36 Lateral Epicondylitis and Symptomatic Minor Instability of the Lateral Elbow (SMILE)

Francesco Luceri, Davide Cucchi, Paul Muriithi Miano, Paolo Arrigoni, and Pietro Simone Randelli

36.1 Background

Lateral elbow pain (tennis elbow) is an overuse injury involving the extensor muscles that originate on the lateral epicondylar region of the distal humerus. Lateral epicondylitis is not an inflammatory disease and generally considered to be an extra-articular condition involving degeneration and tendinosis of the common extensor origin, with the extensor carpi radialis brevis (ECRB) being the most commonly affected tendon. The lateral collateral ligament (LCL) complex is formed by three components: R-LCL, ulnar lateral collateral ligament (U-LCL), and annular ligament. The R-LCL and the most proximal tendon fibers of the ECRB are parallel and overlapping in their proximal insertion. Open or arthroscopic release of the common extensor origin can cause iatrogenic injury to the LCL complex resulting in posterolateral rotatory instability (PLRI). ECRB debridement or release through open, percutaneous, and arthroscopic approaches is generally considered the gold standard surgical treatment for recalcitrant lateral epicondylitis. However, success rates ranging between 65% and 95% suggest that these approaches may not precisely address the underlying pathologic process.

The arthroscopic approach to the elbow joint has demonstrated the presence of potentially pathological intra-articular findings associated with ECRB tendinopathy. The presence of laxity signs within the lateral compartment of the elbow, in conjunction with these intra-articular abnormalities, supports the existence of a symptomatic minor instability of the lateral elbow (SMILE), in which the role of the R-LCL is important as a lateral static stabilizer [1].

Francesco Luceri and Davide Cucchi contributed equally to this work. Paolo Arrigoni and Pietro Simone Randelli equally contributed to this paper as Senior Authors.

F. Luceri
U.O.C. Clinica Ortopedica e Traumatologica Universitaria CTO, Azienda Socio Sanitaria Territoriale Centro Specialistico Ortopedico Traumatologico Gaetano Pini-CTO, Milan, Italy

D. Cucchi
Department of Orthopaedics and Trauma Surgery, Universitätsklinikum Bonn, Bonn, Germany

Department of Biomedical Sciences for Health, Università degli Studi di Milano, Milan, Italy

P. M. Miano
P.C.E.A Kikuyu Hospital, Kikuyu, Kenya

P. Arrigoni (✉) · P. S. Randelli
Department of Biomedical Sciences for Health, Università degli Studi di Milano, Milan, Italy

U.O.C. Clinica Ortopedica e Traumatologica Universitaria CTO, Azienda Socio Sanitaria Territoriale Centro Specialistico Ortopedico Traumatologico Gaetano Pini-CTO, Milan, Italy

Research Center for Adult and Pediatric Rheumatic Diseases (RECAP-RD), Department of Biomedical Sciences for Health, Università degli Studi di Milano, Milan, Italy

D. N. Bhatia et al. (eds.), *Arthroscopy and Endoscopy of the Elbow, Wrist and Hand*,
https://doi.org/10.1007/978-3-030-79423-1_36

36.1.1 Surgical Anatomy

Recalcitrant lateral elbow pain is frequently associated with abnormal intra-articular findings, which could be related to a condition of patholaxity termed "SMILE." This condition may result from repetitive low-energy stress or shear as occurs in simple, repetitive, or prolonged daily or working activities performed with the shoulder in moderate abduction, pronation of the hand, and 50°–70° of elbow flexion, a position in which hand and the forearm create a varus/pronation moment on the lateral elbow. With time, this could result in progressive stretching and elongation of the radial component of the LCL (R-LCL) and of the annular ligament, with relative hypermobility of the radial head. Minor incongruence of the proximal radioulnar joint results in radial head impingement with the notch in pronation, and eventual radial head chondropathy, inflammation, and subsequent synovitis. Finally, abrasion of the stretched R-LCL and anterolateral capsule due to friction over the lateral portion of the capitellum can cause chondropathies of the lateral aspect of the capitellum and capsular tears.

