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Surgical management for refractory medial epicondylitis based on the anatomical characteristics of flexor pronator origin: surgical results of 8 cases and review of the literature

Kenichi Otoshi, MD, PhD[a,b,*], Kinshi Kato, MD, PhD[a,c], Takahiro Kaga, MD[a]

[a]Department of Sports Medicine, Fukushima Medical University, Fukushima City, Fukushima, Japan
[b]Otoshi Orthopedic Clinic, Oshu City, Iwate, Japan
[c]Department of Orthopaedic Surgery, Fukushima Medical University School of Medicine, Fukushima City, Fukushima, Japan

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Background: This case series aimed to introduce surgical management for refractory medial epicondylitis based on the anatomical characteristics of the flexor pronator origin and present the surgical results.

Methods: Ten elbows from 8 patients (2 males and 6 females; mean age 50.2 years) were included in this case series. All patients underwent resection of the degenerated anterior common tendon and repair using suture anchors. Ulnar neuritis was observed in 9 elbows of 7 patients who underwent the relevant additional surgery.

Results: Medial elbow pain was resolved in all patients, and pain provocation tests (wrist flexion test and forearm pronation test) were negative postoperatively. The mean Patient-Rated Elbow Evaluation (Japanese version) score was significantly improved from 79.6 ± 7.7 (range, 64.3-92) preoperatively to 8.4 ± 15.2 (range, 0-50) at the final follow-up.

Conclusion: Angiofibroblastic tendinosis of the anterior common tendon might be an essential pathology of medial epicondylitis, and anterior common tendon resection and repair could be the most appropriate treatment for medial epicondylitis.

Both lateral and medial epicondylitis have been reported as one of the most common disorders of the elbow joint, and the prevalence of medial epicondylitis has been reported as lower than that of lateral epicondylitis.[11,13,14,17] The etiology of medial epicondylitis is described as angiofibroblastic tendinosis of the common flexor-pronator origin induced by microtraumas and degeneration of the common flexor tendon.[4,10,15]

Similar to lateral epicondylitis, medial epicondylitis has been considered as benign, self-limiting disease process that improves with time, and a high success rate of conservative management has been reported.[9,15] Surgical treatment is typically reserved for patients with persistent symptoms, despite an aggressive regimen of nonsurgical therapy for 4-6 months.[2] It has been reported that approximately 12% of patients failed to improve with conservative treatment and required surgery,[9,15] in comparison with <4% of patients with lateral epicondylitis.[9]

Various procedures have been used for treating refractory medial epicondylitis, such as excision of pathologic tissue and repair,[4,10] common flexor muscle release,[7] percutaneous release,[1] arthroscopic débridement,[3,18] and partial medial epicondylectomy.[8] Excision of the pathological portion of the tendon is the main component of surgery. However, the essential lesion of medial epicondylitis has yet to be described precisely from an anatomical perspective, in the same manner as the pathology of lateral epicondylitis, which demonstrates degeneration of the origin of the extensor carpi radialis brevis. Surgeons sometimes confuse the identification of the essential lesion and have difficulty judging the extent of the resection.

Otoshi et al[12] described in their anatomical study that the intermuscular fascia between the humeral heads of the pronator teres (PT), flexor carpi radialis (FCR), palmalis longs, and flexor digitorum superficialis converged and formed the common tendon at their proximal origin, the anterior common tendon (ACT), and the intermuscular fascia between the flexor digitorum superficialis

The study protocol was approved by the ethics committee of the authors' institution, and all participants provided written informed consent.

*Corresponding author: Kenichi Otoshi, MD, PhD, Otoshi Orthopedic Clinic, 31-3 Aza-Tsuka, Mizusawa-Shinjo, Oshu City, Iwate 023-0841, Japan.
E-mail address: kenichiotoshi@email.plala.or.jp (K. Otoshi).

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Table I
Patients' characteristics of this study.

