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Efficacy of kinesio taping versus extracorporeal shock wave therapy in the short term for the calcaneal spur

Nurten NAS KIRDAR[1,*], Tuba KANYILMAZ[2]

[1]Department of Physical Medicine and Rehabilitation, Denizli State Hospital, Denizli, Türkiye
[2]Department of Physical Medicine and Rehabilitation, Çivril Şehit Hilmi Öz State Hospital, Denizli, Türkiye

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Abstract

The calcaneal spur is a common cause of heel pain, and there are various approaches to its treatment. Our aim in this study is to investigate the short-term effectiveness of kinesio taping against Extracorporeal Shock Wave Therapy (ESWT) in the treatment of calcaneal spur. This study was designed as an experimental, prospective and single-center clinical trial. A total of 93 patients with calcaneal spur (18 men, 75 women) were included. Patients were divided into two groups (based on gender, age, BMI, and pain duration) by stratified randomization (kinesio tape group=46, ESWT group=47 patients). 3 sessions of ESWT were applied to the heels of the patients in the 1st group with an interval of 1 week. Kinesio taping was applied to the 2nd group. It was applied once a week, for 3 weeks. Visual Analogue Scale (VAS) and Foot Function Index (FFI) scores of the patients in both groups before the treatment and 1 week after the end of the treatment were recorded. When we evaluated the pre-treatment and post-treatment parameters, we found a significant decrease in VAS, FFI-pain, FFI-disability and FFI-activity restriction scores in both groups (p=0.0001). We also found that kinesio taping was more effective than ESWT in reducing FFI-pain (for after treatment FFI-pain inter group p=0.005, for FFI-pain difference inter group p=0.002) and FFI-disability (for after treatment FFI-disability inter group p=0.023, for FFI-disability difference inter group p=0.0001) scores. To conclude, although both kinesio taping and ESWT treatments reduced patients' pain, disability and activity limitation, kinesio taping was found to be more effective in reducing pain and disability in the short term. Studies with longer follow-up are needed to clarify our results.

Keywords: calcaneal spur, extracorporeal shock wave therapy, kinesio tape, heel pain

1. Introduction

Plantar heel pain is one of the most common feet pains in adults (1). Heel pain has many causes, one of which is a calcaneal spur (2). Studies have shown that the rate of calcaneal spur in the cause of heel pain was found between 30 and 89% (3). Clinical symptoms are inflammation, swelling of the feet, pain and limitations of movement. Treatment options are; nonsteroidal anti-inflammatory drugs, local steroid injections, stretching exercises, acupuncture, iontophoresis, extracorporeal shock wave therapy (ESWT), low-intensity laser therapy, silicone heel pad, medial arc support, night splint, physical therapy modalities, kinesio taping, cold application and rest (4).

Kinesio taping acts by supporting damaged joints and muscles, lifting the skin, increasing lymph and blood circulation, accelerating the removal of inflammatory mediators from the damaged area, and reducing clinical pain. In a recent study investigating efficacy of kinesio taping for plantar fasciitis, Tezel et al. (5) showed that both kinesiotaping and ESWT treatments improved pain levels and quality of life in patients with plantar fasciitis, but kinesio taping also improved functionality. In another study Ercan et al. (6) evaluated the effect of kinesio tape application in addition to extracorporeal shock wave therapy for plantar fasciitis. It was stated that extracorporeal shock wave therapy reduced the pain scores of plantar fasciitis patients in three weeks, but additional kinesio tape application to extracorporeal shock wave therapy did not provide any additional benefit. In the literature, we could not find any studies investigating the effectiveness of kinesio taping in the treatment of calcaneal spur.

Our aim in this study is to investigate the effectiveness of kinesio taping against ESWT, which is a frequently used method in the treatment of calcaneal spur, and to discuss our results in the light of the literature. Our study will be the first study in the literature with this aspect.

2. Materials and Methods

We designed our study as an experimental, prospective and single-center clinical study. Local ethics committee approval was obtained. It has been determined that the effect size obtained in the reference study is strong (d=0.95) (5). As a

*Correspondence: nrtnns@gmail.com

result of the power analysis, it was calculated that if at least 90 people were included in the study, 80% power could be obtained at the 95% confidence level. Thus, a total of 93 patients (46 patients in kinesio tape group, 47 patients in ESWT group) were included in the study. This study was approved by Pamukkale University Non-Interventional Clinical Research Ethics Committee (Date: 13/01/2022, Approval number: E.155512). Participants were informed about the study, and their written informed consent was obtained. The protocol was performed per the ethical standards in the 1964 Helsinki declaration.

2.1. Participants

Patients with a diagnosis of calcaneal spur who applied to the Physical Medicine and Rehabilitation outpatient clinic of Denizli State Hospital between February 2022 and July 2022 were included in the study. Inclusion criteria: to be 18-70 years old, heel pain persisting for at least 4 weeks, presence of radiologically detected calcaneal spur, medical treatment, cold application and stretching exercises have been applied but have not benefited. Exclusion criteria: history of acute trauma to the foot, history of injection in the heel (steroid, PRP (platellet rich plasma), etc.), history of foot surgery, inflammatory rheumatic diseases, neurological diseases (polyneuropathy, radiculopathy, etc.), pregnancy, malignancy.

