Technical Note

Surgical Repair Technique for Proximal Extensor Carpi Radialis Brevis Tears

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Abstract: The extensor carpi radialis brevis (ECRB) is well known to be implicated in lateral epicondylitis as a result of inflammation and degeneration. However, tears of the ECRB should be considered a separate pathology and are poorly reported in the literature. Surgical techniques for this pathology also have been poorly described. In this Technical Note, we present a surgical technique with an open approach and the use of a suture anchor for repair of isolated ruptures of the ECRB. This allows for better approximation and proper maintenance of the tendon as it completes the healing process. Surgical intervention restores anatomy and allows patients to return to full function and activities.

Lateral epicondylitis, or more commonly known as "tennis elbow," has been well studied over the years. Contrary to the etymology of its name, the widely accepted theory behind the pathophysiology of lateral epicondylitis involves repetitive microtrauma to the muscles of the common extensor tendon, which ultimately leads to an impaired healing process called angiofibroblastic hyperplasia.[1,2] The subsequent degenerative tendinosis and fibrosis from these injuries is what drives the clinical manifestation of the symptoms found in lateral epicondylitis. As defined, lateral epicondylitis or epicondylosis results in structural changes to the tendon; however, this does not include a tear of the tendon.

The extensor carpi radialis brevis (ECRB) is the most common portion of the common extensor tendon implicated in lateral epicondylitis. Proximally, the ECRB originates as part of the common extensor tendon from the lateral epicondyle. It resides superficial to the lateral radial collateral ligament and deep to the extensor carpi radialis longus (ECRL). Fibers of the extensor digitorum communis blend into the ECRB; however, the majority of the ECRB fibers lie anterior to the extensor digitorum communis fibers.[3] The ECRB inserts on the radiodorsal aspect of the base of the third metacarpal bone. Along with the ECRL, its mechanism of action mainly consists of extension and abduction of the wrist.[4]

The most common complaint in patients with proximal common extensor tendon pathology is pain along the posterior forearm and lateral aspect of the elbow. This pain is especially reproducible or exacerbated with extension of the wrist or fingers. In severe cases, weakened grip strength may present, which invariably affects quality of life and ability to function.[5]

The treatment for lateral epicondylitis has been well established and typically is successfully treated with a conservative approach.[6] In refractory cases, various procedures have been described to debride the tendon of the tendinosis.[7]

Ruptures of the ECRB are rare in the setting of lateral elbow pain; however, the symptoms present similar to lateral epicondylitis. ECRB tears can occur via attrition in the setting due to lateral epicondylitis but can also occur via trauma due to overload, with patients commonly describing a "pop" at the time of injury. These are commonly initially treated as lateral epicondylitis but often fail nonoperative treatment, as seen by the senior author, who sees patients in a tertiary referral center. These tears are identified commonly on magnetic resonance imaging but often are described as partial-thickness common extensor tendon tears. Upon closer observation, one can see that the tear involves the ECRB specifically (Fig 1). Similar to standard treatment for tendon tears throughout the

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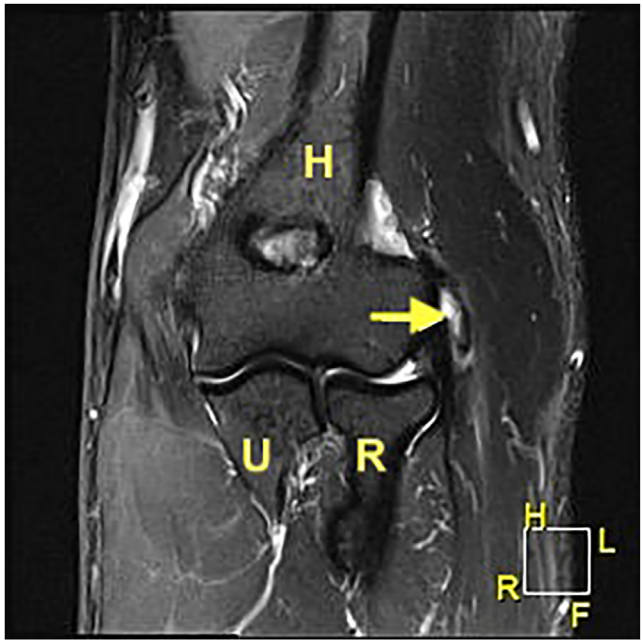

Fig 1. T2-weighted coronal magnetic resonance imaging of the left elbow demonstrates a mildly retracted ECRB tear (arrow) at the lateral epicondyle of the humerus (H). The ulna (U) and radius (R) are at the bottom of the image. (ECRB, extensor carpi radialis brevis.)

musculoskeletal system, we find that repair yields the quickest and most consistent recovery for these specific injuries and return to full activity. Currently, there are few, if any, studies that examine isolated ruptures of ECRB, and those mostly discuss distal tears.[8,9] As a result, the management of this pathology is not well understood. The purpose of this Technical Note is to demonstrate a technique found to be successful in surgical repair for this pathology. Follow-up on these patients has shown that early surgical intervention results in significantly improved outcomes.

