Knee Surg Sports Traumatol Arthrosc (2011) 19:1178–1183
DOI 10.1007/s00167-011-1507-z

ELBOW

Arthroscopic treatment of lateral epicondylitis: comparison of the outcome of ECRB release with and without decortication

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Received: 5 November 2010 / Accepted: 28 March 2011 / Published online: 9 April 2011

Abstract
Purpose The purpose of this study was to compare the early clinical results of arthroscopic extensor carpi radialis brevis (ECRB) release with and without bone decortication in the treatment of lateral epicondylitis.
Materials and methods Thirty-eight patients who were surgically treated for lateral epicondylitis between 2004 and 2008 were included in this retrospective review. Among these 38 patients, 19 underwent arthroscopic ECRB release and 19 patients underwent both ECRB release with decortication of the lateral epicondyle. Outcome measures included pain assessment measured by visual analog scale (VAS) preoperatively, on postoperative day one, at two and 4 weeks postoperatively, and at the final follow-up visit. Functional evaluation was made with the Mayo Elbow Performance Index and grip strength measurement.
Results Patients who underwent simple ECRB release had significantly less pain than patients who underwent ECRB release and decortication immediately postoperatively ($p < 0.05$). This group also showed a lower VAS score on exertion 2 weeks and 4 weeks after simple ECRB release ($p < 0.05$). The mean time taken to return to work was 24.2 ± 18.3 days in the group that underwent simple ECRB release and 39 ± 22.7 days in the group that underwent ECRB release with decortication ($p < 0.05$).
Conclusions Arthroscopic release of the ECRB is an effective method of treatment in patients with recalcitrant lateral epicondylitis. Decortication of the lateral epicondyle leads to increased pain postoperatively and did not improve clinical results.
Level of evidence Nonrandomized clinical trial, Level IV.

Keywords Elbow · Lateral epicondylitis · Arthroscopic release · Decortication

Introduction

Chronic lateral elbow tendinosis or "tennis elbow" is a commonly encountered problem in orthopedic surgery. The term "tennis elbow" was coined more than 100 years ago in reference to lateral elbow pain in lawn tennis players [17]. There have been numerous theories on the pathogenesis of lateral epicondylitis, and the understanding of this disease process has evolved from an inflammatory process to a degenerative one. Recent studies have shown histologic changes at the origin of the ECRB consistent with degenerative followed by reparative cycle [5]. These fibroblastic and vascular responses, pathologically known as angiofibroblastic degeneration, are more commonly referred to as tendinosis [1]. In addition, the common extensor tendon experiences high eccentric and concentric stresses that may lead to microtears. Laser diffraction analysis of the ECRB tendon during elbow flexion showed that the sarcomere length varied differentially, consistent with eccentric contractions, and produced a powerful stress on the ECRB origin [16]. Besides obvious mechanical changes caused by degeneration near the ligamentum annulare radii of the capitulum radii and the lateral epicondyle, traumatic irritations of the surrounding periosteum have also been discussed [7]. Of these, Nirschl and Pettrone [20] attributed the cause to a microscopic rupture

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accompanied by the formation of reparative tissue in the extensor carpi radialis brevis origin on the lateral epicondyle. To date, this remains the most commonly accepted cause of chronic lateral epicondylitis.

The initial treatment of chronic lateral elbow tendinosis should be nonoperative. Activity modification, immobilization, and local or systemic anti-inflammatory drugs can be recommended. Also, physical therapy and physiotherapy can be helpful with emphasis on a daily static stretching program [10, 19]. After a sufficient duration of nonoperative treatment, approximately 5–10% of patients develop chronic symptoms [11, 15, 19]. Recently, surgical treatment is directed at excision of this pathologic tissue through an open approach or through several arthroscopic methods. Although it was conducted using the open procedure, a randomized double-blind comparative prospective trial showed that drilling confers no benefit and actually causes more pain, stiffness, and wound bleeding than no drilling [14]. In the present study, it was hypothesized that arthroscopic decortication of the lateral epicondyle would add no benefit to the treatment of lateral epicondylitis when it was performed in addition to an arthroscopic release of the ECRB origin. Therefore, the purpose of this study was to compare the early clinical results of arthroscopic extensor carpi radialis brevis (ECRB) release with and without bone decortication in the treatment of lateral epicondylitis.

