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Research Article

The Short-Term and Long-Term Effects of Kinesio Taping on Pain, Range of Motion and Disability of Neck in Patients with Myofascial Pain Syndrome: A Randomized Clinical Trial

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Abstract

Background: Myofascial pain syndrome (MPS) is a musculoskeletal disorder characterized by tenderness, the presence of trigger points, localized or referral pain, muscle weakness, and limitation in range of motion, which leads to limitations in physical, vocational and social activities, and ultimately the reduced work efficiency and quality of life.
Objectives: The aim of this study is to investigate the short-term and long-term effects of Kinesio Taping on pain, range of motion, and disability of neck in patients with MPS.
Methods: In a single-blind randomized clinical trial, 30 patients with MPS were randomly divided into two groups, treatment group (n = 15) and control group (n = 15). The treatment group was given Kinesio Taping with proper tension and the control group was given Kinesio Taping without any tension. Pain intensity, range of motion, and neck disability was measured by NPRS, Goniometry, and NDI, respectively. Evaluations were performed before the intervention, three days later, and finally 14 days after the intervention.
Results: A comparison of the patients' mean pain, range of motion of flexion, lateral flexion, and neck rotation in the short and long term indicated a significant difference between the two groups ($P < 0.05$); although no significant difference was observed between the mean range of motion of neck extension between the two groups ($P = 0.33$ and $P = 0.16$ respectively for short term and long term). Neck disability showed a significant difference in both short/long term in pre-post evaluation of treatment group and comparison between groups with $P < 0.05$.
Conclusions: According to the results of this study, Kinesio Taping can reduce neck pain, increase the neck's range of motion, and ultimately reduce the disability caused by myofascial pain syndrome both in the short term and in the long term. However, the duration of use of Kinesio Taping can increase its influence.

Keywords: Myofascial Pain Syndrome, Neck Pain, Triggers Points, Neck Disability, Kinesio Taping

1. Background

Musculoskeletal disorders are among the leading causes of disability among the working-age population and disability in other age groups (1). The myofascial pain syndrome is one of the most common causes of musculoskeletal problems (2, 3) and the most common cause of pain in adults (2). The term myofascial pain syndrome (MPS) was used in 1983 for this syndrome (4), with a prevalence rate of approximately 30%, which reaches 85% in combination with myofascial pain (4). MPS is a chronic pain syndrome characterized by one or more myofascial trigger points (MTPs) in muscle taut bands, fascia tenderness, and fascia constrictions (2, 4-7). The myofascial pain originates from localized and highly sensitive trigger points located within the taut bands of skeletal muscles (1, 3, 6).

MTP is characterized by localized tenderness, with/without referral pain, muscular dysfunction (weakness, fatigue, dryness and poor blood circulation), limited range of motion, changes in motor patterns, autonomic phenomenon, poor posture, and referral spasm, which ultimately result in limitation in physical, vocational and social activities, and reduce the patients' quality of life (1, 3, 6, 7). MTP is painful in pressure and tension, causing a local twitch response defined as a transient visible or palpable contraction of the muscle and skin as the tense muscle fibers contract when pressure is applied (1, 6). This reaction is not a localized reaction and can occur in another (referred) target region specific to each muscle

(6).

Studies conducted on MTPs show that the trapezius muscle, especially the upper trapezius, is the most common muscle in which MTP is most likely to occur, followed by pain in the neck, temporal region, headache, migraine, or shoulder pain (3, 8); most MTPs are activated and continued in the muscle due to the lack of elbow support while one is sitting (8). The upper trapezius muscle is responsible for extension and lateral flexion of the head and neck to the same side and helping the rotation of the head to the opposite side (9).

MTP is classified into active and latent categories, characterized by pain at rest and pain evoked by touch (spontaneous pain) in the active type and the referral or localized pain caused by direct touch and no spontaneous pain in the latent type (1, 3, 5). Latent MTP can be converted to active MTP over time (5). The MPS starts with an active MTP (called the primary MTP) in the affected muscles, and if pain is treated improperly, active MTPs (called secondary MTPs) are created and pain spreads over the entire of limb (7). Excessive and acute muscular pressure can activate MTPs. If damage is not controlled properly, the progressive scar tissue develops and changes into a chronic injury, which is the main cause for the activation of MTPs in the future (7).

