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Original Article

Short-term evaluation of arthroscopic management of tennis elbow; including resection of radio-capitellar capsular complex

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ABSTRACT

Background: There has been controversy regarding the pathogenesis and treatment of lateral epicondylitis. Different surgical techniques for the treatment of lateral epicondylitis prescribed. The purpose of this study was to evaluate the short-term outcomes of arthroscopic management including resection of the radio-capitellar capsular complex, using different validated scores.

Methods: In this study, arthroscopic resection of a capsular fringe complex was done beside debridement of the undersurface of Extensor Carpi Radialis Brevis (ECRB). Thirty-one patients with recalcitrant lateral epicondylitis for a minimum of 6 months had surgery. In all patients, a collar-like band of radio-capitellar capsular complex was found to impinge on the radial head and subluxate into the radio-capitellar joint with manipulation under direct vision. Outcomes were assessed using Mayo Elbow Performance Index (MEPI), the Patient-Rated Tennis Elbow Evaluation (PRTEE), and the Disability of the Arm, Shoulder, and Hand (DASH), beside visual analog scale (VAS) for pain and satisfaction criteria.

Results: After arthroscopic surgery, overall satisfaction was extremely positive, over the 31 patients, 93.5% of the patients are satisfied. The mean score for pain improved from 8.64 to 1.48 points. The total PRTEE improved from 55.53 to 10.39 points. The mean MEPI score was improved from 61.82 to 94.10 points. DASH score also improved from 24.46 to 4.81 points. All improvements are statistically significant ($P < 0.05$).

Conclusion: Arthroscopic release of ECRB in patients with chronic lateral epicondylitis is a reproducible method with a marked improvement in function within a short period, with special consideration for resection of radio-capitellar capsular complex.

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1. Introduction

Lateral epicondylitis is a painful disease of the extensor tendons of hand and finger which was first reported by Runge in 1873.¹ The symptoms were previously described as lawn-tennis elbow because its association to the tennis sport.¹

Since the early description of lateral epicondylitis, there has been controversy regarding the pathogenesis and treatment of lateral epicondylitis.² The term tennis elbow is actually a misnomer because the condition is commonly seen in non-tennis players. Non-operative measures usually are successful, such as physiotherapy or steroid injection, although the recovery period may be prolonged.³ In some studies, the percentage of failed conservative management is up to 25%.³

In the literature, there are more than 15 different surgical techniques for the treatment of lateral epicondylitis. These surgical techniques include simple release,⁴ reconstruction of the common extensor tendons,⁵ a separation of the deep fascia that covers the common extensor tendon, distal tenotomy of the ECRB tendon at the musculo-tendinous border near to the wrist,⁶ extra-articular approach for arthroscopic lateral elbow release,⁷ as well as specific incision and reconstruction of the sufficiently exposed ECRP lesion. Recent studies have reported good results of arthroscopic release used in the treatment of lateral epicondylitis.^{7,8}

A degenerative capsulosynovial fringe of the leading edge of the annular ligament was observed. Presuming there was impingement of this tissue on or in the radio-capitellar joint, we divided and debrided this tissue in addition to the ECRB, extensor carpi radialis, sheath. The common extensor origin was normal and left undisturbed.

Mullett et al⁹ performed a cadaveric study, where they found a degenerative capsular fold impinging on the radial head was seen in 15 elbows. A classification system, based on the relationship of the capsular fold to the radial head was described. In Type 1, the radial head is completely exposed during ROM. In Type 2, there is partial coverage of the radial head by the capsuloligamentous complex without interposition into the joint in any position. Type 3 elbows it is similar to Type 2 but with capsuloligamentous complex interposed in the radio-capitellar joint during flexion and extension, whereas in Type 4 elbows, the radial head is completely obscured by a fully thickened band throughout the range of motion. The lesion was equally prevalent in men and women.

The purpose of this study was to evaluate the short-term outcomes of arthroscopic release of lateral epicondylitis including resection of the radio-capitellar capsular complex, using different validated scores. Authors also attempted to identify socio-demographic factors and arthroscopic findings that may be associated with the outcomes after arthroscopic surgery for lateral epicondylitis.

2. Materials and methods

2.1. Patients

Our study consisted of 33 consecutive arthroscopic tennis elbow releases performed in 31 patients between September

2010 and November 2012. There were 20 male (22 elbows, 66.7%) and 11 female (11 elbows, 33.3%). The average patient age at the time of surgery was 33.70 years (range: 24–42 years). Twelve patients (38.7%) were involved in heavy manual labor, 15 patients (48.3%) described their work as repetitive, and 4 patients (12.9%) were not working at the time of surgery. Eighteen (55%) of the 33 elbows involved the dominant arm. All of these elbows were treated non-operatively before undergoing arthroscopic release. Non-operative measures used were rest, activity modification, physical therapy, non-steroidal anti-inflammatory medication, and corticosteroid injection. All the patients had at least 2 injections before surgery. The overall average number of injections was 2.7. The mean duration of this treatment was 16.3 months (range: 6–36 months). Although all patients ultimately failed nonsurgical measures, 80% of them reported some transient symptomatic relief with the cortisone injections. Clinically, the predominant symptoms were pain that increased with grasping and lifting. On physical examination, patients consistently had point tenderness over the lateral epicondyle as well as pain with resisted wrist dorsiflexion with the elbow extended. Radiographs were insignificant.

