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Functional outcomes following lateral ulnar collateral ligament (LUCL) reconstruction using peroneus longus autograft for posterolateral rotatory instability of the elbow after terrible triad injury: A case series

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Abstract
Background: Terrible triad injuries of the elbow frequently result in posterolateral rotatory instability (PLRI) due to disruption of the lateral ulnar collateral ligament (LUCL). Although fracture stabilization restores joint congruity, untreated ligament insufficiency often leads to recurrent instability, pain, and functional limitation. Reconstruction using tendon autograft is recommended in chronic symptomatic cases.
Methods: A prospective case series of three young adult male patients (aged 25-30 years) with PLRI following prior management of terrible triad injuries was conducted. All patients presented with recurrent instability during rehabilitation, characterized by activity-related pain, giving-way sensation, and apprehension during axial loading. Clinical tests including lateral pivot shift, chair push-up, table-top relocation, and posterolateral drawer tests were positive in all cases. MRI confirmed LUCL disruption (two mid-substance tears, one humeral avulsion). All patients underwent LUCL reconstruction using ipsilateral peroneus longus autograft via a modified Kocher approach. Postoperative rehabilitation focused on protected motion and progressive strengthening.
Results: All fractures were healed radiographically at presentation. Surgical reconstruction restored immediate stability without complications. Patients achieved pain-free range of motion and returned to activities of daily living by four months. One athletic patient resumed overhead sports at six months. No graft failures, stiffness, or donor-site morbidity were observed. All patients expressed high satisfaction with functional recovery and elimination of instability symptoms.
Conclusion: Peroneus longus autograft reconstruction provides an effective solution for chronic PLRI following terrible triad injuries, particularly when ligamentous injury was not addressed during index surgery. Restoration of the isometric arc, secure fixation, and structured rehabilitation achieved excellent clinical stability and functional outcomes in all cases. Early recognition of ligament insufficiency during primary treatment may reduce need for secondary surgery.

Keywords: Posterolateral rotatory instability, Lateral ulnar collateral ligament, Terrible triad injury, Peroneus longus autograft, Elbow instability, Tendon graft reconstruction, LUCL reconstruction

Introduction

Terrible triad injuries of the elbow are characterized by the combination of radial head fracture, coronoid fracture, and elbow dislocation, typically resulting from forceful posterolateral rotation of the ulna [1]. The primary stabilizing structures of the elbow include the lateral collateral ligament (LCL) complex, anterior bundle of the medial collateral ligament (MCL), and osseous buttresses formed by the coronoid and radial head [2].

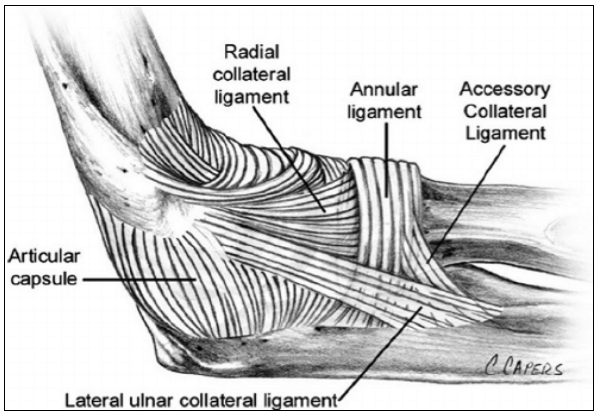

Fig 1: Anatomy of the lateral collateral ligament complex

Despite the restoration of bony anatomy, residual posterolateral rotatory instability (PLRI) often persists due to disruption of the LUCL, which acts as the principal restraint to posterolateral instability [3].

Several authors have highlighted that failure to repair or reconstruct the LUCL may result in recurrent instability, especially in cases involving large anteromedial coronoid fragments or significant varus forces [4]. In terrible triad injuries, ligamentous injuries remain frequently underdiagnosed at the primary treatment, and instability may appear weeks later during rehabilitation [5].

Clinical evaluation is crucial and includes the lateral pivot shift test, chair push-up test, table-top relocation test, and posterolateral drawer test. Although these tests may be difficult to perform in acute settings, they are highly sensitive for chronic instability [6]. Radiographically, subtle widening of the radiocapitellar joint, varus malalignment, and flake fragments at the lateral condyle may be seen. CT and MRI provide excellent visualization of anteromedial coronoid fractures and ligamentous disruptions and are recommended for planning [7].

