Arthroscopic Management of Lateral Elbow Instability

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Eugene T. Ek and Julia C. Kirby

Abstract

The lateral collateral ligament (LCL) complex is an important stabilizer of the elbow, especially when withstanding varus loads. Disruption of this ligament complex, in particular deficiency of the lateral ulnar collateral (LUCL) component of the LCL, can lead to chronic posterolateral rotatory instability (PLRI) resulting in loss of function on the elbow and potentially rapid onset of early degenerative arthritis. Frequently, in the setting of acute rupture of the LCL, the ligament is repaired using an open technique with suture anchor fixation to the lateral epicondyle insertion point. With advancing arthroscopic techniques and improvements in implant technology, the LCL can now be repaired securely and accurately arthroscopically. In this chapter, we describe a simple method of an all-arthroscopic repair of the LCL using a knotless suture anchor technique.

Keywords

Elbow arthroscopy · Lateral collateral ligament repair
Instability

E. T. Ek (✉) · J. C. Kirby
Melbourne Orthopaedic Group, Melbourne, VIC, Australia

Department of Surgery, Monash University,
Melbourne, VIC, Australia
e-mail: eugene.ek@mog.com.au

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20.1 Introduction

Elbow dislocation often results in the disruption of the lateral stabilizers of the elbow including the lateral collateral ligament (LCL) complex, the common extensor origin, and may or may not be associated with fracture of the radial head or coronoid process [1, 2]. The four key components which make up the lateral collateral ligament (LCL) complex of the elbow are the radial collateral ligament (RCL), lateral ulnar collateral ligament (LUCL), accessory LCL, and the annual ligament [1–3].

While many simple elbow dislocations can be successfully managed with closed reduction and splinting [4], a proportion of patients develop posterolateral rotatory instability (PLRI) [5]. This was originally described by O'Driscoll in 1991 [6]. and is the most common pattern of chronic elbow instability [2, 7]. It involves a pattern of rotatory subluxation of the ulnohumeral joint and translation of the radial head posteriorly relative to the capitellum without disruption of the radioulnar articulation [3].

The underlying etiology of PLRI is typically in the setting of a traumatic dislocation of the elbow and subsequent failure of the LUCL to heal [2]. As a result, ongoing instability of the elbow invariably leads to progressive and predictable development of degenerative arthritis of the elbow. As such, early detection of the injury pattern is paramount and subsequent repair of the LUCL is generally recommended in the acute setting, especially where there are associated bony injuries, such as a radial head and/or a coronoid fracture that renders the elbow highly unstable [1].

When injured, the LCL is most commonly avulsed from its humeral origin. This insertion consists of the confluence of the fibers of the RCL and the LUCL. Most frequently, repair of the ligament is performed via an open approach using a suture anchor or intraosseous bone tunnel fixation. However, with the advancement of arthroscopic techniques, arthroscopic repair of the lateral collateral ligament has been increasingly described in the literature [1]. As such, here we describe our technique of an all-arthroscopic repair of the LCL using a knotless suture anchor.

20.2 Indications

- Complete humeral avulsion of the LCL from the lateral epicondyle of the humerus.
- Acute or chronic elbow instability, in particular, posterolateral rotatory instability (PLRI).
- LCL avulsion with concomitant simple radial head fracture that can also be treated arthroscopically using percutaneous cannulated screws.

20.3 Contraindications

- Degenerative/non-repairable lateral collateral ligament necessitating ligament reconstruction with a tendon graft.
- Associated complex bony fractures such as comminuted radial head fracture requiring open reduction and internal fixation or radial head replacement, or coronoid fractures requiring fixation.

