than non–skill position players with no major differences in the level of play at return or clinical outcomes as determined by the *QuickDASH*. This is advantageous because collegiate football players with complete thumb UCL injuries can be appropriately counseled regarding a management course tailored to the demands of their specific position with a reasonable expectation of a satisfactory long-term outcome after surgical repair regardless of treatment pathway. Furthermore, these data may apply to other high-level football athletes, including high school and professional athletes, and to other sports such as baseball, basketball, and volleyball, in which thumb hyperextension and abduction injuries are common and greatly inhibit the athlete’s ability to perform.

This retrospective study has several limitations. The small number of patients decreased the power of the study and subjected the analysis to type II error. The diagnosis for each subject was primarily based on clinical findings without confirmatory advanced

imaging; thus, the accuracy of the clinical assessment is a potential source of error. All patients included in the study underwent surgical treatment, so no control group was available for comparison. Finally, we used only the QuickDASH as a determinant of final clinical outcome; no physical examination was performed. Most other studies of thumb UCL injuries include final thumb MCP and interphalangeal joint range of motion data, measurements of ligamentous laxity, and radiographic parameters assessing the joint, none of which were included in the present study because in-person follow-up was not feasible well after the patients' college careers were completed.

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