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Original Article

The impact of extracorporeal shock wave therapy on pain, grip strength and functionality in patients with medial epicondylitis and lateral epicondylitis

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Abstract

Aim: The aim of this study was to evaluate the effectiveness of extracorporeal shock wave therapy (ESWT) and conventional physical therapy applications on pain, grip strength and functionality in medial and lateral epicondylitis treatment and to compare the results.

Materials and Methods: A total of 116 patients diagnosed with medial and lateral epicondylitis were included in the study. The patients were divided into ESWT group and control group. The patients in the control group received a total of 15 sessions of conventional physical therapy (Hotpack, Transcutaneous electrical nerve stimulation (TENS)) once a day for 30 minutes.Whereas, ESWT was applied to the patients in the ESWT group as 2 sessions per week, for a total of 6 sessions. Pain severity of the patients was measured with Visual Pain Scale (VAS), grip strength with a hand dynamometer and functional level with the Patient Based Forearm Assessment Questionnaire (PFEQ).Measurements were made in all groups before treatment, after treatment and 1 month after treatment.

Results: In comparisons between groups, there was a significant decrease in VAS and PFEQ values after treatment compared to the control group in the ESWT group ($p < 0.05$). In the evaluation of the hand tightening force, it was observed that the hand tightening force in the ESWT group after treatment (p: 0.043) and 1st month controls increased significantly compared to the control group (p: 0.038).

Conclusions: Based on these results, our study demonstrated that the combination of conventional physical therapy and ESWT produced clinically positive effects in patients with epicondylitis.

Keywords: Epicondylitis; functionality; pain; shock wave therapy

INTRODUCTION

Epicondylitis is one of the groups of diseases that occur due to overuse of the muscle-tendon joints that are often attached to the elbow area (1). It is seen by about 3% of population and is more common between 30-50 years of age. The most common type is lateral epicondylitis and is also known as tennis elbow (2). Medial epicondylitis is more rare and is named as golfer's elbow. In epicondylitis, dysfunction due to joint pain and loss of range of motion occurs as a result of degeneration characterized by inflammation in the tissue (1). Many methods are used in the treatment of epicondylitis. Among these, various treatments such as rest, bracing, exercises, local injections (steroid and dry needling), acupuncture, medical and physical therapy are combined (2).

Electrotherapy applications such as superficial heating (hotpacks) and transcutaneous electrical nerve stimulation (TENS) agents from physical therapy methods have been used in the treatment of tendinitis since the past. Hotpack application increases vasodilation, reduces degeneration and accelerates tissue flexibility. According to the gate-control theory, TENS affects the free nerve endings that are sensitive in the tissue as a result of inflammation, reduces pain and is effective in strengthening the tissue as a result of electrical stimulation (3).In a study by Dilekçi et al., TENS was found to be effective in improving pain and loss of physical function in patients with lateral epicondylitis (4). In another study by Halle et al., it was shown that TENS reduces pain intensity in patients with lateral epicondylitis (5).

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In recent years, extracorporeal shock wave therapy (ESWT) has been introduced in the treatment of epicondylitis. Although its effect is not fully clarified, it has been found that ESWT exerts its effect through reflex pain inhibition (hyperstimulation analgesia) and by activating repair mechanisms on the damaged tendon (6). Although effectiveness of ESWT is still controversial, some studies have found effectiveness of ESWT successful by about 90% (6). Whereas other studies have reported that ESWT is ineffective or as effective as placebo (7). In studies, ESWT treatment was generally applied as a treatment modality before surgery in patient who did not benefit from conservative treatment. However, the number of studies comparing ESWT with other conservative treatment methods is limited. Therefore, the aim of this study was to evaluate the effects of conventional physiotherapy applications together with ESWT on pain, grip strength and functionality in the treatment of epicondylitis.

MATERIALS and METHODS

Study Protocol

This study was conducted on patients who applied to the physical therapy and rehabilitation outpatient clinic with elbow pain between January 2019 and December 2019 and were diagnosed with lateral/medial epicondylitis according to clinical and MRI findings. The study was conducted in accordance with the latest version of the Helsinki Declaration and was approved by the Institutional Ethics Committee (Date/No: 26.09.2018/178).All patients who accepted to participate in the study signed informed consent forms before the participation. A total of 116 patients who met the inclusion criteria were included in the study. Then the patients were divided into two groups (58 in each group). Patients who received conventional physiotherapy (CPT) with Hotpack and TENS were included in the control group, and patients who received ESWT in addition to CPT were included in the ESWT group. Exercise was given to all patients included in the study.

