ORIGINAL ARTICLE

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Functional outcomes of arthroscopic treatment of lateral epicondylitis

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Objective: The aim of this study is to evaluate the functional results of arthroscopic lateral epicondylitis (LE) treatment in patients in whom conservative treatment proved insufficient.

Methods: Between 2011–2014, 29 patients with LE (15 women, 14 men; mean age: 46 years; range: 33–79) who received at least 6 months of conservative treatment methods and did not achieve full recovery and thus underwent arthroscopic surgery were included in this study.

Results: One patient was excluded from the functional assessment. Mean follow-up was 20.5 months (range: 7–42). Mean preoperative and postoperative Disabilities of the Arm, Shoulder and Hand (DASH) scores were 81.1±17.5 and 34.7±26.8 ($p<0.0001$), respectively, and Mayo Elbow Performance Scores (MEPS) were 48.5±11.5 and 101.2±22.9 ($p<0.0001$), respectively. Twenty-one patients (75%) were satisfied with the functional outcome.

Conclusion: As a result, LE treated with the arthroscopic method, with its low complication rate, successful degenerated tendon debridement, and decortication of the lateral epicondyle, is a useful method for intervention in pathologies such as annular plica, loose body, synovial hypertrophy, and radiocapitellar chondropathy.

Keywords: Arthroscopy; elbow; lateral epicondylitis.

Level of Evidence: Level IV Therapeutic Study

Lateral (LE) and medial epicondylitis (ME) are common disorders of the upper extremities. Challenging repetitive movements reflected from hand to elbow, related to professional or athletic activities, appear to be the source of epicondylitis disease. Morris described the disease in 1882 as tennis elbow in those who mow lawns and stated that the repetitive supination motion while the elbow was extended had caused the disease.[1]

Frequency of epicondylitis has been reported as 1–3% in the general population, 5–40% in those who play tennis, and 15% of manual workers who perform repetitive movements.[2–4]

It has been reported that up to 79.1% of patients recover with conservative treatment, while the remaining 20.9% require surgical treatment.[5] Conservative treatment methods include various physical therapy regimens,[6–9] corticosteroid injections, extracorporeal shockwave therapy (ESWT),[10] platelet-rich plasma (PRP) injection,[11] prolotherapy,[12] complete blood injection,[13] botox injection,[14] hyaluronic acid injection,[15] and stem cell applications.[16] As surgical treatment options, successful functional results were reported in 89%

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of patients who underwent percutaneous, mini open, or open release of the affected extensor muscles from the origin of the lateral epicondyle under local or general anesthesia.[17–23] Recently, with the exception of non-joint pathology, successful results have been reported using the arthroscopic method for the detection of intra-articular pathologies and their treatment.[24–25]

The aim of this study was to evaluate the functional results of arthroscopic LE treatment in patients in whom conservative treatment proved insufficient.

Patients and methods

Between 2011–2014, 29 patients (15 women, 14 men; mean age: 46; range: 33–79 years) with LE underwent surgery by arthroscopic method because full recovery had not been achieved previously with at least 6 months of conservative treatment methods; 28 were included in the study at final inspection. Twelve (80%) male patients were dominant in the right hand, and 3 (20%) were dominant in the left; 9 (64.3%) female patients were dominant in the right hand, and 5 (35.7%) were dominant in the left. Informed consent was obtained from all patients. Patients whose normal elbow anatomy was disrupted due to trauma or previous elbow surgery were excluded. One case was excluded because of continuous functional assessment. Mean follow-up was 20.5 months (range: 7–42). These patients were divided into 3 groups by occupation: 14 manual workers, 8 housewives, and 6 office workers. Diagnosis was made with Cozen's test (with the elbow extended, if resisted wrist extension triggers pain at the lateral epicondyle, the result is positive) and by measuring tenderness of the lateral epicondyle. To check for the presence of radial tunnel syndrome, sensory examination of the radial nerve autonomic sensory area on the hand was performed, tenderness of the radial nerve tracing distal from the lateral epicondyle of the elbow was investigated, and Tinel's test was used. Cases in which these tests were positive underwent electromyography (EMG). Preoperative radiological images of patients were examined for elbow deformity, presence of loose body, osteoarthritis findings, ectopic calcification, and other bone pathologies. Functional assessment was performed pre- and postoperatively by using Mayo Elbow Performance Score (MEPS)[26] and Turkish Quick Disabilities of the Arm, Shoulder and Hand (Q-DASH) scores.[27] In addition, the lesion in the capsule during arthroscopy, presence of degeneration in the lateral capitellum and radial head, annular plica, and patient satisfaction levels were examined.