20.4 Authors Preferred Technique

20.4.1 Preoperative Planning

- Detailed history and examination of the patient is important to determine the mechanism of injury and the nature of the patient's elbow instability.
- Preoperative imaging such as a CT scan to determine the presence of concomitant fractures such as radial head fracture, coronoid fracture, or intra-articular loose bodies.
- MRI scan is useful to assess the integrity of the LCL.
- Required equipment and implants:
  - 4 mm 30° arthroscope +/− 70° arthroscope
  - 3.0 mm biocomposite knotless Suturetak anchor (Arthrex, Naples, FL, USA)
  - 4 mm full radius arthroscopic shaver blade
  - 90° straight suture lasso passer (Arthrex, Naples, FL, USA).

20.4.2 Patient Positioning

- The patient is placed on the operating table in the lateral decubitus position with the arm secured on an arm holder (Western Elbow Positioner, Smith and Nephew, Watford, UK).
- The elbow is positioned at 90° of flexion with the forearm allowed to hang free.
- A non-sterile tourniquet is placed high in the axilla and inflated to 250 mmHg following limb exsanguination.

20.4.3 Portal Design

- The bony and soft tissue landmarks are identified prior to commencement of the procedure (Fig. 20.1).
- It is the preference of the senior author to perform the posterior compartment arthroscopy first.
- The arthroscope is then moved to the posterolateral / radiocapitellar compartment. To address the lateral collateral, the arthroscope is inserted into "soft spot" portal and this is used as the view portal.
- An accessory posterolateral working portal was established approximately 2 cm proximally.
- A direct lateral portal is later established for insertion of the suture anchor and passing of the sutures through the LCL.

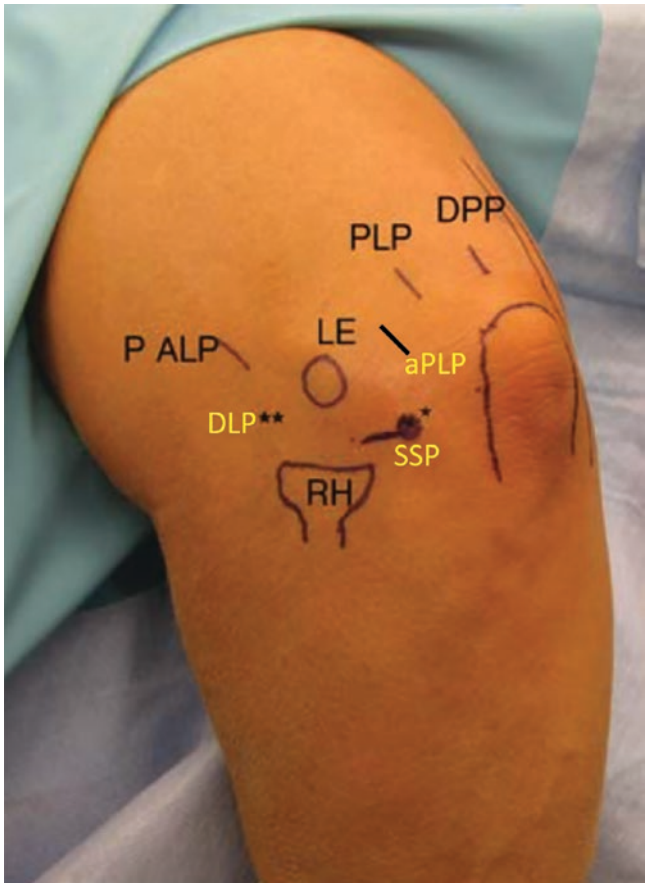

Fig. 20.1 Set up and portals for arthroscopy. Patient is in the lateral decubitus position, with the right arm on an arm holder and the elbow at 90°. *LE* lateral epicondyle, *RH* radial head, *DLP* direct lateral portal, *SSP* soft spot portal, *aPLP* accessory posterolateral portal, *PLP* posterolateral portal, *PALP* proximal anterolateral portal, *DPP* direct posterior portal. Reprinted from the Ek ET, Wang K. Arthroscopic repair of the lateral ulnar collateral ligament of the elbow using knotless suture anchor. *Arthroscopy Techniques* (2018) 1:7(2): e77–e81, with permission from Arthroscopy Techniques. Published by Elsevier Inc.)