In this pathologic cascade, the extensor carpi radialis brevis (ECRB) is considered to act as a dynamic stabilizer, resisting varus forces in support of a deficient or lax R-LCL: ECRB tendinopathy could therefore be intended as the final consequence of repetitive loads and overuse on the R-LCL. With time, this varus/pronation moment created by the hand and the forearm could lead to elongation of the R-LCL and annular ligament The ECRB proximal insertion is located just extracapsular and parallel to R-LCL, in intimate association but easily distinguishable with the lateral collateral ligament. Within the SMILE theory, ECRB tendinopathy could be considered a consequence of R-LCL elongation, as this structure acts as an extra-articular secondary stabilizer resisting varus pronation stresses. Strain on this ligament with the secondary bracing effect of ECRB activity provides the rationale for R-LCL plication. The goal of R-LCL plication is to surgically constrain an intra-articular structure and to stabilize a joint compartment, as similarly described in other joints with satisfactory results.

Future studies will help to confirm this theory and investigate if the pathologic cascade is initiated extra-articularly (from ECRB) and subsequently becomes intra-articular (generating ligamentous laxity and associated lesions), or indeed the opposite. Proving one or the other origin could help to intervene conservatively in the very first symptomatic phase, avoiding progression of the symptoms.

36.2 Indications and Contraindications

Approximately 90–95% of patients with lateral epicondylitis respond to conservative measures and do not require surgical intervention. Patients whose condition is unresponsive to 3–6 months of conservative therapy (e.g., corticosteroid injections, splinting, and occupational therapy) are candidates for surgical treatment.

There are no absolute contraindications for surgical treatment of lateral epicondylitis. Relative contraindications include any comorbidity that would place the patient at a higher level of surgical risk.

36.3 Surgical Technique

The patient is placed in the lateral decubitus position.

- Posterior compartment arthroscopy is performed first. A complete inspection of the posterior compartment of the joint includes the posterior capitellum, the posterior trochlea, the olecranon fossa, and the tip of the olecranon. The integrity of cartilage, ligaments, capsule, and tendons is assessed, and the presence of loose bodies or other pathologic conditions is noted. Ligament lesions if present must be immediately repaired.
- The anterior compartment is accessed by proximal anteromedial (AM) and anterolateral (AL) portals. The AL portal is used to insert a retractor aimed toward the radiocapitellar joint to protect the posterior interosseous nerve, which lies just anterior to the capsule at

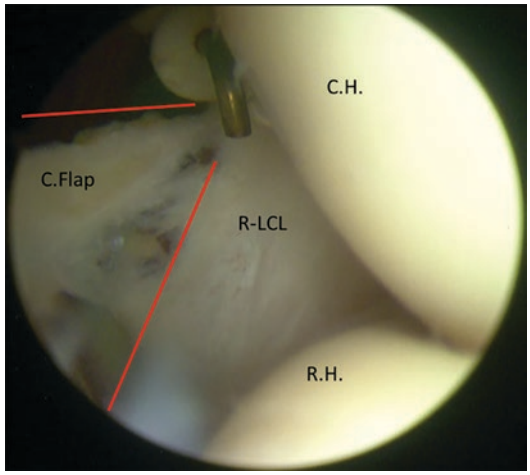

Fig. 36.1 V-shaped capsular flap to reach the extra-articular aspect of elbow. This flap allows an arthroscopic view of the complete R-LCL. (Reprinted by permission from Elsevier Inc.: Arthroscopy: The Journal of Arthroscopic & Related Surgery; Arrigoni et al. [3], Copyright © 2014 Arthroscopy Association of North America)