Surgical Technique (With Video Illustration)

A 3- to 4-cm oblique linear incision is made distal and anterior to the lateral epicondyle (Fig 2). The common extensor fascia is split at the interval between the ECRL and extensor digitorum communis (Fig 3). The ECRL is then reflected anteriorly (Fig 4). The ECRB is visualized deep to the ECRL. Any degenerative tendon tissue, scar tissue, and adhesions at the end of the tendon tear are debrided using the Nirschl scratch maneuver[10] and with a rongeur (Fig 5). The ECRB tendon stump is mobilized (Fig 6). A suture anchor (2.3-mm OSTEORAPTOR anchor; Smith & Nephew, Andover, MA) is placed at the footprint on the lateral epicondyle (Fig 7). The suture is then passed using a modified locked Krackow technique with a minimum of 6 locked throws through the tendon. The tendon is reduced onto the anchor and tied

Fig 2. Viewing the lateral aspect of the left elbow with the elbow flexed at 90°, a 3-cm oblique incision is made distal and anterior to the lateral epicondyle. The patient is in a supine position with the shoulder internally rotated and the elbow flexed over a bump. The shoulder is to the top of the picture and the hand is to the right of the picture.

into place (Fig 8). The knot from the repair is buried deep to the ECRL. The fascia between he ECRL and extensor digitorum communis is repaired. The patient is placed into a removable elbow immobilizer (Count'R Force Elbow Immobilizer 90°; Arlington, VA) or simple sling. Video 1 demonstrates the surgical technique.

Active full range of motion is initiated immediately after surgery. Light strengthening up to 5 lbs is started at week 4. Full strengthening is progressed at week 8.

Fig 3. Viewing the lateral aspect of the left elbow with the elbow flexed at 90°, the interval between the ECRL (a) above the Freer elevator and ECRB (b) below the Freer elevator. The proximal arm is towards to the top of the picture and the forearm is to the right of the picture. (ECRB, extensor carpi radialis brevis; ECRL, extensor carpi radialis longus.)

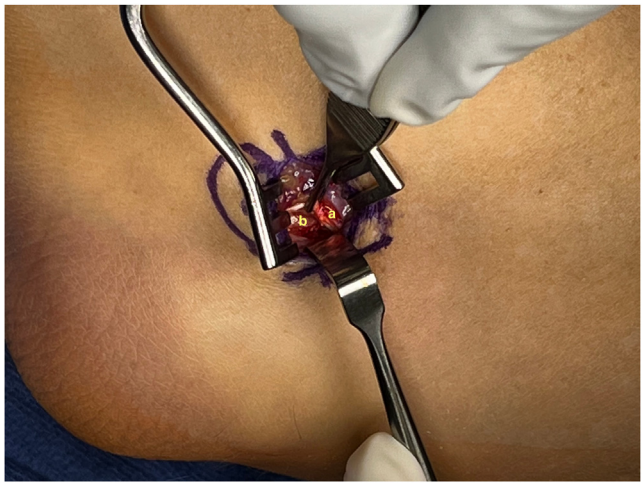

Fig 4. Viewing the lateral aspect of the left elbow with the elbow flexed at 90°, the ECRL (a) held by the forceps is reflected anteriorly off the ECRB (b), which lies deep to the ECRL. The proximal arm is towards the top of the picture and the forearm is to the right of the picture. (ECRB, extensor carpi radialis brevis; ECRL, extensor carpi radialis longus.)

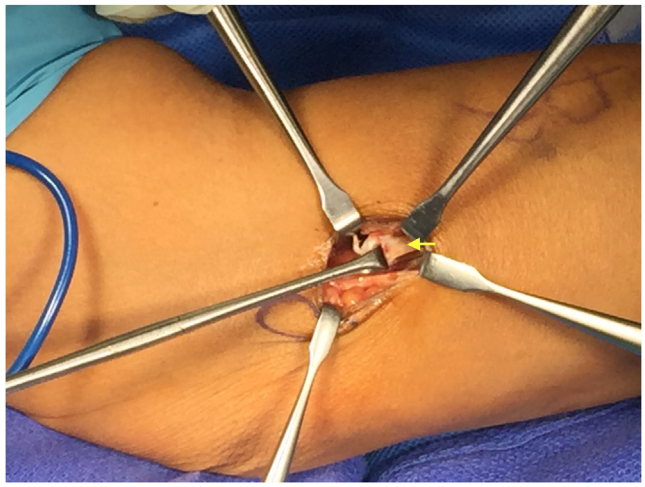

Fig 6. Viewing the lateral aspect of the left elbow with the elbow flexed, the ECRB (arrow) is mobilized. The proximal arm is towards the top of the picture and the forearm is towards the right of the picture. (ECRB, extensor carpi radialis brevis.)

Sports-specific conditioning programs may begin at week 12 with potential progression to full activity and sports at week 16.

