The Effect of Kinesio Taping on the Hand Functions and Symptoms in Patients with Hand Osteoarthritis (a Preliminary Study)

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ABSTRACT

Objectives: Hand osteoarthritis is one of the most common diseases in older adults, with negative consequences in the daily life. This study was aimed to investigate the effect of Kinesio Taping on the hand functions and symptoms in patients with hand osteoarthritis. Methods: A total of 9 subjects, in the age range of 64 to 75, participated in a quasi-experimental study. All the patients were assessed three times using Numeric pain rating scale, Pinch gauge, Dynamometer, and Goniometer. Wilcoxon's signed rank test was also used for the statistical analysis. Results: Analysis of data at post intervention assessment revealed a significant improvement in pain, grip, and pinch strength, as well as the range of motion. In addition, the follow up analysis showed a significant change, as compared to the initial analysis. Discussion: It seems that Kinesio Taping has a positive effect on improving the hand functions and symptoms in patients with hand osteoarthritis. Given the lack of information in this area, further research is needed.

Key Words: Hand Osteoarthritis, Kinesio Taping, Pain, Range of Motion, Grip and Pinch Strength.

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INTRODUCTION

Hand osteoarthritis (HOA) is one of the most prevalent forms of osteoarthritis [1]; it typically involves the inter phalangeal and carpometacarpal joints [2]. Individuals with HOA experience pain, loss of the range of motion, joint stiffness, reduced muscle strength including grip and pinch strength, increased fatigue, and decreased resistance [3-5]. These complications may lead to the decline in hand-related daily tasks such as grooming, eating, cleaning, cooking, driving, dressing, bathing, etc., which all require the use of hands to handle heavy objects or manipulate small items [6]. Other functional consequences are reduced mobility, activity limitations, and participation restrictions, leading to the reduced work ability and the increased dependency [7-9].

There is currently no cure for osteoarthritis disease. Management of HOA consists of non- pharmacological and pharmacological interventions [4]. Rehabilitative interventions are often used to maintain or regain a person's maximum function. They include treatments such as exercise, splints, joint protection principles, control of edema, use of physical agents as such as cooling or heating, and electrotherapy [5, 10]. Most of these interventions can be enhanced by using adjunct techniques such as kinesio taping (KT) for maximizing the recovery.

Kinesio tape has benefits for pain reduction, joint approximation, and improvement of joint alignment, the range of motion and strength [11, 12]. To the best of our knowledge, the effects of kinesio taping have not been investigated adequately in HOA. One study, however, addressed effects of applying KT, as compared with

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orthotic treatment, in patients with HOA. The results showed that both interventions significantly improved pain and function, but only a significant improvement in stiffness was found for KT [13]. Another case report study revealed that mobilization with the movement technique in combination with kinesio taping led to the improvement of pain, ROM, grip force, and daily activities in the patients with HOA [14]. Some studies have investigated the effects of KT in patients with Rheumatoid Arthritis. These studies have revealed that applying kinesio tape can improve the range of motion, hand- grip strength, and hand functions [15-17]. Despite the increasing number of studies investigating conservative intervention in patients with HOA, there are few studies related to KT, and the available evidence supporting KT use is not sufficient. Therefore, the purpose of this study was to assess the effect of kinesio taping on the hand functions and symptoms in patients with hand osteoarthritis.

METHODS

Participants

Based on convenience sampling, a total of 9 individuals with hand osteoarthritis participated in this clinical study. Participants were recruited from retirement homes in Tehran, Iran. Inclusion criteria were as follows: 1) being older than or equal to 60 years, 2) having been previously diagnosed with OA of the hand, 3) being stable at least 4 weeks before and during the period of the study, 4) considering the absence of cognitive deficits, 5) currently not receiving another specific rehabilitation intervention, 6) not suffering from neurological pathologies, or severe visual or sensory deficits.

Procedure

This study was approved and also granted by Baqiyatallah University of Medical Sciences (Ethics Code: IR.BMSU.REC.1396.43). All the assessments were administered individually by an occupational therapist that was blind to the trail details in a single session that lasted about 1 hour. Participants were informed in writing about the objectives, benefits, and possible inconveniences associated with the research protocol; they were assured that their participation in the research would be voluntary and they could withdraw from the study whenever they wished. In the process of collecting data, each participant was assessed three times: 1- initial assessment before KT intervention, 2- post intervention assessment after KT, 3- the follow up assessment one month after KT intervention. After obtaining signed consent forms and conducting the initial assessment, taping was performed by another occupational therapist. The subjects were taped in accordance with Kenzo Kase's Kinesio taping Manual [18]. Taping was applied with the subjects in a sitting position while shoulder was abducted, forearm was in the neutral position, and elbow was flexed to 90 degrees; the wrist was also in the neutral position. An I- strip was placed over the extensor muscles of the forearm from proximal to distal to cover all of the CMC joints except the TMC joint. The second I strip was placed over the TMC joint up to the first thumb phalanx as a corrective strip over the snuff box and parallel to tendons. The tape was removed and changed after 3 days, when it was necessary. There was one-day rest after each KT session to allow the skin of the participants to rest. We chose 1h/d, 3d/wk for 8 weeks as an effective and tolerable dose for this trial. During the KT period, it was also recommended that participants carry out daily activities that require the use of hands. In addition, none of participants use pain killer drugs.