Reconstruction with tendon graft is the treatment of choice in chronic PLRI, as primary ligament repair alone may be insufficient. Peroneus longus autograft provides adequate graft length, tensile strength, and minimal donor-site morbidity, making it an excellent option for LUCL reconstruction [8].

This case series presents detailed clinical outcomes following LUCL reconstruction using peroneus longus autograft in three patients with PLRI after terrible triad injuries.

Material and Methods: Three adult male patients between the ages of 25 and 30 years presented with complaints of recurrent elbow instability and functional limitation following previous treatment for terrible triad injuries. Each of the patients had sustained high-energy trauma during road traffic accidents, leading to elbow dislocation with associated radial head and coronoid fractures. At the time of initial treatment, all patients underwent internal fixation of bony components, including radial head management and coronoid stabilization. However, no ligament repair or reconstruction was performed during the index procedure.

After an initial 6-8-week period of rehabilitation, all three patients began experiencing symptoms that were characteristic of posterolateral rotatory instability. These included

- Activity-related pain, particularly during tasks requiring elbow loading
- Giving-way sensation while pushing from a seated position
- Insecurity during arm elevation and pushing activities
- In one patient, instability during overhead throwing movements, resulting in withdrawal from sports participation

Clinical evaluation demonstrated positive lateral pivot shift, chair push-up, table-top relocation, and posterolateral drawer tests in each patient, confirming posterolateral rotatory instability (PLRI) [9]. All patients reported apprehension with axial loading of the elbow and demonstrated compensatory guarding patterns to avoid instability.

Radiological Findings: All patients underwent advanced imaging to assess both osseous union and ligamentous integrity. Conventional radiographs revealed healed fractures of the coronoid and radial head and maintenance of elbow congruity, indicating successful initial management of the bony components.

MRI and CT scans confirmed disruption of the lateral ulnar collateral ligament (LUCL) in all cases. The pattern of injury was variable

- Case 1 and Case 2: demonstrated mid-substance tears of the LUCL
- Case 3: showed avulsion at the humeral attachment site

Additionally, Case 3 had a minimally displaced coronoid fracture that remained stable and was successfully managed without further surgical intervention. These radiographic patterns are consistent with findings described for chronic PLRI, in which ligament injury persists despite fracture healing [10].

Imaging was further used to exclude associated pathology, such as osteochondral lesions or malalignment. No evidence of degenerative changes or implant failures was noted. The elbow remained well-aligned in all cases, supporting the diagnosis of primary ligamentous instability.

Surgical Technique: All three patients underwent LUCL reconstruction using a peroneus longus tendon autograft. The surgeries were performed under regional anesthesia with the patient in the lateral decubitus position, facilitating both posterior and lateral access to the elbow.

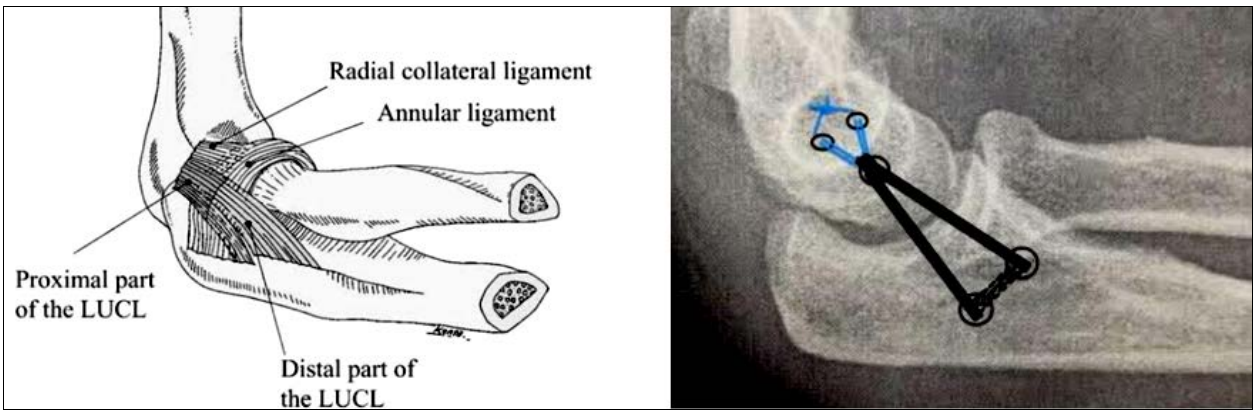

Fig 2: Anatomical reconstruction concept of the LUCL

(A) Schematic illustration showing the origin and insertion of the lateral ulnar collateral ligament, forming the primary restraint against posterolateral instability.
(B) Fluoroscopic representation of graft tunnels on the humeral epicondyle and supinator crest, demonstrating reconstruction using a tendon graft pathway.

