

COMPARISON OF KINESIOLOGIC TAPING AND EPICONDYLITIS ORTHOSIS APPLICATION IN THE TREATMENT OF LATERAL EPICONDYLITIS: PROSPECTIVE OBSERVATIONAL STUDY

Lateral Epikondilit Tedavisinde Kinesiyolojik Bantlama ve Epikondilit Ortezi Uygulamasının Karşılaştırılması: Prospektif Gözlemsel Çalışma

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ABSTRACT

Objective: Lateral epicondylitis is a clinical condition causing pain, sensitivity, functional disability in the elbow. The treatment approach is mostly conservative. We aimed to evaluate the effectiveness of kinesio taping versus epicondylitis orthosis in the treatment.

Material and Methods: Eighty patients (51 female, 29 male; mean age 39.5±7.4) who were diagnosed lateral epicondylitis were enrolled to our study. Patients were randomly allocated two groups; epicondylitis orthosis and kinesio taping were applied group 1 and group 2. Visual analog scale (VAS) for pain severity, goniometric measurement of range of motion for clinical assessment, disability assessment (arm, shoulder and hand problems questionnaire: QUICK DASH (QD) for upper extremity function, Short Form-36 (SF-36) scale for quality-of-life assessment were used as used in the study. Before treatment and 1th, 4th weeks variances of values were compared between groups.

Results: There were improvement in VAS scores, SF-36 physical function (PF) and mental health (MH) subgroups, Quick Dash Function/Symptoms questions (QD FS) and work (W) subgroups scores of Group 2 was significantly higher than scores of Group 1 (p<0.05). However, within the groups, there were significant differences in VAS, QD FS and W scores, SF 36 subgroups scores between before treatment and after treatment at 4 weeks follow up (p<0.05).

Conclusion: Our study results show that both of treatment applications are effective in reduce pain, upper extremity function and quality of life in patients with lateral epicondylitis. maybe kinesio taping application preferred for short-term and rapid effect compared to epicondylitis orthosis for the relief of pain.

Keywords: Elbow Pain; Epicondylitis Orthosis; Lateral Epicondylitis; Kinesologic Taping

ÖZET

Amaç: Lateral epikondilit, dirsekte ağrı, hassasiyet ve fonksiyonel kısıtlılığa neden olan bir klinik durumdur. Tedavi yaklaşımı çoğunlukla konservatiftir. Biz bu çalışmada, lateral epikondilit tedavisinde kinesiyolojik bant ile epikondilit ortezinin etkinliğini değerlendirmeyi amaçladık.

Gereç ve Yöntemler: Çalışmamıza, lateral epikondilit tanısı konan 80 hasta (51 kadın, 29 erkek; yaş ortalaması 39,5±7,4) dahil edildi. Hastalar rastgele iki gruba ayrıldı: birinci gruba epikondilit ortezi, ikinci gruba ise kinesiyolojik bant uygulandı. Ağrı şiddeti için Vizüel Analog Skalası (VAS), klinik değerlendirme için eklem hareket açıklığı gonyometrik ölçümü, üst ekstremitte fonksiyonu için Kol, Omuz ve El Sorunları Anketi (QD) ve yaşam kalitesi değerlendirmesi için SF-36 (Short Form 36) ölçeği kullanıldı. Tedavi öncesi ile tedavi sonrası 4. haftada değerler gruplar arasında karşılaştırıldı.

Bulgular: Grup 2'nin (kinesiyolojik bant) VAS skorları, SF-36 Fiziksel Fonksiyon (FF) ve Mental Sağlık (MS) alt grup skorları ile Quick Dash (QD) Fonksiyonel Durum (FD) ve İş (İ) alt grup skorları Grup 1'e (epikondilit ortezi) göre anlamlı derecede daha yüksek iyileşme gösterdi (p<0,05). Ayrıca, her iki grup içinde, VAS, QD FD ve İ skorları ile SF-36 alt grup skorlarında tedavi öncesi ile 4 haftalık takip sonrası arasında anlamlı farklılıklar mevcuttu (p<0,05).

Sonuç: Çalışmamızın sonuçları, her iki tedavi yönteminin de lateral epikondilitli hastalarda ağrıyı azaltma, üst ekstremitte fonksiyonunu iyileştirme ve yaşam kalitesini artırmada etkili olduğunu göstermektedir. Kinesiyolojik bant uygulamasının, ağrı giderimi için epikondilit ortezine kıyasla kısa süreli ve hızlı etki açısından tercih edilebileceği düşünülmektedir.