20.4.4 Step-by-Step Description of the Technique

- Commonly, in the acute setting, a hemarthrosis is present which needs to be cleared with a shaver for adequate visualization.
- Depending on the experience of the surgeon, other concomitant injuries can be addressed arthroscopically, such as radial head fixation. All bony internal fixation should be performed prior to repair of the LCL, as would be the case in open surgery.
- With disruption of the LCL, a clear "drive through sign" (ability to advance the arthroscope into the anterior compartment through the radiocapitellar joint) will be evident. PLRI can be observed with increased gapping of the ulnohumeral joint when the elbow is placed in extension, supination, and valgus (Fig. 20.2a, b).
- By advancing the arthroscope to the lateral side of the radiocapitellar joint, one will see the loss of the humeral attachment of the LCL to the lateral epicondyle (Fig. 20.2c).
- Debride lateral epicondyle where LCL inserts with shaver to remove scar tissue and debris followed by gentle burring. A 70° arthroscope can be useful in this evaluation and also determine suture anchor position.
- Through the direct lateral portal, which was established through an outside-in technique using needle localization a 3.0-mm knotless bioabsorbable suture anchor (SutureTak, Arthrex, Naples FL) is inserted into the lateral epicondyle at the isometric point, which can be identified by direct arthroscopic visualization at the site of ligament avulsion (Fig. 20.3a).
- The single-strand 2-0 fiberwire repair suture attached to the anchor is separated from the double-strand FibreLink shuttling suture (Fig. 20.3b).
- The Fiberwire repair suture is passed through the substance of the proximal LCL using a QuickPass 90° suture lasso (Arthrex), which is inserted through the common extensor tendon and the LCL substance through the same lateral skin incision but approximately 10 mm distal to the already made portal so as to create an adequate tissue bridge of the LCL for the repair (Fig. 20.3c).
- Retrieve the loop of the suture lasso and the Fiberwire through the accessory posterolateral portal to shuttle the Fiberwire through the LCL.
- The Fiberwire is passed through loop in the suture lasso and the other end of the lasso is then withdrawn out of the direct lateral portal thus shuttling the fiberwire suture through the LCL (Fig. 20.3c).
- The Fiberwire suture is then passed through the loop of the FibreLink shuttling suture.
- The non-looped end of the FibreLink shuttling suture is then pulled, which shuttles the fiberwire repair suture through the SutureTak anchor (Fig. 20.4a).
- The elbow is placed into flexion (90°) and pronation to reduce the elbow joint. The reduction can be visualized arthroscopically.
- The fiberwire repair suture is gently pulled therefore bringing the ligament to the lateral epicondyle. Due to the "finger-trap" locking mechanism within the suture, the repair can be securely tensioned, which can be visualized arthroscopically and further adjusted if necessary (Fig. 20.4b).
- The radiocapitellar joint is then reassessed and if the LCL is adequately repaired, the "drive-through" test should be absent and stability of the ulnohumeral joint restored.