2.2. Method

Age, gender, body mass index, and duration of heel pain of the patients included in the study were noted. The patients were allocated to both groups by stratified randomization (according to gender, age, BMI, and duration of pain). In terms of variables, our groups were as follows;

1- female, male,

2- age (18-45 years, 46-65 years, 66-70 years),

3- BMI (<18.5, 18.5-24.9, 25-30, >30 kg/m2),

4- duration of pain (4-12 weeks, >12 weeks).

Patients were requested not to take any analgesics and/or NSAIDs during the course of the study. 3 sessions of ESWT were applied to the heels of the patients in the 1st group with an interval of 1 week (with Chattanooga Intelect RPW device, 10 Hz, 3.2 bar, 2000 beats to the heel). Kinesio taping was applied to the 2nd group (Tmax Kinesiology Tape cotton, standard 5.0 cm tape). It was applied once a week, for 3 weeks. During the taping, the patient was in a prone position with the knee joints at 90° of flexion and the ankle joints at a neutral position. The tape was cut longitudinally into four slices of equal width. It was applied to the forefoot by stretching it by 25% (7). Visual Analogue Scale (VAS) and Foot Function Index (FFI) scores of the patients in both groups before the treatment and 1 week after the end of the treatment were recorded (8, 9). Foot function index consists of 23 items with 3 subgroups; pain, disability, and limitation of activity. Nine item-containing pain subscale measures the level of foot pain in a variety of situations. With the disability subscale containing 9 items, the foot depending on the problems, the degree of difficulty in performing various functional activities is determined. Containing five items with activity limitation subscale; due to foot problems activity limitations are evaluated.

2.3. Statistical analysis

All statistical analyses were performed using SPSS 25.0 (IBM SPSS Statistics 25 software (Armonk, NY: IBM Corp.)) software. Continuous variables were defined by the mean ± standard deviation, median, interquartile range (25.-75. percentiles), minimum- maximum values and categorical variables were defined by number and percent. In examining the differences between the groups, when the parametric test assumptions were met, Independent samples t test was used. When the parametric test assumptions were not met, Mann Whitney U test was used. In examining dependent group differences, when the parametric test assumptions were met, Paired samples t test was used. When the parametric test assumptions were not met, Wilcoxon Signed Rank test was used. Differences between categorical variables were analyzed by Chi-square analysis. Statistical significance was determined as $p<0.05$.

3. Results

A total of 93 patients (18 men, 75 women) were included in this study. The mean age of the patients was 47.48 years (min 23- max 70). The mean body mass index (BMI) was 30.77 kg/cm2. The number of patients with pain duration between 4-12 weeks was 43, and the number of patients with pain longer than 12 weeks was 50.

Table 1 shows that there is no statistically significant difference between the two groups in terms of age, BMI, gender and pain duration.

Table 1. Demographic characteristics of groups

		Kinesio tape (n=46)			ESWT (n=47)			Inter group p
		Mean±S.D	Med (IQR)	Min.-Max.	Mean±S.D	Med (IQR)	Min.-Max.	
Age		48.67±10	48.5(42.75-56.25)	26-69	46.32±8.96	46 (40- 53)	23- 70	0.235 (t=1.196)
BMI		31.03±4.42	30 (27.7-34.03)	24.6-44	30.5±4.14	30 (27.6- 32.8)	21- 43.8	0.721 (z=-0.358)
Gender (n%)	**Male**	6 (13%)			12 (25.5%)			0.127 (cs=2.323)
	Female	40 (87%)			35 (74.5%)			
Duration (n%)	**>12 weeks**	26 (56.5%)			24 (51.1%)			0.598 (cs=0.279)
	4-12 weeks	20 (43.5%)			23 (48.9%)			

ESWT: Extracorporeal shock wave therapy, BMI: Body mass index, S.D: Standard deviation, Med (IQR): Median (25.–75. Percentiles); t: Independent samples t test; cs: Chi Square test

When we evaluated the pre-treatment and post-treatment parameters, we found a significant decrease in VAS, FFI-pain, FFI-disability and FFI-activity restriction scores in both groups (p=0.0001). We also found that kinesio taping was more effective than ESWT in reducing FFI-pain (inter group p for after treatment FFI-pain=0.005, for FFI-pain difference=0.002) and FFI-disability (inter group p for after treatment FFI-disability=0.023, for FFI-disability difference=0.0001) scores. The results of the evaluation parameters of the groups before and after the treatment and the comparison of both groups are shown in Table 2.