Patient's number	Gender	Age	Side	Period of conservative treatment (mo)	Follow-up period after surgery (mo)	Classification*	Treatment methods of ulnar nerve
1	Male	42	Left	24	73	Type1B	Simple decompression
2	Female	50	Right	39	68	Type2	Anterior transposition
			Left	49	48	Type2	Simple decompression
3	Male	53	Right	36	68	Type1A	None
4	Female	50	Right	24	38	Type 2	Simple decompression
			Left	30	32	Type2	Anterior transposition
5	Female	51	Right	19	32	Type2	Anterior transposition
6	Female	50	Right	23	28	Type1B	Simple decompression
7	Female	51	Left	32	24	Type2	Simple decompression
8	Female	53	Right	48	26	Type2	Simple decompression

*Classification of medial epicondylitis Type1A: no associated ulnar neuropathy, Type1B: mild associated ulnar neuropathy, Type2: moderate to severe associated ulnar neuropathy.

and flexor carpi ulnarlis also formed a common tendon, the posterior common tendon. Since several previous studies have described that the proximal origin of the PT and the FCR is a common site of injury,[2,4,7] the ACT might be the essential lesion of involvement in medial epicondylitis.

The purpose of this case series was to introduce surgical management for refractory medial epicondylitis based on the anatomical characteristics of the flexor pronator origin and present the surgical results of these 8 cases.

Materials and methods

Of the 18 patients who underwent surgery for medial epicondylitis at our institutions between 2018 and 2022, 8 patients who were followed up for over 2 years postoperatively were included in this case series (Table I). Our cohort consisted of 2 males and 6 females, with ages ranging from 42 to 53 years (mean age: 50.2 years). Four patients had involvement of the elbows on the right side, 2 on the left side, and 2 patients had bilateral involvement. The diagnostic criteria for medial epicondylitis were as follows: (1) subjective medial elbow pain; (2) tenderness at the medial epicondyle of the humerus; (3) induced medial elbow pain around the medial epicondyle during resisted wrist flexion (wrist flexion test) or resisted forearm pronation (forearm pronation test); and (4) intensity change at the proximal origin of the flexor-pronator muscles (FPMs) using magnetic resonance imaging or ultrasonography. All patients received standard conservative treatment, such as rest, physical therapy, oral nonsteroidal anti-inflammatory drug administration, and multiple local steroid injections. The mean period of conservative treatment for our patients was 32.4 months (range, 19-49 months). Ulnar neuritis was observed in 9 elbows in 7 patients. Tinel's sign at the cubital tunnel was observed in all 7 patients, and sensory disturbance of the ulnar nerve was observed in 5 patients. According to the classification described by Gabel et al,[4] one patient was type 1A, 2 patients were type 1B, and 5 patients (2 with bilateral involvement) were type 2. All 9 elbows in 7 patients had received additional surgery for the ulnar nerve (simple decompression in 6 elbows and subcutaneous nerve transposition in 3 elbows). The study protocol was approved by the ethics committee of our institute, and all participants provided written informed consent.

Surgical procedure

The primary surgical procedure is the resection of the degenerated ACT (Video 1). After exposing the superficial fascia of the FPMs, the intermuscular septum between the PT and the FCR is identified (Fig. 1*a*). The fascia is incised just over this septum, and the muscle belly of the PT and FCR are dissected away carefully from the septum (Fig. 1*b*). The ACT is identified as superior to the medial ulnar collateral ligament. Degenerative scar-like tissue is identified around the attachment site of the ACT at the medial epicondyle in majority of cases. The degenerated ACT is completely resected without damaging the anteromedial joint capsule or medial ulnar collateral ligament (Fig. 1*c*). Two 1.5-mm soft suture anchors are inserted at the medial epicondyle (Fig. 1*d*), and the muscle belly and fascia of the FCR and PT are tightly sutured to create a new FPMs origin at the medial epicondyle (Fig. 1*e*). Additional treatment for the ulnar nerve (simple decompression or subcutaneous nerve transposition) should be performed if patients have ulnar neuritis (Fig. 1*f*). It is not preferable to select nerve transposition in cases of hyperextensible elbows to avoid hyper-stretching of the ulnar nerve during elbow extension.

Postoperative treatment

The patients are placed in a simple sling. The wrist joint is immobilized using a splint in a neutral position for 2 weeks. Active range of motion exercises of the finger and elbow joint are initiated immediately after surgery. After splint removal, gentle wrist range of motion exercises are started, and patients are allowed to perform all light activities of daily living. Strengthening exercises of the wrist and elbow are started 6 weeks postoperatively. Return to repetitive activity and heavy lifting are permitted 8-12 weeks postoperatively.

Measure of outcomes

Clinical results were assessed using the Japanese version of the Patient-Rated Elbow Evaluation Japanese version (PREE-J).[6] The PREE-J is able to evaluate separate subscales of pain and function. The scores were calculated for each patient's first visit and compared with the scores 2 years postoperatively.

The pain provocation test (wrist flexion and forearm pronation tests) was performed at the same time. The data were analyzed using a paired-sample t-test.