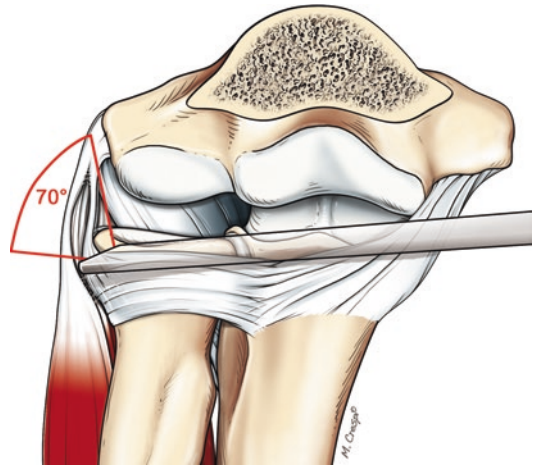

Fig. 36.2 The position of a 70° arthroscope looking toward the lateral compartment. (Reprinted by permission from Elsevier Inc.: Arthroscopy: The Journal of Arthroscopic & Related Surgery; Arrigoni et al. [3], Copyright © 2014 Arthroscopy Association of North America)

this level [2]. At this point the R-LCL is not identifiable as an isolated structure but appears as a thickening of the capsule.

- A limited anterolateral V-shaped capsulotomy is performed with a hooked electrocautery device introduced through the standard anterolateral portal (Fig. 36.1) under visualization with a 30° arthroscope. The superior arm of the "V" is performed parallel to the distal humerus, whereas the inferior arm is parallel and anterior to the R-LCL. The R-LCL is seen as a thickening of the capsule and better visualized by tensioning the capsule in pronation. If visualization is still difficult, the ideal location of the R-LCL is projected and capsulotomy is performed anterior to that. Care should be taken to perform the capsulotomy with the forearm in pronation to tension the R-LCL and facilitate the protection of this structure. Pronation also offers a second advantage of moving the posterior interosseous nerve further medial to the surgical area [2]. The inferior limit of the capsulotomy is approximately 0.5–1 cm superior to the radial head. Switching to a 70° arthroscope from the 30° scope gives a better visualization and the arthroscope can be advanced into the window created by the capsulotomy [3]. This offers a frontal view of the most lateral aspect of the lateral compartment with the capsule/R-LCL defining the articular side and the tendon fibers of the ECRB on the extra-capsular side (Fig. 36.2).
- The hook electrode is then advanced through the anterolateral portal. After ECRB tendon release, the posterior common extensor origin is assessed. This is located as an independent structure more posterior to the ECRB tendon at the very end of the 70° camera field. The tendon is probed to check the integrity of the common extensor origin (Fig. 36.3).
- Based on the SMILE concept, lateral epicondylitis due to tendinosis of the ECRB is usually preceded with laxity of the LCL; arthroscopic plication of the LCL is therefore an alternative treatment option to ECRB release. During elbow arthroscopy the patholaxity noted of the LCL can be evaluated using the three signs of laxity: the "annular drive-through" (ADT), the "Loose Collar Sign" (LCS), and the "R-LCL pull-up Sign" (RPS) [1]. Other pathologic findings include synovitis anterior to the radial head, anterolateral capsular tears, and chondropathy of either the radial head or the lateral portion of the capitellum. Patients, who present at least one of the previous signs of minor instability in

