



Open Posterolateral Ligament Plication and Lateral Ulnar Collateral Ligament Repair in Posterolateral Rotatory Instability of the Elbow Using an All-Suture Construct

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Abstract: Posterolateral rotatory instability of the elbow is the most common form of lateral-sided instability; it is often the result of an injury to the lateral collateral ligament complex involving the lateral ulnar collateral ligament. Recently, the posterolateral capsule of the elbow has been recognized to play a major role in preventing posterolateral rotatory instability, identifying it as an independent ligament of the lateral complex (posterolateral ligament). We present our technique for posterolateral elbow stabilization through plication of the posterolateral ligament associated with repair of the lateral ulnar collateral ligament using an all-suture anchor.

Posterolateral rotatory instability (PLRI) of the elbow is relatively uncommon, but it is the most common form of elbow instability. Symptoms include chronic pain, snapping, elbow subluxation, and recurrent dislocations with physical activity.¹ Chronic instability of the elbow can lead to progressive cartilage damage as a result of joint incongruence, which may later result in early elbow arthritis. Traditionally, injury to the lateral ulnar collateral ligament (LUCL) has been recognized as the primary cause of PLRI, whether as an iatrogenic injury after lateral elbow surgery or in the aftermath of an elbow dislocation.²

Several techniques, both open and arthroscopic, have been described to address this issue. The consensus in contemporary practice is to repair the

LUCL in the acute setting, whereas for chronic cases, ligamentous reconstruction using tendon autografts has been the standard of care.³ Recently, the posterolateral joint capsule has gained attention as a primary stabilizer of the elbow,⁴ with authors recognizing it as an independent structure: the posterolateral ligament (PLL) of the elbow.⁵

Insufficiency of the PLL was first mentioned in 1966 by Osborne and Cotterill,⁶ who described it as a detachment of the superior aspect of the posterior capsule of the elbow, which creates a sort of pouch in which an unstable radial head would slide during axial loading. O'Driscoll et al.⁷ described the mechanics of PLRI and increased laxity in the posterolateral aspect of the elbow capsule in 1991, yet no specific strategies or surgical techniques were developed to address this structure. We present our technique for PLRI stabilization through PLL plication and LUCL repair using an all-suture anchor.

Surgical Technique

Preoperative Setup

As depicted in [Video 1](#), the patient is placed in the supine position. After anesthesia is administered and before surgery, instability of the elbow is confirmed with a pivot shift test ([Fig 1](#)). The arm is then placed in an arm table, and the elbow is prepped and draped. ([Fig 2](#)).

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Received April 17, 2024; accepted June 8, 2024.

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2212-6287/24628

<https://doi.org/10.1016/j.eats.2024.103172>

Lateral Approach to the Elbow

With the elbow in 90° of flexion, the lateral epicondyle, olecranon process, and radiocapitellar joint are identified and outlined. A 7-cm incision is planned from a point located 5 mm proximal to the lateral epicondyle toward the posterior edge of the ulna, passing through the radiocapitellar joint (Fig 3). Sharp dissection is carried down the subcutaneous tissue, creating anterior and posterior skin flaps to ease exposure of the underlying fascia. Once the fascia has been exposed, Kocher's interval is identified and developed between the anconeus and extensor carpi ulnaris (Fig 4).⁸

PLL Dissection

Once the Kocher interval has been developed, an anterior flap containing the extensor muscle tendons and a posterior flap containing the LCUL and PLL are created; at this point, the anconeus muscle belly must be carefully elevated from the posterolateral capsule to allow full exposure of the PLL (Fig 5A). In cases with PLRI, the PLL appears insufficient with a "floppy" aspect and, sometimes, bony avulsions or the LUCU stump may be encountered. These must be identified and treated accordingly (Fig 5 B and C).

