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ORIGINAL ARTICLE

Functional outcomes following lateral ulnar collateral ligament reconstruction for symptomatic posterolateral rotatory instability of the elbow in an athletic population

Marina J. Rodriguez, MD[a,*], Nicholas A. Kusnezov, MD[a], John C. Dunn, MD[a], Brian R. Waterman, MD[a,b], Kelly G. Kilcoyne, MD[a]

[a]*Department of Orthopaedic Surgery and Rehabilitation, William Beaumont Army Medical Center, El Paso, TX, USA*
[b]*Wake Forest Baptist Medical Center, Winston-Salem, NC, USA*

Hypothesis: The purpose of this investigation was to characterize the functional and surgical outcomes following lateral ulnar collateral ligament (LUCL) reconstruction for posterolateral rotatory instability in an athletic population.

Methods: All US military service members who underwent LUCL reconstruction between 2008 and 2013 were identified. A retrospective chart review was performed, and the prospective Mayo Elbow Performance Score and QuickDASH (short version of Disabilities of the Arm, Shoulder and Hand questionnaire) score were obtained. The primary outcomes were return to preinjury activity and resolution of symptoms.

Results: We identified 23 patients with a mean age of 31.6 ± 7.2 years (range, 19-46 years), and 87% were men. A history of instability and/or dislocation was reported by 11 patients (48%), and 8 patients (35%) had undergone prior elbow surgery. At final follow-up of 4.6 ± 1.8 years (range, 2.2-7.6 years), all patients demonstrated significant decreases in pain (average pain score, 4 vs 1.34) with resolution of instability and achieved a functional arc of motion. After surgical reconstruction, 83% were able to return to prior activity, whereas 4 patients (17%) underwent medical separation, including 3 with elbow disability precluding continued service (13%). Overall 83% of patients reported good to excellent outcomes by the Mayo Elbow Performance Score, and 96% of patients reported no significant disability by the QuickDASH disability evaluation. Postoperatively, 4 patients (17%) experienced complications, with 3 (13%) requiring reoperation.

Conclusion: Although the diagnosis and surgical management of isolated LUCL injury are relatively infrequent, LUCL reconstruction for posterolateral rotatory instability offers a reliable return to preinjury level of function among active individuals with intense upper extremity demands. However, although function reliably improves, the rate of perioperative complications is greater than 15%.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Lateral ulnar collateral ligament; posterolateral rotatory instability; functional outcomes; elbow instability; reconstruction; return to activity

Institutional review board approval: William Beaumont Army Medical Center IRB (protocol No. 399155).

*Reprint requests: Marina J. Rodriguez, MD, Department of Orthopaedic Surgery and Rehabilitation, William Beaumont Army Medical Center, 5005 N Piedras St, El Paso, TX 79920, USA.
E-mail address: rodrimar8@gmail.com (M.J. Rodriguez).

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In 1991, O'Driscoll et al[15] described posterolateral rotatory instability (PLRI) as the clinical condition resulting from insufficiency of the lateral ulnar collateral ligament (LUCL). As the primary stabilizer against varus stress, the LUCL is responsible for maintaining reduction of the radiocapitellar and ulnohumeral joints, particularly under axial load with the forearm in supination.[1-4,11-13] Consequently, partial or complete disruptions of the LUCL often result in symptomatic radiocapitellar joint subluxation and may impair participation in sports or other load-bearing upper extremity activity.[10,14]

When injured, the LUCL may be repaired primarily if the injury is acutely identified and good-quality ligament is available.[17] However, most patients present with chronic—sometimes occult—instability and are managed most reliably with ligamentous reconstruction after failure of conservative approaches, although arthroscopic repair may also be used.[1,7] There is limited literature evaluating functional outcomes following LUCL reconstruction.[6,9,10,16,17] Furthermore, the ability to return to preinjury levels of activity, especially in a young athletic population who might typically sustain these injuries, remains unknown.

The purpose of this investigation was to characterize the functional and surgical outcomes following LUCL reconstruction for PLRI in a homogenously active military cohort with intense and unique upper extremity demands. The hypothesis was that LUCL reconstruction would offer active military patients restoration of elbow stability allowing them to stay on active duty and return to their previous level of activity.

