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ORIGINAL ARTICLE

Effect of kinesio Taping on Pain and Disability in Patients with Chronic Low Back Pain

Khaled Z. Fouda[1], Ibrahim M. Dewir [2]

1 Lecturer of Physical Therapy, Basic Science for Physical Therapy Department, Faculty of Physical Therapy, Cairo University, Egypt.
2 Physiotherapist, Alkaser AlEini Hospital, Cairo University, Egypt.
Corresponding Author:
Dr. Khaled Z. Fouda (PhD, PT);
7 Ahmed El Zayat Street, Bein El Sarayat, Giza 12612, Egypt.
E-mail: kzfouda2004@yahoo.com

ABSTRACT

Background: Low back pain (LBP) is a significant public health problem and it is associated with enormous costs to society and disability. Kinesio Taping (KT) is widely used in patients with LBP with different techniques of application.

Objective of Study: The purpose of this study was to investigate the effect of different techniques of KT on pain, disability and muscle endurance in patients with chronic nonspecific LBP.

Methodology: Forty five patients with chronic nonspecific LBP were randomly assigned into three equal groups. Group A received the conventional physical therapy program only, group B received the conventional physical therapy program plus the "H pattern technique" KT while group C received the conventional physical therapy program plus the "Star-pattern technique" KT. Pain was evaluated by Visual Analogue Scale (VAS), disability was evaluated by Oswestry Disability Index (ODI) while muscle endurance was evaluated by Sorensen test. All measurements were recorded at baseline and after four weeks intervention.

Results: One-way ANOVA revealed that there was a significant difference ($P< 0.05$) among the three groups following four weeks of treatment. Post-hoc test showed greater significant improvement ($P< 0.05$) in the measured outcomes for group B in comparison to the other groups.

Conclusion: Adding KT to the conventional physical therapy treatment of chronic nonspecific LBP significantly reduced pain, disability and improved isometric endurance of the trunk muscles than conventional physical therapy treatment alone.

Keywords: Kinesio taping, Pain, Disability, Low back pain

INTRODUCTION

Low back pain (LBP) is a significant public health problem and it is associated with enormous costs to society and disability.[1] Approximately 39% of the population suffers from low back pain at some stage in their life.[2] Nonspecific low back pain (NSLBP) refers to LBP of unknown pathology. It establishes about 85% to 95% of the entire cases. It is often created spontaneously, and could be disabling and painful.[3,4]

Several interventions commonly used by physical therapists for treatment of patients with LBP, such as manual therapy techniques [5], electro physical agents [6] and exercises.[7,8] However, the vast majority of these interventions have a modest effect in reducing pain and disability.[9,10]

Therefore, new interventions have been tested in order to enhance the effects of existing treatments. A new treatment option that is very popular in athletes is the Kinesio Taping (KT) and it is being widely used in patients with LBP. The technique uses an elastic adhesive tape that is extremely thin and much more elastic than conventional bandages and applies it to the patient's skin. This tape made of cotton fibers which allow for the faster drying and evaporation, also it can be stretched to 140% of its original length, producing less mechanical retention and restriction to movement.[11]

There are a large number of researches investigated the efficacy of adding KT to the conventional physical therapy treatment program of LBP. These researches often are contradictory in results, some investigators showed that, patients did not get additional benefit from the use of KT. [12-14] However, many other investigators showed a significant evidence for their efficacy in reduction of pain and disability.[15-20]

Within the available literatures, there are different techniques of KT application with different parameters have been used in previous studies.[12-20] So, the purpose of this study was to investigate the effect of different techniques of KT on pain, disability and muscle endurance in patients with chronic NSLBP.

