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Original Research Article

Ultrasound guided percutaneous tenotomy for lateral epicondylosis

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ABSTRACT

Introduction: Lateral elbow tendinopathy is a common condition affecting two to three percent of the population. While non-operative management is the mainstay of treatment, 10-15% remain refractory. Ultrasonic percutaneous tenotomy is a recent therapeutic option for clinicians to treat lateral elbow tendinopathy. The goal of this study was to evaluate the survival rate of ultrasonic percutaneous tenotomy in the treatment of lateral elbow tendinopathy.

Materials and Methods: 83 patients underwent ultrasonic percutaneous tenotomy from September 2015 to August 2018 and met full inclusion criteria to participate. 63 patients consented to enroll in the study, with 50 (79.4%) completing the postoperative questionnaire. Data obtained included range of motion, patients' report of improvement, Quick Dash Score (Q-Dash), Visual Analogue Scale (VAS) pain, VR 12, Mayo Elbow Performance, patient satisfaction, further post-operative adjunct procedures which included additional steroid injections, platelet-rich plasma (PRP) injections or need for reoperation at a minimum of 12 months post procedure.

Results: Overall survival rate for ultrasonic percutaneous tendinopathy was 94% (47/50). Three patients required post-operative adjunct procedures, two received steroid injections and one required PRP injection. Mean VAS score improved from 8.1 to 2.8 in the no failure group vs 7.9 to 2.7 in the failure group. Mean postoperative Mayo Elbow score and Q-DASH score was 89 (range 60 to 100) and 12.7 (range 2.3 to 61.4), respectively. 84 percent of patients were either very satisfied (N=31) or satisfied (N=11) with their procedure.

Conclusion: This three year study demonstrates that ultrasonic percutaneous tenotomy appears to be a safe and efficacious therapeutic option with a high survival rate for patients with recalcitrant lateral elbow tendinopathy.

1. Introduction

Lateral elbow tendinopathy, or commonly referred to as "tennis elbow", is an extremely common condition affecting two to three percent of the population.[1–3] Socioeconomically, it has a large disease burden due to its tendency to occur in a more active, working population typically between the ages of 40 to 50.[4–6] While non-operative treatment is the mainstay of treatment for the vast majority of patients, 10-15% of cases are refractory.[6–12] In addition, approximately eight and a half percent of patients will suffer a relapse of symptoms following successful non-operative treatment.[7–13] Historically, treatment options for these refractory cases include extracorporeal shock

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wave therapy, platelet-rich plasma injections, percutaneous needling, or surgery.

A more recent approach involves using a percutaneous ultrasonic tenotomy device to localize and ablate the pathologic tissue in recalcitrant cases. This technique allows clinicians the ability to sonographically localize the diseased tissue and to perform a microresection with ultrasonic energy.[1] Clinical studies thus far have supported percutaneous ultrasonic tenotomy as a viable option for patients with recalcitrant lateral elbow tendinopathy.[1,6,7,14] The primary purpose of this study was to add to the existing literature by evaluating the survival rate of percutaneous ultrasonic tenotomy in the treatment of lateral elbow tendinopathy. Secondarily, we sought to report postoperative functional outcome scores and associated complications.

2. Materials and Methods

After the institutional review board's approval, this study evaluated a consecutive series of patients who underwent ultrasonic percutaneous tenotomy by a single clinician (I.C.) from September 2015 to August 2018 for the treatment of chronic recalcitrant lateral elbow tendinopathy. Inclusion criteria at the time of surgery included patients age 18 years or older with history consistent with lateral elbow pain greater than four months duration and physical examination consistent with lateral elbow tendinopathy. All patients had MRI confirmed common extensor tendinopathy. Prior to the procedure all patients underwent formal non-operative treatment which included nonsteroidal anti-inflammatory medications, activity modification, a minimum of three months physical therapy, and counterforce bracing. Preoperative corticosteroid injections were not part of the exclusion criteria. Exclusion criteria included a documented ipsilateral upper extremity musculoskeletal condition (other than elbow tendinosis in the same arm on the opposite side) or MRI confirmed full thickness tear.

Baseline demographic data was collected through chart reviews in addition to a post-operative survey at a minimum of one year after ultrasonic percutaneous tenotomy. This included age, gender, BMI, dominant sided procedure, comorbidities (e.g., diabetes mellitus etc.), inciting mechanism (atraumatic/traumatic), and prior steroid injection(s). Social factors collected included workers compensation, legal claims, work status and smoking status. Our primary endpoint was defined as survival not requiring further post-operative adjunct procedures which included additional steroid injections, platelet-rich plasma (PRP) injections or need for reoperation. Post-operative questionnaires collected information on range of motion, patients' report of improvement, Quick Dash Score (Q-Dash), Visual Analogue Scale (VAS) pain, VR 12, Mayo Elbow Performance, patient satisfaction (ordinal scale- very satisfied, satisfied, neutral and not satisfied) at a minimum of one year post procedure. Additionally, post-procedure complications and work status were also collected. The post-operative questionnaire was administered through Research Electronic Data Capture (REDcap) secure data collections service. Questionnaires were completed by patients from April-July 2019. Study coordinators collected and scored patient data which was stored in a deidentified database. Statistical analysis of the data included Mann-Whitney U test and multivariate regression analysis.