Methods

This is a retrospectively reviewed case series of active-duty military service members undergoing LUCL reconstruction with prospectively collected validated outcome scores. The Military Health System Management Analysis and Reporting Tool (M2) was queried to identify all tri-service (Army, Navy, and Air Force) US military service members who underwent LUCL reconstruction (Current Procedural Terminology [CPT] code 24344) between 2008 and 2013. The dataset generated was then cross-referenced with the Armed Forces Health Longitudinal Technology Application electronic medical record system, and we performed a retrospective chart review of all patients to first confirm the patients' diagnoses and indicated procedure. Active-duty service members who underwent primary LUCL reconstruction with at least 2 years of follow-up were included. The following exclusion criteria were applied: other military beneficiaries (ie, family members or retired status), patients with prior LUCL reconstruction, and/or patients with insufficient follow-up. We initially identified 44 patients by Current Procedural Terminology code; 21 patients were excluded because of inaccurate procedural coding, concomitant fracture fixation, medial collateral ligament repair or reconstruction, or inadequate follow-up.

For patients meeting the inclusion and exclusion criteria, we recorded demographic data (age, sex, race, branch of service, rank, military occupational specialty, body mass index, hand dominance, medical comorbidities, tobacco use, and previous injuries and surgical procedures), injury-related characteristics (laterality, mechanism and timing of injury, concomitant injuries, and symptoms), and surgical variables (time to surgery, primary procedure, graft type, and concomitant procedures), as well as preoperative and postoperative self-reported pain score (0-10) and range of motion (ROM).

In addition, the Mayo Elbow Performance Score (MEPS) and the score on the short version of the Disabilities of the Arm, Shoulder and Hand (QuickDASH) questionnaire were obtained for all patients at final follow-up. All interviews were performed by an independent third-party investigator. For the MEPS system, scores were interpreted under the following framework: a score of 90 points or greater was considered an excellent outcome; 75-89, a good outcome; 60-74, a fair outcome; and less than 60, a poor outcome. For the QuickDASH, a score between 0 and 100 was generated, with 0 being no disability and 100 being completely disabled. Generally, it is accepted that a score less than 30 is considered little to no disability of the limb whereas a score greater than 69 is considered highly limiting.[5]

The primary outcomes of interest were the ability to return to full preoperative levels of upper extremity activity without restrictions following surgery, as well as the resolution of symptoms. We additionally assessed all complications (superficial or deep surgical-site infection, flexion contracture, development of cubital tunnel symptoms, and recurrent instability), reoperations, and revision surgical procedures as secondary outcome measures.

US military service members are required to maintain a level of physical training that typically exceeds that of the average civilian. Specific standards for medical fitness are delineated in regulations for the Air Force, Army, Navy, and Marine Corps, and these stipulations dictate the stringent physical requirements of all military service members.[8] These regulations are specific to each branch of military service but generally require successful completion of semiannual physical fitness testing that may include timed push-ups, sit-ups, and an aerobic event. Service members are also involved in the following at-risk activities: daily aerobic fitness, weight training, tactical field exercises, and periodic combat deployments (for which service members must be able to lift and carry packs weighing >50 lb, as well as other personal gear), in addition to recreational and competitive sporting activities. All military service members with initiation of an elbow-related medical separation after LUCL reconstruction were identified using the electronic medical record for this study.

Statistical means and standard deviations were calculated for continuous variables. Frequencies and percentages were recorded for categorical variables. To evaluate the impact of the various independent variables on the continuous outcomes of interest, the 2-sample *t* test was performed for categorical independent variables and linear regression analysis for continuous independent variables. In addition, for the binary outcome variable for medical separation, logistic analysis was performed. $P < .05$ was considered statistically significant. All calculations were performed using SAS software (version 9.4; SAS Institute, Cary, NC, USA).

Results

Demographic data

A total of 23 patients with primary LUCL reconstruction met the inclusion criteria (Table I). The mean age was 31.6 ± 7.2 years (range, 19-46 years), and most patients were men (87%).