All patients underwent an examination and evaluation preoperative and at 6 months postoperatively. Patients were assessed and asked to assess their elbow function and pain using different scores including: Mayo Elbow Performance Index (MEPI), the Patient-Rated Tennis Elbow Evaluation (PRTEE), and the Disability of the Arm, Shoulder, and Hand (DASH), beside visual analog scale (VAS) for pain and satisfaction criteria.

2.2. Operative procedure

The patient positioned in lateral decubitus position with his arm in a holder. General anesthesia with a non-sterile tourniquet is used. The elbow is distended with 20–30 mL of fluid through the standard lateral “soft spot” portal between the tip of the olecranon, lateral epicondyle, and the radial head. This step allows a safe entry into the joint through the antero-medial portal, which becomes the viewing portal. A small skin incision is made about 2 cm proximal to the medial epicondyle and 1 cm anterior to the intermuscular septum. Then bluntly spreading, using small artery, down to the capsule along the anterior humerus aiming toward the radio-capitellar joint with the arm at 90° of flexion in neutral rotation, this made the trocar to be introduced into the distended capsule. The proper placement of this portal allows excellent viewing of the lateral compartment of the elbow. Using the 30° scope, a diagnostic arthroscopy is performed through the medial viewing portal before the creation of the lateral working portal. This allows visualization of the anterior aspect of the elbow and a perfect evaluation of the lateral structures including the ECRB tendon. Then working instruments were passed through the proximal lateral portal which made using an outside-in method. The status of the ECRB origin were evaluated according to Baker et al¹⁰ and those of the radio-capitellar synovial plica were evaluated according to Mullett et al.⁹ Next, a 4.5 mm mechanical shaver is inserted through the cannula and the procedure is initiated. The radio-capitellar capsular complex was excised distally to

normal annular ligament. The radio-capitellar joint was then examined in flexion and extension to ensure that there was no more impingement. Then the origin of the ECRB tendon is extra-articular and must be visualized during the procedure. The joint capsule ECRB tendon was resected with either a shaver or an electrothermal device. After that, the area just below the superior capitellum is resected, which is proximal to the ECRB tendon. The resection stops once the ECRL fibers appear. Care was taken to avoid injury to the LCL by limiting the resection to the portion anterior to the mid-axis of the radial head. We did not decorticate the lateral epicondyle. We used only 2 arthroscopic portals and did not perform a posterior elbow arthroscopy in this study. Portals were sutured and a soft bulky dressing was applied. The patients wore a splint for 2–3 days, and sutures' ends were removed at 2 weeks.

2.3. Statistical analysis

Statistical analysis was performed using the Student's paired t-test to compare between the preoperative and postoperative variables with the statistical significance set at $P < 0.05$. Statistical analysis was performed with SPSS version 20 (SPSS, Chicago, IL).

3. Results

The surgical findings of radio-capitellar synovial plica, according to Mullett et al⁹ we found 18 (54.5%) type 1 variant, 11 (33.3%) type 2 variant, 4 (12.2%) type 3 variant, and no one type 4 variant (Figs. 1–3). Concerning the ECRB origin according to Baker et al¹⁰ were 22 (66.7%) type I lesions (intact capsule), 7 (21.2%) type II lesions (linear capsule tear), and 4 (12.1%) type III lesions (complete capsular tear) (Fig. 4). There was no statistical correlation between these different arthroscopic findings and the clinical results.

In a mean follow-up time of 14.4 months (range: 12–24 months) most of the patients reported a significant

Fig. 2 – Arthroscopic view showing inflamed degenerated undersurface of Extensor Carpi Radialis Brevis (ECRB), RCC type II.

improvement after arthroscopic treatment. According to the patient's reports, after surgery 12 patients described themselves as completely asymptomatic, 17 were better or much better, and 2 remained the same. A highly statistically significant improvement was identified comparing preoperative with postoperative VAS for pain and PRTEE score ($P < 0.05$). The mean score for pain improved from 8.64 ± 0.92 (range, 7–10) to 1.48 ± 1.91 (range 0–3). The total PRTEE, with 100 representing the worst possible score (maximal pain and functional disability), improved from 55.53 ± 11.16 out of 100 (range, 35.5–72.5) to 10.39 ± 18.73 out of 100 (range, 1–68). Overall satisfaction was extremely positive, over the 31 patients, 93.5% of the patients rated their satisfaction using VAS between 7 and 10 out of 10. While the remaining 6.5% (2 patients) rated as 3 out of 10. The average time for return to work was 8 days (range, 3–21 days).

Fig. 1 – Arthroscopic view showing Capitellum (C), Radial Head (R), and Radio-capitellar Complex (RCC). RCC is impinging on radial head.