Patients were prepared in the prone position under general anesthesia. A pneumatic tourniquet was applied to the upper end of the bracket. The upper-middle part of the arm was placed on arm support locked to the operation table. Thereby, 90° of elbow flexion was achieved, and full elbow flexion and extension were allowed. The soft spot on the elbow (at the middle of the olecranon-radial head-LE trigon), proximal medial, proximal lateral portals, and starting point of the extensor carpi radialis brevis (ECRB) tendon were marked (Figure 1a).

At the lateral part of the elbow joint, an 18 gauge spinal needle entered the joint from the soft spot between the olecranon, radial head, and lateral epicondyle of the elbow; the joint was inflated with 25–30 cc of saline, and 2 cm proximal of the medial epicondyle was marked. Skin incision was made with a No. 11 scalpel after blunt dissection of the subcutaneous tissue with hemostats; entry was made from the anterior part of the medial intermuscular septum, and tissue was removed from the front of the capsule. A blunt trocar was advanced through this gap, the capsule was passed, and the joint was entered. A 30° 4-mm arthroscope was placed in the lateral compartment of the elbow, and the radiocapitellar joint was observed. A 30-mmHg pressurized irrigation pump was used during surgery. The ECRB tendon trace was marked from the joint by arthroscope via a 22 gauge spinal needle that was inserted into the lateral compartment of the elbow joint from 1 cm proximal to the anterior part (proximal anterolateral portal) of the lateral epicondyle (Figure 1b). The capsule was punctured with a No. 11 scalpel. In the joint, laterally to medially, the capsule, lateral border of the capitellum, capitellum, radial head, trochlea humeri, coronoid process, medial compartment of the joint, and medial groove were observed. Passing the lateral compartment, the capsule corresponding to the ERCB tendon insertion and the exposed tendon of the ERCB were cleaned retrogradely with a 4.5-mm arthroscopic shaver (Figure 1c). Decortication of the lateral part of the capitellum and ECRB insertion point was performed with an arthroscopic burr (Figure 1d). While performing these processes, care was taken to stay in the anterior half of the radiocapitellar joint to avoid lateral collateral ligament injury.[28] Elbow flexion-extension motion was measured, and presence of annular plica that pinched at the radiocapitellar joint was investigated; positive ones were cleaned with a shaver or radiofrequency probe. In cases in which adequate debridement could not be performed, entry was made from the posterior portal, and debridement of the plica was completed at the lateral groove. Additional pathologies such as synovial hypertrophy were treated. A hemovac drain was applied to the joint, and the portals were sutured. The elbow was wrapped with compressive bandages.