Preparation for Anchor Placement

After the PLL and LUCU stump have been identified, fibrotic tissue and nonviable bony fragments should be removed and the lateral aspect of the capitellum debrided to promote tissue healing. A circle that fits the anterior curvature of the capitellum is then outlined. The center of this circle is marked using the cautery (Fig 6A) to represent the center of rotation of the capitellum, which will serve as anchorage site for the repair⁹ (Fig 6 B and C). It is important to mention that in this case, the patient is skeletally immature, which is why we selected a 1.8-mm all-suture anchor with an



Fig 2. Patient positioning. The patient is placed in a supine position with an arm table at the appropriate height to allow the operative limb to rest comfortably at the side. Before prepping and draping the elbow, the surgeon makes sure that all bony prominences are well padded and that the arm table does not interfere with the elbow movement.

aiming device (TruShot; ConMed, Largo, FL), whereas in adult patients, we prefer a 2.8-mm all-suture anchor (Y-Knot RC, ConMed).

PLL Plication and LUCU Repair

To reduce and stabilize the joint, the elbow is placed in 30° of flexion with the forearm in pronation. The PLL is then repaired in a sequential posterior-to-anterior manner. Using wide Mason-Allen stitches the most posterior aspect of the PLL is captured and plicated with a square knot (Fig 7 A and B), the process is repeated for the anterior half of the PLL. When restoring tension to the PLL alone, relocation of the radial head can be observed before LUCU fixation. To complete the repair,



Fig 1. Pivot shift test, left elbow. The examiner stands behind the patient in the supine position and raises the patient's left arm over his head with both hands (A). The elbow is then placed in full extension and the forearm is gently supinated. In this position, the radial head is unstable and subluxated, which produces a dimple on the skin (B). Gently, axial loading and valgus stress are applied to the elbow as it is slowly flexed. Approximately at 40° of flexion, the triceps tightens and the forearm pivots around the medial ulnar collateral ligament, which results in an audible snap and sudden reduction of the joint with progressive flexion (C). If the elbow is extended again, radial head subluxation will be appreciated at the posterolateral edge of the elbow.

Fig 3. The left elbow is prepped and draped in the standard fashion; the surgeon is seated directly in front of the operative limb with an assistant at the proximal side of the arm, to the right of the surgeon in this case. With the elbow in 90° of flexion, the lateral epicondyle (LE) is easily identified and marked on the skin, and the radiocapitellar joint (RCJ) is located by palpation of the radial head during passive pronation and supination. The olecranon process (OP) and posterior edge of the proximal ulna are also outlined. An oblique incision is projected on the skin from a point 0.5 cm proximal to the LE toward the posterior edge of the ulna, passing through the RCJ; this will grant complete access to the lateral aspect of the elbow.

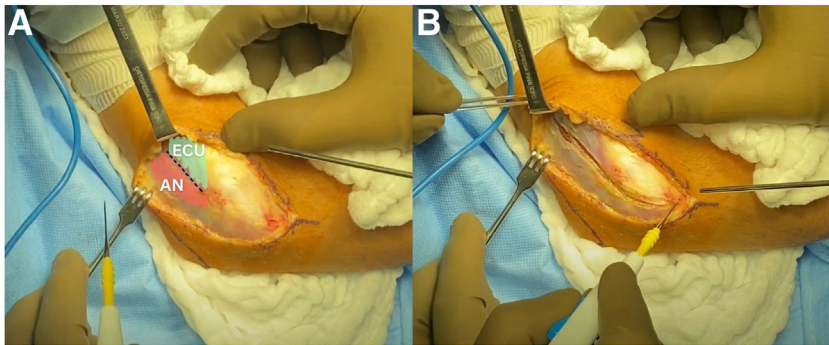
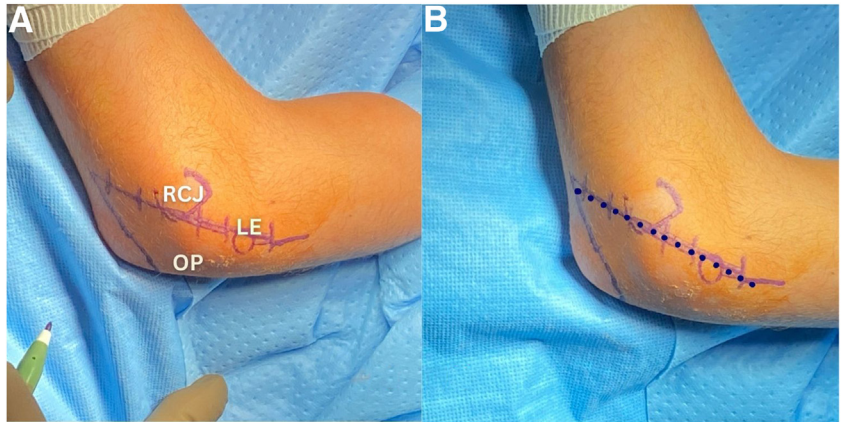