Materials and methods

Between 2004 and 2008, a single surgeon performed 38 arthroscopic procedures on 38 patients diagnosed with recalcitrant lateral epicondylitis. This study was conducted as a nonrandomized clinical trial. Nineteen patients (6 men and 13 women) underwent both extensor carpi radialis brevis (ECRB) release and decortication, and nineteen patients (8 men and 11 women) underwent ECRB release only. The median age of patients was 46 (range 26–60) years. The median length of follow-up was 29.5 (range 18–72) months. Before undergoing arthroscopic surgery, all patients were initially treated with minimum 6 months of nonoperative treatment. Conservative modalities consisted of relative rest, activity modification, nonsteroidal anti-inflammatory medication, counterforce bracing, corticosteroid injections (1–6 injections), and physical therapy. The nonoperative treatment continued until the patients felt that the strength, endurance, and flexibility of the affected side reached the level of the unaffected side. Patients who were enrolled only after nonoperative treatment of at least 6 months did not relieve symptoms, had persistent positive physical examination, and had symptom relief by lidocaine injection to the ECRB origin. Exclusion criteria were patients who had less than 6 months of nonoperative treatment, who had concomitant medial epicondylitis, who were older than 60 years, or who underwent an open ECRB release. The median duration of nonoperative treatment before surgery was 15.4 (range 6–48) months in the group undergoing ECRB release alone and 12.0 (range 6–39) months in the group undergoing both ECRB release and decortication.

The subjective evaluation included the assessment of pain level using a visual analog scale (VAS) preoperatively, 1 day, 2 weeks, and 4 weeks after the surgery and at the last follow-up visit. Patients were asked to mark a numeric rating scale to rate their elbow pain at rest, during activities of daily living (ADLs), during work, and were also asked about the time period between the surgery and their return to their work. Elbow function was evaluated using the Mayo Elbow Performance Index (MEPI), and grip strength was measured using a dynamometer.

Surgical technique

All the procedures were performed with the patients positioned in the lateral decubitus position. The standard proximal anteromedial, proximal anterolateral, and mid-anterolateral elbow arthroscopic portals were made. A 2.7-mm, 30-degree arthroscope was inserted through the proximal anteromedial portal to visualize the anterior radiocapitellar articulation and adjacent joint capsule. Due to the relatively small size of patients in our study population, 2.7-mm scopes were routinely used for ECRB releases. The condition of the capsule was categorized using the Baker's classification method (Fig. 1) [4]. A 3.5-mm full radius resector shaver was used and placed in the mid-anterolateral portal, and the capsule was gently debrided. Degenerative changes in the ECRB tendon origin were observed between the capsule and the overlying extensor digitorum communis musculature (Fig. 2). The ECRB tendon was detached from its origin at the lateral epicondyle using a radiofrequency device (Bisector, ArthroWand; ArthroCare, Sunnyvale, California) (Fig. 3). The release of the ECRB origin was continued from the medial to the lateral side until only the healthy tendon tissue remains, taking care not to pass posterolaterally over half the diameter of the radial head. The lateral collateral ligament was preserved to avoid postoperative instability. After the complete tendon release, the bony part of the origin area was debrided with a 3.5-mm spherical burr (Linvatec, Conmed, Largo, FL) in the patient group undergoing ECRB release with decortication (Fig. 4). We did not routinely examine the posterior compartment unless there were associated pathologies revealed preoperatively. Further, any pathological lesions observed at the synovium adjacent the radial head were