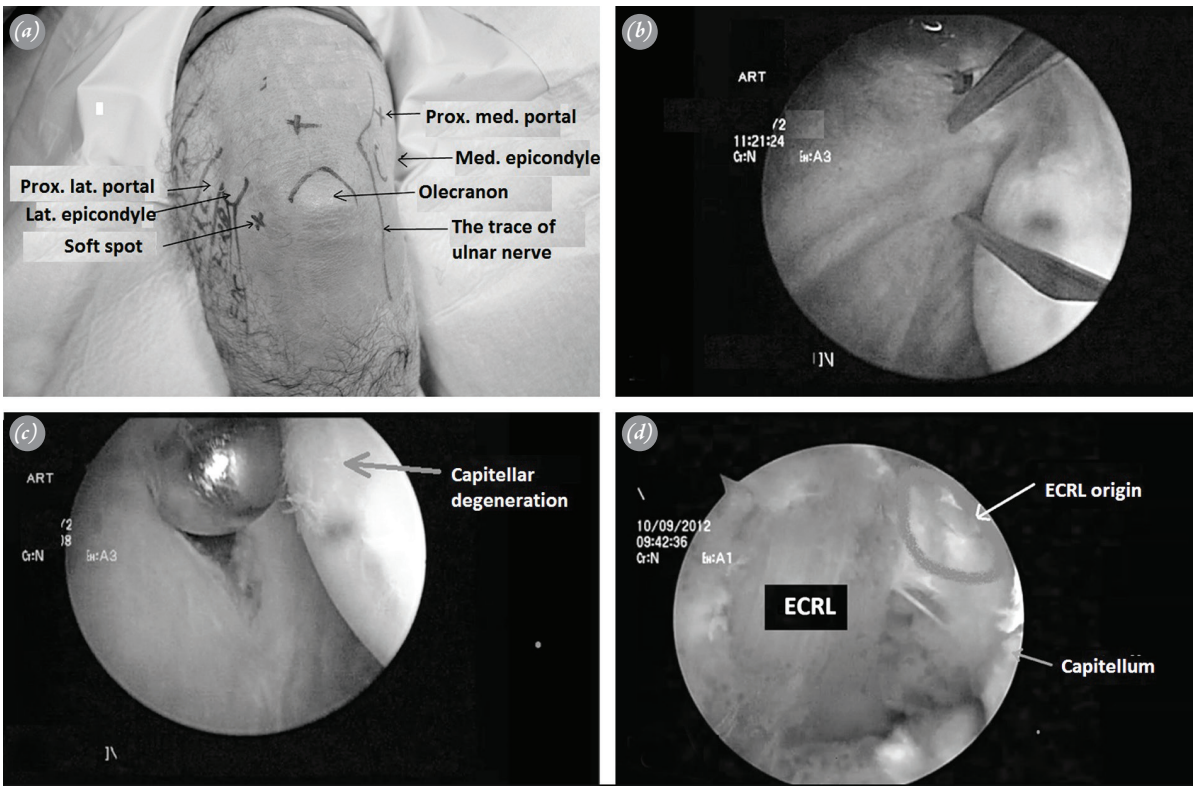

Fig. 1. **(a)** Marking of soft spot on the elbow, proximal medial-lateral portals and tendon of ECRB. **(b)** Marking the location of the ERCB the tendon with needle tip during arthroscopy. **(c)** Debridement of capsul and ERCB tendon with arthroscopic shaver from lateral portal. **(d)** ECRB tendon and capsul after debridement.

Appropriate doses of intravenous antibiotics and analgesics (tenoxicam) were administrated to all patients for the first postoperative 24 hours. The hemovac drain was removed the first postoperative day. After 2 days of elevation, patients were advised not to grip anything tightly for 3 weeks. No restrictions were placed on activity. There was no need for additional physical therapy and rehabilitation. After 3–6 weeks, all patients returned to their jobs.

SPSS version 17 (SPSS Inc., Chicago, IL, USA) software was used for statistical analysis of the survey data. Mean±standard deviation (SD) was used for the identification of quantitative variables and number and percentage for qualitative variables. Shapiro-Wilk test showed that qualitative variables were not normally distributed ($p<0.05$). Therefore, preoperative and postoperative changes of quantitative variables were assessed using the Wilcoxon signed-rank test. A value of $p<0.05$ was considered statistically significant.

Results

Total and profession-specific preoperative and postoperative Q-DASH and MEPS scores are shown in Table 1. A statistically significant correlation was found between

Table 1. Change in the value of profession specific pre- and postoperative MEPS and Q-DASH Turkish scores.