Fig 4. Kocher interval. The gap between the anconeus (AN) muscle and the extensor carpi ulnaris (ECU) muscle is identified under direct vision and by palpation at the posterior aspect of the approach (A). The fascia is then incised in line with the muscle fiber direction up to the lateral epicondyle (B).⁸

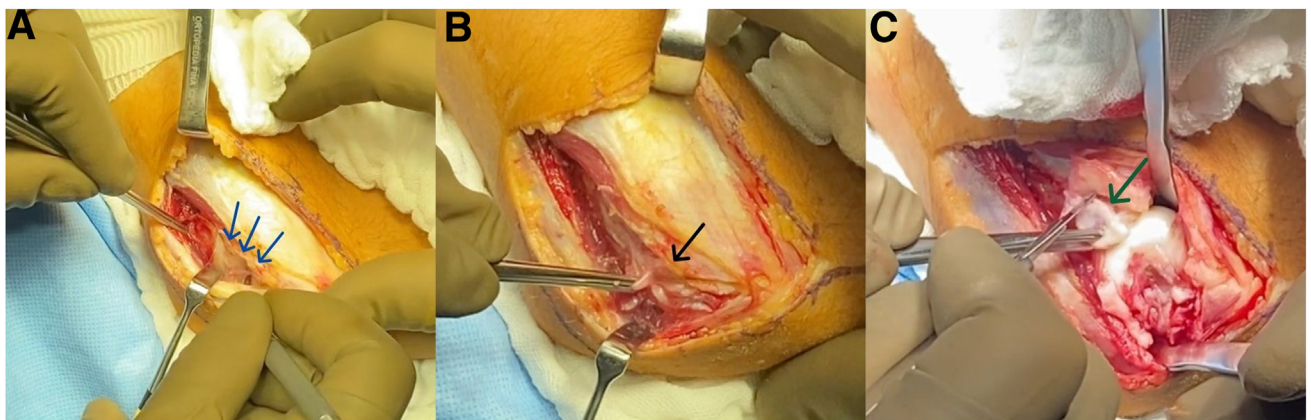


Fig 5. Deep dissection. Using a freer, the anconeus is elevated from the posterolateral ulna (A), creating a plane between the muscle belly and the posterolateral capsule (blue arrows). After the anconeus has been elevated, the posterolateral ligament may be identified (B) at its distal insertion proximal to the supinator crest (black arrow). Oftentimes, as in this patient, bony avulsions from the lateral ulnar collateral ligament origin may be embedded in ligament and/or fibrotic tissue (green arrow); if the fragments are nonviable, they should be resected to ensure soft-tissue healing (C).