MPS treatment is aimed at reducing pain, improving muscle strength, and creating a proper body position (2). In general, the therapeutic strategy for MPS and MTP is divided into invasive and non-invasive methods. The non-invasive therapies include cognitive behavioral therapy, drug therapy, and rehabilitation (including sprays and stretch, general exercises, fascia release, massage, muscle relaxation, manipulation, electrotherapy, ultrasound, laser, etc.). The invasive therapeutic techniques include injections (botulinum toxin, corticosteroids, local anesthesia, and dry needling) that are effective (2-4), however, they are unpleasant for the patient and requires considerable expertise (6). Many studies have suggested that Kinesio Taping can be a good treatment option for people with musculoskeletal problems such as MPS and MTP (3).

Kinesio Taping is a passive therapeutic method that is effective in reducing pain by facilitating blood circulation and inducing muscle relaxation (10). Kinesio Taping can increase the range of motion; reduce inflammation, swelling, and bruising; increase blood circulation, muscle strength and tone; and prevent muscle constrictions and accelerate the recovery of damaged muscles in muscle spasm (3, 11-13). The main goal of Kinesio Taping is elevating the space under skin and soft tissue so that the space for movement can be enlarged, the circulation of blood and lymph fluid can be facilitated, and healing rate of tissue can be increased (7, 13). However, despite the popularity and widespread clinical use of Kinesio Taping, there are few studies supporting the effectiveness of Kinesio Taping for the position of the neck and upper limb (4). The Kinesio Taping is effective in reducing MTP pain (3), however, there is little proprietary evidence on its effectiveness in MPS (6).

2. Objectives

The aim of this study is to assess the effect of Kinesio Taping on the pain, disability, and range of motion of the neck in patients with myofascial pain syndrome.

3. Methods

In a single-blind randomized clinical trial (IRCT201701033871N1), patients with myofascial pain syndrome referred to the Imam Hossein Hospital in Mashhad were randomly divided into treatment and control groups by lottery. The inclusion criteria were: 1- having an age above 18 years, 2- having symptoms lasting more than two weeks, 3- having no history of orthopedic and neurological involvement, 4- having at least one MTP in the upper trapezius (diagnosis of MTP: Touching the taut bands or sensitive point, detecting the patient's pain with soft tissue traction, normal neurological tests, the slow or deep pain that gets worse due to stress), and those with: 1- Diagnosis of fibromyalgia, 2- use of drugs that affect the severity or threshold of pain, and 3- musculoskeletal, neurological, or inflammatory diseases. Patients with allergic symptoms to Kinesio Taping were excluded from the study.

In the treatment group, Kinesio Tape applied with the space correction technique (X shape) directly over the painful point (MTP of the upper trapezius muscle) with a tension of 30%, as well as the upper trapezius muscle inhibition technique (muscular technique, Y shape) from below the acromion process (insertion) to the upper part of the spinal cord (hairline, muscle origin) were used with a 25% tension (Figure 1). However, Kinesio Taping was performed without any tension (sham taping) for the control group. In both groups, Kinesio Tape was applied for 2 weeks and changed every 3 days. In this study Kinesio Tape was applied based on Dr. Kenzo Kase techniques; the founder of this method.

The pain, range of motion, and neck disability was evaluated before the intervention, three days later, and two weeks after the intervention. The pain numerical rating scale was used to assess the severity of pain. This scale is an instrument used to measure pain intensity in adults and contains 11 items (from 0 to 10). The neck disability index is a 10-item questionnaire used to measure the effect of

Figure 1. Kinesio Tape application

neck pain on one's ability to perform daily activities of life, and includes: Pain intensity, personal care, lifting, sleeping, driving, recreation, headaches, concentration, reading, and work (14). The neck range of motion was evaluated in extension, flexion, and lateral flexion to the painful side and rotation to the opposite side using goniometer. This study was approved by the Human Research Ethics Committee of the Baqiyatallah University of Medical Sciences with IR.BMSU.REC.1396.308. An informed consent was obtained from all patients to participate in this study. Normal distribution was confirmed by the Kolmogorov-Smirnov test. Analysis of Variance (ANOVA) was used to identify between groups differences. The differences in pre and post-intervention pain and ROM and ND in relation to each intervention group were examined with paired *t*-tests. A P value < 0.05 was considered statistically significant.

4. Results

A total of 30 patients participated in this study, of which 15 patients were female (7 patients in the treatment group and 8 patients in the control group) and 15 patients were male (6 patients in the treatment group and 9 patients in the control group). The Analytical and Descriptive information's is presented in Table 1. The mean age was 30.20 $\pm$ 3.55 in the treatment group and 32.80 $\pm$ 6.98 in the control group. The mean score of pain before treatment (T1) was not significantly different between the two groups, however, a significant difference was observed between the two groups in the short term and long term (T2, T3). There was no significant difference in the mean score of neck disability before the intervention (T1) and in the short term (T2) between the two groups, however, a significant difference was observed in the treatment groups in the long term (T3). In the study of short-term intra-group changes, it was found that the difference in mean neck disability with P = 0.000 was significant in the treatment group, while in the control group it was not significant with P = 0.26.