Fig. 3 – Arthroscopic view showing RCC type III after shaving part of it.

Fig. 4 – Arthroscopic view showing Type III ECRB.

The mean MEPI score was improved from 61.82 ± 1.74 (range, 55–85) preoperatively to 94.10 ± 1.72 (range, 70–100) postoperatively, this improvement was statistically significant ($P < 0.05$).

Evaluation of functional outcomes with the DASH score also revealed statistically significant improvement ($P < 0.05$). The mean preoperative score was 24.46 ± 1.46 (range, 13.80–37.10), while the mean postoperative score was 4.81 ± 1.45 (range, 0–30.20).

No significant associations were observed between age, gender, preoperative length of non-operative treatment, time to return to work and final outcome ($P > 0.05$).

Two complications were reported: one patient had radial nerve palsy and other one had superficial wound infection. Patient with the radial nerve palsy at the 4-month follow-up after surgery, motor and sensory functions were partially restored. And at the 12-month follow-up, the patient's motor and sensory functions had fully recovered with just supportive medical treatment. Patient who had superficial wound infection was treated successfully with a short course of antibiotics.

4. Discussion

It was suggested that lateral epicondylitis occurs primarily in the common extensor origin.² Numerous surgical procedures included detachment, debridement, denervation, and alteration of the anatomic origin of these tendons are reported.^{2,7,11} Successful outcome was observed after all of these procedures, however approximately 10% of patients have recurrent symptoms.² Additionally, postoperative recovery is prolonged. It is reported that after open procedures, patients usually have prolonged postoperative discomfort with a delayed return to work and sporting activities. A radio-capitellar collar was observed in all patients and some of them was impinging at the radio-capitellar articulation, as described by Mullett et al.⁹

In this series, most patients had rapid return of motion, performance, activities of daily living and reported early return to original job and same level of other activities. It was

suggested that the presence of a degenerative capsular fold can impinge on the radial head and could be interposed in the anterior or posterior portions of the radio-capitellar joint. Others presumed that forceful contraction of the overlying extensors compresses the underlying capsule against the bone, as postulated by Bosworth.¹²

Unlike other arthroscopic procedures for lateral epicondylitis, the common extensor origin was not altered or released because the tendon was observed to be grossly normal once the deeper, capsular layer was debrided.¹⁰

Bosworth¹² described the evolution of his treatment of lateral epicondylitis from complete division of the common aponeurotic origin of the extensor muscles to simple resection of the anterolateral capsule. He noticed that the annular ligament pinched a synovial fringe that extended into the radio-capitellar joint and speculated that the limited success of division of the common extensor origin was by reducing the tension acting on the synovial fringe rather than addressing the primary disorder.

Baker et al¹⁰ using an arthroscopic technique of releasing the common extensor origin, suggested accelerated rehabilitation and return to work and other activities (average, 2.2 weeks) as the chief advantages to the procedure. However, as in the standard open procedure, the, capsular lesion is not specifically addressed. Ten percent of patients had pain with everyday activities, which was consistent with results of another study of open tennis elbow release.²

Antuna and O'Driscoll¹³ described a snapping plica caused by a hypertrophic synovial fold associated with radio-capitellar chondromalacia. They reported good results from arthroscopic resection of this tissue in 14 patients.

Mullett et al⁹ hypothesized that this snapping plica was a variant of the spectrum of morphologic features of the radio-capitellar capsule observed in their cadaveric study. This tissue can cause symptoms of lateral epicondylitis if it impinges on the radial head or interposes in the radio-capitellar joint even in the absence of the classic snapping sensation associated with plica syndrome.

In another study, a synovial fold of the humeroradial joint has been described as being responsible for lateral epicondylalgia of the elbow. Histologically, the authors observed deep nerve fibers that may explain why pain at rest may occur in patients with lateral epicondylitis although an inflammatory response is not seen.¹⁴

In this study, the presence of a dense radio-capitellar capsular complex impinging on or in the radio-capitellar joint, found in the majority of patients, were resected arthroscopically with good results.

There are multiple advantages of arthroscopic division of the radio-capitellar collar. The diagnosis may be confirmed by a thorough arthroscopic examination at which time other abnormalities can be addressed. The technique causes little postoperative pain and wound healing is rapid.

Range of motion is restored quickly (postoperative stiffness was not seen). The technique allows precise dissection and complete access to the entire proximal radioulnar joint and radio-capitellar joint which could be done only by an extensile open lateral approach. Although elbow arthroscopy is not done frequently, the technique may be mastered quickly by surgeons with established arthroscopic skills.⁹

The clinical results in this series compared favorably with results of standard open techniques, with a faster return to work, sporting, and leisure activities. The final results are also comparable to that mentioned in the other literature.^{10,15}

In conclusion, the arthroscopic release in patients with lateral epicondylitis is a reproducible method with a marked postoperative increase in function within a short rehabilitation period, with special consideration for resection of radio-capitellar capsular complex.

Conflicts of interest

All authors have none to declare.

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