Anahtar Kelimeler: Dirsek Ağrısı; Epikondilit Ortezi; Lateral Epikondilit; Kinesiyolojik Bantlama

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INTRODUCTION

Lateral epicondylitis is a clinical condition causing pain and sensitivity in musculotendinous adhesion regions of wrist extensor muscles originated from the lateral epicondyle of the humerus as a result of repetitive stress due to overuse (1-3). The causes of lateral epicondylitis are repetitive stress, tendon injury, and overuse of the wrist extensors, which leads to tendinosis, microtrauma, and tendon tear (1,2).

Currently there is not gold standard treatment protocol in lateral epicondylitis. Treatment approach is primarily conservative. The basic principle of treatment of lateral epicondylitis is to reduce excessive and repetitive overload for the upper extremities and increase the level of functional activity by modifying their daily activities. There are patient education, rest, activity modification, orthosis application (hand-wrist, elbow orthosis, epicondylitis orthosis), corticosteroid injections, the use of electrotherapy agents (analgesic currents, ultrasound, laser), ice massage and exercise program among traditional conservative treatment approaches applied in lateral epicondylitis (1,2). These interventions aim to alleviate pain, reduce inflammation, and promote healing of the affected tissues (4). In recent years, manual therapy and eccentric strengthening exercises have been found to be quite beneficial in the treatment of lateral epicondylitis, with complementary techniques such as shockwave therapy, bandaging, and kinesio taping also being added (5). In a current study ekstrakorporeal shock wave therapy and high intensity laser therapy were found to be effective for lateral epicondylitis (6). Within the conservative treatment options, forearm counter-force brace (forearm support band = tennis elbow brace = Epicondylitis orthosis) is commonly used. This orthosis reduces the pressure applied on the extensor muscles through creating a false origin to forearm muscles of the person at the distal radial head. Epicondylitis orthosis works in two ways to reduce pain and promote healing. First, it gently squeezes the forearm muscles, limiting their full contraction. This reduces the pulling force on the tendons near the elbow, easing tension. Second, the brace applies pressure directly to the extensor carpi radialis brevis muscle, potentially creating a stabilizing anchor point. Additionally, the support from the brace may

improve your sense of joint position (proprioception), leading to better movement mechanics, less overuse, and potentially a higher pain tolerance. The use of a brace increases proprioception, thereby improving the biomechanics of the joint, reducing overuse, and increasing the pain threshold (4). In addition, tendon heat is maintained with orthosis approach, proprioceptive feedback is provided, increased stress on extensor carpi radialis brevis muscle (7).

Kinesio taping (KT), as a noninvasive popular therapy to relief pain and treat muscular dysfunction, was first designed by Dr Kase in 1973. KT works through activating door control and descending inhibitory mechanisms with sensory stimulation in relieving pain by reducing swelling and inflammation. In addition, it creates an analgesic effect by regulating superficial and deep fascia functions (8). KT works in several ways to promote healing and improve function. It can help balance muscle activity by calming overly tight muscles and supporting weaker ones. The tape may also improve vascular and lymphatic circulation by encouraging blood and fluid flow in the area. Additionally, KT can provide gentle support to improve joint movement and potentially reduce pain by creating a slight lifting effect under the skin, giving more space for tissues underneath (9). It has been reported that KT may be able to not only relieve pain but also enhance functional status in patients with several kinds of musculoskeletal disorders (10).

KT and epicondylitis orthosis are inexpensive, effective and easily applicable treatments for lateral epicondylitis. The aim of our study is to compare the effectiveness of KT and epicondylitis orthosis in lateral epicondylitis treatment. We hypothesize that there will be a significant difference in pain reduction and functional improvement between patients with lateral epicondylitis treated with KT versus those treated with epicondylitis orthosis application, with the former group experiencing greater efficacy due to enhanced biomechanical support and facilitation of tissue healing

MATERIALS AND METHOD

This study is a prospective, observational clinical trial. This research has been approved by the ethics committee of the authors' affiliated institutions. (ethics approval number: B.30.2.YBÜ.006.06.01/127/)

December 24, 2012 . All patients were informed about the study in detail and a written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki.

