

Efficacy of Kinesio Tape and Home Exercise Program on Pain Intensity and Functional Disability in Patients with Lumbar Spondylosis

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ABSTRACT

Purpose: To find out the effect of Kinesio tape (KT) with a home exercise program versus home exercise program alone on pain intensity and functional disability in patients with lumbar spondylosis. **Subjects:** Thirty patients with lumbar spondylosis participated in this study. They were randomly distributed into two groups. Group (A): Consisted of 15 patients. Their mean age was $45.26(\pm 10.94)$ y, their mean height was $161.86(\pm 10.78)$ cm, and their mean weight was $74.73 (\pm 15.61)$ kg. Group (B): Consisted of 15 patients. Their mean age was $43.46 (\pm 8.27)$ y, their mean height was $162(\pm 8.73)$ cm, and their mean weight was $76.13 (\pm 15.48)$ kg. **Materials and methods:** Assessment was conducted before and after the treatment period by the visual analogue scale (VAS) for pain intensity and Oswestry disability questionnaire for functional disability. Group (A) received KT applied for four weeks and was changed once every week. In addition, they received home exercises for lumbar region in the form of abdominal strengthening exercises and stretching exercises for the lower back muscles, hip flexors, hamstrings and calf muscles three times per week for four weeks as a home exercises program. Group (B) received only the same home program three times per week for four weeks. **Results:** SPSS package was used for data analysis. Both groups showed a significant reduction in pain severity and functional disability ($P < 0.05$). Group (A) who received the KT plus the home exercise program had a greater significant reduction in pain severity and functional disability than group (B) who received the home exercise program alone ($P < 0.05$). **Conclusion:** KT is effective in decreasing pain severity and functional disability and should be added to the exercise program in patients with lumbar spondylosis.

Key words: Lumbar Spondylosis, Kinesiotape, Exercises.

INTRODUCTION

Low back pain (LBP) is a devastating disorder that causes a huge degree of

human suffering; it has its effect on life and work capacity. It is the most common cause for chronic or permanent impairment in U.S. adults under the age of 65, and the most common cause of activity limitations in persons under the age of 45³. About one-quarter of U.S. adults reported that low back pain lasted at least a whole day in the last three months⁸. It was reported that in developed countries, the point prevalence of LBP is 12% to 33%, one-year prevalence is of 22% to 65%, and lifetime prevalence is of 11% to 84%²⁸. The terms lumbar osteoarthritis, disc degeneration, degenerative disc disease, and spondylosis are used in the literature to describe anatomical changes to the vertebral bodies and intervertebral disk spaces that may be associated with clinical pain syndromes³⁹.

While exercise is a first choice recommendation for the treatment of LBP, the preferred modality remains unclear¹. In the chronic stage of LBP (12 weeks and longer), there is an increasing acceptance as well as scientific evidence that various exercise regimens designed by physiotherapy are effective^{10,45}. It has been proven that exercises have a great effect regarding increasing strength, mobility, flexibility, and relaxation. They also develop coordination and skill and at the same time, improve endurance and cardiovascular fitness²⁵. In the current study, the researchers concentrated on strengthening of the abdominal muscles and the stretching of the lower back muscles, hip flexors, hamstrings and calf muscles as designed by Williams⁴⁹. Abdominal exercises and stretching of the lower back and the tight lower limb muscles were used by many researchers and found to be effective in relieving back pain^{6,9,19,30,38,40}. The strengthening and stretching exercises used in the current study are theoretically effective in decreasing the zygapophyseal joint compressive forces, stretching of hip flexors

and lumbar extensors, strengthening of the abdominal and gluteal muscles, decreasing compressive forces to the posterior disc, and opening the intervertebral foramina⁴⁹.

Taping is defined as the application of adhesive elastic tape (stretch) or non-elastic (rigid) in order to provide support and protection to soft tissues and joints and to minimize swelling and pain after injury²⁹. It's is widely used in the field of rehabilitation as both a means of treatment and prevention of sports-related injuries^{4,7,16,17,26,44}. The essential function of most tape is to provide support during movement. It is believed that tape serves to enhance proprioception and therefore, to reduce the occurrence of injuries^{5,27,32}.