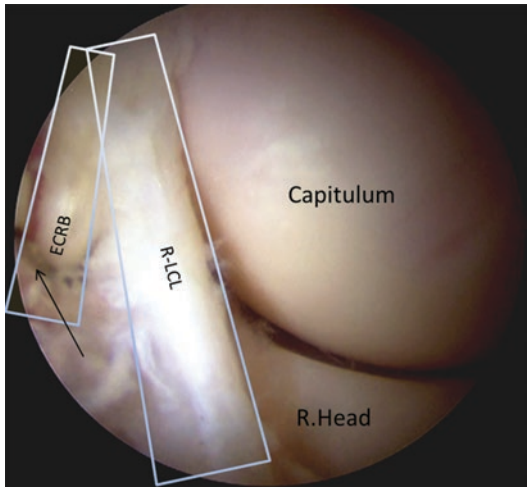

Fig. 36.3 Arthroscopic intraoperative picture after ECRB release of right elbow. The arrow shows the gap left after tendon release. The ECRB tendon stump is visible in the upper part of the figure (*CH* capitellum humerus, *RH* radial head). (Reprinted by permission from Elsevier Inc.: Arthroscopy: The Journal of Arthroscopic & Related Surgery; Arrigoni et al. [3], Copyright © 2014 Arthroscopy Association of North America)

addition to one or more intra-articular associated lesions, are considered eligible for R-LCL plication (Fig. 36.4).

- To perform plication, a suture anchor is inserted high and lateral in the anterolateral aspect of the capitellum at the capsular insertion. Sutures are passed into the R-LCL beyond a level anterior to the mid-point of the radial head and approximately 0.5 cm proximal to the radiocapitellar joint line. Sutures are then retrieved from the anterolateral portal and a standard sliding knot is performed, ensuring that it lies extra-articularly (see Chap. 12). Debridement of any synovitis or chondral irregularity is then performed and a re-assessment for any residual sign of laxity then undertaken.

36.4 Postoperative Management and Rehabilitation

Patients who have undergone arthroscopic ECRB release for lateral epicondylitis are discharged from the operating room with a sling. The ice, bandage, and dressing are removed on the third day after surgery. The sling is worn for

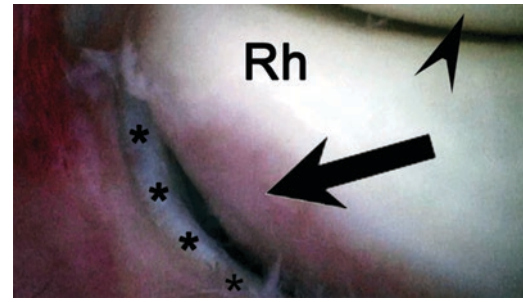

Fig. 36.4 Loose collar sign (LCS). Radial neck exposure under the cartilaginous area (arrow) may be associated with annular ligament redundancy and laxity (asterisks). Right elbow anteromedial view; Rh radial head. (Reprinted by permission from Springer Nature Customer Service Centre GmbH: Springer Nature; Knee Surgery, Sports Traumatology, Arthroscopy; Arrigoni et al. [1], Copyright © 2017, Springer Nature)

1 week and then discarded. Light active range of motion is encouraged after the sling is discontinued. During the first 6 weeks the patients are taught to stretch the wrist extensor muscles with the elbow extended, the forearm pronated, and the wrist and fingers flexed. Caution should be exercised to avoid overuse.

In patients who have undergone plication of the R-LCL, rehabilitation protocol is less aggressive. After surgery, an elbow brace locked at 90° of flexion is placed for just 10 days to allow soft tissues to heal. From day 10–20, range is limited to 30° of extension and free flexion. From day 20, patients are encouraged to obtain full passive ROM with physiotherapy assistance. Active wrist, elbow, and shoulder range of motion exercises are progressively initiated. After 4 weeks, strengthening exercises are begun. Varus stress is not allowed until 4 months after surgery.

36.5 Complications

- The most common complications after ECRB release are incomplete release and nerve injuries. The first one causes the persistence of a residual pain. Nerve injuries can range from a transient to a permanent neurologic deficit.
- Stiffness including loss of extension is possible.
- ECRB debridement or release through open, percutaneous, and arthroscopic approaches

for recalcitrant lateral epicondylitis may not precisely address the underlying pathologic process according to the SMILE that may lead to persistent micro-instability of the lateral elbow and persistent lateral elbow pain.

- Iatrogenic injury of the LCL complex can also predispose the elbow to posterolateral rotatory instability.

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