Results

The postoperative follow-up period was 24-73 months (mean 43.7 months).

Medial elbow pain resolved for all patients, and pain provocation test results (wrist flexion and forearm pronation tests) were negative at the final follow-up. The mean PREE-J score significantly improved from 79.6 ± 7.7 (range, 64.3-92) preoperatively to 8.4 ± 15.2 (range, 0-50) at the final follow-up (Fig. 2). As for the PREE-J subscales, pain and function scores were each significantly improved postoperatively; pain score: 45.2 ± 5.0 (range, 35-50) to 5.7 ± 9.9 (range, 0-33), function score: 33.0 ± 4.3 (range, 26.7-42.3) to 2.7 ± 5.3 (range, 0-17).

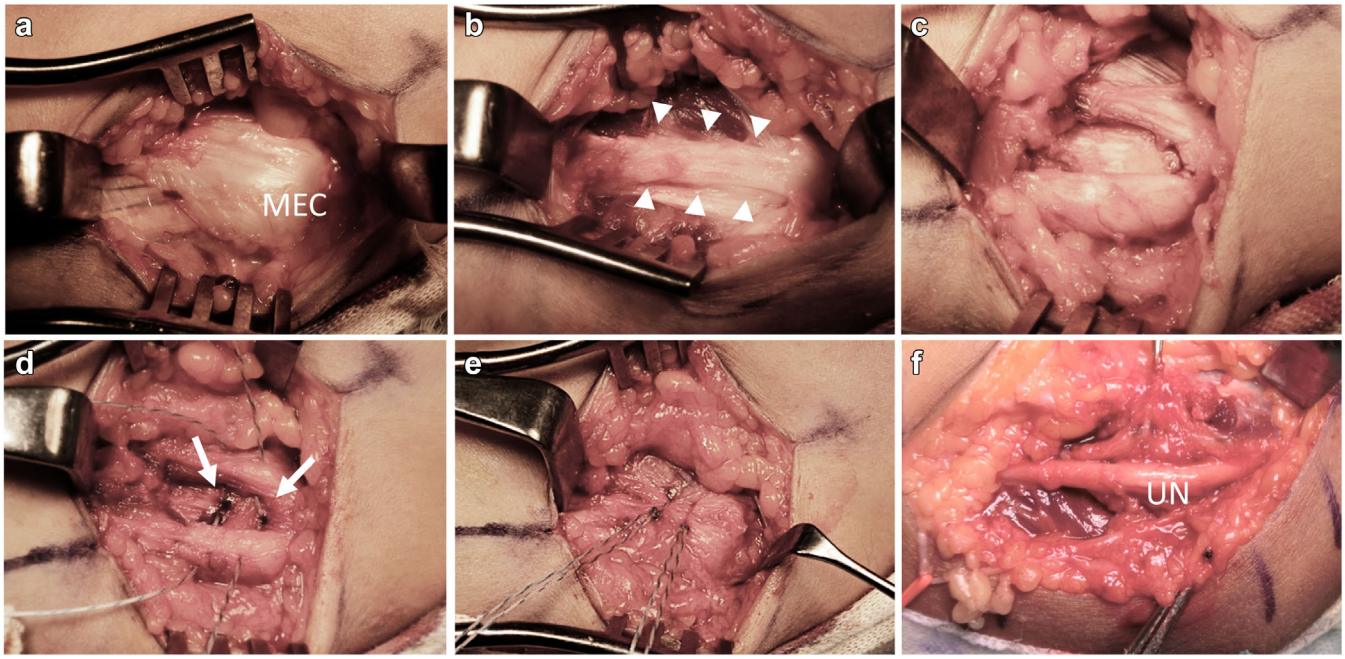
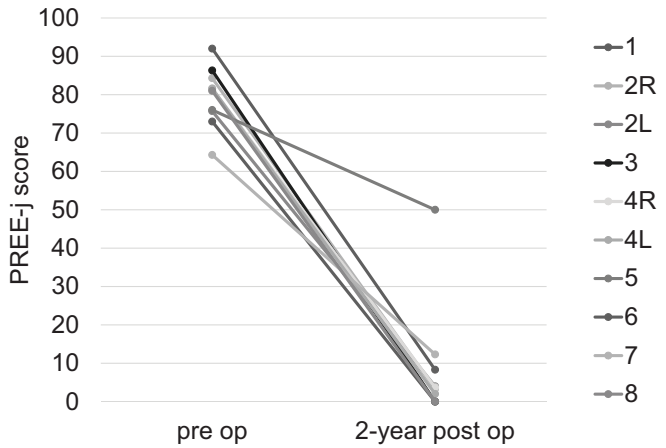