Kinesio Taping (KT) is a technique based on the body's own natural healing process. The method uses a uniquely designed and patented tape, (Kinesio Tex Tape), for treatment of muscular disorders and lymphedema²⁹. Karatas et al.,²⁰ found that Kinesio taping would be an effective method of reducing neck and low back pain and improving functional performance in surgeons who have musculoskeletal system pain after performing surgery. For application of tape the patient is placed in position of stretch on the muscle to be taped. Placing the muscle on a stretch will create convolutions in the skin that may appear following the basic application or during normal joint motion. Creation of convolutions aids in the normal flow of blood and lymphatic fluids that increases the interstitial spaces. This could help in taking off the pressure and irritation from the neural and sensory receptors, thus, alleviating pain. Pressure is gradually taken off the lymphatic system, allowing it to channel more freely after 15–20 minutes of exercise²².

Kinesio taping is theorized to have several functions including: restoring correct muscle function by supporting weakened muscles; reducing congestion by improving the flow of blood and lymphatic fluid; decreasing pain by stimulating neurological system and correcting misaligned joints by retrieving muscle spasm²⁴. In addition, it causes cutaneous stimulation of the sensorimotor and proprioceptive systems⁴².

Although KT research is limited, several studies have supported the efficacy of this treatment technique for addressing acute injury inflammation, promoting a faster return to activity, enhancing proprioception training, reducing pain, enhancing neurological function post injury, and reducing muscle imbalances^{13,14,15,31,34,35,46,47}.

Therefore, the purpose of the study was to investigate the effect of kinesio taping combined with a home exercise program versus home exercise program alone on pain and functional disability in patient with lumbar spondylosis.

PATIENTS AND METHODS

Thirty male and female patients diagnosed as lumbar spondylosis at the level of L3-L5 participated in this study. They were randomly distributed into two groups. All the patients signed a consent form before participating in the study.

Group (A): Consisted of 15 patients. Their mean age was 45.26(±10.94) years, their mean height was 161.86(±10.78) cm and their mean weight was 74.73(±15.61) Kg.

They received the application of KT for four weeks and it was changed once every week and exercises for lumbar region in the form of abdominal strengthening exercises and active stretching exercises for the lower back muscles, hip flexors, hamstrings and calf muscles three times per week for four weeks as a home program.

Group (B): Consisted of 15 patients. Their mean age was 43.46(±8.27) years, their mean height was 162.13(±8.73) cm and their mean weight was 76.13(±15.48) Kg. They received exercises for lumbar region in the form of abdominal strengthening exercises and active stretching exercises for the lower back muscles, hip flexors, hamstrings and calf muscles, three times per week for four weeks as a home program.

Patients were included in the study if they had age ranged between (40-60) years old; diagnosed as lumbar spondylosis and had severe disability (40-60%) determined by Oswestry low back pain disability questionnaire.

Procedures

Patient assessment procedures:

Patients were assessed just before and after 4 weeks of treatment. The assessment procedure included the following items.

- Pain assessment

Pain was assessed by Visual Analogue Scale (VAS). It consists of a horizontal line of 10 cm long, with anchors at either ends. The first anchor represents no pain while the last anchor represents pain as bad as it could possibly be. The patient was asked to place a mark through the line at the point that best describes how much pain is experienced. The measurement was taken as the distance from the zero end to the mark made by the patient. Visual analogue scale can give a valid data for chronic pain⁴¹.

- The functional disability assessment

The Oswestry disability questionnaire version 2.0 was used to assess the functional disability. It is a valid and reliable tool for measuring the functional disability in patients with low back pain. It consists of ten sections including the daily functional disability. Each section includes six statements. The patient selected the best statement which described his disability. The maximum score is 50 divided as follows; each section has a score of 5. The first statement in each section has a score of 0 while the sixth statement has a score of 5. Then, all the scores for all sections were added together. The higher score indicates greater disability. Scores from 0 to 20% indicate minimal disability. Scores from 20 to 40% indicate moderate disability. Scores from 40 to 60% indicate severe disability. Scores from 60 to 80% represented crippled disability and scores from 80 to 100% represent patients confined to bed¹¹.