3. Results

From September 2015 to August 2018, 106 patients underwent ultrasonic percutaneous tenotomy for treatment of chronic recalcitrant lateral epicondylitis. Of the 106 patients, 83 patients met full inclusion and exclusion criteria. 63 were consented to participate and were enrolled into the study. 20 patients declined to participate in the study. 13 of the patients did not complete the questionnaire leaving 50 patients with completed surveys (79.4%) with a mean follow-up of 24 Months (range 11 to 44 Months) were included in the data analysis. Mean age was 55 years (SD, ±12; range, 22-74) and 52% were female (Table 1).

Table 1: Demographics

Demographics	N=50
Age	55.0 (12.0)
Gender	
Female	26 (52.0%)
Male	24 (48.0%)
BMI	28.5 (6.03)
Smoke	
No	47 (94.0%)
Yes	3 (6.00%)
Non-Traumatic vs Traumatic	
Non-Traumatic	41 (82.0%)
Traumatic	9 (18.0%)
Diabetes	
No	43 (86.0%)
Yes	7 (14.0%)

The survival rate was 94% (47/50). Three patients required further intervention: two patients had steroid injections, and one patient had a PRP injection. On multivariate regression analysis, BMI (P=0.02) was associated with procedure failure. Mean VAS score improved from 8.1 to 2.8 in the no failure group vs 7.9 to 2.7 in the failure group. Mean postoperative Mayo Elbow score and Q-DASH score was 89 (range 60 to 100) and 12.7 (range 2.3 to 61.4), respectively (Table 2). With regard to patient satisfaction, 84 percent of patients were either very satisfied (N=31) or satisfied (N=11) with their procedure. There were no cases of infection, bleeding, nerve injury or other intra-procedural or post-procedural complications.

Table 2: Outcomes

Outcomes	No Failure N=47	Failure N=3	P Value
BMI	28.8 (6.15)	25.1 (1.45)	0.02
Q-Dash	12.7 (14.2)	23.5 (22.8)	0.499
Mayo Score	89.0 (14.0)	81.7 (20.2)	0.594
Pre OP VAS	8.13 (1.86)	7.90 (0.26)	0.471
Post OP VAS	2.75 (3.13)	2.67 (2.08)	0.955
VR-12 Mental	60.1 (6.49)	64.9 (1.56)	0.006
VR-12 Physical	50.4 (8.09)	54.5 (4.26)	0.232
VR6D	0.78 (0.10)	0.86 (0.07)	0.175

4. Discussion

It is well-established that chronic elbow tendinopathy is a degenerative condition secondary to repetitive microtrauma. This represents a paradigm shift from the previously held notion that this was an inflammatory condition of the common extensor tendon.[8,15–17] Histologic changes include fibroblastic proliferation, angiofibroblastic hyperplasia, disorganized collagen, cellular apoptosis and autophagic cell death.[1,6,7,15–18] Surgical intervention in the form of arthroscopic, open and percutaneous procedures are often required in these refractory cases to remove diseased tissue and induce a healing response. These various surgical options can be effective, however expose patients to operative risks and often a protracted recovery.

Ultrasound guided percutaneous tenotomy can help mitigate these risks by allowing for precise identification and removal of tendonotic tissue. Previous studies have established this minimally invasive procedure as a viable treatment option.[1,6,7,14] The goal of our study was to determine survival rates of ultrasonic percutaneous tenotomy in patients who fail non-operative management for the treatment of recalcitrant lateral epicondylitis. Based upon our definition of survival, we were able to determine that this procedure is effective at relieving patient symptomology with sustained clinical benefit in the subset of patients who do not respond to standard non-operative modalities.

Our study results for the treatment of recalcitrant lateral elbow tendinopathy with ultrasonic percutaneous tenotomy compare favorably with the existing body of literature.

The original paper by Koh et al. out of Singapore established the technique for this novel procedure with a cohort of twenty patients with recalcitrant lateral elbow tendinopathy.[1] The authors' reported no complications, improved pain scores and function sustained at one year—many of whom saw improvement at one-week post-operatively. 95% of patients in the study reported being "very" or "somewhat" satisfied with the procedure. From this original cohort, Seng et al. reported three year follow up data with not only maintained results but continued improvement in VAS pain scores and DASH-compulsory scores at 36 months.[7] Additionally, a recent prospective study by Barnes et al. found similar results.[6] Of note, their study included both medial (7/19) and lateral (12/19) elbow tendinopathy—both of which had sustained clinical improvement at one year.

We demonstrated a 94 percent survival rate of this minimally invasive procedure in patients who had been previous non-responders to conservative therapy. These results are in agreement with the one year follow up data reported independently by Koh et al and Barnes et al. both of which demonstrated a sustained therapeutic response.[1,6] Additionally, no procedural complications were observed in our study affirming the safety of this procedure as previously reported in the literature.[1,6,7,14] When evaluating our three non-survival patients, two patients received post-operative steroid injections and one patient received PRP injection. The patient who received the PRP injection went on to complete resolution of their symptomology. Of the two patients who received steroid injections, one still notes continued pain despite receiving post procedural intervention and the other failed to comment on his/her current status.