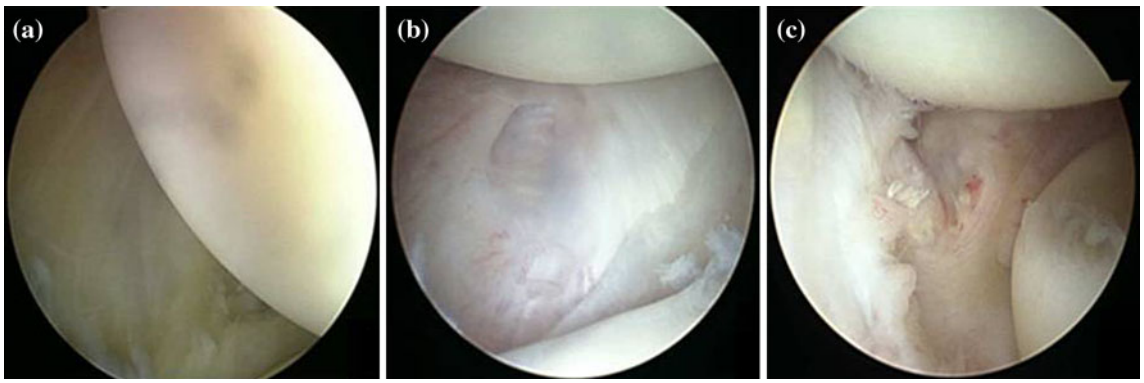

Fig. 1 Baker's classification **a** type I (intact capsule) **b** type II (linear capsular tear) **c** type III (complete capsular tear)

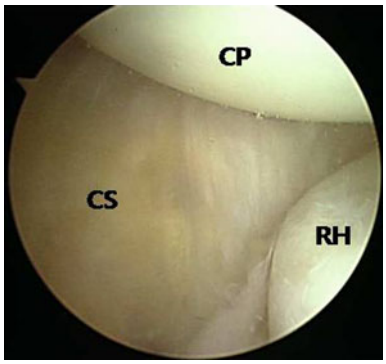

Fig. 2 The ECRB tendon lies between the capsule and the overlying extensor digitorum communis musculature (*CP* capitellum, *RH* radial head, *CS* capsule)

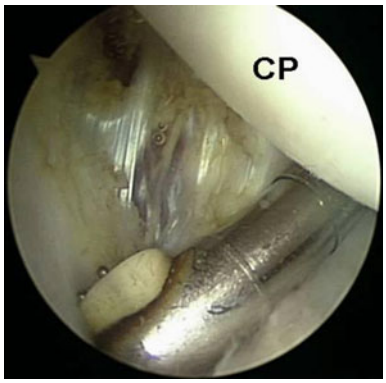

Fig. 3 The ECRB tendon was separated from the proximal origin at the lateral epicondyle by using a radiofrequency device (*CP* capitellum)

removed using a shaver. Postoperatively, the elbow was immobilized in a long-arm splint with the elbow flexed at 90° for one day. Elbow range of motion exercise was initiated on the second postoperative day, and then the patients were allowed for gradual return to activities of daily living as they could tolerate. Forceful grip and wrist extension were not allowed until 4 weeks after the surgery.

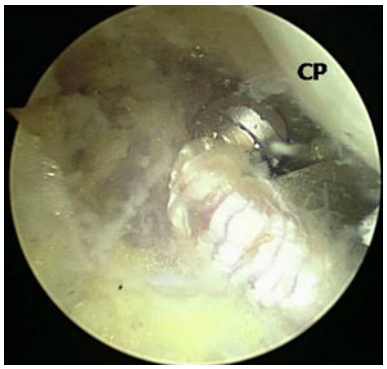

Fig. 4 Bony part of the insertion area was debrided with a burr (*CP* Capitellum)

Statistical analysis

Statistical analysis was performed using the Student's *t* test to compare variables between the two groups with the statistical significance set at $p < 0.05$. Statistic analysis was performed with SPSS version 10.1.3 (SPSS, Chicago, IL).