As a result of the power analysis performed with the Gpower 3.1 soft ware before starting the study, the minimum sample size was 34 people and the study power was found to be 90% (95% confidence interval; 5% margin of error).

Patient Selection

Among patients aged 18-65 years who had complaint of elbow pain, continuing for at least 4 weeks, those with unilateral elbow pain at the physical examination, local tenderness on palpation around lateral or medial epicondyle and positive epicondyle provocation tests (pain in flexion and pronation of the wrist or extension and supination of the wrist when the elbow is extended against resistance) and MRI findings. The exclusion criteria included patients aged under 18 or above 65 years, those with a history of surgery around the medial or lateral epicondyle, patients with cervical radiculopathy, those underwent local injection treatment at elbow area within the last 1 month, patients with pacemaker, tumoral formation, coagulation problems, previous systemic or local infections, connective tissue and rheumatic articular disease, a history of humerus, ulna or radius fractures, pregnant patients, those with deformity at the upper extremity or neurologic disorders, diabetes mellitus, pain lasting more than 3 months and patients who received medical or physical therapy within the last month and those who refused participation were excluded from the study.

Evaluation

Following parameters were used in the evaluations:

1. Sociodemographic and clinical features of the patients
2. Pain severity
3. Grip strength
4. Functionality level

In order not to affect the measurements, the patients were asked not to use any analgesic or anti-inflammatory medication during the study period and not to receive another application.

In the beginning of the study, patients' age, weight, height, body mass index (BMI), dominant hand, affected arm and duration of complaints were recorded.

Visual Pain Scale (VAS) was used to determine pain severity of the patients. Patients were asked to mark the pain they felt during palpation and grip. Accordingly, "0" value indicates no pain and "10" value unbearable pain. The distance between the marked point and start of the line was measured in centimeters (8). Pain intensity of the patients was measured 3 times before treatment, after treatment, and at 1 month after treatment.

Patient-rated forearm evaluation questionnaire (PFEQ) was used to evaluate the functionality. PFEQ consists of 15 questions with 5 questions indicating pain characteristics, 6 questions elbow functions in special activities, and 4 questions elbow functions in daily activities. Each question is scored between 0-10 points (0: very good, 10: very bad) (9).

Grip strength was evaluated with JAMAR (Jamar hand dynamometer; Lafayette, Michigan, USA) hand dynamometer by two ways as both pain free grip strength and maximum grip strength. The measurements were repeated three times while the elbow was in flexion and extension positions and averaged. Measurements were made comparatively on both extremities and values were recorded as kilogram (kg)-force (10).

Treatment Protocol

Patients in the control group received a total of 15 sessions CPT (20 minutes hotpacks and 30 minutestranscutaneous electrical nerve stimulation (TENS) at convensional mode with 200Hz, 10-30A 100 pulses included in 1 session). Patients in the ESWT group, received 6 sessions of ESWT (20 minutes at 15 Hz 2.1 bars 2000 pulses included in 1 session) with 15 sessions CPT.

Statistical Analysis

Statistical Package for the Social Sciences 22.0 for Windows (SPSS, IL, USA) was used for the statistical analysis. The normality of the distribution for all variables was determined with the Kolmogorov-Smirnov test. In between two groups, Student t-test was used for normally distributed variables, and Mann-Whitney U test was used for nonparametric variables. Before, after and 1st month after treatment variables within groups were compared with ANOVA and Friedman test. The statistically significant point was set at <0.05.

RESULTS

Female/male (F/M) ratio was 28/30 in the ESWT and 29/29 in the control group. The mean age was 45.57±2.43 years, disease duration 2.35±0.74 months and BMI 24.21±4.41 in the ESWT group, while the mean age was 44.70±1.94 years, disease duration 2.16±0.50 months and BMI 25.12±4.33 in the control group, and no statistically significant difference was found between the groups (p>0.05). Majority of patients in both groups were working in the jobs requiring arm power (70.7% in ESWT group, 60.0 % in control group) and the rate of lateral epicondylitis was higher in both groups (89.7 in ESWT group, 91.4 in control group). Demographic features of both groups are shown in Table 1.

No significant difference was found between the groups in terms of pre-treatment VAS, PFEQ-PAIN, PFEQ-FUNCTION and PFEQ-DAILY ACTIVITY values (p>0.05).

