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Deep Friction Massage Versus Steroid Injection in the Treatment of Lateral Epicondylitis

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Abstract

Background: The aim of the study was to determine the efficacy of deep friction massage in the treatment of lateral epicondylitis by comparing outcomes with a control group treated with splinting and therapy and with an experimental group receiving a local steroid injection. **Methods:** A randomized clinical trial was conducted to compare outcomes after recruitment of consecutive patients presenting with lateral epicondylitis. Patients were randomized to receive one of 3 treatments: group 1: splinting and stretching, group 2: a cortisone injection, or group 3: a lidocaine injection with deep friction massage. Pretreatment and posttreatment parameters of visual analog scale (VAS) pain ratings, Disabilities of the Arm, Shoulder and Hand (DASH) scores, and grip strength were measured. **Results:** Outcomes were measured at early follow-up (6-12 weeks) and at 6-month follow-up. There was a significant improvement in VAS pain score in all treatment groups at early follow-up. DASH score and grip strength improved in the cortisone injection group and the deep friction massage group at early follow-up; these parameters did not improve in the splinting and stretching group. At 6-month follow-up, only patients in the deep friction massage group demonstrated a significant improvement in all outcome measures, including VAS pain score, DASH score, and grip strength. **Conclusions:** Deep friction massage is an effective treatment for lateral epicondylitis and can be used in patients who have failed other nonoperative treatments, including cortisone injection.

Keywords: lateral epicondylitis, tennis elbow, injection, nonoperative, steroid

Introduction

Lateral epicondylitis remains a poorly understood disease process without a clear treatment algorithm despite numerous studies. Many studies have proposed different mechanisms of pain generation, which may offer an explanation for the temporary pain relief provided by steroid injections into tissue that is devoid of acute inflammation. Free nerve endings in the aponeurosis, granulation tissue around the lateral epicondyle, increased levels of substance P receptors, and increased levels of the excitatory neurotransmitter glutamate have been implicated as pain generators.[1,5,7,9,11] Nonetheless, steroid injections are only beneficial in short-term symptom relief, and at 1-year, the outcome from steroid injection is the same as, if not worse than the outcome from a wait-and-see approach or physiotherapy.[2,14]

Other treatment modalities are proposed to stimulate healing of the diseased tendon through delivery of inflammatory cells to the site. Extracorporeal shockwave (ECSW) therapy was studied and demonstrated induction of an inflammatory reaction in rabbit tendon and a significant reduction in pain in patients treated with ECSW therapy.[8,12,13] Autologous blood injections and platelet-rich plasma have also been studied as an intervention to deliver inflammatory mediators to induce a healing cascade, and both modalities were shown to relieve pain in patients.[3,10]

We propose that deep friction massage can successfully treat lateral epicondylitis. The proposed treatment is based on the understanding that the degenerative process is marked by a lack of inflammation. We hypothesize that deep friction massage stimulates local inflammation, thereby initiating the tendon healing process. The purpose of this study was to compare 3 different clinical regimens for nonoperative management of lateral epicondylitis.

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Materials and Methods

An institutional review board (IRB)–approved randomized controlled trial was conducted on patients enrolled between the years of 2006 and 2012. Patients were recruited from an academic orthopedics outpatient practice. Patients were included if they had signs and symptoms consistent with lateral epicondylitis for at least 6 weeks and were greater than 18 years of age. Clinical diagnosis was made based on tenderness to palpation anterior and distal to the lateral humeral epicondyle or pain with provocative testing of resisted wrist extension with the elbow in extension and the forearm in pronation. Exclusion criteria were evidence of nerve compression syndrome, cervical radiculopathy, duration of symptoms less than 6 weeks, previous surgery or trauma to the region, and inability to provide consent.

Patients were randomized to one of 3 groups based on a computer-generated randomized number. The control group (group 1) received a removable cock-up wrist splint to be worn full-time for 6 weeks, except for hygiene and when performing therapy. The patients in group 1 were provided with a standardized therapy protocol that started after 2 weeks of rest. The standardized therapy protocol was prescribed to all patients across the 3 groups and consisted of a supervised upper-extremity stretching program for the wrist and finger extensors and flexors, as well as range of motion exercises for the elbow, forearm, and wrist. The patients were instructed to perform these exercises daily as their home exercise program. Group 2 received a cortisone injection of 20-mg methylprednisolone with 1% lidocaine totaling a 10-mL solution, injected into the area of maximal tenderness. Patients then wore a removable cock-up wrist splint for 3 to 5 days with instructions to start the stretching and reconditioning protocol once the injection pain subsided after 1 to 2 weeks of rest. Group 3 received a 10-mL 1% lidocaine injection into the area of maximal tenderness at the lateral epicondyle and then underwent a deep friction massage. The lidocaine provided local anesthesia for the patients to tolerate the friction massage. The friction massage was performed by the attending physician and consisted of deep circular motions using the fingertips over the area of maximal tenderness. Firm pressure was applied to compress the extensor tendons, their origins, and the musculotendinous junctions between the underlying bone and the fingertips. The massage was performed for a total of 5 minutes. Postmassage management of group 3 patients was the same as that for group 2, with all patients following the same splinting and standardized therapy program (Table 1).