Outcome measures

There were five tools for collecting data:

Demographic questionnaire: contained general and medical information such as sex, age, and duration of illness.

Visual analogue scale (VAS): The VAS consisted of a 100-milimeter line with ends of the line designated with descriptions such as "no pain at all" and "the worst pain possible". The patient marked on the line the point that represented the intensity of the pain he or she felt [19].

Pinch gauge: Pinch strength was evaluated by using the finger dynamometer (pinch gauge), which was correctly and periodically calibrated during the study. The pad to pad pinch strength and the pad to side pinch strength, which were exerted by the thumb and index finger, were measured. Participants were trained to pinch the dynamometers as hardly as possible. They were seated with their shoulders adducted and rotated in a neural manner; the elbow was also flexed at 90. Three repetitions of approximately 3 or 4 seconds were completed and registered. The final score was calculated by measuring the average of 3 values [20].

Dynamometer: Grip strength measurements were taken with a grip dynamometer while the patient was also in the sitting position [21]. The reliability of the measurements was expressed by ICC; it was between 0.82 and 0.97 for grip strength measurements [22]. Pinch and grip strength measurements were expressed in kilograms. The instrument was calibrated before and after the treatment of each subject.

Goniometer: A finger goniometer made of stainless steel was used to assess the active and passive range of motions [23]. A dorsal placement of the goniometer was placed over the table in the supine position to measure the finger joints. In this study, the total active motion (TAM) was used to measure the range of motions in fingers. In the thumb, the active and passive flexions at inter phalangeal joint, the flexion and extension at the

metacarpi phalangeal joint, the active and passive flexion, and extension and abduction at the carpometacarpal joint were registered. For the opposition, the ruler measurement was used. The pad of the thumb was rotated to meet the pad of each finger. The little finger was rotated to better meet the pad of the thumb. As a summary, the measure of opposition recorded the distance from the tip of the thumb pad.

Statistical analysis

Data analysis was performed using SPSS 16. Based on Kolmogorov–Smirnov test, it was proved that the variables had no normal distribution. The Wilcoxon signed-rank test was applied as a nonparametric statistical hypothesis test to compare the scores before and after the follow-up intervention in subjects. It was used as an alternative to the paired Student t test. All tests were performed at a confidence interval of 95% (P<0.05).

RESULTS

Nine subjects (4 males and 5 females) participated in this study. The mean age and duration of HOA were 70.33± 1.26 years and 78± 9.6 months, respectively.

Visual analogue pain scale

The Wilcoxon signed-rank test analysis revealed statistically significant differences for VAS outcome measures at the post intervention assessment. In addition, the third assessment at follow-up showed a significant change for pain in relation to the pre intervention assessment (Table 1).

Table 1: Visual analogue scale changes observed after intervention.

Variable		Mean± SD	P value
Pain	BI comparison with AI	6.55± 0.50 4.11± 0.35	0.007
	BI comparison with FI	6.55± 0.50 4.77± 0.40	0.012
	AI comparison with FI	4.11± 0.35 4.77± 0.40	0.014

BI: Before Intervention; AI: After intervention; FI: follow up Intervention

Pinch and grip strength

There were significant differences between three types of pinch and grip strength after intervention. Furthermore, one month after intervention, the follow up assessment showed a significant change in pinch and grip strength, revealing the improvement of pinch and grip strength, as compared to the initial assessment (Table 2).