Profession	Q-DASH Turkish			MEPS		
	Preop	Postop	p	Preop	Postop	p
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
Manual worker (n=14)	79.7±16.9	36.2±27.1	0.001	51.1±11.9	100.7±23.5	0.001
Housewife (n=8)	90.1±16.6	41.7±31.9	0.012	46.8±5.3	98.1±14.8	0.010
Office worker (n=6)	72.2±17.4	21.8±15.6	0.028	45.0±16.4	106.6±32.5	0.027
Total (n=28)	81.1±17.5	34.7±26.8	0.0001	48.5±11.5	101.2±22.9	0.0001

Q-DASH: Quick Disabilities of the Arm, Shoulder and Hand; MEPS: Mayo Elbow Performance Score; SD: Standard deviation.

Table 2. Distribution of patient satisfaction by arthroscopic findings.

Arthroscopic findings	Satisfaction			
	Satisfied		Not satisfied	
	Case	%	Case	%
Capsular lesion				
Grade I (n=7)	5	71.4	2	28.6
Grade II (n=12)	10	83.3	2	16.7
Grade III (n=6)	6	66.7	3	33.3
Capitellar degeneration				
Present (n=26)	19	73.1	7	26.9
Absent (n=2)	2	100.0	0	–
Degeneration at radial head				
Present (n=26)	19	73.1	7	26.9
Absent (n=2)	2	100.0	0	–
Anular plica				
Present (n=21)	16	76.2	5	23.8
Absent (n=7	5	71.4	2	28.6
Total (n=28)	21	75.0	7	25.0

them. In addition, the lesion in the capsule during arthroscopy, presence of degeneration at the lateral capitellum, degeneration of the radial head, presence of annular plica, and level of patient satisfaction were examined. In this section, there was not a sufficient number of groups; thus, no statistical analysis could be performed, and results could only be presented as numbers and percentages (Table 2). A total of 21 patients (75%) were found to be satisfied with the functional results.

In postoperative examination, Cozen's test was still positive in 21 (75%) patients, and tenderness of the lateral epicondyle remained in 8 (28.6%) patients. All patients returned to their jobs; none required additional rehabilitation.

Two patients with radial tunnel syndrome, negative EMG test results, and radial tunnel compression symptoms whose postoperative complaints could not be significantly reduced underwent decompression surgery for posterior interosseous nerve. Operative findings showed the nerve under pressure. In the follow-up of these 2 patients, it was noted that complaints decreased significantly. At final follow-up all of the patients, there was no elbow instability or any complications such as vascular and nerve injury; no patients required revision surgery.

Discussion

In the present study, 28 of 29 patients who underwent surgery with arthroscopic method were evaluated. Change in the value of overall total and profession-specific pre- and postoperative MEPS and Q-DASH Turkish scores were statistically significant (Table 1). Mean preoperative and postoperative Q-DASH scores were 81.1±17.5 and 34.7±26.8, respectively ($p<0.0001$), and MEPS elbow performance scores were 48.5±11.5 and 101.2±22.9, respectively ($p<0.0001$). When patients were categorized by profession, it was observed that 14 patients were manual workers, 8 were housewives, and 5 were office workers. Twenty-one (75%) patients were found to be satisfied with the functional outcome, and 7 (25%) patients were not completely satisfied (Table 2). It is important to note that all patients returned to their former jobs in approximately 3–6 weeks. Oki et al. reported that significant pain reduction and functional improvement were obtained 3 months after arthroscopic treatment of tennis elbow, and when they assessed pain using the visual analog scale (VAS), stated that less than 10 points 6 months postoperatively.[29]

One of the surgical treatment methods of LE is percutaneous cutting of extensor tendons from the origin point at the lateral epicondyle. The advantages of this technique are shorter surgical time, a smaller incision, and ability to be performed under only local anesthesia. Ray et al. reported good and very good results in 35 of 40 patients treated with this method.[22] Dunkow et al. surgically treated 47 elbows of 45 patients diagnosed with LE; 24 elbows were treated by formal open release and 23 were treated by percutaneous tenotomy. It was reported that percutaneous tenotomy had significantly better results than the formal open release technique.[17] Işikan et al. reported successful results in 90.6% of patients after open surgical debridement without en-

tering the elbow joint.[20] However, after unsuccessful treatment of LE by open or percutaneous techniques, Organ et al. performed formal open surgery (degenerated tendon debridement, opening holes with drill to the lateral epicondyle, and investigation of lateral articular degeneration or snovitis) for 35 elbows of 34 patients and found that the degenerated portion of the ECRB tendon in 27 patients had not regenerated, and complete open debridement had not been performed in 7 patients. Good and excellent results were obtained in 83% of these cases with adequate debridement. It was emphasized that percutaneous release caused loss of power of the extensor tendon, and incomplete debridement of degenerating tendon tissue that is causing pain is associated with worse functional outcomes.[30]