All eligible patients provided information pertaining to demographics, symptom presentation including duration and mechanism, history of previous episodes, treatment, and employment status. The primary outcome measure was the visual analog scale (VAS) measure of pain. Secondary outcome measures included the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire and grip strength.

Table 1. Therapy Protocol.

Group 1: splinting and stretching	Group 2: cortisone injection	Group 3: deep friction massage
Cock-up wrist splint for 6 wk	Cock-up wrist splint worn for 3 to 5 d	Cock-up wrist splint worn for 3 to 5 d
Therapy after 2 wk of rest	Therapy after 1 to 2 wk of rest	Therapy after 1 to 2 wk of rest

The grip strength was measured with a Jamar dynamometer in 2 positions: with the elbow flexed and extended. Two measures in each position were recorded, and an average was taken.

Outcome measures were captured by a physician assistant who was blinded to the treatment group. Outcomes were recorded at 3 time points: (1) baseline; (2) early follow-up between 6 and 12 weeks; and (3) late follow-up at 6 months. Results were analyzed with a 2-sample *T* test comparing pretreatment and posttreatment data for the VAS, DASH, and grip strength scores. The treatment groups were compared with each other using analysis of variance (ANOVA). The *P* value was set at .05.

Results

Forty-one patients were enrolled, but 7 patients were lost to follow-up, leaving 34 patients in the study. Patient demographics of sex and age were evenly distributed between groups.

There were 13 men and 21 women. The average age of patients was 48 ± 9 years with a range from 31 to 72 years. The right elbow was affected in 85% of patients, 85% were right-hand dominant, and the dominant elbow was affected in 74% of patients.

All 34 patients returned for the early follow-up between 6 and 12 weeks postoperative. Half the patients were lost to later follow-up; 17 were available for the 6-month follow-up. The average follow-up was 20 weeks. There were no complications or adverse reactions in any group.

At early follow-up, there was a significant difference in VAS pain score in all 3 groups. The VAS pain scores for group 1 decreased from 6.7 to 4.5 (P = .008), group 2 decreased from 7.9 to 3.7 (P = .003), and group 3 from 7.3 to 4.1 (P = .006). There was no improvement in DASH score at early follow-up for group 1; however, there was an improvement for group 2 from 45.4 to 31.4 (P = .048) and for group 3 from 48.3 to 32.7 (P = .007). Similarly, grip strength with the elbow extended did not improve for group 1 but did improve for group 2 from 46.7 to 60.5 lbs (P = .041) and for group 3 from 46.9 to 60.0 lbs (P = .048). There was no significant difference at early follow-up in the grip strength measured with the elbow flexed at 90° (Table 2).

At 6-month follow-up, the VAS pain score did not demonstrate a significant change between pretreatment and posttreatment in either group 1 or group 2; however, group 3

Table 2. Outcome Measures at Early (6-12 Week) Follow-up.

	Group 1: splint (n = 11)	Group 2: cortisone (n = 11)	Group 3: deep friction massage (n = 12)
Baseline			
VAS	6.7	7.9	7.3
DASH	43.7	45.4	48.3
Grip strength	39.8	46.7	46.9
6-wk follow-up			
VAS	4.5*	3.7*	4.1*
DASH	36.0	31.4*	32.7*
Grip strength	48.5	60.5*	60.0*

Note. VAS = visual analog scale; DASH = Disabilities of the Arm, Shoulder and Hand.
*$p < .05$ for comparison between pretreatment and posttreatment.

Table 3. Outcome Measures at 6-Month Follow-up.