Treatment procedure

Taping procedure:

Based on the work of Kase et al.,²², H technique was used in the application of the Kinesiotape. The patient was positioned in a flexed spinal position. The therapist applied 2

longitudinal Kinesio tape strips parallel to the spine from the base of the sacroiliac joint region, or a minimum 2 inches below the point of pain to the inferior angle of the scapula with tension of 20-25%. The third strip was a space correction technique, which was applied over the region of the greatest pain with 100% tension as shown in figure (1).



Fig. (1): H- application of the Kinesio taping on the back.

The exercise program for the lumbar spine included pelvic tilting exercises, single knee to chest, double knee to chest, partial sit-ups, toe touch stretch, hip flexor stretch, squatting from standing and calf muscle stretching according to Williams⁴⁹. Each exercise was repeated for 5 times for 3 sets with rest 5 minutes in between sets. The holding time was 15 seconds in each exercise. All exercises were done actively by the patient as a home program.

RESULTS

For the purpose of data analysis, SPSS package was used for within groups as well as between groups comparison. Unpaired t-test was used for comparison between groups regarding age, weight and height, pain intensity and functional disability. As shown in table (1) there was no significant difference between the two groups before treatment regarding age, weight, height, pain intensity and functional disability.

Table (1): Between group differences before treatment.

| Variables | Group (A) | Group (B) | Comparison | | |
|-----------------------|-----------------------|----------------------|------------|---------|------|
| | Mean (\pm SD) | Mean (\pm SD) | t value | P value | Sig. |
| Age (Yrs) | 45.26 (\pm 10.94) | 43.46 (\pm 8.27) | 0.5083 | 0.61 | NS |
| Weight (Kg) | 74.73 (\pm 15.61) | 76.13 (\pm 15.48) | 0.2466 | 0.80 | NS |
| Height (cm) | 161.86 (\pm 10.78) | 162.13 (\pm 8.73) | 0.0752 | 0.94 | NS |
| Pain intensity | 7.33(\pm 1.44) | 7.40(\pm 1.12) | 0.15 | 0.88 | NS |
| Functional disability | 47.60(\pm 11.64) | 47.40(\pm 7.05) | 0.06 | 0.96 | NS |

NS: non significant

Pain intensity

Within groups differences were tested using paired t-test.

Group (A): The mean of the pretreatment pain intensity was 7.33(\pm 1.44), and for post treatment was 1.40(\pm 1.05) with t-value 10.67

and P-value 0.0001 as shown in table 2. Thus, there was a significant difference between the pretreatment and post treatment means of pain intensity in group (A) who received the Kinesio tape with the home exercise program.

Table (2): Pain intensity: Group (A) within group differences.

| Pre-treatment | Post-treatment | Mean difference | t value | P value | Significance |
|-------------------|-------------------|-----------------|---------|---------|--------------|
| Mean (\pm SD) | Mean (\pm SD) | | | | |
| 7.33(\pm 1.44) | 1.40(\pm 1.05) | 5.93 | 10.67 | 0.0001 | Sig. |

Sig.: Significant

Group (B): The mean of the pretreatment pain intensity was 7.40(\pm 1.12), and for post treatment was 5.26(\pm 1.09) with t-value 12.25 and P-value 0.003 as shown in table (3). Thus,

there was a significant difference between the pretreatment and post treatment means of pain intensity in group (B) who received the home exercise program alone.

Table (3): Pain intensity: Group (B) within group differences.

| Pre-treatment | Post-treatment | Mean difference | t value | P value | Significance |
|-------------------|-------------------|-----------------|---------|---------|--------------|
| Mean (\pm SD) | Mean (\pm SD) | | | | |
| 7.40(\pm 1.12) | 5.26(\pm 1.09) | 1.56 | 12.25 | 0.003 | Sig. |

Sig.: Significant

Between groups comparison post treatment

Unpaired t-test was used to compare between groups:

Group (A): the mean of the post treatment pain intensity was 1.40(\pm 1.05). For group (B) the mean of the post treatment of pain intensity

was 5.26(\pm 1.09) with t-value 9.88 and P-value 0.001 as shown in table (4). Thus, there was a significant difference between groups of the post treatment means of pain intensity in favor of group (A).