METHODOLOGY

Participants

A total of 45 patients with chronic NSLBP

diagnosed by orthopedic physicians were recruited for the study from outpatient physical therapy clinics in Cairo University hospitals. The eligible patients should have a history of chronic NSLBP of at least three months and their age ranged from 25 to 55 years.[21] Patients were excluded if they had metabolic or vascular disease with a neurological component such as diabetes or atherosclerosis, nerve root compression (disc hernia ion, spondylolisthesis, stenosis in lumbar spine), inflammatory disorder (ankylosing spondylitis), KT therapy or corticosteroid treatment in the previous two weeks, previous spinal surgery or fracture, congenital back disorder and any contraindications to KT (skin allergy and/or intolerance to tape, dermatitis, or preexisting skin lesion and infection).[18,22] All patients considered eligible for the study performed a KT allergy test before randomization. The test consisted of sticking a small piece of KT to the thoracic spine and leaving it for 24 hours. The patients who developed an allergic reaction to the tape were asked to remove it immediately and excluded from the study. [18]The study was approved by the ethical committee of the Faculty of Physical Therapy, Cairo University and informed consent was signed by each patient before the beginning of the study. The research design was randomized; single-blinded clinical trial. Randomization was performed simply by adding a specific identification number for each patient. A SPSS program (version 20) was used to randomly assign the patients into three equal groups (n=15).

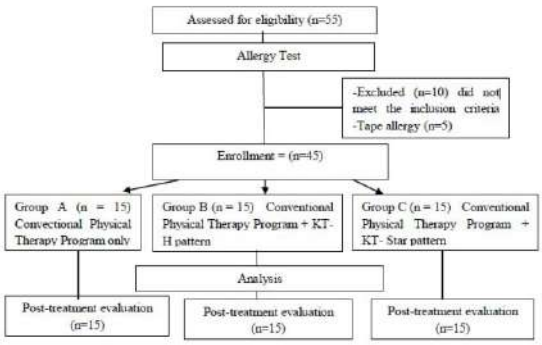

Figure (1): Participants flow chart.

Outcome Measures

Pain intensity

Visual Analogue Scale (VAS) was used to measure pain intensity level pre and post treatment. [23] It consists of a 10-cm straight line anchored at one end by a label such as "no pain" and at the other end by a label such as "the worst pain ".It was translated into Arabic and introduced to the patients.VAS was reported as valid and reliable tool for pain assessment.[24,25]

Functional disability

Arabic version of Oswestry Disability Index (ODI) was used to measure the level of daily living activities pre and post treatment.The questionnaire contains 10 items related to limitations in daily living activities. Each item includes six potential responses that are rating on a 0 to 5 points scale, with maximum scores of 5 or total disability and a minimum score of 0 or no disability. The total score is calculated as follows: (patient' score/50) x100 to obtain the score expressed in percentage. It was reported as valid tool for disability assessment.[26,27]

Isometric endurance of the trunk muscles

Sorensen test was used to measure the amount of time in seconds a person can hold the unsupported upper body in a horizontal prone position with the lower body fixed to the examining table until fatigue. Isometric muscle endurance was evaluated pre and post treatment. The test was reported as valid and reliable tool for assessment of isometric endurance of the trunk muscle.[28.29]

Procedures

Patients in group A received the conventional physical therapy program only which consisted of stretching exercises for the back, iliopsoas, and hamstring muscles. Strengthening exercises for the abdominal muscles. Three sets of stretching exercises, each involving a 30-sec hold and 30-sec of rest repeated three times. One set of strengthening exercises, consisting of 10 repetitions with a 5-sec hold.[13]

Patients in group B received the conventional physical therapy program plus the "H pattern technique" KT. Cure tape (Tape Concept Ltd., Larnaca, Cyprus) with a width of 5 cm and 0.5 mm thickness was used in the present study.