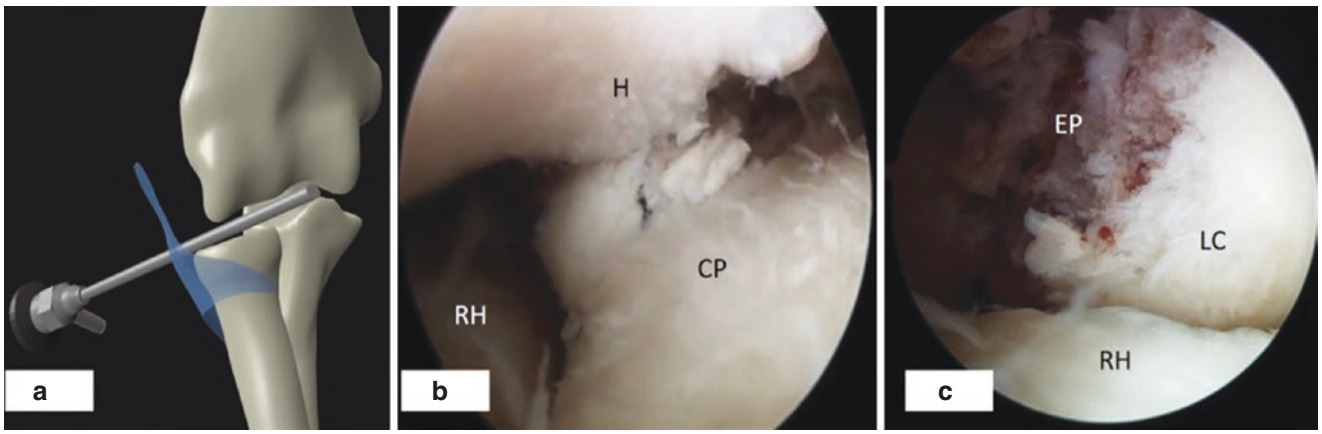

Fig. 20.2 Arthroscopic assessment of posterolateral rotatory instability and avulsed lateral collateral ligament. The viewing portal is through the soft spot portal. (**a**) diagram demonstrating a positive drive-through sign. (**b**) incongruity of the ulnohumeral joint space. (**c**) Bare wall of the lateral epicondyle where the lateral collateral had been avulsed. *H* humerus, *CP* coronoid process, *RH* radial head, *EP* lateral epicondyle, *LC* lateral condyle. Reprinted from the Ek ET, Wang K. Arthroscopic repair of the lateral ulnar collateral ligament of the elbow using knotless suture anchor. *Arthroscopy Techniques* (2018) 1:7(2): e77–e81, with permission from Arthroscopy Techniques. Published by Elsevier Inc.)