Figure 1 Surgical procedure of this study (medial side of the right elbow). (**a**) After exposing the medial epicondyle and superficial fascia of the flexor-pronator muscles (FPMs), palpate the intermuscular septum (ACT) between the pronator teres and flexor carpi radialis. (**b**) Incise the fascia just over this septum and dissect the muscle belly of the pronator teres (PT) and flexor carpi radialis (FCR) carefully away from the ACT (arrowheads). (**c**) The degenerated ACT is completely resected without damaging the anteromedial joint capsule and medial ulnar collateral ligament. (**d**) Two 1.5-mm soft suture anchors were inserted at the medial epicondyle (arrows). (**e**) Suture the muscle belly and fascia of FCR and PT tightly to make a new FPMs origin at the medial epicondyle. (**f**) Additional treatment for the ulnar nerve (simple decompression or subcutaneous nerve transposition) should be added if the patient has ulnar neuropathy.



	pre op	2-year post op
Total	79.6 ± 7.7	8.4 ± 15.2 *
Pain	45.2 ± 5.0	5.7 ± 9.9 *
Function	33.0 ± 4.3	2.7 ± 5.3 *

Paired-t test *P<0.05

Figure 2 Pre- and postoperative Patient-Rated Elbow Evaluation Japanese version (PREE-J) score. At the final follow-up, the mean PREE-J score significantly improved from 79.6 ± 7.7 before surgery to 8.4 ± 15.2 at the final follow-up. As for the PREE-J subscales, pain and function scores were each significantly improved post-operatively; pain score: 45.2 ± 5.0 (range, 35-50) to 5.7 ± 9.9 (range, 0-33), function score: 33.0 ± 4.3 (range, 26.7-42.3) to 2.7 ± 5.3 (range, 0-17).

Histopathologic examination of the resected ACT showed vascular and fibroblastic proliferations (angiofibroblastic hyperplasia) within the randomly oriented collagen fibers, establishing a pathological diagnosis of chronic tendinosis (Fig. 3). There were no complications for any patient except for slight ulnar nerve irritation in one patient who underwent ulnar nerve transposition.

Discussion

Our study showed that the ACT was the key lesion in medial epicondylitis, and resection of the ACT might be the definitive treatment. Although it is acknowledged that pathological changes are observed at the intermuscular septum between the FCR and PT, clarifying and defining the pathological lesion from an anatomical perspective might be important for understanding the pathology of medial epicondylitis. During surgery for medial epicondylitis, it is sometimes difficult to identify the pathologic lesion from the superficial fascia of the FPMs, especially for inexperienced surgeons. Vinod and Ross described that only 30% of cases demonstrated pathological changes in the superficial tissues, and 70% of cases required fascia incision to reach the pathologic lesion.[16] Our surgical concept could assist surgeons to not only facilitate the detection of the essential lesion of medial epicondylitis but also simplify the surgical procedure by providing concise and clear surgical strategies.

One disadvantage of our method is the invasiveness towards the FPMs. Since our surgery requires a separation of the muscle from the ACT with complete resection of the proximal portion, there is the risk of a dysfunctional development of the FPMs, such as muscle weakness of wrist flexion and forearm pronation. To avoid functional deterioration of the FPMs, we repaired the origin of the FPMs using suture anchors to create a new proximal origin.

Ulnar neuritis has been reportedly associated with medial epicondylitis at a rate of 23% to 61%.[4,7,10,15] Consequently, the clinical stratification of medial epicondylitis has been defined by the presence and extent of ulnar neuritis.[4] Kurvers et al[7] hypothesized that local inflammatory factors in medial epicondylitis can induce

