

Outcomes of open debridement via Z-lengthening technique for medial epicondylitis in 14 elbows

Brandon J. Erickson¹, Jennifer L. Hoffman², Charles Cassidy²

¹Department of Sports Medicine and Orthopaedic Surgery, Chicago, Illinois, United States, ²Department of Hand and Elbow Surgery and Orthopaedic Surgery, Boston, Massachusetts, United States

Address for correspondence: Brandon J. Erickson, Department of Sports Medicine and Orthopaedic Surgery, Chicago, Illinois, United States. E-mail: berickso.24@gmail.com

Received: March 20, 2015

Accepted: April 15, 2015

Published: April 30, 2015

ABSTRACT

Purpose: The purpose was to determine whether Z-lengthening approach for common flexor tendon debridement is a viable option for medial epicondylitis refractory to non-surgical treatment. **Methods:** A total of 12 patients (14 elbows) who underwent surgical debridement via Z-lengthening approach for management of medial epicondylitis between 1997 and 2009 met inclusion criteria. All patients failed conservative treatment. There were 4 men (4 elbows) and 8 women (10 elbows). Mean age: 55 ± 9 . Two patients required ulnar nerve transposition for pre-operative symptoms. **Results:** At an average of 14.8 ± 4.7 months follow-up, post-operative satisfaction averaged 9.2 ± 0.77 out of 10. The Nirschl clinical assessment was rated as excellent in 30%, good in 50%, fair in 20%, and failure in 0%. McGowan grading system demonstrated: 11 of 14 elbows had no neuropathy (numbness/tingling/weakness/atrophy distal to the elbow), two had Grade I, and one had Grade II. Average visual analog scale pain score out of a possible 10 was 0.78 ± 1.5 at rest, 1.71 ± 1.72 with daily activities, and 2.85 ± 2.74 with sports. Average disability of the arm, shoulder, and hand: 37.73 ± 13.11 . **Conclusion:** Patients with medial epicondylitis refractory to conservative management should be considered for surgical debridement via a Z-lengthening approach for debridement of the common flexor mass.

KEY WORDS: Common flexor tendon, golfer's elbow, McGowan, medial epicondylitis, Nirschl, pitcher's elbow, surgical treatment, Z-lengthening

INTRODUCTION

Medial epicondylitis, also known as golfer's elbow, pitcher's elbow, and medial tennis elbow, is an overuse injury which results from repetitive trauma to the common flexor tendon (flexor carpi radialis, flexor carpi ulnaris, palmaris longus) as well as the pronator teres. The term epicondylitis is a misnomer as the injury pattern is considered to be tendinosis rather than tendonitis, with histology of the injured area revealing non-inflammatory tissue [1]. According to a Finnish study, medial epicondylitis has a prevalence of 0.4% as opposed to lateral epicondylitis which has a prevalence of 1.3% [2].

Medial epicondylitis can occur in patients of all ages, but predominantly affect patients in the fourth and fifth decades of life with no gender predominance [3]. Potential etiology of the injury includes overuse and repetitive microscopic or macroscopic avulsion injuries of the common flexor tendon, most commonly the flexor carpi radialis and pronator teres, or from a single traumatic event [4]. In the latter, the patient may recall hearing a "pop" around the site of the medial epicondyle following some stress in which an object was pulled from the patient's hand [5]. Medial epicondylitis is diagnosed by point tenderness just distal and anterior to the medial epicondyle as

well as pain that is reproduced by resisted flexion and pronation of the wrist. The two most common problems that can mimic medial epicondylitis are cubital tunnel syndrome and medial ulnar collateral ligament insufficiency [5].

There is both an acute and chronic phase of medial epicondylitis; the former is characterized by symptoms mostly during activity while the chronic consists of constant, dull pain that may only slightly worsen with activity [5]. Risk factors for medial epicondylitis include smoking, obesity, repetitive movements for at least 2 h daily, and activities which place more than 20 kg of force on the arm [2]. Surgical intervention for medial epicondylitis is considered the last line of treatment for the condition and is only attempted after conservative treatment has failed to relieve the patient of pain. Most clinicians consider persistent pain for more than 6-12 months an indication for surgical treatment [6].