This prospective study included 90 patients aged 27-64 who were admitted to our physical therapy and rehabilitation outpatient clinic with elbow pain and diagnosed with lateral epicondylitis between January-June 2013. Inclusion criteria were; having ongoing elbow pain for one month and being diagnosed with lateral epicondylitis. The exclusion criteria were identified as bilateral symptoms, cervical spine or other upper extremity pathologies, history of upper extremity surgery, trauma and fracture to the elbow, malignancy, dementia or other psychiatric illness, having physical therapy or injections for the elbow over the last six months.

Patients were divided into 2 group to either the epicondylitis orthosis+ exercise group 1 or the Kinesio tape+ exercise group 2 at a ratio of 1:1 using randomization with closed envelope method.

The research staff excluded patients based on physical examination and clinical tests. Patients received both verbal explanation and an informational sheet detailing the aims and nature of the study. Data including patient demographics, level of education, occupation, and clinical characteristics of patients were recorded. The patients were examined and followed up by the same doctor.

82 patients without exclusion criteria and who agreed to participate in the study and signed the consent form were included in the study. The study flow chart is shown in Figure 1.

Both groups were treated and measurements before (at baseline) and after treatment at 4 weeks were evaluated by the same physician.

Epicondylitis orthosis was applied to the 1st group. It was said to continue to use of epicondylitis orthosis for 3 weeks and remove only at nights. Patients were called for control once a week, 3 times in total. The upper edge of the orthosis was placed 2-2.5 cm distal to the manually palpable lateral epicondyle (Figure 2). The KT (Kinesio Tex Gold) was applied to the patients by doctor for 3 times with a renewal per week for total 3 weeks. The application method for lateral

epicondylitis, as suggested by Kaze et al., involves placing the primary strip along the extensor muscles, with a secondary strip positioned vertically to the first one on the proximal forearm (Figure 3) (8). The primary strip was utilized to inhibit the targeted muscles, while the secondary strip was employed to address fascial correction. The patient's elbow was positioned in extension with the wrist in ulnar deviation and flexion. Two Y-shaped strips of tape were utilized. The anchor of the first strip was secured to the wrist. The tape was then stretched to approximately 30% of its available tension and the tails were laid down without tension. Pressure was applied to the tape surface to ensure proper adhesion. The second strip was applied distally and anteromedially to the lateral epicondyle without initial tension. Subsequently, approximately 30% tension was applied to each tail, crossing the wrist extensors. The tails were then laid down at the ulnar border without tension, and pressure was applied to the tape surface to establish adhesion (8).

Both groups were given exercise program included elbow range of motion and stretching exercises 3 sets of 10 repetitions, twice a day, for 4 weeks , and compliance with the exercises was checked by phone calling once a week. Patients allowed to use paracetamol in case of need. Both groups were recommended to perform repetitive elbow and wrist movements to the affected side elbow and to avoid heavy lifting and possible trauma as a modification of daily living activities.

Pain scale Visual Analogue Scale (VAS), disability assessment (arm, shoulder and hand problems questionnaire: QD questionnaire), quality of life scale SF-36 (Short form-36) were used as evaluation parameters in the study.

Pain was evaluated with VAS. VAS is a simple, inexpensive, easily applicable, subjective method that can be easily understood by the patient and can evaluate pain in the last 24 hours (11). Patients were told what the numbers mean on a 10 cm horizontal line. 0 was stated as no pain, 10 as the most severe pain experienced in life. The patients were asked to define the severity of their pain on the scale by questioning separately VAS for pain at rest, VAS at night for pain at night, and VAS movement for pain during activities of daily living. QD (Disability of the Arm, Shoulder, and Hand) is a scale in which upper extremity disability and