Table (4): Post treatment between groups comparison.

| Group A | Group B | t value | P value | Significance |
|-------------------|-------------------|---------|---------|--------------|
| 1.40(\pm 1.05) | 5.26(\pm 1.09) | 9.88 | 0.001 | Sig. |

Sig.: Significant

Functional disability

Within groups differences were tested using paired t-test.

Group (A): The pretreatment mean for functional disability score was 47.60(\pm 11.63), and for post treatment was 11.86(\pm 6.86) with

t-value 16.60 and P-value 0.0001. Thus, there was a significant difference between the pretreatment and post treatment scores of functional disability in group (A) who received the Kinesio tape plus the home exercise program as shown in table (5).

Table (5): Functional disability: within group differences.

| Pre-treatment | Post-treatment | Mean difference | t-value | p-value | Significance |
|---------------------|--------------------|-----------------|---------|---------|--------------|
| mean(\pm SD) | Mean(\pm SD) | | | | |
| 47.60(\pm 11.64) | 11.86(\pm 6.86) | 35.73 | 16.60 | 0.0001 | Sig. |

Sig.: Significant

Group (B): The pretreatment mean for functional disability was 47.40(\pm 7.05), and for post treatment was 39.46(\pm 8.07) with t-value 8.64 and P-value 0.003 as shown in table(6). Thus, there was a significant difference

between the pretreatment and post treatment values regarding functional disability in group (B) who received the home exercise program alone.

Table (6): Functional disability: group (B) within group differences.

| Pre-treatment | Post-treatment | Mean difference | t-value | p-value | Significance |
|--------------------|--------------------|-----------------|---------|---------|--------------|
| mean(\pm SD) | Mean(\pm SD) | | | | |
| 47.40(\pm 7.05) | 39.46(\pm 8.07) | 7.93 | 8.64 | 0.003 | Sig. |

Sig.: Significant

Between group comparison post treatment:

Unpaired t-test was used to compare between groups:

Group (A): The mean of the post treatment functional disability score was 11.86(\pm 6.86).

Group (B): The mean of the post treatment functional disability score was 39.46(\pm 8.07)

with t-value= 10.09 and P-value 0.0001 as shown in table (7). Thus, there was a significant difference between groups of the post treatment means of functional disability in favor of group (A).

Table (7): Functional disability post treatment between groups comparison.

| Group A | Group B | t value | P value | Significance |
|--------------------|--------------------|---------|---------|--------------|
| 11.86(\pm 6.86) | 39.46(\pm 8.07) | 10.09 | 0.0001 | Sig. |

Sig.: Significant

DISCUSSION

The results of this study revealed that the home exercise program that consisted of abdominal strengthening exercises and stretching of the lower back muscles, hip flexors, hamstrings and calf muscles was effective in decreasing pain and functional disability in patients with lumbar spondylosis. The results are supported by Elnaggar et al.,⁹ Johanssen et al.,¹⁹ Buswell⁶ and Ponte et al.,³⁸. They compared the Williams spinal flexion exercise with the McKenzie spinal extension program to find their effects on pain severity, functional disability and range of motion. They found that the flexion exercise program designed by Williams⁴⁹ was effective as well as the extension program in relieving back pain and disability. Saad et al.,⁴⁰ found the combined spinal flexion and extension exercise programs were effective as well as the lumbar stabilization exercise program in decreasing pain intensity, functional disability

and improving range of motion. Soukup⁴³ found that 20 sessions of exercises that focused on pelvic, hip and abdominal exercises had a significant reduction in recurrent low back pain episodes in the exercise group when compared with a control group. The exercise program used in this study as a home program is theoretically effective by decreasing the zygapophyseal joint compressive forces, decreasing the compressive forces to the posterior disc and opening the intervertebral foramen⁴⁹.