	Group 1: splint (n = 5)	Group 2: cortisone (n = 5)	Group 3: deep friction massage (n = 7)
Baseline			
VAS	7.1	8.0	6.7
DASH	42.2	35.4	48.6
Grip strength	42.5	47.5	46.8
6-mo follow-up			
VAS	3.0	7.0	1.3***
DASH	32	37.1	10.3***
Grip strength	76.1	64.6	79.5***

Note. VAS = visual analog scale; DASH = Disabilities of the Arm, Shoulder and Hand; ANOVA = analysis of variance.
*$p < .05$ for *t*-test comparison between pretreatment and posttreatment.
**$p < .05$ for ANOVA comparison between groups.

did show a significant improvement from 6.7 to 1.3 ($P = .002$). The DASH score also demonstrated significant improvement only in group 3 from 48.6 to 10.3 ($P = .001$); the other groups did not have a significant change post treatment. Similarly, the grip strength with the elbow extended significantly improved in group 3 from 46.8 to 79.5 ($P = .003$), but there was no significant change in the other groups (Table 3).

ANOVA demonstrated no significant difference in treatment effect between the 3 groups at early follow-up. There was a significant improvement in results at the 6-month follow-up for patients in treatment group 3 receiving the deep friction massage compared with either group 1, splinting and stretching, or group 2, cortisone injection (Table 3).

Discussion

Current treatment of lateral epicondylitis includes a variety of nonoperative treatment modalities without an established standard. Although the majority of patients with lateral epicondylitis improve regardless of treatment type, it is unclear whether one specific intervention is most effective in curing symptoms or preventing the need for further intervention. Our study compared 3 nonoperative treatments: splinting versus steroid injection versus deep friction massage.

Corticosteroid injections for lateral epicondylitis have been evaluated in numerous studies. In a randomized controlled trial of 164 patients by Hay et al,[6] cortisone injection was compared with naproxen versus placebo. At the 4-week evaluation, 92% in the injection group were better, versus 57% for naproxen and 50% for placebo. At the 12-month mark, there was no difference in pain scores between the 3 groups. The authors concluded that corticosteroids were effective at early measures, but by 12 months, the outcome was good irrespective of treatment with a steroid injection versus naproxen versus placebo.

Smidt et al[14] conducted a randomized controlled trial comparing cortisone injections, physical therapy, and wait-and-see policy. One hundred eighty-five patients were randomized to one of 3 groups, and a blinded researcher assessed the severity of elbow complaints, grip strength, and pressure pain threshold. They found that the success rate of the cortisone group was significantly higher than the other 2 groups at the 6-week mark, but the recurrence rate in the injection group was high.

Most recently, Coombes et al[4] performed a systematic review of randomized controlled trials to evaluate the efficacy and safety of corticosteroid injections versus other injections for management of tendinopathy. In the pooled analysis from 17 studies for treatment of lateral epicondylitis, cortisone injection had a large effect on pain reduction in the short term compared with no intervention, but at intermediate and long-term follow-up, this benefit reversed and no intervention was favored compared with cortisone injection.

In the present study, splinting, cortisone injection, and deep friction massage all demonstrated a significant improvement in pain at the early follow-up between 6 and 12 weeks. In addition, at the early follow-up, patients receiving either a cortisone injection or deep friction massage demonstrated improvement in DASH score and grip strength. However, ANOVA testing failed to demonstrate a therapeutic benefit of any of the 3 treatment groups over the other at early follow-up.

At the midterm follow-up of 6 months, a significant improvement in VAS pain score, DASH score, and grip strength was found only in the deep friction massage group. There was no significant change in the groups receiving either splinting or a cortisone injection.

The results of this study demonstrate that deep friction massage has a lasting therapeutic effect at the 6-month follow-up, whereas splinting or cortisone injection demonstrated early benefit without a lasting effect. In addition,

deep friction massage might be beneficial in patients who have failed cortisone injection(s) or who do not want to have cortisone. This is an area that needs further investigation.

The strength of our study is its prospective, randomized design comparing 3 treatment groups; however, there were limitations. The greatest limitations were sample size and duration of follow-up. These limitations likely reflect the urban location of our institution where acute level 1 trauma and tertiary referrals comprise the majority of patient presentations with elective musculoskeletal complaints presenting less frequently. In addition, long-term follow-up is difficult to obtain in large numbers at our institution. Larger scale, randomized clinical trials with follow-up of at least 1 year would be beneficial in determining whether the therapeutic effect of deep friction massage is truly lasting. Another limitation of our study is the lack of measurement of compliance with the splint use, as well as compliance with the stretching protocol. A self-reported assessment could be added in the future; however, a true measurement of compliance would be difficult to obtain. Future investigation into magnetic resonance imaging and/or histologic changes occurring after deep friction massage would help support our proposed mechanism of action of induced tissue healing occurring through the delivery of inflammatory cells to the diseased tissue.

Ethical Approval

Written consent was obtained from the Rutgers University Institutional Review Board.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5). There were no animal subjects involved in this study.

Statement of Informed Consent

Informed consent was obtained from all individual participants included in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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