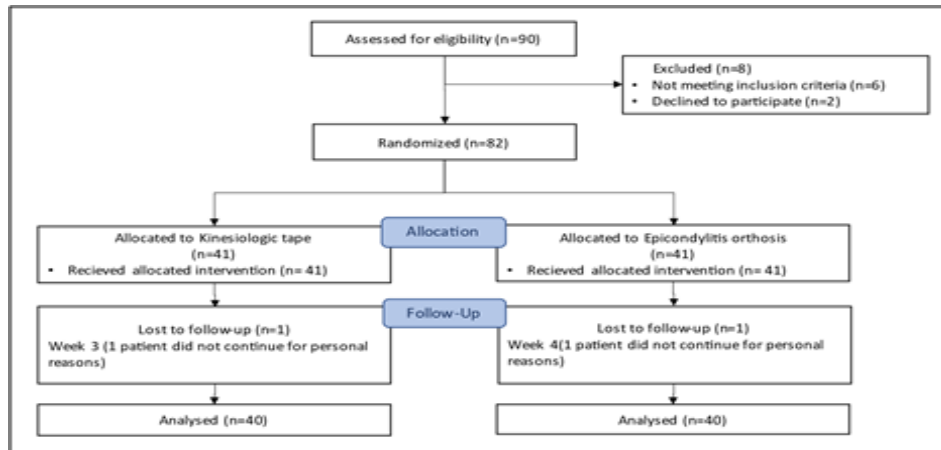


Figure 1. Flow Diagram of the Study



Figure 2. KT application was applied from the origin of the forearm extensor muscles to the insertion using a muscle inhibition technique as a longitudinal Kinesio-tape strip and additionally a transverse elbow band was applied using the 'facial correction' technique.



Figure 3. Epicondylitis orthosis; The upper edge of the orthosis was placed 2-2.5 cm distal to the manually palpable lateral epicondyle.

symptoms can be assessed as region-specific and patient is able to do by himself. It is a criterion whose validity and reliability in Turkish have been demonstrated (12). Negative changes, i.e., decrease, in QD score indicates the improvement level. The questionnaire is commonly used to investigate improvement in patients with upper limb disorders. QD function questions/symptoms (FS) and QD work model (W) parameters, intra-group and inter-group values were compared before and after treatment.

SF-36 is a generic quality of life assessment scale, and its reliability and validity have been shown in musculoskeletal diseases (13,14). We utilized the SF-36 health survey form to assess the quality of life among patients. This survey comprises 36 items and encompasses eight subscales: physical functioning, physical role limitations, bodily pain, general health perceptions, vitality, social functioning, emotional role limitations, and mental health. Scores for each

subscale ranged from 0 to 100. Higher scores indicated better quality of life. Turkish validity and reliability of the short form 36 (SF 36) questionnaire has been demonstrated by Demiral et al (14).

Sociodemographic characteristics of all patients including age, sex, body mass index (BMI), disease duration, dominant hand and affected side were recorded.

Outcomes are the change of VAS, disability assessment arm, shoulder and hand problems questionnaire (QD questionnaire), quality of life scale SF-36, from baseline to scores at follow up 4 weeks. Primary outcome measure included changes in pain using the VAS while secondary outcome measure was functional and quality of life recovery. No post-treatment complications were seen in any of the patients.

Statistical Analysis

The data obtained in this study were analyzed using

version of the 20 Statistical Package for the Social Sciences (IBM Corp®, Armonk, New York, USA). For the evaluation of the data, independent samples to test were used for the comparison of parameters with normal distribution, Mann-Whitney U test was used for the intergroup comparison of parameters without normal distribution and Chi-square test was used for qualitative comparison of the groups. Paired t-test and the Wilcoxon test were used for the comparison of treatment efficacy within the groups. McNemar test was used for determining whether there is a relationship between categorical dependent variables. The statistical significance level in this study was $P < 0.05$.

RESULTS

82 patients diagnosed with lateral epicondylitis were included into the study. Two patients from each of two groups did not respond to our follow-up attempts. 41 patients (50.0%) were randomized to treatment with epicondylitis orthosis, 41 (50.0%) to KT application. 64% of patients ($n = 51$) were female, 36% ($n = 29$)

were male. There were 25 females and 15 males in the group of epicondylitis orthosis application, and there were 26 female and 14 male patients in the group of KT application.

Demographic characteristics of the groups are shown in Table 1.

No statistically significant differences were found between groups in terms of age, sex, BMI, occupation, duration of complaint, and the dominant side ($p > 0.05$). The incidence of disease at the dominant side was greater in both groups.

Within both of epicondylitis orthosis group and kinesio taping group, a statistically significant improvement was found in resting pain VAS, night pain VAS, and motion pain VAS values, QD scores before and after treatment ($p < 0.001$) (Table 2).