Moreover, it was found that the combined effect of Kinesio tape and the home exercise program was more effective than the home exercise program alone. KT helped in relief of pain and functional disability when added to the home exercise program. These results are supported by Karatas et al.,²⁰ who found that Kinesio taping is effective in reducing neck and low back pain and functional disability in surgeons and Paoloni et al.,³⁷ who found that the KT is promising as an

intermediate and short term pain relief therapy as it reduces abnormal paraspinal EMG activity. In addition, they found that the combined effect of KT and exercises leads to a greater reduction in pain related disability in low back pain population. The results also are in agreement with the results of Walther et al.,⁴⁸ who found significantly greater reductions in disability and pain which were obtained immediately after treatment of the patients who suffers from shoulder impingement syndrome who received genuine kinesio taping than by those who received a sham application. Various investigators^{12,18,33} have previously reported improvements in function, pain, and range of motion through the use of kinesio tape. These reports were either performed on healthy subjects or as case series of the ankle, shoulder and upper limb pathologies.

The precise mechanisms underlying the effect of kinesio taping on musculoskeletal pain are not yet clear. Two theories may aid in understanding this finding. One theory is that Kinesio tape increases blood circulation in the taped area^{23,35,36,46,47} and this physiological change may affect the muscle and myofascia functions after the application of kinesio tape. An additional theory is that kinesio tape stimulates cutaneous mechanoreceptors at the taped area^{13,14,15,31,34,35,46,47}. A further possible mechanism that explains how kinesio taping induced these changes may be related to the neural feedback received by the participants, which may improve their ability to reduce the mechanical irritation of soft tissue when moving the lumbar spine²².

Furthermore, Kase et al.,²¹ proposed a theoretical framework to explain decrease in lumbar pain associated disability observed immediately after kinesio taping. They argued that when a muscle is hypertonic, it stimulates Golgi receptors to transmit information to the central nervous system, where inhibitory motor neurons are activated, and that the kinesio taping application would act by stimulating Golgi receptors to initiate this process.

On the other hand, the results of this study was not in agreement with Aktas and Battaci² who found that kinesiotape may have

a small, but not statistically significant effect on muscle activation.

Conclusion

Kinesio taping is an effective modality that could help in relieving pain and functional disability in patients with lumbar spondylosis and should be added to the exercise program.

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الملخص العربي

فاعلية شريط كنسيو و برنامج تمرينات منزلي على شدة الألم و العجز الوظيفي في مرضى خشونة الفقرات القطنية

الغرض من البحث : دراسة تأثير شريط كنسيو اللاصق مع برنامج تمرينات منزلي مقابل برنامج التمرينات المنزلي وحده على الألم و الإعاقة الوظيفية في مرضى خشونة الفقرات القطنية . **الأشخاص والطرق :** شارك في هذه الدراسة ثلاثون مريضاً بخشونة الفقرات القطنية . تم توزيعهم عشوائياً لمجموعتين . مجموعة (أ) تكونت من خمسة عشر مريضاً . تلقوا شريط كنسيو اللاصق لمدة 4 أسابيع مع تغييره آخر كل أسبوع و تمرينات للمنطقة القطنية في صورة تقوية لعضلات البطن و تمرينات استطالة لعضلات أسفل الظهر والعضلات القابضة لمفصل الفخذ والعضلات الخلفية للفخذ وعضلات السمانة ثلاث مرات في الأسبوع لمدة أربع أسابيع كبرنامج منزلي . مجموعة (ب) تكونت من خمسة عشر مريضاً تلقوا نفس البرنامج المنزلي ثلاث مرات في الأسبوع لمدة 4 أسابيع . تم التقييم قبل وبعد فترة العلاج باستخدام مقياس شدة الألم و مؤشر أوسوستري للعجز الوظيفي . **النتيجة :** تم استخدام وحدة SPSS في تحليل النتائج . ظهر في المجموعتين انخفاض فعلي في شدة الألم والعجز الوظيفي . المجموعة الأولى التي تلقت شريط كنسيو مع برنامج التمرينات المنزلي كانت أكثر فاعلية في انخفاض شدة الألم والعجز الوظيفي عن المجموعة (ب) التي تلقت برنامج التمرينات المنزلي وحده . **الاستنتاج :** شريط كنسيو اللاصق مؤثر في تخفيض شدة الألم و العجز الوظيفي ويفضل إضافته لبرنامج التمرينات في مرضى خشونة الفقرات القطنية .

الكلمات الدالة : خشونة فقرات الظهر - شريط كنسيو - تمرينات .