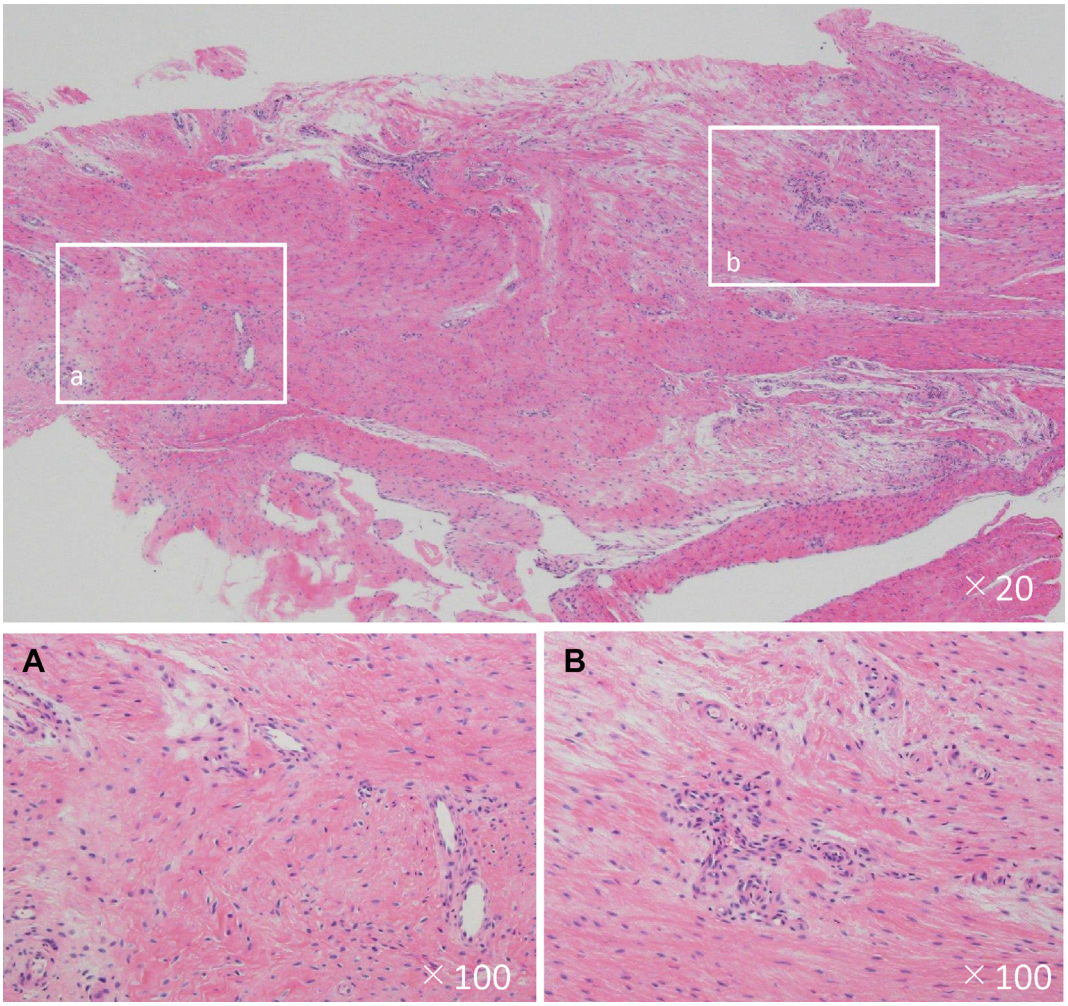


Figure 3 Histopathologic examination of resected anterior common tendon (ACT) with hematoxylin-eosin stain (Patient no 1). Histopathologic examination of the resected ACT showed vascular and fibroblastic proliferations (angiofibroblastic hyperplasia) within the randomly oriented collagen fibers, establishing a pathological diagnosis of chronic tendinosis (**a** and **b**).

ulnar neuritis, producing symptoms of cubital tunnel syndrome due to the close proximity of the ulnar nerve to the medial epicondyle. In addition, co-existing ulnar neuritis has been associated with poor results when combined with a diagnosis of medial epicondylitis requiring operative treatment.[4,5] These findings would suggest that the presence of ulnar neuritis should be considered when treating patients with medial epicondylitis and that the ulnar neuritis severity might be a key factor in the decision to perform surgical treatment. According to our surgical cases, 7 of the 8 patients (9 out of 10 elbows; 90%) had symptoms related to ulnar neuritis, and over half of the patients (5 out of 8 patients; 62.5%) had moderate-to-severe ulnar neuritis (type II). All 7 patients underwent additional ulnar surgery, which improved their symptoms. Verifying the presence of ulnar neuritis before surgery and appropriate additional surgical procedures for the ulnar nerve may be necessary to obtain satisfactory surgical results.

Conclusion

Angiofibroblastic tendinosis of ACT might be an essential pathology of medial epicondylitis. Our method (ACT resection and repair) could be the most appropriate treatment for medial epicondylitis.

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Supplementary data

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