Table 2: Pinch and grip strength changes observed after intervention

Variable		Mean± SD	P value
Pinch PP	BI comparison with AI	5.27± 0.48 6.72± 0.57	0.011
	BI comparison with FI	5.27± 0.48 6.11± 0.51	0.019
	AI comparison with FI	6.72± 0.57 6.11± 0.51	0.018
Pinch PS	BI comparison with AI	6.55± 0.37 8.61± 0.40	0.009
	BI comparison with FI	6.55± 0.37 7.94± 0.26	0.014
	AI comparison with FI	8.61± 0.40 7.94± 0.26	0.026
Pinch TRI	BI comparison with AI	7.90± 0.36 10.11± 0.61	0.012
	BI comparison with FI	7.90± 0.36 9.11± 0.51	0.034
	AI comparison with FI	10.11± 0.61 9.11± 0.51	0.017
Grip Strength	BI comparison with AI	18.44 ± 1.22 25± 2.98	0.017
	BI comparison with FI	18.44 ± 1.22 22.55± 2.69	0.05
	AI comparison with FI	25± 2.98 22.55± 2.69	0.042

BI: Before Intervention; AI: After intervention; FI: follow up Intervention;
PP: pad to pad; PS: pad to side; TRI: Tripod

Range of motion

There were statistically significant improvements in the TAM and thumb opposition after the intervention. In addition, all variables had a significant change, as compared to the initial assessment (Table 3).

Table 3: Range of motion changes observed after intervention

Variable		Mean SD	P value
TAM_I	BI comparison with AI	169.44± 8.1 213.33± 9.7	0.007
	BI comparison with FI	169.44± 8.1 208.44±9.22	0.008
	AI comparison with FI	213.33± 9.7 208.44±9.22	0.048
TAM_M	BI comparison with AI	167.22±3.45 210.55±5.29	0.008
	BI comparison with FI	167.22±3.45 205.26±4.33	0.008
	AI comparison with FI	210.55±5.29 205.26±4.33	0.445
TAM_R	BI comparison with AI	170±4.56 219.44± 4.44	0.007

	BI comparison with FI	170±4.56 208.88±4.06	0.007
	AI comparison with FI	219.44± 4.44 208.88±4.06	0.007
TAM_L	BI comparison with AI	178.88±5.51 230± 5.20	0.009
	BI comparison with FI	178.88±5.51 224.44± 4.45	0.007
	AI comparison with FI	230± 5.20 224.44± 4.45	0.008
OP	BI comparison with AI	25.55±2.05 19.88±1.26	0.007
	BI comparison with FI	25.55±2.05 21.55±1.51	0.012
	AI comparison with FI	19.88±1.26 21.55±1.51	0.019

BI: Before Intervention; AI: After intervention; FI: follow up Intervention; TAM: Total active motion; I: Index finger; M: Middle finger; R: Ring finger; L: Little finger; OP: Opposition

DISCUSSION

The purpose of this study was to determine whether kinesio taping could improve the hand functions and symptoms in persons with HOA. Based on the results, it appeared that kinesio taping had a positive impact on the whole group of participants. It could be postulated that the stimulation of different receptors in the skin by the KT led to different responses in the nervous system, with an effect on pain reduction [11, 24, 25]. The findings indicated that subjects had less pain after the application of kinesio tape. This was consistent with the previous studies, suggesting that Kinesio taping joints could be an effective intervention to improve pain [26-30]. In the field of HOA rehabilitation, few studies have assessed the effect of KT on pain relief. One study investigated the effect of KT on rhizarthrosis symptom, showing pain improvement in the trapezoid 1st metacarpal joint [13]. Another study used joint mobilization in combination with KT, finding significant pain relief after intervention [14]. Some other studies used KT in rheumatoid hand and recommended KT as an effective intervention to improve the pain [15, 17].

Other findings revealed that KT could improve grip and pinch strength, similar to other studies. One study also found that the forearm muscles KT could significantly improve grip strength in healthy participants [31]. In the area of hand rehabilitation, an earlier study using mobilization in combination with KT reported the increased tip pinch strength in patients with trapeziometacarpal osteoarthritis [14]. Other studies using KT for hand arthritis reported improvement in grip and pinch strength and also, better hand functions, which could be related to hand strength [16, 17]. It seems that the application of KT could lead to the stimulation of pain receptors and proprioceptors and the better alignment of joints, thereby improving hand functions and strength.

The results of this study also showed the positive effect of KT on the range of the motion of fingers ad thumb opposition. In a previous study, it has been shown that the mobilization technique with KT improved the range of the motion of the trapeziometacarpal joint [14]. Another study also reported improvement in stiffness after KT in patients with first metacarpal joint osteoarthritis [13]. Similar to these findings, some studies have suggested KT as an adjunctive intervention to improve the range of the motion in rheumatoid hand [15, 17].

CONCLUSION

The findings of this study revealed that KT could be an effective intervention to improve pain, the range of motion, and pinch and grip strength in elderly individuals with HOA, but these findings need to be further confirmed by further research in a carefully designed randomized control trial before any conclusions could be drawn regarding the effectiveness of this modality.

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