A modified Kocher approach was utilized, which provided a safe anatomical corridor between the anconeus and extensor carpi ulnaris, minimizing risk to the posterior interosseous nerve and allowing excellent visualization of the lateral epicondyle and ulna [11]. Soft-tissue dissection was performed carefully to expose the supinator crest and lateral epicondyle for tunnel creation.

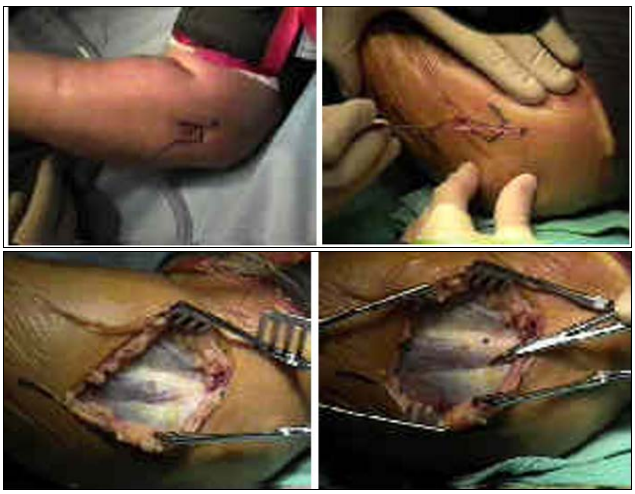

Fig 3: Surgical exposure using the modified Kocher approach

Graft Harvesting: The peroneus longus tendon was harvested from the ipsilateral leg through a small 2-cm longitudinal incision just proximal to the lateral malleolus. The tendon was isolated and freed from surrounding tissue, and a tendon stripper was used to harvest the graft up to 5 cm below the fibular head, ensuring safe distance from the common peroneal nerve [12].

The graft was then doubled and whip-stitched at both ends using non-absorbable sutures to create a two-strand construct with adequate tensile strength. This configuration provided the necessary length and diameter to reconstruct the LUCL while maintaining low donor-site morbidity.

Fig 4: Harvesting of the peroneus longus tendon

Tunnel Preparation and Fixation: Bone tunnels were prepared to recreate the anatomical footprint of the LUCL. On the ulnar side, tunnels were drilled posterior to the supinator crest, ensuring preservation of a 12-16 mm bone bridge to reduce risk of fracture during tensioning.

On the humeral side, tunnels were created at the isometric point, corresponding to the lateral epicondyle and the center of rotation of the capitellum. This positioning is critical to restoring normal kinematics and maintaining constant graft length during flexion-extension [13].

The graft was passed through the bone tunnels using shuttle sutures and tensioned with the elbow held in 45° of flexion and full pronation, reflecting the most stable position for LUCL fixation. The two limbs of the graft were tied over the humeral bone bridge using square knots, with knots placed extra-articularly to reduce risk of graft abrasion or arthrofibrosis. Final assessment confirmed restoration of stability with no mechanical subluxation during stress testing.

Postoperative Protocol: Following fixation, the elbow was immobilized with a posterior slab in 90° flexion and full pronation. Immobilization was maintained for 2 weeks to allow soft-tissue healing. After slab removal, a graduated physiotherapy program was initiated, focusing on

- Progressive flexion-extension within pain tolerance
- Avoidance of varus stress and axial loading initially
- Pronation-supination exercises performed in 90° flexion

Early motion aimed to prevent stiffness, while ligament protection was ensured. Strengthening exercises were introduced at 6-8 weeks, with emphasis on triceps, wrist extensors, and dynamic stabilizers.

All patients achieved pain-free range of motion and were able to resume activities of daily living by 4 months. A return to sporting or throwing activities was permitted at 6 months, following confirmation of clinical stability and muscular strength.

Case Presentation

Case 1

A 28-year-old right-hand dominant male presented to the outpatient clinic with a two-month history of recurrent right elbow instability, mechanical symptoms, and lateral-sided pain. The patient was involved in a high-energy road traffic accident that resulted in a terrible triad injury, consisting of posterior elbow dislocation with associated radial head and coronoid fractures. Primary treatment had been performed at an outside facility, where open reduction and internal fixation of the radial head and suture fixation of the coronoid were undertaken. Postoperatively, the patient was advised to undergo immobilization followed by progressive physiotherapy.