Table 1. Demographic features of ESWT group and control group

n: 116	ESWT group (n:58)	Control group(n:58)
Female/Male	28/30	29/29
Marital status	%60.3 married	%57.3 married
	%39.7 not married	%42.7 not married
Education level	%18.6 primary	%45.7 primary
	%13.9 middle	%11.3 middle
	%25.8 highschool	%12.7 highschool
	%33.5 college	%25.1 college
	%8.2 illiterate	%5.2 illiterate
Working in the requiring arm power	%70.7 working	%60.0working
	%29.3 not working	%40.0 not working
Affected elbow	%40.3 right	%50.6 right
	%69.7 left	%49.4 left
Epicondylitis type	%89.7 lateral	%91.4 lateral
	%10.3 medial	%8.6 medial
Age (years)	45.57±2.43	44.70±1.94
Duration (month)	2.35±0.74	2.16±0.50

ESWT: Extracorporeal Shock Wave Therapy

Table 2. Relationship between clinical parameters between Eswt group and the control group

		ESWT group (n:58)	Control group (n:58)	p
VAS scores	Before Treatment	6.36±1.76	6.38±1.54	>0.05
	After Treatment	2.56±0.78	3.92±0.59	**<0.001**
	1st month after treatment	3.15±0.80	3.18±0.68	>0.05
PFEQ-pain	Before Treatment	6.99±1.91	7.02±1.80	>0.05
	After Treatment	2.15±1.30	4.15±1.19	**<0.001**
	1st month after treatment	2.60±0.91	2.64±0.34	>0.05
PFEQ-functionality	Before Treatment	7.49±0.82	7.41±1.37	>0.05
	After Treatment	2.55±0.64	4.24±0.77	**<0.001**
	1st month after treatment	4.88±0.92	4.94±0.62	>0.05
PFEQ-dailyactivities	Before Treatment	6.24±1.85	6.24±1.92	>0.05
	After Treatment	3.11±0.28	5.17±0.40	**<0.001**
	1st month after treatment	3.52±0.56	5.62±0.16	**<0.001**
Hand grip strenght	Before Treatment	77.53±4.42	79.67±5.63	>0.05
	After Treatment	90.06±2.54	83.50±7.07	**<0.001**
	1st month after treatment	94.15±3.06	88.86±7.43	**<0.001**

ESWT: Extracorporeal Shock Wave Therapy, VAS: Visual Pain Scale, PFEQ: Patient-rated forearm evaluation questionnaire

In the intragroup comparisons, there was a statistically significant difference between pre- and post-treatment VAS, PFEQ-PAIN, PFEQ-FUNCTION and PFEQ-DAILY ACTIVITY values in both ESWT and control groups (p<0.001). PFEQ-DAILY ACTIVITY value remained significant at the 1st month control in the ESWT group (p:0.045) (Table 2).

In the intergroup comparisons; VAS (p<0.001), PFEQ-PAIN (p<0.001) and PFEQ-FUNCTION (p<0.001) values were significantly decreased in the ESWT group compared to the control group (Table 2) (Figures 1, 2, 3).