Prior to KT application, the skin of the lower back was cleaned with alcohol swabs to ensure that it is free of lotions and oils, excessive hair must be shaved for the best results and less pain when removing the tape. The "H pattern technique" utilizes three pieces of tape cut into strips and with the corners rounded off to reduce snagging on clothing. Two strips tapes were applied on the erector spine par vertebral muscles (bilaterally) parallel to the spinous processes of the lumbar spine. The patients assumed sitting position on a chair without back support to allow forward bending while the therapist standing behind the participants. The KT was applied as the following; the initial anchor point of tape (4–5 cm) was carefully removed from its paper backing and applied to the posterior superior iliac spine without stretch. After that, the patient was asked to perform maximum trunk flexion to lengthen the tissue in the area being taped then the tape was removed from the backing paper and applied with "paper-off tension" (the natural stretch of the tape as it is removed from the paper backing which is equal to 10% to15% stretch), the tape was applied in the shape of an "I" over the skin in the par vertebral region up to the T12 vertebra. The final anchor point of tape (4–5 cm) was fixed directly above the transverse process of the T12 vertebra without stretch; the tape was rubbed by hand several times to warm the adhesive film to achieve adhesion. The same procedure was then applied to the other side. The third strip was applied horizontally directly over painful area. Stretch the tape 50% in the middle and then apply it over the spine and rub to activate the adhesive, and then continue to remove the paper backing and apply the remainder of the tape on each side with paper-off tension. [30, 31] Patients in group C received the conventional physical therapy program plus the "Star-pattern technique" KT. This technique utilizes four pieces of tape cut into strips and with the corners rounded placed at 25% tension overlapping in a star shape over the point of maximum pain in the lumbar area. Strips were applied by pressing and adhering the central part before the end. Patients in group B and C were advised to leave the tape in place for 5 days. [19]

The KT was re-applied again at the beginning of the next week for four weeks. All patients received the conventional physical therapy treatment for three sessions per week in alternative days for four weeks.

Data analysis was performed by SPSS (Version 20) for Windows. Mean, standard deviation and percentage of differences were calculated. A one-way analysis of variance (ANOVA) was used to test the differences among the groups regarding their pain, functional disability and isometric trunk muscle endurance pre and post treatment followed by Post-hoc test to find out the significance of mean difference for between group comparisons. The P-value < 0.05 was taken as significant.

RESULTS

Participants' characteristics of the groups were presented in table (1). There were no significant differences among the groups regarding age, weight, height, body mass index and duration of LBP as (P>0.05).

Table (1): Demographic characteristics of participants

General Characteristics	Group (A) Mean	Group (B) Mean	Group (C) Mean	P-value
Age (year)	38.85± 2.64	37.95± 2.15	38.54± 2.42	0.587
Weight (Kg)	85.96±7.13	84.87±6.94	85.27±7.25	0.913
Height (cm)	169.82±4.9	170.65±5.1	171.15±5.3	0.776
Body mass index(Kg/m^2)	29.71± 2.14	29.36±2.19	29.20±2.05	0.719
Duration of LBP (months)	23.92±2.53	23.42± 1.95	24.11±2.28	0.692

±: Standard deviation. P: Probability

Application of ANOVA revealed that, there was no significant difference (P>0.05) among the groups for the pre-treatment values where F-value was 0.244 for VAS, 0.556 for ODI and 1.10 for Sorensen test. While post treatment, there was a significant difference (P< 0.05) among the groups, where F-value was 33.44 for VAS, 12.76 for ODI and 90.16 for Sorensen test. The mean values for the measured outcomes among the groups were presented in table (2).

Table (2): Results of ANOVA among the groups for pain intensity (VAS), functional disability (ODI) and isometric endurance of the trunk muscles (Sorensen test).

Study groups	VAS Mean		ODI Mean		Sorensen test Mean	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Group A	6.5±1.31	4.5± 0.89*	25.19±2.5	14.48±2.6*	28.95± 3.1	40.75± 3.2*
Group B	6.2±1.12	2.3±0.49*	24.26±2.3	10.13±1.9*	30.52±3.4	59.53± 4.3*
Group C	6.3±1.16	2.9± 0.78*	24.65±2.4	12.30±2.3*	29.12±2.9	50.64± 3.8*

ANOVA P< 0.05 (among groups comparison post-treatment) ±: Standard deviation

Post-hoc test was applied to determine the difference among the groups post treatment. It revealed that there was a significant difference in

the measured outcomes among the groups. The mean difference between the groups and their P-values were presented in table (3).The percentage of improvement in the measured outcomes post treatment was presented in table (4).