The purpose of this study was to determine whether the Z-lengthening approach for common flexor tendon debridement is a viable option for cases of medial epicondylitis refractory to non-surgical treatment based on patient satisfaction, visual analog scale (VAS) pain score, Nirschl and Pettrone clinical assessment, disability of the arm, shoulder, and hand (DASH)

score, and the McGowan grading system. The authors hypothesized that patients treated with the Z-lengthening approach for common flexor debridement will experience significant pain relief and adequate function post-operatively.

METHODS

From 1997 to 2009 a total of 12 patients (14 elbows) required surgical debridement of the common flexor tendon via a Z-lengthening approach for medial epicondylitis due to failure of conservative treatment and had complete medical records with accurate telephone numbers and addresses. All Z-lengthening surgeries were performed by the senior author. All patients attempted several non-operative treatments prior to surgery. Radiologic findings were not assessed. Post-operatively patients were evaluated with: The VAS for pain, the DASH assessment, McGowan grading system, and the Nirschl and Pettrone grading system. The study conformed to the ethical guidelines outlined in the 1996 declaration of Helsinki and was approved by our Institutional Review Board.

Of the 12 patients analyzed, two underwent bilateral surgery for a total of 14 operations; 14 elbows. Of the 14 elbows, 10 (71%) were able to return to the office for an objective physical examination and strength testing. The four elbows who did not return did not want to make the long trip back into a major city as there was no incentive offered to the patients for participation in this study. A copy of the patient questionnaire is shown in the Appendix.

For patients who returned to clinic, written informed consent was obtained by the lead author and for those who did not, verbal informed consent was obtained by the lead author. All study, subject, and surgery parameters were collected. Descriptive statistics were reported as mean \pm standard deviation.

Surgical Technique

The Z-lengthening surgical technique has been described in text but not published in the literature [5]. The senior author will extend the approach to a Z-lengthening technique as when he feels exposure is not adequate to perform a thorough debridement. Before the induction of anesthesia, the surgeon must mark the point of maximal tenderness at the medial epicondyle to better guide the site of pathology intraoperatively. The procedure can be performed under regional or general anesthesia. The patient is placed supine and the arm prepped and draped free and placed on a hand table. The limb is exsanguinated with an Esmarch, and a non-sterile tourniquet is inflated. A gently curving 3 cm incision is made, extending slightly distal and posterior to the medial epicondyle. Dissection is carried through the subcutaneous tissue to the level of the flexor-pronator fascia. The medial antebrachial cutaneous nerve usually crosses distally to this incision and is not routinely visualized. Nevertheless, cutaneous nerve branches should be identified and protected. The anterior flap is then mobilized in order to visualize the entire width of the flexor pronator fascia, which most often appears normal. For this reason, the surgeon

must have identified and marked the focal area of maximal tenderness pre-operatively.

A fiber splitting incision is made directly overlying this location. When in doubt, the surgeon should visualize the flexor-pronator mass as divided into thirds, and incise the junction between the upper one-third and the lower two thirds, which roughly corresponds to the pronator teres/flexor carpi radialis interval. The fascial incision extends approximately 3 cm distal to the medial epicondyle. Careful dissection is performed through the deeper layers. Involved tissue has a characteristic gray, amorphous appearance, distinctly different from the surrounding healthy tendon, and ligament. All involved tissue should be debrided sharply. Thorough debridement usually exposes the anterior portion of the medial epicondyle. In this study, all patients underwent a Z-lengthening of the flexor-pronator origin as performed for the submuscular transposition, using the longitudinal fascial incision. This allowed improved exposure in these patients, so the entire flexor-pronator mass could be identified and properly debrided. The fibers of the medial collateral ligament must be protected during the debridement. Upon completion of the debridement, the exposed area of medial epicondyle is drilled several times using a 5/64-inch drill bit to stimulate revascularization.

The wound is irrigated copiously and the fascial incision is approximated with a running 2-0 absorbable suture. No effort is made to reattach the debrided tendon. The subcutaneous tissue is approximated with interrupted 4-0 absorbable suture, and the skin is approximated with a running subcuticular 3-0 pullout suture. Steri-strips, a sterile dressing, and a well-padded plaster posterior splint are applied, incorporating the wrist for comfort. The tourniquet is then deflated.