Results

In the ECRB release group, the median length of follow-up period was 25.2 (range 18–32) months, and all patients in this group returned for a follow-up examination at our clinic. In the ECRB release with decortication group, the median length of follow-up period was 31.2 (range 24–72) months. In this group, 16 patients returned for a follow-up examination, and the remaining 3 patients were evaluated with a telephone interview. During the telephone interview, patients were asked about pain, range of motion, stability, function, and complication such as infection or reoperation. At the last follow-up, there was no significant difference in the pain score between the patient group that underwent simple ECRB release and the patient group that underwent

Table 1 Preoperative and postoperative VAS score

	Simple ECRB release ($n = 19$)	ECRB release with decortication ($n = 19$)	p Value
Preoperative (at rest)	4.0 (3–9)	5.0 (3–10)	n.s.
Preoperative (at activity)	7.0 (6–10)	7.0 (5–10)	n.s.
Postoperative day 1	3.0 (2–5)	4.0 (2–7)	$p < 0.05$
Postoperative weeks 2	2.0 (1–4)	3.0 (1–7)	$p < 0.05$
Postoperative weeks 4	2.0 (1–4)	3.0 (1–8)	$p < 0.05$
Last follow-up	1.0 (1–3)	1.0 (1–4)	n.s.

n.s. No significance

Data are presented as median (range)

ECRB release with decortication. Further, there was no significant difference in subjective pain at rest and during daily activity between the two groups. However, following postoperative day 1, postoperative week 2, and postoperative week 4, the median VAS score was 4.0 (range 2–7), 3.0 (range 1–7), and 3.0 (range 1–8) points in the ECRB release with decortication group and 3.0 (range 2–5), 2.0 (range 1–4), and 2.0 (range 1–4) points in the ECRB release group, respectively. Statistical analysis indicated a significant difference in pain between the 2 groups ($p < 0.05$) (Table 1).

The median Mayo Elbow Performance Index measured preoperatively and at the last follow-up in the ECRB release with decortication group showed 45.0 (range 40–70) before surgery and 95.0 (range 60–100) at the last follow-up. In the ECRB release only, group showed 45.0 (range 35–65) before surgery and 95.0 (range 65–100) at the last follow-up. Grip strength showed no significant difference between the groups at the last follow-up (n.s.). The mean time taken to return to work was 24.2 ± 18.3 days in the group that underwent ECRB release alone and 39.0 ± 22.7 days in the group that underwent both ECRB release with decortications ($p < 0.05$) (Table 2). The statistical analysis showed that the ECRB release alone group had a significantly higher rate of return to work. No patient required further surgery or repeat injections after surgery, but 4 patients (2 patients in each group) continued to wear a counterforce brace at work. There were three types of associated pathologies—synovial hypertrophy (5 patients), radiocapitellar synovial fold (9 patients), and loose body (1 patient). There was no correlation between the 3 different types of lesions and the clinical results. Postoperative instability or other complications were not observed.

Discussion

The most important finding of this study was that decortication of the lateral epicondyle did not lead to a better clinical outcome in patients undergoing an arthroscopic ECRB release for recalcitrant lateral epicondylitis. Rather, it appeared that decortication was associated with increased pain in the early postoperative period. Although there have been many studies that investigated arthroscopic treatment of lateral epicondylitis, there are few studies that specifically investigated the effect of performing additional decortication of the lateral epicondyle on the clinical outcome. Based on the findings of the present study, simple arthroscopic ECRB release may be sufficient for the treatment of recalcitrant lateral epicondylitis.

In the literature, there are more than 15 different surgical techniques for the treatment of lateral epicondylitis. These surgical techniques include simple release [6, 8, 25], reconstruction of the common extensor tendons [12], a separation of the deep fascia that covers the common extensor tendon [22], extra-articular approach for arthroscopic lateral elbow release [9], and arthroscopic release and repair of lesions [23]. Recent studies have reported the outcomes of the technique of arthroscopic release used in the treatment of lateral epicondylitis [3, 13, 18, 21]. Many authors have reported similar successful outcomes by using

Table 2 Overview of clinical outcome

	Simple ECRB release ($n = 19$)	ECRB release with decortication ($n = 19$)	p Value
MEPI (preop/postop)†	45.0 (35–65)/95.0 (65–100)	45.0 (40–70)/95.0 (60–100)	n.s.
Return to work (months)‡	24.2 ± 18.3	39.0 ± 22.7	$p < 0.05$
Grip strength (post op) kgm†	12.7 (8.3–19.7)	11.2 (6.4–17.6)*	n.s.