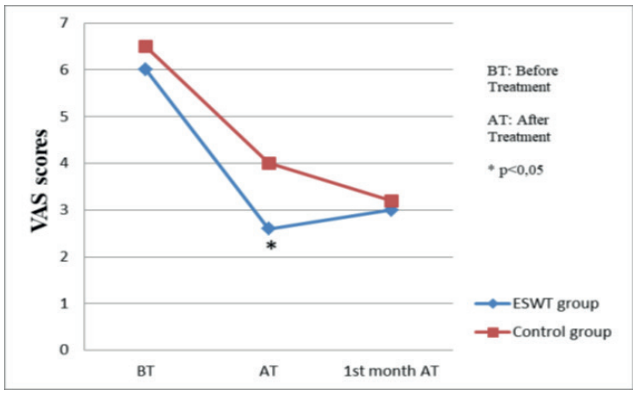

Figure 1. Changes in VAS post-treatment

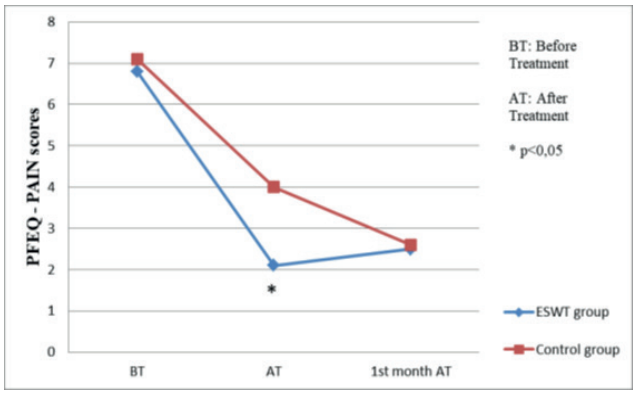

Figure 2. Changes in PFEQ-PAIN between the group

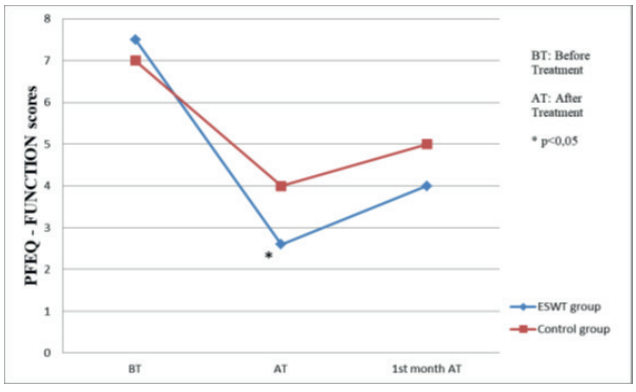

Figure 3. Changes in PFEQ-FUNCTION between the groups

PFEQ-DAILY ACTIVITY value was significant in the ESWT group compared to the control group both post-treatment and at 1st month control(p<0.001) (Figure 4).

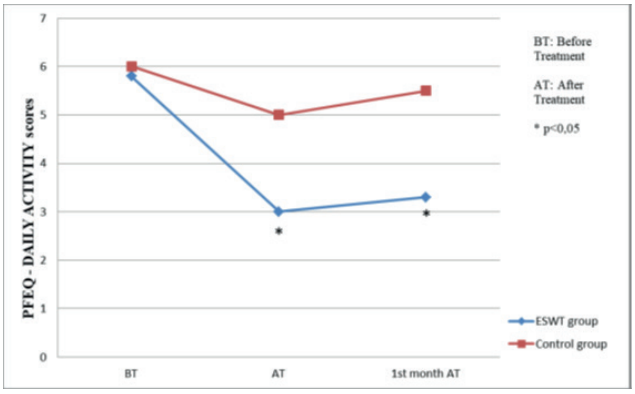

Figure 4. Changes in PFEQ-DAILY ACTIVITY between the groups

Grip strength was significantly increased post-treatment and at 1st month control in both ESWT and control groups (p<0.001). In the intergroup comparisons; grip strength was significantly increased in the ESWT group compared to the control group post-treatment (p<0.05) and at the 1st month control (p<0.05) (Figure 5).

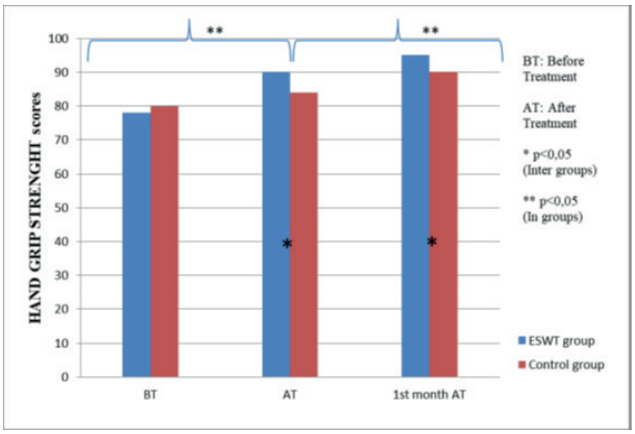

Figure 5. Change in grip strength between the groups

DISCUSSION

The aim of this study was to observe the possible benefits of ESWT therapy in addition to conventional physiotherapy (hotpack and TENS), which is often used in the treatment of epicondylitis.

Epicondylitis is a musculoskeletal disease commonly seen in the worldwide population and affects labor force and quality of life negatively and increased pain severity in the forearm with decreased handgrip strength in patients with epicondylitis (11). Therefore, many treatment modalities have emerged for the treatment of this disease. Medical, conservative and surgical treatments are used, although there is no consensus on effectiveness of these treatments.

In the last decade, a novel physical treatment agent, ESWT has been introduced in the treatment of epicondylitis, which is a common tendinopathy. As the mechanism of action, studies have found that ESWT inhibits reflex pain inhibition (hyperstimulation analgesia), stimulating nerve endings at the painful points as well as activating the repair

mechanisms on the tendon, and increasing blood flow and oxygenation through the formation of new vessels (6).