Post-operatively the patient is placed in a plaster splint and dressings, which are removed on the second post-operative day. Tubigrip (Seton Healthcare Group, Oldham, England) is placed over the elbow and a wrist splint is applied. The patient begins gentle elbow motion exercises and resumes the stretching exercise which allows stretch of the flexor-pronator origin. With the wrist maintained in supination and extension, the patient actively extends the elbow until the pain is elicited. The wrist splint is worn during the day for 4 weeks. Depending on the rate of recovery, strengthening is begun cautiously at 4-6 weeks. Exercises are begun with one-pound weights, avoiding the extremes of extension and supination. Weight is increased gradually to three pounds. For athletes, a conservative return to sports begins 8-10 weeks post-operatively. A counterforce brace is used for approximately 6 months.

RESULTS

The mean age on the day of operation was 55 ± 9 years (with all \pm denoting one standard deviation in this paper) [Table 1]. Of the 14 elbows, 10 were female (71%), and 4 were male (29%). 11 (79%) of the surgeries were performed on the dominant elbow. The mean follow-up was 14.8 ± 4.7 months. Non-operative treatments included anti-inflammatory

medications (100%), physical therapy (79%), and steroid injections (100%; average 3.4 ± 2.3 injections per elbow). The duration of pre-operative symptoms ranged from 6 to 60 months, average of 26.8 ± 14.8 months. Two of the 14 cases had ulnar neuropathy prior to surgery (evidence of slowing in conduction across the elbow) and underwent concomitant submuscular ulnar nerve transposition. Radiologic findings were not assessed. Intraoperatively, the majority of patients (86%) had degeneration of tissue overlying the flexor pronator mass. No patient required subsequent surgery for ulnar neuropathy. No patient had concurrent lateral epicondylitis. Five of the 14 elbows (36%) reported a traumatic injury that resulted in their symptoms. Of the 14 elbows, five reported participation in sports; three for tennis and two for golf.

Average VAS pain score was 0.78 ± 1.5 at rest, 1.71 ± 1.72 with daily activities, and 2.85 ± 2.74 with sports. Average DASH score was 37.73 ± 13.11 . Per the McGowan system for grading ulnar neuropathy, 79% of patients had no neuropathy, 14% had Grade I, 7% had Grade II, and 0% had Grade III [Table 2]. The Nirschl and Pettrone system showed excellent results in 30%, good in 50%, fair in 20%, and failure in 0%. Post-operative satisfaction averaged 9.2 ± 0.77 out of 10. Of the 14 elbows, 37.5% reported point tenderness in the vicinity of the medial

Table 1: Pre-operative demographic data and treatments (± 1 SD)

Average age (years)	55	
Gender		
Male	4	29%
Female	10	71%
Dominant elbow	11	79%
Non-dominant elbow	3	21%
Pre-operative treatment	14	100%
Anti-inflammatories	14	100%
PT	11	79%
Steroid injections	14	100%
Average number of injections	3.4 ± 2.3	

PT: Physical therapy, SD: Standard deviation

Table 2: Objective and subjective outcome data: VAS, ADL, DASH (± 1 SD)

VAS	
Rest	0.78 ± 1.5
ADL	1.71 ± 1.72
Sports	2.85 ± 2.74
DASH	37.73 ± 13.11
McGowan (%)	
None	79
Grade I	14
Grade II	7
Grade III	0
Nirschl and Pettrone (%)	
Excellent	30
Good	50
Fair	20
Poor	0
Grip strength	
Operative side	44 ± 19.5 lbs
Non-operative side	40 ± 15.5 lbs

VAS: Visual analog scale, ADL: Activities of daily living, DASH: Disability of the arm, shoulder and hand, SD: Standard deviation

epicondyle upon follow-up exam, although all patients stated this pain was very minimal and did not cause any disability (all clinical tools used to evaluate these patients are explained in the Appendix).

In the 10 patients who were able to return to the clinic for an objective assessment, all elbows had full range of motion (ROM) of their elbow (defined as ROM from 0° to at least 135° of flexion), forearm (defined as a minimum of 60° of pronation and 70° of supination), and wrist (defined as a minimum of 70° of both flexion and extension); radial and ulnar deviation was not assessed. Average grip strength of the operative side was 44 ± 19.5 pounds versus 40 ± 15.5 pounds on the non-operative side, regardless of hand dominance. Six elbows (37.5%) were workman's compensation cases, 100% of the patients stated they would have the same operation again, 65% of whom would have liked to have the surgery sooner. All five of the patients who participated in sports pre-operatively were able to return to sport.