*Number of ECRB release with decortications: 16 patients; *n.s.* No significance

† The values are given as median (range)

‡ The values are given as the mean and standard deviation

various surgical techniques. In the study by Baker and Baker [3], the authors concluded that arthroscopic resection and debridement of the pathologic tendinosis tissue is an effective surgical treatment for recalcitrant lateral epicondylitis, and the early high rate of success is maintained at long-term follow-up. Wada et al. [26] have reported that preoperative MRI of the ECRB origin and socioeconomic factors were significantly associated with postoperative residual symptoms evaluated with the DASH score. Szabo et al. [24] in a comparative study of open, percutaneous, and arthroscopic treatments reported a total of 41 patients treated arthroscopically with a mean follow-up of 47 months. There were no statistically significant differences with regard to complications, recurrences, failures, visual analog scale pain scores, or preoperative or postoperative Andrews–Carson scores [2] among the 3 surgical groups. However, Baker et al. [4] found a marked difference in the duration required for return to work and sports postoperatively with a mean of 66 days in the open group and a mean of 35 days in the arthroscopic group. Many authors have reported the outcomes from the comparative studies of open procedures and arthroscopic procedures. In most of the articles, similar results have been reported. However, no study has examined whether it is better to perform the decortication following ECRB release or to solely perform simple ECRB release. In the study by Khashaba [14], the authors compared Nirschl tennis elbow release with or without drilling. An important finding is that drilling or decorticating the bone does not offer any benefit and should be avoided. Research by Khashaba et al. was conducted using an open procedure. To date, no articles have described the arthroscopic technique. Although this is a nonrandomized, retrospective study, it clearly showed that the initial pain following the surgery and the time taken to return to work in the simple ECRB release group were significantly better than those in the decortications and ECRB release group. At the final follow-up, however, both groups had similar results. According to the article published by Khashaba, the drilling caused such disadvantages as increased postoperative pain, less postoperative elbow movement, and increased wound bleeding. Likewise, the arthroscopic decortication might also produce similar disadvantages. In the treatment of lateral epicondylitis, during the final follow-up, there was no significant difference in the function between the arthroscopic simple ECRB release and the decortication group. In the simple ECRB release group, minimal postoperative pain, early rehabilitation, and early return to activity could be achieved. Arthroscopic ECRB release with decortication is a treatment option for lateral epicondylitis, but the findings of our study suggest that adding decortication can be associated with significant morbidity in the early postoperative period and may not be beneficial in treating lateral epicondylitis.

The present study may have significant limitations because it was a retrospective study that was not conducted in a randomized or blinded fashion. This study also had a relatively small sample size. It may be also a limitation that the present study did not fully take into account the potential factors that could influence the outcome such as age, sex, and activity level. The potential strength of the present study is the use of standardized and validated outcome tools to evaluate the elbow function. Another strength may be that all the procedures were performed by a single surgeon leading to homogenous surgical indication, skills, and postoperative management. In addition, all data were analyzed by an independent investigator decreasing the potential for investigator bias.

Despite these limitations, we believe that the present study demonstrated an important and clinically relevant finding. Decortication of the lateral epicondyle did not improve clinical results and was associated with an increase in pain in the early postoperative period. This suggests that simple ECRB release may be sufficient for the lateral epicondylitis management, and that decortications of the lateral epicondyle are not warranted.

Conclusions

Based on our study findings, it could be concluded that arthroscopic decortication of the lateral epicondyle may lead to increased pain in the early postoperative period, and does not lead to better outcomes than the arthroscopic simple ECRB release.

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