There is still no consensus on the effectiveness of ESWT among the studies. This is thought to be a result of the use of different devices, different doses and protocols applied in the treatment, and differences in patient selection, evaluation methods and disease durations (6).

In some studies, only ESWT has been compared with placebo on the management of pain, which is one of the clinical findings of epicondylitis, in one of them, pain severity and loss of function were found to decrease in ESWT group (12). In another study, Speed et al. demonstrated that ESWT and placebo have the same effect (13). In a study with 26 epicondylitis patients, pain severity was decreased from pre-treatment to the 1st month followupwith ESWT (14), while in another study with 78 patients, ESWT was compared with placebo in patients with chronic epicondylitis, and pain was significantly decreased in both groups at the end of the 1st month (15). In a study in which 40 epicondylitis patients were randomized, pain severity was significantly decreased in the ESWT group at the 1st month follow-up (2). In another study by Collins et al., pain severity was decreased with ESWT at 2-month follow-up of the patients (16). In another study with 54 epicondylitis patients, ESWT was found to significantly decrease pain severity after 3 months in patients with a short disease duration (<12 weeks) and those with a long disease duration (>12 weeks) (17). In a randomized placebo controlled study, pain severity was significantly decreased at 1-year follow-up compared to placebo as a result of ESWT therapy (18). In another study compared ESWT and other treatment modalities, 22 epicondylitis patients received ESWT or local steroid injection. It was observed that injection was effective in pain relieving at 2-weeks follow-up, but when follow-up was continued, ESWT had better outcome in the second month (1). In ESWT and laser randomization of 60 patients with lateral epicondylitis, the decreased pain in the ESWT group in the postoperative 1st month continued until the 3rd month (19). In a study on 40 patients with lateral epicondylitis investigating the effects of dry needling and ESWT on pain, grip strength and functionality, combined treatment was found to be highly effective at the end of the 1st month (6). In another study, effects of ESWT and acupuncture were similar in reducing pain (20). In a study with 59 patients having lateral epicondylitis, intragroup comparisons were made in the patients who received ESWT, local injection and physiotherapy, and no significant difference was found between the group in terms of the decrease in pain severity (21). Similar to the above mentioned studies, in our study pain was significantly decreased in both groups post-treatment and at the 1st month compared to pre-treatment, and when the groups were compared, pain severity was significantly decreased in the ESWT group compared to the control group.

Decreased handgrip strength, cause impairment in daily activities and decreased forearm functionality. Some studies have found ESWT successful by 68-90% regarding its effect on hand functions (11). Whereas other studies have found ESWT ineffective or as effective as placebo (22,23). A significant improvement was observed in handgrip strength at the end of the 1st month in a group epicondylitis patients who received ESWT (24). Significant improvements were found in forearm functions with ESWT compared to local steroid injection at 2-month follow-up, and compared to placebo at 6-month follow-up (1,25). It was observed that ESWT was effective in a study conducted on 62 patients with treatment-resistant chronic lateral epicondylitis and there was a significant improvement in the functions of the patients (6,26). A significant improvement was found with ESWT compared to laser therapy in a randomized study with 3-month follow-up, while in a similar study with 1-month follow-ıp ESWT provided improvement in the upper extremity functions, but it was ineffective in handgrip strength (19,24).

While the effect of physiotherapy in epicondylitis remains debatable, different results have been obtained by various studies. In a study, physiotherapy consisting of hotpacks, TENS and ultrasound were compared and similar effects were found between the groups (21). In another study, it was stated that TENS therapy was effective compared to the beginning of the treatment than ESWT, but these methods showed similar effects at follow-up (27). In our study, a significant improvement was found in forearm functions and handgrip strength in both groups post-treatment and at 1st month control compared to pre-treatment, while the improvement was more significant in the ESWT group at the 1st month.

Short follow-up duration (1 month) and relatively small number of patients were the main limitations of the our study. Another limitation, data were obtained from a single center. Nevertheless, we think that the multi-faceted evaluation of ESWT in patients with medial epicondylitis in addition to patients with lateral epicondylitis in the literature increases the value of our study.

CONCLUSION

In conclusion, our study demonstrated that combined treatment with conventional physiotherapy and ESWT clinically produced positive effects in patients with epicondylitis and that combined conventional physiotherapy and ESWT provided better clinical outcomes.

Competing Interests: The authors declare that they have no competing interest.

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Ethical Approval: Ethical approval: This study was approved by Aksaray University Ethics Committee. (Date/No: 26.09.2018/178).

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