Complications

Post-operative complications included tenderness over the medial epicondyle in 37.5% of patients. There were no cases of infection, nerve injuries, or subsequent rupture of the common flexor tendon. No patient had to undergo subsequent surgery for ulnar nerve symptoms.

DISCUSSION

Medial epicondylitis is an understudied problem that plagues a substantial number of people each year. The problem can evolve from repetitive microtrauma or a single traumatic event [4]. The purpose of this study was to determine whether the Z-lengthening approach for a common flexor tendon debridement is a viable option for cases of medial epicondylitis refractory to non-surgical treatment based on patient satisfaction and clinical outcome scores. The authors hypothesized that patients treated with the Z-lengthening approach for common flexor debridement would experience significant pain relief and adequate function post-operatively. These hypotheses were confirmed as patients had a mean post-operative satisfaction of 9.2 out of 10, and good to excellent results in almost all outcome measures. In addition, there were no infections or wound dehiscence in this group.

As medial epicondylitis frequently responds to non-surgical treatment, most studies examining the surgical management of this pathology contain a low number of patients. There have been various techniques described for debridement of the common flexor mass for the treatment of medial epicondylitis. Kurvers reported a technique where there was no removal of bone or debridement of tissue and showed median satisfaction score of 7.7 (interquartile ranges, 5.4-9.2) compared to the mean of 9.2 in this study [7]. Furthermore, 62% of the patients who underwent the surgery without debridement reported point tenderness over their medial epicondyle post-operatively.

This author's technique resulted in 37.5% of patients with point tenderness post-operatively, although it did not cause significant disability in any patient. Shahid *et al.* demonstrated improvement in both the DASH (average of 25.7 points) and Mayo scores with a simple debridement of the tendon and no reattachment of the tendon to bone. A study by Ollivierre *et al.* with a similar technique corroborated these results, showing a significant improvement in pain post-operatively [8].

A different technique reported by Vangsness and Jobe included detachment of the common flexor origin, excision of abnormal tissue, and reattachment of the common flexor origin once the medial epicondyle was drilled with multiple small holes [6]. Vangsness and Jobe used the Nirschl and Pettrone grading system to evaluate their patients and found 69% were excellent, 19% were good, 3% were fair, and there were no failures [6]. These results were slightly better than the results achieved with our Z-lengthening technique (excellent in 30%, good in 50%, fair in 20%, and failure in 0%), illustrating that both techniques are viable options in treatment. An important outcome is that neither technique produced any failures.

Recently, Gong *et al.* described a similar surgical technique used to treat patients with medial epicondylitis and coexistent ulnar neuropathy [9]. They reported an improvement in both VAS pain scores and DASH scores as well as grip strength post-operatively. Their study looked specifically at patients who had concomitant ulnar neuropathy whereas our study only treated two of these patients. However, on a small comparison, the patients in our study with the ulnar nerve symptoms who received an ulnar nerve transposition at the time of surgery had an average post-operative satisfaction of 8.5 with average VAS pain scores of at 0 rest, 4 with daily activities, and 7.5 with sports. These results were similar for pain at rest and with daily activities, but slightly inferior to those reported by Gong *et al.* with sports [9]. The results for the DASH assessment could not be compared as Gong *et al.* used a different method for this scoring system [9].

A literature search revealed few articles which focused on the outcomes of surgical intervention of medial epicondylitis, with significantly more reporting outcomes of lateral epicondylitis [10]. According to Vangsness and Jobe, the mean estimate of elbow function was 39% of normal pre-operatively, and improved to 98% of normal in post-operative patients [6]. We did not assess the function of our patients pre-operatively, but given the high post-operative satisfaction (9.2 out of 10) along with 65% of patients wishing they had the operation sooner, it seems as though the patients had a subjective improvement. Objectively, the grip strength was slightly higher than the non-operative side, a result that was not seen with all other techniques mentioned. These results make a strong case for the effectiveness of this Z-lengthening procedure to treat medial epicondylitis with or without ulnar neuropathy [9]. Furthermore, given that 80% of the patients in this study scored either excellent or good on the Nirschl assessment, it is evident that the surgery was successful in minimizing the amount of pain the patients experienced [11].