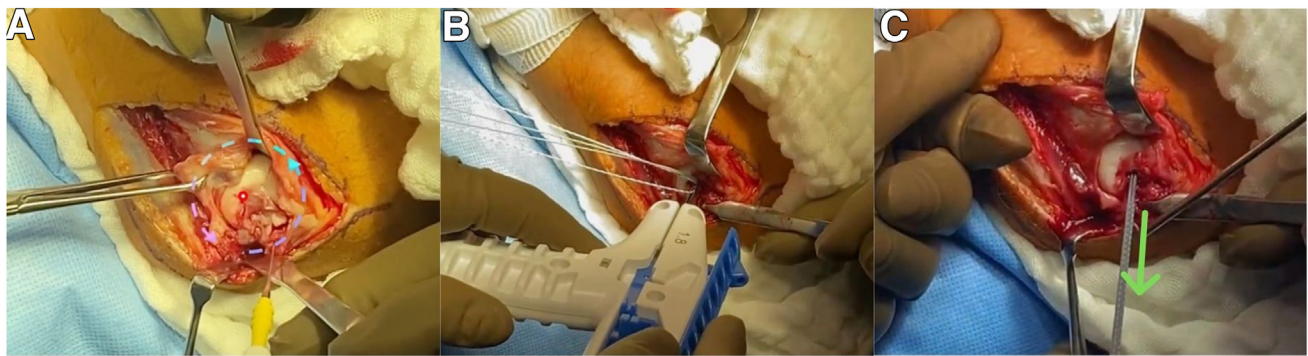


Fig 6. Anchor placement. The lateral aspect of the capitellum is completely exposed and the center of an imaginary circle that fits the curvature of the capitellum is outlined with the cautery; the center of this circle represents the capitellum's center of rotation (A).⁹ This point will serve as the entry site for the anchor (red dot). A double-loaded all-suture anchor is applied with an aiming device (B) (TruShot; ConMed, Largo, FL). Traction is applied to the sutures to activate the anchor (C).

the stump of the LUCL is incorporated to the construct using the anterior strand of the suture anchor in the same fashion as with the PLL (Fig 7 C and D). Lastly, the overlying fascia is closed with a locking continuous suture using a No. 1 VICRYL suture (Ethicon, Somerville, NJ), and the skin is closed with interrupted sutures (Fig 8).

Rehabilitation

After the surgery, the elbow is placed in a hinged brace, allowing full flexion of the elbow but restricting extension to 30°. Immediate grip and wrist exercises are encouraged. From 0 to 3 weeks, range of motion (ROM) is allowed from 30° to 140° of flexion, and from 4 to 6 weeks, active extension is advanced 10°

per week, to achieve full ROM at 6 weeks.¹⁰ Pronation of the forearm must be continued for the entire 6-week period. The hinged brace is discontinued at 6 weeks and advanced ROM exercises are started, including full ROM out of the hinged brace, terminal extension of the elbow with the forearm in neutral position is performed, and an elbow and forearm strengthening program is established. Varus stress and axial loading of the elbow are avoided until 8 to 12 weeks postoperatively.

Discussion

Chronic posterolateral instability of the elbow is often the result of simple elbow dislocations, and, almost always, surgical stabilization is required to prevent

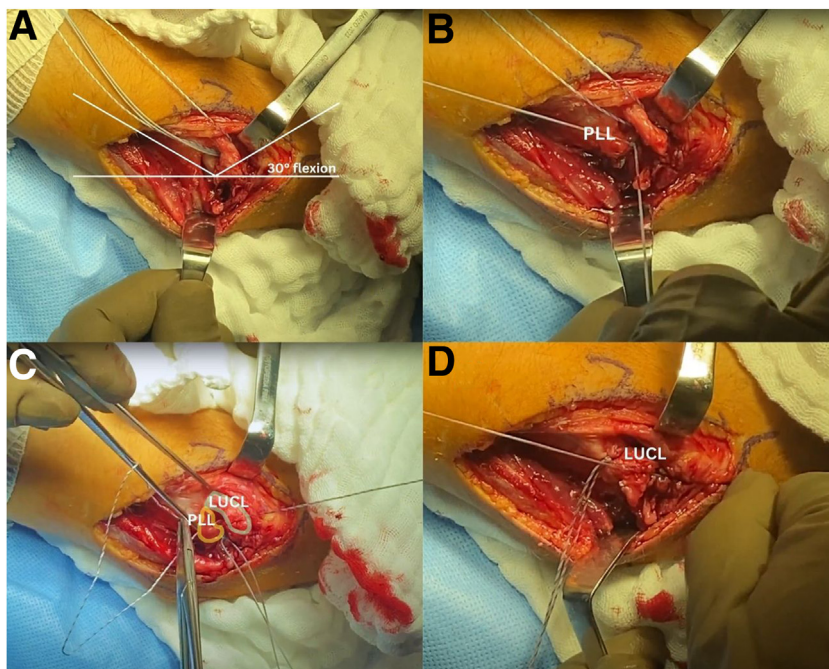


Fig 7. PLL plication and LUCL repair. Before soft-tissue repair, the elbow is placed in 30° of flexion with a slight valgus stress and the forearm in pronation (A). First, the posterior suture strand is passed through the posterior half of the PLL using a wide Mason-Allen stitch and taking care to grasp most of the redundant tissue to ensure adequate plication (B). The suture is tied with its counterpart using a square knot and the process is repeated with the anterior half of the PLL (C). Finally, using the anterior strand of the suture, the LUCL is incorporated into the repair using Mason-Allen stitches to reattach it to the lateral aspect of the capitellum (D). (LUCL, lateral ulnar collateral ligament; PLL, posterolateral ligament.)