There was no significant difference between the mean score of the neck extension in any of the evaluation times (T1, T2, T3) between the two groups, however, the mean score of the neck extension in the intervention group was increased. There was no significant difference between the mean score of neck flexion and rotation before the intervention (T1) between the two groups, however, there was a significant difference in this regard between the two groups in the short and long term (T2, T3). There was a significant difference in the mean score of lateral flexion to the painful side before the intervention (T1) between the two groups, however, a significant difference was observed between the two groups three and 14 days after the intervention (T2, T3).

5. Discussion

Myofascial pain syndrome found no effect on pain relief in the control group with placebo Kinesio Taping. These differences can be related to the technique used, due to the fact that we used a combination of muscle and is the most common musculoskeletal disorder with no standard and acceptable therapeutic program. The main point in treating this syndrome is to provide conditions to reduce pain in the trigger point, improve disability, and increase the neck range of motion. However, limited clinical trials have been conducted on the effectiveness of Kinesio Taping on the pain, range of motion, and disability in myofascial pain syndrome (2).

Table 1. Compare the Mean of Variables Between Groups in Short and Long Term[a,b]

Intervention	T.G	C.G	P Value
Neck disability			
T1	40.67 ± 18.14	30.27 ± 24.05	0.19
T2	21.40 ± 12.01	29.73 ± 23.00	0.220
T3	14.67 ± 10.73	30.13 ± 22.40	0.02
Pain			
T1	4.93 ± 1.53	5.33 ± 1.83	0.52
T2	2.00 ± 1.19	5.07 ± 2.12	0.000
T3	0.8 ± 0.775	5.40 ± 1.84	0.000
Neck extension			
T1	35.33 ± 13.81	39.47 ± 19.54	0.5
T2	45.00 ± 11.49	39.27 ± 19.44	0.33
T3	47.67 ± 11.47	39.13 ± 20.29	0.16
Neck flexion			
T1	38.20 ± 10.79	35.33 ± 11.50	0.26
T2	49.87 ± 12.88	33.13 ± 12.31	0.001
T3	53.53 ± 11.34	33.33 ± 11.12	0.000
Neck lateral (flexion to affected side)			
T1	33.00 ± 13.73	35.40 ± 14.17	0.64
T2	48.00 ± 7.51	35.80 ± 14.17	0.006
T3	45.67 ± 9.61	35.80 ± 14.17	0.034
Neck rotation to non-affected side			
T1	43.33 ± 11.75	35.13 ± 10.67	0.055
T2	60.33 ± 14.57	35.00 ± 10.69	0.000
T3	61.00 ± 13.52	35.13 ± 10.63	0.000

[a] Values are expressed as mean ± SD.
[b] T.G, treatment group; T.G, control group; T1, before treatment; T2, short term; T3, long term.

The results of this single-blind randomized clinical trial showed that Kinesio Taping on the pain area and on the upper trapezius muscle can statistically significantly improve the neck pain disability and range of motion (flexion, lateral flexion and rotation) in the short and long term and clinical changes in extension; longer use of Kinesio Taping can increase its effects and prolong its effectiveness. In our study, application of Kinesio Tape was effective in pain, ROM, and disability of neck in three days, however, use of it in longer periods of time was more effective; furthermore, 2 weeks after beginning was observed a higher reduction in parameters than 3 days was clinically and statistically. Lack of a significant difference in the mean score of disability between the two groups before and three days after the treatment was due to the fact that before the treatment, the mean score of disability was lower in the treatment group than in the control group, however, this mean score was higher in the treatment group than in the control group after the treatment; these numbers are not statistically significant, although they are very different in clinical terms.

Various theories have described the mechanism of the effect of Kinesio Taping, such as: Increasing the proprioception, stimulation of Cutaneous mechanoreceptors, improvement of blood and lymphatic circulation, reduction of pain intensity, improvement of joint alignment, contributing to postural alignment, and muscle relaxation (2); however, there is no precise mechanism explaining the effect of Kinesio Taping on musculoskeletal pain yet. There are some hypotheses that explain the possible effect of Kinesio Taping on pain reduction, and the theory of gate control seems to be the most basic approach. Theory of gate control asserts that non-painful input closes the "gates" to painful input, which prevents pain sensation from traveling to the central nervous system (2, 3). Therefore, stimulation by non-noxious input is able to suppress pain (2-4). In other words, Kinesio Taping, if used correctly, stimulates first-order afferent receptors in the skin that can inhibit the transmission of pain at the spinal cord level and reduce the pain (15).