Limitations

The strengths of this study include the multitude of outcome measures assessed and length and number of pre-operative therapies attempted by the patients. The limitations of the study include its small sample size and lack of pre-operative data. The sample size is one that is difficult to address. Given the low prevalence of medial epicondylitis, especially medial epicondylitis which requires surgical intervention, obtaining a very large sample size would take a very long time. This study collected data from patients over a 12 years period, but still did not produce a very large sample size. Although pre-operative data was available for the more recent patients, for the vast majority it was not. The available data did show significant improvement in the outcome measures, but because of lack of pre-operative data for the majority of study participants, these data were excluded. Unfortunately, this study was not powered to detect prognostic factors which could have aided in determining who would benefit from early surgical intervention versus conservative treatment. Finally, patients in this study did not undergo some of the newer conservative treatments for medial epicondylitis, such as kinesio taping, although studies have yet to confirm the efficacy of this treatment [12]. Further, higher powered, prospective studies evaluating surgical treatment of medial epicondylitis are warranted.

CONCLUSION

Patients with medial epicondylitis refractory to conservative management should be considered for surgical debridement via a Z-lengthening approach for debridement of the common flexor mass.

Clinical relevance: Medial epicondylitis is a relatively uncommon problem that often responds to non-surgical treatment. However, in cases in which it is refractory to nonoperative treatment, the surgeon should be prepared to perform the appropriate surgical intervention. In order to properly surgically treat this condition, adequate exposure is paramount to ensure all non-viable tissue is debrided. The Z-lengthening approach assists with exposure to ensure proper debridement has taken place. The results from this study, which is one of the largest to report on surgical outcomes of medial epicondylitis, are encouraging.

REFERENCES

1. Nirschl RP. Elbow tendinosis/tennis elbow. *Clin Sports Med* 1992;11:851-70.
2. Shiri R, Viikari-Juntura E, Varonen H, Heliövaara M. Prevalence and determinants of lateral and medial epicondylitis: A population study. *Am J Epidemiol* 2006;164:1065-74.
3. Ciccotti MC, Schwartz MA, Ciccotti MG. Diagnosis and treatment of medial epicondylitis of the elbow. *Clin Sports Med* 2004;23:693-705, xi.
4. Van Hofwegen C, Baker CL 3rd, Baker CL Jr. Epicondylitis in the athlete's elbow. *Clin Sports Med* 2010;29:577-97.
5. Cassidy C, Chung AN. Diagnosis and management of medial epicondylitis. In: Zelouf DS, editor. *Atlas of the Hand Clinics: Tendonitis and Tenosynovitis*. Vol. 4. Philadelphia: Saunders;1999. p. 61-7.
6. Vangsness CT Jr, Jobe FW. Surgical treatment of medial epicondylitis. Results in 35 elbows. *J Bone Joint Surg Br* 1991;73:409-11.
7. Kurvers H, Verhaar J. The results of operative treatment of medial epicondylitis. *J Bone Joint Surg Am* 1995;77:1374-9.

8. Ollivierre CO, Nirschl RP, Pettrone FA. Resection and repair for medial tennis elbow. A prospective analysis. *Am J Sports Med* 1995;23:214-21.
9. Gong HS, Chung MS, Kang ES, Oh JH, Lee YH, Baek GH. Musculofascial lengthening for the treatment of patients with medial epicondylitis and coexistent ulnar neuropathy. *J Bone Joint Surg Br* 2010;92:823-7.
10. Hoogvliet P, Randsdorp MS, Dingemanse R, Koes BW, Huisstede BM. Does effectiveness of exercise therapy and mobilisation techniques offer guidance for the treatment of lateral and medial epicondylitis? A systematic review. *Br J Sports Med* 2013;47:1112-9.
11. Nirschl RP, Pettrone FA. Tennis elbow. The surgical treatment of lateral epicondylitis. *J Bone Joint Surg Am* 1979;61:832-9.
12. Chang HY, Wang CH, Chou KY, Cheng SC. Could forearm Kinesio Taping improve strength, force sense, and pain in baseball pitchers with medial epicondylitis? *Clin J Sport Med* 2012;22:327-33.

© SAGEYA. This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, noncommercial use, distribution and reproduction in any medium, provided the work is properly cited.

Source of Support: Nil, Conflict of Interest: None declared.