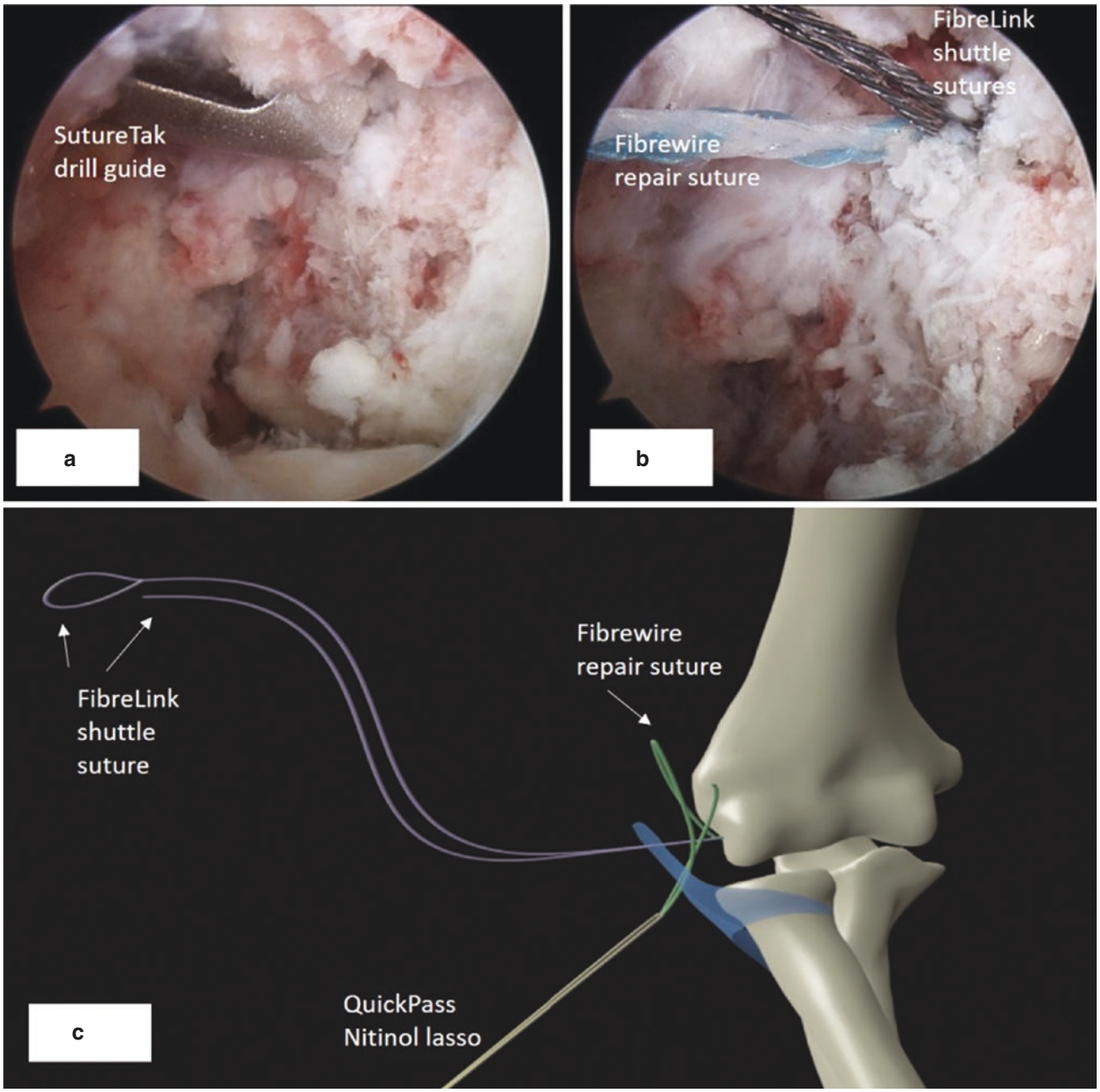

Fig. 20.3 Arthroscopic lateral collateral ligament repair process, with the viewing portal through the soft spot portal. (**a**) Drill guide is placed through direct lateral portal onto the isometric point of the lateral surface of the lateral condyle. (**b**) Fiberwire repair suture is separated from the two strands of the FibreLink shuttling suture. (**c**) Diagrammatic representation of the Fiberwire repair suture being shuttled through the lateral collateral ligament approximately 1 cm more distal (but through the same skin incision) using the QuickPass nitinol suture lasso. Reprinted from the Ek ET, Wang K. Arthroscopic repair of the lateral ulnar collateral ligament of the elbow using knotless suture anchor. *Arthroscopy Techniques* (2018) 1:7(2): e77–e81, with permission from Arthroscopy Techniques. Published by Elsevier Inc.)