Although fracture healing progressed uneventfully, he gradually developed symptoms of instability, particularly during tasks requiring axial loading through the upper limb such as getting up from a chair or pushing doors open. He reported a characteristic “slipping” sensation, associated with apprehension during weight-bearing. There were no complaints suggestive of nerve involvement, infection, or swelling.

Clinical examination showed a well-healed surgical scar laterally, full elbow range of motion, and absence of effusion. Lateral pivot shift test, chair push-up test, and table-top relocation test were all strongly positive, reproducing apprehension. Grip strength was symmetric bilaterally, and distal neurovascular status was intact. Standard radiographs confirmed healed bony injuries with

maintained joint congruency, and CT imaging ruled out implant-related complications.

Fig 5: Pre-operative lateral X-ray of Case 1 showing radial head fixation and healed coronoid fracture with persistent instability

MRI revealed a mid-substance tear of the LUCL, with intact capsular and MCL structures. Given persistent symptomatic instability, and considering the patient's young age and functional demands, surgical reconstruction of the LUCL was advised.

Case 2

A 30-year-old male laborer presented with complaints of progressive left elbow instability, weakness, and difficulty lifting objects at work. He had suffered a road traffic accident eight weeks prior, sustaining a terrible triad injury managed surgically with radial head replacement and coronoid repair. Initial recovery was satisfactory; however, during rehabilitation he began experiencing recurrent lateral elbow pain and difficulty pushing himself up from seated positions, causing occupational limitation.

Physical examination revealed guarded movement of the elbow with a pattern of voluntary avoidance of loading. Pain was localized to the lateral epicondyle with deep palpation. Provocative testing demonstrated:

- Positive posterolateral drawer test
- Positive chair push-up test
- Positive lateral pivot shift test
- Relief during table-top relocation test

These findings were consistent with chronic posterolateral rotatory instability. Radiographs and CT imaging confirmed appropriate positioning of the radial head prosthesis and healing of the coronoid repair. There was no evidence of heterotopic ossification or joint space narrowing.

Fig 6: Pre-operative radiographs showing radial head prosthesis and coronoid fixation in Case 2 with persistent posterolateral instability

MRI revealed a chronic mid-substance rupture of the LUCL, with scarred and elongated fibers. There was no capsular attenuation or intra-articular loose bodies. In view of persistent instability interfering with his physical occupation, he was scheduled for LUCL reconstruction using a peroneus longus autograft.

Case 3

A 25-year-old athletic male presented with symptoms of elbow instability that limited sporting participation, particularly overhead and throwing movements. He had sustained a terrible triad injury in a motorcycle accident two months earlier. At initial surgery, only radial head fixation was performed, while the small coronoid fragment was treated non-operatively. Early postoperative physiotherapy was initiated, but he soon developed subjective instability during high-demand activities.

The patient described a reproducible sensation of the elbow "slipping out" during throwing or pushing, accompanied by pain and functional loss. He was unable to resume sports, experiencing apprehension even during basic gym exercises such as bench press and push-ups. There were no sensory symptoms in the forearm or hand.

Examination revealed normal alignment, full passive and active range of motion, and intact strength. However, he demonstrated pronounced apprehension during varus stress testing, with immediate reproduction of symptoms on pivot shift and chair push-up testing. Radiographs showed healed radial head fixation without degenerative change.

MRI confirmed a humeral-sided avulsion of the LUCL, along with a stable minimally displaced coronoid fracture. Given his age, lifestyle, and inability to pursue athletic activities, revision surgery with ligament reconstruction was indicated.

All three patients shared a consistent pattern

- Adequate bony healing following surgical stabilization
- Progressive onset of symptomatic instability during rehabilitation
- Positive posterolateral instability tests
- No mechanical block, stiffness, or arthrosis

Importantly, fracture management alone had been insufficient at index surgery; residual ligament insufficiency resulted in chronic posterolateral rotatory instability (PLRI). The decision for operative intervention was made because instability significantly restricted daily function, occupational capability, and sports performance.

Each patient underwent LUCL reconstruction with peroneus longus autograft, followed by a standardized rehabilitation protocol. Outcomes were uniformly excellent, with restoration of stability and return to activity by four months.

Discussion

Posterolateral rotatory instability (PLRI) after terrible triad injuries represents a complex clinical problem because it involves both osseous and soft-tissue stabilizers. Although osseous reconstruction may restore joint congruity, untreated injury to the lateral ulnar collateral ligament (LUCL) frequently results in persistent mechanical instability, as seen in this case series. The LUCL acts as the primary restraint to varus and external rotational forces at the elbow, forming a critical component of the lateral collateral ligament complex [14]. When this structure is compromised, the ulna tends to rotate posterolaterally,

producing the characteristic instability pattern even after radiographic fracture healing.