There was no significant difference between VAS scores rest, night and movement between the two groups before treatment ($p > 0.05$). VAS changes within the groups and between the groups were compared before and after the treatment. There was a significant difference in terms of VAS rest ($p = 0.049$), night

Table 1. Clinical and demographic characteristics of patient groups

	Group 1 (n:40) (Epicondylitis orthosis)	Group 2(n:40) (Kinesio logic tape)	P
Age (med.±SD)	39.53 ± 7.473	39.45±8.243	0.966**
Sex (male/female)	15/25	14/26	0.060*
BMI (med.±SD)	26.50 ± 2.818	25.67 ± 3.016	0.214**
Complaint duration(Month) Median(Min-Max)	5.50 (1-24)	5.5 (1-36)	0.981***
Job (housewife/retired/officer/employee)	11/4/10/15	14/3/11/12	0.444**
Dominant side (right/left)	34/6	36/4	-
Affected side (right/left)	25/14	27/12	0.287*

*Chi-Square Test, **Independent Sample T Test, *** Mann Whitney U Test, (BMI: body mass index), SD: standard deviation, med: median.

Table 2. Comparison of before treatment and after treatment in VAS scores in Group 1 and Group 2

Group 1	Before treatment(BT)	After treatment(AT)	p
	Median(Min-Max)	Median(Min-Max)	
VAS rest	3 (0 - 7)	2 (0 - 6)	0.001
VAS night	5 (0 - 7)	3 (0 - 7)	0.001
VAS movement	9 (7 - 10)	6 (3 - 9)	0.001
Group 2	BT	AT	
VAS rest	4 (0 - 6)	0 (0 - 6)	0.001
VAS night	5 (0 - 8)	0 (0 - 7)	0.001
VAS movement	9 (7 - 10)	4 (2 - 9)	0.001

*Wilcoxon test, * $p < 0.05$: significant value, (VAS: Visual analog scale), min-max: minimum/maximum

($p=0.041$) and movement ($p<0.001$) between 1st group and 2nd group after treatment.

For the evaluation of daily life activities, intra-group and inter-group difference of values of SF-36 subscale were examined before and after the treatment. When difference of values of SF-36 subscales between Group 1 (epicondylitis orthosis group) and Group 2 (KT group) before and after the treatment; there were significant difference in terms of SF-36 physical function (PF) subscore difference of value ($p<0.05$). Accordingly, a statistically significant improvement was observed in SF-36 PF subscore of kinesio taping group compared to Group 1 ($p=0.007$). Improvement in subsection SF 36 mental health (MH) after treatment was also detected as more significant in KT group ($p=0.004$). There was no significant difference in terms of RF (physical role limitation), P (pain), GH (general health), V (vitality: energy), SF (social function), RE (emotional role difficulties) difference of values within SF 36 subgroups between Group 1 and Group 2 before and after the treatment ($p>0.05$). When the patient groups were evaluated, better improvement in QD FS, W scores of Group 2 (kinesio taping group) was detected compared to Group 1. ($p=0.005$). The other parameters were improved in both groups. However, it was statistically

more significant in this Group 2 $p=0.001$ (Table 3).

DISCUSSION

Lateral epicondylitis is a clinical presentation localized to the lateral epicondyle of the elbow and characterized by pain which can be spread to the distal of forearm. There are several conservative treatment modalities for lateral epicondylitis but it is still controversial which option is the most effective (2). We have conducted this study to verify whether KT application is a preferable method compared to epicondylitis orthosis in treatment of lateral epicondylitis.

According to the results of our study, evaluation parameters were similar between groups either immediately or after 4 weeks. However, only functional scores work scores of QD questionnaire, VAS during activity and physical function score of SF 36 subgroups was statistically significant improvement in KT group.

In the literature, Waseem et al showed that lateral epicondylitis is common among both men and women (15). Stasinopoulos et al. stated that the disease is more prolonged and more severe in women (16). In our study statistically no significant difference was found between the two groups in terms of gender. Our results were similar with literature in terms of age and

Table 3. Comparison of variations in follow-up parameters of Group 1 and Group 2

Clinic Parameters	Group 1	Group 2	p
	Median (Min.-Max)	Median (Min.-Max)	
VAS Rest	-2 (-4 - 2)	-3 (-5 - 0)	0.049
VAS Night	-2 (-7 - 1)	-3 (-7 - 0)	0.041
VAS Movement	-3 (-6 - 0)	-4 (-6 - 0)	0.000
SF 36 PF	30 (-10 - 70)	15 (-10 - 75)	0.007
SF 36 RP	50 (-50 - 100)	50 (-25 - 100)	0.269
SF 36 BP	21.5 (-11 - 62)	22.5 (-1 - 53)	0.353
SF 36 GH	10 (-45 - 52)	2.5 (-40 - 55)	0.752
SF 36 VT	12.5 (-20 - 50)	0 (-20 - 55)	0.451
SF 36 SF	0 (-25 - 50)	12.5 (0 - 75)	0.059
SF 36 RE	0 (-100 - 100)	0 (-30 - 100)	0.334
SF 36 MH	6 (-12 - 40)	0 (-12 - 28)	0.004
QD FS	-24.75 (-43.2 - 18.2)	-36.50 (-51.3 - 0.5)	0.005
QD W	-25 (-50-0)	-50(-63-0)	0.001