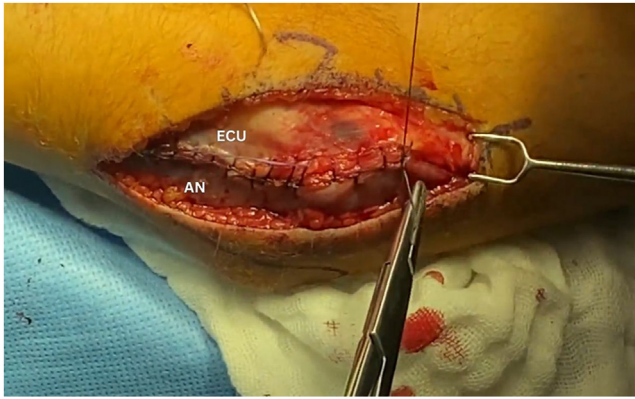


Fig 8. At the end of the case, the overlying fascia is closed with a locking continuous suture using No. 1 VICRYL; the subcutaneous tissue and skin are closed in the standard fashion with interrupted sutures. (AN, anconeus; ECU, extensor carpi ulnaris.)

cartilage damage and subsequent arthritis. Traditionally, arthroscopic imbrication, repair, or reconstruction of the lateral collateral complex, namely the LUCL, has been the cornerstone of treatment for this entity.³ In the last decade, the biomechanical importance of the PLL has come to light. In a cadaveric biomechanical study conducted in 2018, an increase in posterior radial head displacement was noted at 30° and 60° of flexion after isolated tearing of the posterolateral capsule of the elbow.⁴ In 2024, an anatomic study of the PLL was carried out in 6 cadaveric specimens, describing the ligament's characteristics, trajectory, and footprint dimensions, along with the authors' experience about 5 cases of PLL lesion, 3 of which presented with chronic PLRI, 2 of them presenting with an isolated injury to the PLL.⁵ These findings suggest that the posterolateral aspect of the capsule holds more importance than previously thought and must be considered as an independent ligament that acts as a primary posterior

Table 1. Tips and Tricks

Approach	Oblique skin incision from the lateral epicondyle to the posterior edge of the ulna allows for complete exposure of the lateral elbow.
Anconeus dissection	A freer or small Cobb elevator will ease anconeus dissection from the posterolateral capsule.
Anchor placement	Plication of a redundant PLL may be accomplished with an all-suture anchor placed at the capitellum's center of rotation. If PLL is detached from its insertion, an additional anchor at the back of the capitellum should be used.
LUCL repair	Whenever possible, the LUCL stump should be reattached to the capitellum. In poor-quality tissue, LUCL reconstruction should be considered in addition to PLL plication.

NOTE. Important technical aspects for plication and repair of the posterolateral ligament of the elbow are listed.

LUCL, lateral ulnar collateral ligament; PLL, posterolateral ligament.

Table 2. Advantages and Disadvantages

Advantages

- Complete visualization of the lateral collateral complex
- Visual control of joint reduction
- Anatomic reattachment of the LUCL
- Possibility of applying a second anchor in the back of the capitellum
- Complete posterolateral stabilization of the elbow with a single implant
- Bone preservation with the use of an all-suture anchor

Disadvantages

- Open approach to the elbow
- High cost of all-suture implants

NOTE. Advantages and disadvantages to the open posterolateral ligament plication and LUCL repair procedure are listed.

LUCL, lateral ulnar collateral ligament.

stabilizer of the radiocapitellar joint. We agree with the previous statements that PLL detachment or tear may in fact result in chronic PLRI, and in our opinion every effort should be made to recognize this structure intraoperatively and restore its attachment to provide complete stabilization of the posterolateral aspect of the elbow. Tips and tricks for plication and repair of the PLL are shown in Table 1 and described above. The advantages and disadvantages to be considered are described in Table 2.

Disclosures

All authors (M.R.S., J.E.T.R., R.G.G., A.F.C.A.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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