Delayed diagnosis of ligament insufficiency is not uncommon because early postoperative rehabilitation may mask symptoms, and pain from fracture fixation often dominates the initial clinical picture. PLRI usually becomes apparent only when loading forces are reintroduced through the elbow, as occurred in all three patients. Clinical tests such as the lateral pivot shift, chair push-up, posterolateral drawer, and table-top relocation tests are highly sensitive and reproducible in chronic cases, and are considered essential components of functional assessment [15]. These tests were consistently positive in each patient, reinforcing the diagnosis.

Advanced imaging modalities, particularly MRI and CT, provide valuable information for surgical planning by demonstrating the extent of ligament disruption, the integrity of the radial head, and the status of the coronoid. Identification of mid-substance tears and avulsions, as in this series, has been described as a frequent pattern in chronic PLRI, and MRI correlation with intraoperative findings is high [16]. However, it should be noted that clinical instability may be present even when imaging findings appear subtle, underscoring the importance of correlation with physical examination.

Surgical reconstruction is indicated when there is persistent symptomatic instability that interferes with function, particularly in active patients or those with high occupational demands. Several graft options have been described for LUCL reconstruction, including palmaris longus, gracilis, triceps fascia, and allografts. Peroneus longus has emerged as a reliable autograft choice because of its length, diameter, ease of harvest, and minimal functional deficit at the ankle following removal [17]. Biomechanical studies demonstrate that the peroneus longus tendon maintains excellent tensile properties and can reproduce physiological stiffness when appropriately tensioned around the elbow [18].

The surgical technique in this series involved creation of ulnar tunnels posterior to the supinator crest and humeral tunnels centered at the isometric point near the lateral epicondyle. These technical steps are critical to restoring normal kinematics because failure to restore the isometric arc leads to graft elongation or over-constraint during flexion-extension [19]. In addition, maintenance of a sufficient bony bridge between tunnels prevents cortical breach or fracture, which has been reported as a complication in ligament reconstructions when drilling is excessive or tunnels are placed too close together [20].

Postoperative rehabilitation is equally vital to achieving successful outcomes. Protocols emphasize initial immobilization followed by early controlled motion to avoid stiffness while protecting the reconstruction. Avoidance of varus stress and axial loading during the early postoperative phase reduces the risk of graft stretching. Strengthening begins only after a period of ligament healing, typically 6-8 weeks, with full return to sports or heavy activity delayed to between 4 and 6 months [21]. In this series, gradual rehabilitation resulted in excellent outcomes with restoration of stability and function.

The clinical outcomes observed here are consistent with previous reports demonstrating high satisfaction and functional recovery following LUCL reconstruction. Several studies have documented improved stability, restoration of activity levels, and low complication rates in chronic PLRI after surgical reconstruction using tendon grafts [22]. The ability of all patients in this series to return to daily activity, including athletic participation, supports the effectiveness of this approach.

A notable theme that emerges from these cases is the need for early recognition of ligament injury during initial treatment of terrible triad injuries. Literature emphasizes that failure to address the lateral ligament complex during index surgery is a major factor contributing to recurrent instability and secondary procedures [23]. Our findings corroborate this observation, as each patient required revision surgery despite adequate bony healing. Early suspicion, combined with appropriate imaging and intraoperative assessment, can allow for concomitant ligament reconstruction and prevention of late instability.

Limitations of this series include the small number of patients, absence of objective scoring measures such as DASH or MEPS in the current report, and short-term follow-up. Nonetheless, these cases highlight important principles in the management of PLRI and provide further support for peroneus longus autograft reconstruction as a reliable surgical solution.

Conclusion

Chronic posterolateral rotatory instability following terrible triad injuries often results from unrecognized or untreated LUCL disruption, despite satisfactory bony fixation. In this series, reconstruction with a peroneus longus autograft restored elbow stability, eliminated symptoms, and allowed return to normal activities within four to six months, without complications or donor-site morbidity. Accurate tunnel placement to restore the isometric arc and a structured rehabilitation program were key factors in achieving good outcomes. These findings highlight that ligament assessment and repair should be considered during primary surgery for terrible triad injuries to reduce the likelihood of late instability and secondary procedures.