In 16 elbows treated for LE with the arthroscopic method by Owens et al., the rate of intra-articular pathologies such as synovitis and osteophytes was 18.8%.[31] Evaluating intra-articular pathology, Newman et al. performed arthrotomy after open surgical debridement of LE and found radial head degeneration in 20 of the 25 cases and capitellar degeneration in 1 case.[32] In this context, an experimental study performed on cadaver elbows by Tanaka et al. demonstrated that the pressure created by the extensor carpi radialis longus (ECRL) and ECRB tendons, especially on the lateral capitellum and radial head, significantly increased with pronation of the forearm and elbow varus stress application when the elbow was extended.[33] In this case, we consider that intra-articular pathologies commonly seen in LE, as in our study, may explain the cause of capitellar and radial head degeneration. Similar studies supporting the presence of radiocapitellar arthrosis with ratio of 66–88% in lateral elbow pain have increased in the literature.[34,35] The advantages of arthroscopic surgery include small incisions (2 incisions of 0.5–1 cm in length), availability of treatment for intra-articular pathologies, lower infection rates, and faster rehabilitation. In our study, in terms of patient satisfaction, though not statistically significant relationships, the rate of capsular lesion, radial head and lateral capitellum cartilage degeneration, and presence of annular plica were found to be 89.2% (25 patients), 73.1% (19 patients), and 76.2% (16 patients), respectively (Table 2). Szabo et al. treated 109 patients who did not benefit from conservative treatment of LE, performing percutaneous method for 24 of them, arthroscopic method for 44, and open surgical procedure for 41. They reported no significant difference between the results obtained.[36] Yan et al. treated 28 elbows of 26 patients and applied open surgery for 13 elbows, performed arthroscopic surgery for 15 elbows, and reported 100% and 93.3'% excellent and good functional results in both groups, respectively.[37] In a similar comparative study, Solheim et al. reported excellent functional results in 78% of the open surgery group and 67% of the arthroscopic group.[38] Othman et al. treated 33 patients and applied open surgery for 19 elbows while performing arthroscopic-assisted surgery for 14 of them, with an average follow-up of 12 months. In these patients, DASH score decreased from 72 to 48 in the first group and increased from 50 to 70 in the second group. Satisfaction rate for the first group was 50% and 42% for the second group.[39] The present study found a decrease in Q-DASH Turkish scores from 81% to 34% overall, and satisfaction rate was found to be 75%.

We believe the rate of tenderness in the lateral epicondyle of 28.6% of our patients in the final assessment after surgery may be related to arthroscopic decortication. In the literature, it is reported that the drillisation or decortication of the lateral epicondyle can cause sensitization in the lateral epicondyle for an extended period after surgery.[40,41]

Temporary or permanent nerve injuries, joint stiffness, collateral ligament injuries, vascular injuries, and joint surface cartilage injuries can occur as complications after elbow arthroscopy. Elbow arthroscopy should be applied by taking these potential complications into account and adhering to the principles and indications for surgery. In evaluating complications in 473 patients in whom elbow arthroscopy was performed, 0.8% experienced septic arthritis and 11% experienced other minor complications (temporary or permanent nerve palsy, minor elbow contractures).[42] We treated 29 patients by the arthroscopic method and did not encounter any complications.

As a result, LE treated with the arthroscopic method, with its low complication rate, successful degenerated tendon debridement, and decortication of the lateral epicondyle, is a useful method for intervention in pathologies such as annular plica, loose body, synovial hypertrophy, and radiocapitellar chondropathy.

Conflics of Interest: No conflicts declared.

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