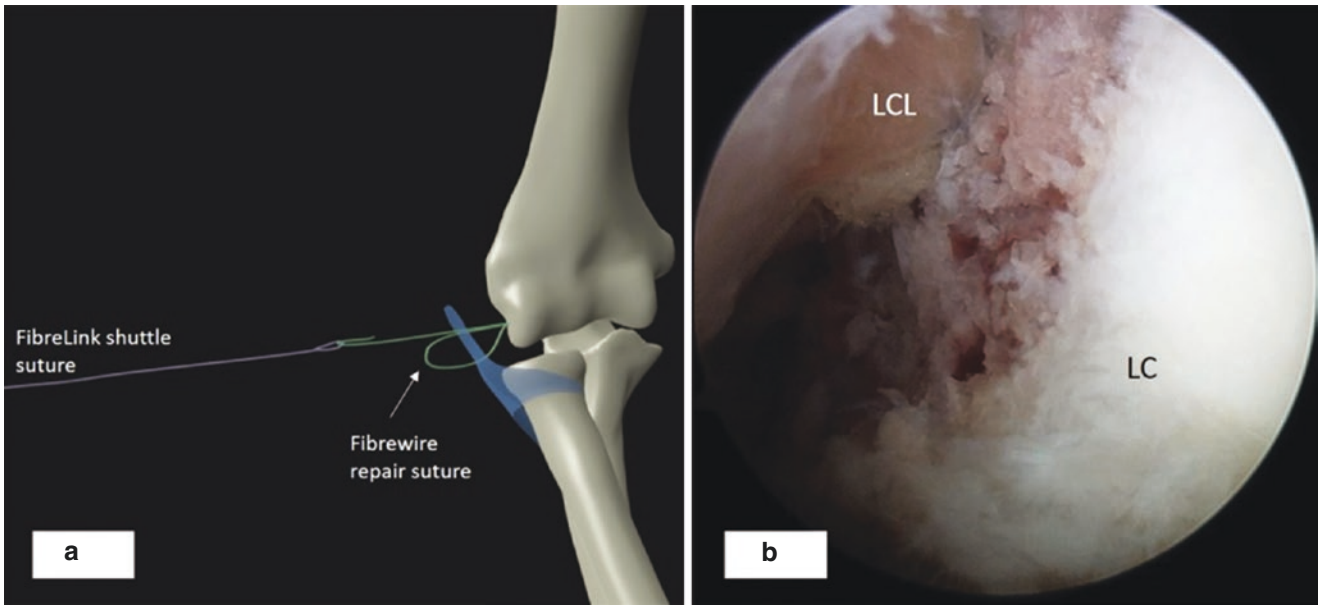

Fig. 20.4 Tightening of the suture repair. (**a**) Diagrammatic representation of the Fiberwire repair suture being shuttled through the "finger-trap" mechanism of the SutureTak anchor using the FibreLink shuttling suture. (**b**) Arthroscopic view through the soft spot portal showing the lateral collateral ligament being tightened onto the lateral epicondyle. *LC* lateral condyle, *LCL* lateral collateral ligament. Reprinted from the Ek ET, Wang K. Arthroscopic repair of the lateral ulnar collateral ligament of the elbow using knotless suture anchor. *Arthroscopy Techniques* (2018) 1:7(2): e77–e81, with permission from Arthroscopy Techniques. Published by Elsevier Inc.)

20.4.5 Complications and Management

- Potential iatrogenic injury to neurovascular structures, in particular, radial nerve.
- Injury to LCL and common extensor origin with direct lateral portal.
  - Requires careful portal placement.
  - Minimize the size of skin incision and portal.

20.4.6 Postoperative Care

- Elbow flexion maintained at 90 degrees and the forearm pronated to 80° with a posterior plaster splint for 2 weeks to minimize tension on the LCL repair.
- At the first postoperative visit (Day 10), converted to a thermoplastic posterior elbow shell with the elbow the above position.
- Patients begin supine range of motion exercises guided by physiotherapist, i.e., patient lies supine and the elbow is placed overhead to avoid varus or valgus force to elbow.
- Full flexion and forearm rotation are permitted from weeks 2 to 6 postoperatively. Active assisted extension of the elbow to 30° with the forearm in pronation for first 6 weeks. No extension of the elbow in supination.
- After 6 weeks the brace is weaned off and active upright range of motion is commenced with strengthening from 12 weeks postoperatively.
- Return to normal sporting activity at 6 months.

20.5 Summary

- With careful patient evaluation and selection, all-arthroscopic management of lateral elbow instability can be achieved using a knotless suture anchor that repairs the LCL to its anatomic location on the humerus.
- Advantages of this technique are that it is minimally invasive, allows intra-articular visualization and treatment of concomitant pathology, e.g., removal of loose bodies, arthroscopic fixation of simple fractures, and assessment of chondral injuries.
- However, this technique can be technically demanding and clear visualization and careful suture management is required.

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