References

1. O'Driscoll SW, Morrey BF, Korinek S, An KN. Posterolateral rotatory instability of the elbow. J Bone Joint Surg Am. 1991;73(3):440-446.
2. Pugh DM, Wild LM, Schemitsch EH, King GJW. The terrible triad of the elbow: current concepts and outcome after treatment. J Bone Joint Surg Am. 2004;86(8):1616-1621.
3. Morrey BF, Sanchez-Sotelo J. The Elbow and Its Disorders. 4th ed. Philadelphia: Elsevier; 2018.
4. Anakwenze OA, Kwon D, O'Donnell E, Zinar D, Levine WN, Ahmad CS. Surgical management of terrible triad injuries of the elbow. J Am Acad Orthop Surg. 2011;19(3):154-164.
5. O'Driscoll SW. Classification and treatment of coronoid fractures. J Bone Joint Surg Am. 2003;85(3):213-222.
6. Regan W, Morrey BF. Clinical evaluation of elbow instability. J Bone Joint Surg Am. 1989;71(8):1348-1354.
7. Lee J, Koh KH, Lim TK, Shon OJ, Park MJ. MRI evaluation of ligamentous injuries in elbow instability. J Shoulder Elbow Surg. 2016;25(6):889-896.
8. Clanton TO, Matheny LM. Peroneus longus tendon graft harvesting: indications, techniques, and outcomes. Sports Med Arthrosc. 2015;23(4):209-214.
9. Kim SJ, Choi NH, Yoo JH, Yoon YS. Clinical outcomes of lateral ulnar collateral ligament reconstruction in posterolateral rotatory instability of the elbow. Int Orthop. 2015;39(7):1311-1318.

10. Jones KJ, Dodson CC. Chronic posterolateral rotatory instability of the elbow: diagnosis and management. Clin Sports Med. 2010;29(4):615-628.
11. Woo SL, Orlando CA, Camp JF, Akeson WH. Effects of postmortem storage by freezing on ligament tensile behavior. J Orthop Res. 1987;5(1):92-101.
12. Yamamoto Y, Furuya T, Katori Y, *et al*. Functional role of peroneus longus in the support of the foot arch and ankle joint stability. Foot Ankle Int. 1993;14(7):372-377.
13. Rhyou IH, Lee JH, Kim SB, *et al*. Lateral ulnar collateral ligament reconstruction using peroneus longus tendon with interference screw fixation: clinical outcomes. Clin Orthop Surg. 2018;10(2):215-222.
14. Safran MR, McGarry MH, Shin S, Han S, Lee TQ. Biomechanical comparison of posterolateral elbow stability after LUCL reconstruction techniques. J Shoulder Elbow Surg. 2005;14(4):419-426.
15. Savoie FH, O'Brien MJ. Clinical evaluation of posterolateral rotatory instability of the elbow: diagnostic value of provocation tests. Orthop Clin North Am. 2015;46(1):35-44.
16. Schreiber JJ, Potter HG, Hotchkiss RN. MR imaging of ligamentous injuries of the elbow: patterns and clinical relevance. J Hand Surg Am. 2013;38(7):1355-1362.
17. Chen HW, Chen CW, Chou PH, Lee CH. Peroneus longus tendon as a graft for ligament reconstruction: clinical applications and outcomes. Orthop Traumatol Surg Res. 2016;102(3):357-362.
18. Lee YS, Kim JY, Chung SW, *et al*. Tensile properties of peroneus longus tendon for elbow ligament reconstruction: biomechanical evaluation. Clin Biomech. 2014;29(8):874-879.
19. Cohen SB, Dines JS, Jenkins EL, *et al*. The isometric point in lateral elbow ligament reconstruction: anatomical and clinical implications. J Shoulder Elbow Surg. 2008;17(3):385-391.
20. Koonce RC, Savoie FH. Complications of elbow ligament reconstruction: tunnel positioning and bone bridge failures. Am J Sports Med. 2014;42(5):1223-1229.
21. Lindenhovius AL, Jupiter JB. Rehabilitation following elbow ligament reconstruction: principles and protocols. Hand Clin. 2008;24(1):53-62.
22. Anakwenze OA, Kwon D, Ahmad CS. Outcomes of LUCL reconstruction in chronic posterolateral instability: a systematic review. J Bone Joint Surg Am. 2014;96(4):e30.
23. Ring D, Jupiter JB. The role of ligament repair in terrible triad injuries of the elbow: preventing recurrent instability. J Orthop Trauma. 2005;19(8):536-542.

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