Table 2. The results of the evaluation parameters of the groups before and after the treatment and the comparison of both groups

	Kinesio tape (n=46)		**ESWT (n=47)**		
	Mean±S.D	**Min.-Max.**	**Mean±S.D**	**Min.-Max.**	**Inter group p**
b.t. VAS	8.09±1.43	4-10	7.77±1.73	3-10	0.346 (z=-0.943)
a.t. VAS	4.91±1.36	1-7	5.47±1.38	1-8	0.054 (z=-1.929)
Intra Group p		**0.0001*** (z=-5.908)		**0.0001*** (z=-5.712)	
VAS difference	3.17±1.39	-1-6	2.3±1.55	-1-5	**0.004*** (z=-2.858)
b.t. FFI1	70.34±11.16	47.1-92.8	68.88±16.08	32.8-100	0.612 (t=0.509)
a.t. FFI1	45.02±10.99	21.4-67.1	52.74±4.38	21.4-82.2	**0.005*** (t=-2.904)
Intra Group p		**0.0001*** (t=13.896)		**0.0001*** (t=7.104)	
FFI1 difference	25.32±12.36	-8.6-50	16.14±15.58	-10.9-51.4	**0.002*** (t=3.143)
b.t. FFI2	67.75±15.26	22.9- 90	63.03±16.51	18.8-91.1	0.124 (z=-1.538)
a.t. FFI2	43.4±12.93	12.2- 76.6	50.24±15.39	8.8-78.8	**0.023*** (t=-2.318)
Intra Group p		**0.0001*** (z=-5.512)		**0.0001*** (t=6.744)	
FFI2 difference	24.34±15.55	-26.7-50	12.79±13	-20- 45.6	**0.0001*** (z=-4.005)
b.t. FFI3	38.66±10.05	23.3-66.6	32.52±14.04	3.3-66.6	**0.014*** (z=-2.464)
a.t. FFI3	23±11.47	10-73.3	24.79±9.45	3.3-46.6	0.14 (z=-1.477)
Intra Group p		**0.0001*** (t=11.157)		**0.0001*** (z=-4.515)	
FFI3 difference	15.65±9.52	-13.3- 36.7	7.73±9.58	-6.7-33.3	**0.0001*** (z=-4.02)

*p<0.05 statistically significant; For Inter group p t: Independent samples t test; z: Mann Whitney U test; For Intra group p t: Paired samples t test; z: Wilcoxon Signed Rank test, ESWT: Extracorporeal shock wave therapy, b.t.: before treatment, a.t.: after treatment, VAS:visual analogue scale, FFI: foot function index, FFI1: pain FFI2: disability, FFI3: limitation of activity

4. Discussion

In this study, we investigated the short-term effectiveness of kinesio taping against ESWT in the treatment of calcaneal spur and found that there was a statistically significant reduction in pain, disability and activity limitation with both treatment methods. In addition, we found that kinesio taping was more effective than ESWT in reducing pain and disability in the short term.

On the other hand, 75 (80.6 %) of the patients included in the study were women and the mean BMI of the patients was 30.77 kg/cm2. There are also studies in the literature showing that female gender and obesity are risk factors in the formation of calcaneal spurs (10). Our results also support the literature on this subject.

In the treatment of calcaneal spur, ESWT has been used for a long time and its effectiveness has been shown (11–15). Although it has some mild side effects (pain, minor hematoma, vs.), it is generally a safe and beneficial treatment option (16). Therefore, it is often compared to ESWT when a new treatment option is explored (5, 17). The short-term effectiveness of kinesio taping against ESWT has been demonstrated in our study, which will make it more preferable as a treatment option. When we offer ESWT as an option in the treatment of calcaneal spur, we find that most patients have concerns that the procedure may be painful. In this respect, kinesio taping treatment comes to the fore a little more. Because there is no pain during or after the procedure.

Kinesio taping is a taping method that has been used in sports injuries and musculoskeletal pain since the 1970s. Kuyucu et al. (18) investigated the effect of kinesiotaping in calcaneal apophysitis seen in male athletes and found that it was effective in restoring foot function but had a limited effect in reducing pain. A meta-analysis of 84 studies concluded that available evidence does not support the use of Kinesio taping applied to the ankle for improvements in functional performance, regardless of population (19). In another study, it was stated that the use of kinesio taping as an alternative to medical treatment or in combination with medical treatment would be beneficial (20). We see that there are opposite views in the literature about kinesio taping. A few studies have emphasized the need for high-quality, placebo-group studies (21, 22).

In this study, we came to a conclusion by evaluating the scales of the patients before and 1 week after the treatment. In this way, we have seen that kinesio taping is effective in a short time. However, we believe that the results may be different in longer follow-ups. The fact that our total follow-up period was 4 weeks can be considered as a limitation of the study. We think that studies with longer follow-up periods are needed to clarify our results. Another limitation of our study is the absence of a control group.

In conclusion, our study is the first to investigate the effectiveness of kinesio taping in the treatment of calcaneal spur, and our results will contribute to the literature. Kinesio

tape is a good and effective treatment option in the treatment of calcaneal spur due to its ease of application, cost effectiveness and tolerability, and the absence of side effects such as pain or hematoma.

Ethical statement

This study was approved by Pamukkale University Non-Interventional Clinical Research Ethics Committee (Date: 13/01/2022, Approval number: E.155512).

Conflict of interest

None to declare.

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Authors' contributions

Concept: N.N.K., T.K., Design: N.N.K., T.K., Data Collection or Processing: N.N.K., T.K., Analysis or Interpretation: N.N.K., T.K., Literature Search: N.N.K., T.K., Writing: N.N.K.

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