The pain reduction mechanism may also be associated with lowering the subcutaneous receptor pressure (4). Subcutaneous receptors in the affected area (the trigger point) are under pressure and excessive fluid accumulation causes pain. The Kinesio Taping mechanism elevates the skin and increases the area under the skin, which helps improve lymphatic drainage, thereby reducing the inflammatory and pressure factors, improving the muscle movements, and reducing the pain (7, 15). The present study also showed the effectiveness of Kinesio Taping in pain relief in the Trigger point area.

Neck pain can lead to disabilities and problems in participation in activities of daily living and work (14), and since the NDI measures the effect of pain on Activities of daily living, pain reduction reduces the disability (16). A decrease in the intensity of neck pain was shown in this study to increase the ability to perform activities assessed by the NDI.

The limitation of the range of motion in the myofascial pain syndrome is most often due to muscle spasm (17). We used Kinesio Taping with the upper trapezius muscle inhibition technique in our study, the results of which showed that flexion, lateral flexion, and rotation have statistically significant changes in the treatment group in comparison with the placebo group, and there was not a statistically significant difference between the two groups in extension, however, this motion was greatly improved in the treatment group and was not changed in the placebo group. Ay et al. came to similar findings in their study, although the range of motion showed significant changes in both groups in their study and the participants had received training regarding therapeutic exercises at home in addition to Kinesio Taping (2). Mariana and Carmen-Oana also reported an increase in the range of motion in the flexion, rotation, and lateral flexion, as did our study (10).

The findings of a study conducted by Ozturk et al. was also consistent with ours, as they showed that Kinesio Taping reduces pain and improves disability (4). Chao et al. also concluded that Kinesio Taping can reduce the severity of pain, although this was a comparative study of the effect of Kinesio Taping with and without manual pressure release, which showed the effectiveness of the combination of manual pressure release and Kinesio Taping on pain and disability is more than each one of the two techniques (6). Mariana and Carmen-Oana found that both massage and Kinesio Taping are effective in reducing pain and disability, however, Kinesio Taping has a faster effect on pain relief (10). Ay et al. came to similar findings regarding pain reduction but not disability (2). Paweł et al. also found that Kinesio Taping is a quick and effective way to reduce pain (18). However, Halski et al.'s findings are slightly different from those of the present study. They conducted a comparative study on the effectiveness of Kinesio Taping and cross and non-elastic adhesive, finding that the bioelectric activity of upper trapezius was not different in any of the groups, however, there was pain reduction in all three groups. In other words, the three methods had no differences and it was shown that Kinesio Taping does not have any more effect on pain reduction. However, Kinesio Taping was shown in this study to reduce pain and improve neck disability. Those researchers also asserted that the placebo can also reduce pain, although the present research used space techniques in our study, they only used the space techniques (3).

The present study indicated no significant difference in the control group receiving placebo Kinesio Taping without tension between the pre- and post-treatment evaluations. It seems that Kinesio Taping cannot have therapeutic effects if not properly used. It should be noted that when Kinesio Taping is used as placebo and without any tension, it does not induce any skin stimulation and its resultant stimulation is by no means comparable to that of Kinesio Taping with proper tension (19). The results of the present study confirm this, due to the fact that Kinesio Taping, with a proper tension in the intervention group, improved the pain, range of motion, and neck disability, however, no change was observed in the control group, which had used Kinesio Taping only as placebo and without tension. However, Ozturk et al.'s study showed considerable improvement in the level of pain in the control group immediately after the intervention, leading the researchers to attribute this result to psychological effects, or to the conclusion that that placebo Kinesio Taping may have caused sensory feedback during neck movements, which may have improved patient awareness (4). The small size of patients can be considered as a limitation that must be taken into account in this study.

In conclusion, Kinesio taping is a non-invasive and pain-reducing method with few side effects, which can be used in myofascial pain syndrome to reduce pain and increase the range of motion and ultimately reduces neck disability after several time usages. Kinesio Taping can also reduce the symptoms of this syndrome both in the short term and in the long term, and it can also increase physical health, reduce disability, and help maintain therapeutic effects if used repeatedly.

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Footnotes

Authors' Contribution: Study concept and design by Alireza Shamsoddini. Acquisition of data by Zabih Allah Rasti. Analysis and interpretation of data by Alireza Shamsoddini and Zabih Allah Rasti. Drafting and editing by Alireza Shamsoddini and Zabih Allah Rasti.

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