There are several limitations to our study. It is certainly possible, as a result of patients declining to participate or those who were unable to be contacted, that our results could be biased for survival rates and post-operative outcomes. Additionally, a lack of preoperative scores limits us to quantify clinical functional improvements. Finally, longer follow-up may have revealed a lower survival rate.

This study demonstrates that ultrasonic percutaneous tenotomy appears to be an effective treatment option with a high survival rate for improving pain and function of patients with recalcitrant lateral elbow tendinopathy. Prospective investigations should continue to explore the safety and therapeutic benefit of this procedure and to provide a direct comparison with surgical intervention.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. Koh JB, Mohan PC, Howe TS, Lee BP, Chia SL, Yang Z, et al. Fasciotomy and surgical tenotomy for recalcitrant lateral elbow tendinopathy: early clinical experience with a novel device for minimally invasive percutaneous microresection. *Am J Sports Med*. 2013;41(3):636–44.
2. Verhaar JA. Tennis elbow: anatomical, epidemiological and therapeutic aspects. *Int Orthop*. 1974;18(5):263–7.
3. Allander E. Prevalence, incidence, and remission rates of some common rheumatic diseases or syndromes. *Scand J Rheumatol*. 1974;3(3):145–53.

4. Wang D, Degen RM, Camp CL, Mcgraw MH, Altcheck DW, Dines JS. Trends in surgical practices for lateral epicondylitis among newly trained orthopedic surgeons. *Orthop J Sports Med*. 2017;5(10):2325967117730570.
5. Sanders TL, Kremers HM, Bryan AJ, Ransom JE, and BFM. Health care utilization and direct medical costs of tennis elbow: a population-based study. *Sports Health*. 2016;8(4):355–8.
6. Barnes DE, Beckly JM, Smith J. Percutaneous ultrasonic tenotomy for chronic elbow tendinosis: a prospective study. *J Shoulder Elbow Surg*. 2015;24(1):67–73.
7. Seng C, Mohan PC, Koh SBJ, Howe TS, Lim YG, Lee BP, et al. Ultrasonic percutaneous tenotomy for recalcitrant lateral elbow tendinopathy: sustainability and sonographic progression at 3 years. *Am J Sports Med*. 2016;44(2):504–10.
8. Nirschl RP, Pettrone FA. Tennis elbow. The surgical treatment of lateral epicondylitis. *J Bone Joint Surg Am*. 1979;61(6A):832–9.
9. Cullinane FL, Boocock MG, Trevelyan FC. Is eccentric exercise an effective treatment for lateral epicondylitis? A systematic review. *Clin Rehabil*. 2014;28(1):3–19.
10. Krogh TP, Bartels EM, Ellingsen T, Stengaard-Pedersen K, Buchbinder R, Fredberg U, et al. Comparative effectiveness of injection therapies in lateral epicondylitis: a systematic review and network meta-analysis of randomized controlled trials. *Am J Sports Med*. 2013;41(6):1435–46.
11. Solheim E, Hegna J, Oyen J. Arthroscopic versus open tennis elbow release: 3- to 6-year results of a case-control series of 305 elbows. *Arthroscopy*. 2013;29(5):854–9.
12. Tosti R, Jennings J, Sewards JM. Lateral epicondylitis of the elbow. *Am J Med*. 2013;126:1–6.
13. Sanders TL, Kremers HM, Bryan AJ, Ransom JE, Smith J, Morrey BF, et al. The epidemiology and health care burden of tennis elbow: A population-based study. *Am J Sports Med*. 2015;43(5):1066–71.
14. Niedermeier SR, Crouser N, Speeckaert A, Goyal KS. A survey of fellowship-trained upper extremity surgeons on treatment of lateral epicondylitis. *Hand (N Y)*. 2019;14(5):597–601.
15. Kraushaar BS, Nirschl RP. Tendinosis of the elbow (tennis elbow): clinical features and findings of histological, immunohistochemical, and electron microscopy studies. *J Bone Joint Surg Am*. 1999;81(2):259–78.
16. Mcshane JM, Nazarian LN, Harwood MI. Sonographically guided percutaneous needle tenotomy for treatment of common extensor tendinosis in the elbow. *J Ultrasound Med*. 2006;25(10):1281–9.
17. Chen J, Wang A, Xu J, Zheng M. In chronic lateral epicondylitis, apoptosis and autophagic cell death occur in the extensor carpi radialis tendon. *J Shoulder Elbow Surg*. 2010;19(3):355–62.
18. Gosens T, Peerbooms JC, Laar WV, Oudsten BLD. Ongoing positive effect of platelet-rich plasma versus corticosteroid injection in lateral epicondylitis: a double-blind randomized Controlled Trial With 2-year Follow-up. *Am J Sports Med*. 2011;39(6):1200–8.

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