Discussion

In this Technical Note, we present an open technique for surgical repair of an isolated proximal rupture of the ECRB that uses a suture anchor to reapproximate the tendon to its anatomical site of origin. Open approaches for surgical debridement and tenotomy of the common extensor tendon in lateral epicondylitis have been documented to have improved functional outcomes and pain scores postoperatively.[11] However, there are few reports in the literature regarding isolated ECRB ruptures and virtually no studies that describe in detail a surgical technique or treatment for a proximal tear. In a case report by Huffaker et al.,[8] a patient experienced spontaneous midsubstance rupture of the ECRB tendon, close to its insertion site at the third metacarpal. Although the patient experienced prolonged symptoms of associated pain and diminished function, conservative management was elected, and symptoms eventually resolved. In another case report by Mundell et al.,[9] they describe a patient who experienced avulsion of both the ECRB and ECRL, close to their insertion site. Subsequently, the patient was treated surgically, with the use of suture anchors to reapproximate the tendons to the second and third metacarpals. Although both instances describe an isolated rupture of the ECRB, the site of injury was closer to the site of insertion; we describe a technique for repair of a proximal ECRB rupture, near the site of origin at the lateral epicondyle.

Fig 5. Viewing the lateral aspect of the left elbow with the elbow flexed at 90°, the Nirschl scratch maneuver is used with a no. 15 blade scalpel to debride any degenerative tissue, scar tissue, or adhesions at the end of the ECRB tear. The proximal arm is towards the top of the picture and the forearm is towards the right of the picture. (ECRB, extensor carpi radialis brevis.)

This open technique provides the best exposure of the site of injury and allows for optimal visualization of surgical repair. This is necessary when considering the anatomy of the ECRB with respect to more overlying superficial structures such as the ECRL. Debridement before reapproximating the ruptured tendon is useful to facilitate better muscle repair with healthy tissue to healthy tissue contact and artificial stimulation for local wound healing factors. The use of a suture anchor provides greater pullout strength and helps to maintain

Fig 7. Viewing the lateral aspect of the left elbow with the elbow flexed at 90°, the anchor is placed at the footprint of the lateral epicondyle. The proximal arm is towards the top of the picture and the forearm is towards the right of the picture.

correct anatomical position until healing is complete. There is a small risk of fracture due to torsional stress imparted by the anchor. However, this can be minimized through proper positioning into the lateral epicondyle of the humerus, where the cortex is thickest, along with ensuring that the tendon approximation is aligned correctly with the anchor. Finally, the Krackow suture is ideal for tendon fixation, as the use of multiple locking loops can significantly improve the strength of repair.

We have found that in our practice that these patients exhibit exceptional outcomes postoperatively with return to full sport and activities. Although lateral epicondylitis is the most common presentation of atraumatic lateral elbow pain, surgeons should be aware of ECRB tear presentation in the clinical setting, particularly in patients who do not respond to conservative treatment with suspected lateral epicondylitis, and be well-equipped if surgical intervention is warranted. Pearls and pitfalls of our technique are

Fig 8. Viewing the lateral aspect of the left elbow with the elbow flexed at 90°, the ECRB (arrow) is reduced onto the lateral epicondyle and tied into place to secure the repair. The proximal arm is towards the top of the picture and the forearm is towards the right of the picture. (ECRB, extensor carpi radialis brevis.)

Table 1. Pearls and Pitfalls

Pearls
The ECRB can retract on occasion. If the ECRB tendon is not fully visualized deep to the ECRL, then consider exposing distally to see if it has retracted.
An extensile incision can be made for patients with large amounts/deep subcutaneous tissue. A curvilinear incision can be used for better exposure.
Make sure to fully bury the knot from the ECRB repair deep to the ECRL when closing the fascia to avoid irritation of the knot stack/symptomatic hardware.
Aim the drill and anchor proximally to avoid any potential concern of violating the joint.
Pitfalls
When using a small 3-cm incision, make sure it is placed directly anterior and distal to the lateral epicondyle.
Make sure to find the appropriate interval between the ECRL and EDC. The ECRL always has muscle belly deep to the fascia. If this isn't seen, then the split was into the EDC.
Be careful when debriding any tissue to avoid iatrogenic injury to the lateral radial collateral ligament.

ECRB, extensor carpi radialis brevis; ECRL, extensor carpi radialis longus; EDC, extensor digitorum communis.

Table 2. Advantages and Disadvantages

Advantages
Can be performed through a small incision.
An anatomic repair can be performed through this approach.
Provides better approximation of the tendon to allow anatomic healing.
Patients can immediately perform active range of motion postoperatively for early movement.
Disadvantages
Can be challenging to fully visualize through a small incision.
Unable to address other pathology, such as to the lateral ulnar collateral ligament, through this approach.
May be more technically challenging in patients with large amounts of subcutaneous tissue.

presented in Table 1. Advantages and disadvantages are presented in Table 2.

Disclosures

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