Table (3): Post-hoc test among the groups for pain intensity (VAS), functional disability (ODI) and isometric endurance of the trunk muscles (Sorensen test)

Study groups	VAS Mean difference (P-value)	ODI Mean difference (P-value)	Sorensen test Mean difference (P-value)
	Post-test	Post-test	Post-test
Group A vs. group B	2.21(0.001)*	4.35(0.001)*	18.78(0.001)*
Group A vs. group C	1.52(0.001)*	2.18(0.039)*	9.89(0.001)*
Group B vs. group C	0.69(0.037)*	2.17(0.040) *	8.89(0.001)*

Significant or significance difference (P< 0.05). P: Probability

Table (4): Percentage of improvement among the groups for pain intensity (VAS), functional disability (ODI) and isometric endurance of the trunk muscles (Sorensen test)

Study groups	VAS % of improvement	ODI % of improvement	Sorensen test % of improvement
Group A	30.76%	42.51%	40.75%
Group B	62.90%	58.24%	95.05%
Group C	53.96%	50.10%	73.90%

DISCUSSION

The purpose of this study was to investigate the effect of different techniques of KT on pain, disability and muscle endurance in patients with chronic NSLBP. The results of the present study revealed that, there were a statistical significant reduction in pain and functional disability, also there was a statistical significant improvement in the isometric endurance of the trunk muscles after four weeks of treatment in the three groups under investigation, moreover there were a significance difference among the groups in the mean values of pain, functional disability and isometric endurance of the trunk muscles. Furthermore, the H pattern technique of KT produced greater improvement in the measured outcomes compared to the star pattern technique of KT or the conventional physical therapy treatment only. Adding KT to the conventional physical therapy treatment produced greater reduction in pain and functional disability than conventional physical therapy alone. Our finding were in agreement with Sathyal et al., Added et al.and Al-Bahel et al. whom reported significant reduction in pain and disability when using KT in conjunction with different physical therapy programs.[15,18,23] In contrast with Al-Shareef et al. who demonstrated that, the effects of KT was very small to be considering clinically relevant and meaningful when compared with placebo taping. The discrepancy in results may be attributed to the very short-term effect of time used in this study, also KT used in isolation without any physical therapy treatment intervention.[22]

Isometric endurance of the trunk muscles showed greater statistical significant improvement when adding KT to the conventional physical therapy program than the conventional physical therapy program alone, the participants could maintain the Sorensen test position for a significantly longer duration than those without any taping. These finding were in agreement with Alvareza et al. and Paoloni et al. whom reported that, KT applied on the lower back significantly delays the onset of par vertebral muscle fatigue.[17,20] It has been reported that, pain during the Sorensen test is a factor limiting performance of the test. So decreasing pain would enhance performance of the test. [28] The precise mechanisms underlying the effect of KT on musculoskeletal pain are not yet clear. It is hypothesized that KT applies pressure to the skin or stretches the skin and that this external load may stimulate cutaneous mechanoreceptors (large myelinated fibers) and thus inhibit pain transmission. Stimulation of joint mechanoreceptors can also signal information of joint movement or joint position which could improve joint function[32,33]

The changes induced by KT may be related to the neural feedback received by the participants, which may improve their ability to reduce the mechanical irritation of soft tissues when moving the lumbar spine.[19] Also KT may increase recruitment in the motor units of the lumbar erector spine muscle to perform the activity due to increased proprioceptive stimulates which have been enhanced through increased cutaneous feedback.[34,35]Another proposed mechanism suggests that keratinocytes, which are found in the skin, may represent the primary transduction of mechanical non-neuronal stimuli. These mechanisms would activate cascade processes such as intracellular Ca2+ flows evoking a response from C-fibers or C-polymodalnociceptors. Therefore, the stimulation caused by the KT on the skin would

interfere with the transmission of mechanical stimuli and decrease perception of pain.[36] This study is limited to male patients only. Further researches are required to investigate the effect of KT on a large patient population including both genders for longer time periods in combination with different physical therapy modalities to confirm the findings of this study. Also, further electromyography studies are needed to validate the efficacy of KT in patients with low back pain.

CONCLUSION

Adding KT to the conventional physical therapy treatment of chronic NSLBP significantly reduced pain and disability and improved isometric endurance of the trunk muscles than conventional physical therapy treatment alone. Furthermore, the H pattern technique of KT was more effective than the star pattern technique of KT in regarding to the measured outcomes. The present study suggests that KT should be used in conjunction with the conventional physical therapy treatment of LBP.

Conflict of Interest

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript

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