*Mann Whitney U Test, * $p<0.05$ significant value, (SF: Short form, PF: Physical Function, RP: Physical Role Limitation, BP: Body Pain, GH: General Health, VT: Vitality-Energy, SF: Social Function, RE: Role Limit-Emotional, MH: Mental Health, QD FS: Quick Dash Function / Symptoms questions, QD W: Quick Dash Work), min: minimum, max: maximum.

sex distribution.

KT is one of the nonsurgical treatment methods used frequently in the treatment of lateral epicondylitis management in recent years. Giray et al. reported that KT in addition to exercises is more effective than sham taping and exercises only in improving pain in daily activities and arm disability due to lateral epicondylitis (17). Liu et al. applied muscle inhibition technique, which is commonly used in KT and observed that muscle movement after taping was reduced compared to pre-taping condition (18). In our study, we identified a significant reduction in pain of the patients receiving KT application after treatment. We associated these results with limitation of muscle movement and provision of muscle relaxation by KT application.

Research focusing on kinesio taping's immediate effects highlighted enhancements in resting pain intensity and functionality (19,20). Goel et al. applied a transverse kinesio tape strip for fascial correction alongside a longitudinal kinesio tape strip on the forearm extensor muscles (19). This transverse application has been suggested to enhance pain reduction, particularly when used to complement the longitudinal tape (8). In our study, additionally we incorporated a 'fascial correction' strip tape to the forearm extensor muscles and a longitudinal KT strip. Our conception affects pain control positively by increasing exercise compliance. These enhancements may stem from a neurophysiological mechanism, wherein tactile stimulation of the skin and subcutaneous tissue can modify nociceptive signals, alleviating pain and enhancing muscle activity (9).

Epicondylitis orthosis is also one of the popular and an easy-to-apply treatment method in lateral epicondylitis (LE). It is also known as a forearm band and reduce extensor muscles' activity in the wrist during movements (21). Meyer et al. reported that using a brace to treat LE decreases the muscle load and reduces pain, leading to a stronger muscle contraction and increasing grip strength (22). In our study we also found pre and posttreatment significant improvements in KT and epicondylitis orthosis groups patients' pain, functions, and quality of life. In a study Kachanathu et al. showed that the application of forearm band in LE treatment provides significantly better functional improvement than elbow taping and conventional

therapy (9). Unlike, Phadke et al. showed that KT and counterforce braces are equally effective pain and decreasing disability in patients with LE (23). Our study had similarly affect on pain, function and quality of life for both applications, only duration of effect was different between groups.

Liu, Goel, and Shamsoddini et al, showed significant reduction in VAS scores with KT application (18-20). In our study, changes in VAS rest, VAS night and VAS movement levels were assessed within the group and between groups before and after the treatment. In both groups, the subgroup analysis revealed a significant decrease in pain level. Significantly greater improvement in pain level was detected in the group with KT application compared to the group treated with epicondylitis orthosis in shorter time frame.

When we consider the limitations our study involved a short follow-up period of four weeks and included two groups' comparisons: kinesio taping and epicondylitis orthosis. The absence of a control group precluded the assessment of the comparative effectiveness between the two therapeutic methods. Other limitations included the lack of blinding, qualitative feedback from patients, absence of a non-treatment or routine care group, and the inability to evaluate long-term outcomes.

CONCLUSION

The results of this study show that KT and epicondylitis orthosis have similar beneficial effects in patients with lateral epicondylitis. In this study, we found that the application of KT contributed to the short-term resting, night and motion pain VAS scores, upper extremity functional status, physical function subdimension of the quality of life scores of the lateral epicondylitis patients.

We think that KT application is an effective treatment for rapid reduction in pain and increasing daily activities, therefore our study will provide contribution to the literature on this subject. A large-scale prospective randomized clinical trial with a control group and a longer-term follow-up is needed in the literature. Clinicians need a guide about the future applications, appropriate taping techniques and application time.

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