Immediate Effect of Kinesio Taping on Cervical Lateral Flexion Range of Motion in Subjects With Myofascial Trigger Point in Upper Trapezius Muscle

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ABSTRACT

Purpose: The purpose of this study was to investigate the effect of kinesio-taping on the range of motion of cervical lateral flexion point in subjects with trigger point in upper trapezius muscle.

Methods: A total of 32 subjects with myofascial trigger point in their upper trapezius muscles participated in this randomized controlled trial (RCT). The subjects were randomly assigned to two groups: Kinesio-taping (KT) (n=16) and KT placebo (n=16). Their ipsilateral and contralateral cervical lateral flexion range of motion was measured before and immediately after treatment in both groups using a standard goniometer. Paired t-test was used to determine any significant difference in the range of motion after treatment sessions compared with pretreatment score in the control and experimental group. Analysis of covariance (ANCOVA) was calculated to determine the significance of differences between two groups in posttest scores, with pretreatment scores used as covariates in the analysis.

Results: Statistical analysis (paired t-test) revealed no significant increase in cervical lateral flexion range of motion in both ipsilateral and contralateral side immediately after KT application in both groups compared with pretreatment score ($P>0.05$). In the ANCOVA, with controlling pretest scores, no significant difference was found between the two groups (KT and placebo) after treatment sessions ($P>0.05$)

Conclusion: Application of kinesio taping cannot immediately produces an improvement in cervical lateral flexion in subjects with trigger point in upper trapezius muscles.

1. Introduction

Myofascial pain syndrome is one of the major causes of musculoskeletal disorders [1-3]. Myofascial trigger point (TP) is commonly defined as a hyperirritability spot located in a taut band of muscle which is tender in palpation or compression and has referral pain or tenderness. When force is applied to a TP, a “jump sign” or “jump response” is elicited [4].

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Several reports indicated that TPs are the primary source of musculoskeletal pain [5, 6, 7, 8]. It has detrimental effects on work-related activities and quality of life and causes pain and functional disability in neck and shoulder area [2, 3, 9].

Investigators established that the local oxygen saturation at a TP site is less than 5% of normal. Local tenderness and referred pain following TP palpation results in muscle nociceptors stimulation in response to reduced oxygen levels and increased inflammatory biochemicals [6, 10, 11-13]. Histological studies have confirmed the presence of extreme sarcomere contractions in TP [11].

Upper trapezius (UT) is one of the most affected muscles by TP [14-16]. Taut and painful muscle, tension headache, neck pain, dizziness or vertigo, limited neck and shoulder range of motion (ROM) are the he common symptoms and pain patterns in subjects with TP in UT muscle [4, 17-19].

With regard to the attachment of the UT muscle to lower and upper cervical spine and suboccipital region and considering the role of UT in controlling ROM of the cervical lateral flexion, it is proposed that TP in UT muscle can result in limited cervical ROM [20, 21].

Physiotherapy programs play a significant role in the management and improvement of symptoms in patients with Myofascial trigger point (MTP). The ischemic compression (IC) is currently used for the subjects with MTP attending physical therapy clinics [1, 13, 22].

Kinesio taping (KT) is a non-invasive method to treat musculoskeletal disorders. KT has non-allergenic properties and can be placed on the skin comfortably for several days [23]. Elastic tape used in KT method is extremely thin and much more elastic than conventional bandages and can be stretched up to 30-40% of its resting length [24].

Investigators stated that the KT can improve blood and lymphatic circulation, reduces pain, realign joints, and reduces the muscle tension. KT is recently used by physical therapists to unload the myofascial structure and TP. KT is clinically suggested for mechanical correction, fascia correction, ligament-tendon correction, functional correction, lymphatic correction, and space correction. KT application can affect fascia and skin mechanoreceptors, result in reducing muscle tension [23]. The effects of KT are multidimensional such as mechanical, neurophysiological, and psychological [25].

KT can also be used to lift the soft tissues above the painful or inflammation area. It was proposed this method would deload the underlying soft tissues, resulting in decreasing pain and tenderness. One possible mechanism for deloading property of KT is related to neurophysiological effects that modulates nociceptive processing. KT stimulates mechanoreceptors and alters skin tension. The role of cutaneous mechanoreceptors is to detect the pressure. Therefore it is postulated that through this mechanism tape can alter the perception of an applied external pressure over cutaneous tissues and affect pressure pain thresholds [25].

Review of the literature revealed that a few RCT (randomized clinical trials) have been conducted to determine the effectiveness of KT in the treatment of TP in UT muscle. The purpose of this study was to investigate the immediate effect of KT method on active cervical lateral flexion ROM compared with placebo control in individuals with MTP in UT muscle.

2. Materials and Methods

Study participants

A total of 32 patients with TP in their UT muscles, who were referred for outpatient physiotherapy evaluation and intervention, participated in this study. The study sample were between 20 and 50 years old and chosen by convenience sampling method. They were consecutive patients who agreed to participate and fulfilled the inclusion criteria.

The inclusion criteria for having active TP in UT muscle were as follow [26, 27]:

1. Existence of taut band in muscle;

2. Existence of a hypersensitive tender point in the taut band;

3. Reproduction of the referred pain pattern of the TP in response to pressure. Pressure was assessed using a mechanical pressure algometer;

4. Spontaneous presence of the typical referred pain pattern and/or patient recognition of the referred pain as familiar; and

5. Pain of at least 30 mm on a visual analogue scale (VAS).

The selected TP of the UT muscle was located in the middle of the UT muscle.

The exclusion criteria comprised fibromyalgia syndrome, whiplash injury, cervical spine surgery and fracture, cervical radiculopathy, any systematic disease such as rheumatism and tuberculosis or cervical myelopathy, multiple sclerosis [12]. All subjects signed an informed consent form approved by the human subjects committee at the University of Social Welfare and Rehabilitation Sciences.

Patients were randomly assigned to a control (Placebo) group (n=16, mean±SD age=31.62±11.43 y) and an experimental (KT) group (n=13, mean±SD age=26.81±2.1 y). Physical characteristics of the patients in each group are shown in Table 1.

Procedure

The treatment protocol for experimental group consisted of the KT technique on TP in UT muscle. For this purpose, the subject's position was sitting with neck placed in neutral position with slight. The base of KT, Y strip, was placed over the insertion of the muscle in the acromion with no tension. The superior tail was attached over the upper part of the muscle and ended at the medial side of the muscle near the spinous process. The lower tail was attached along the lower part of the muscle below the TP. In this study, KT was modified and applied over UT using an unloading technique. After attaching the superior tail, the therapist lifted the taut band with one hand and then attached the lower tail with the other hand with 75% tension on the tails.

Therefore, the muscle was unloaded by lifting up the soft tissue and the trigger point was surrounded by two tails which ended at the spinous process [28]. The treatment protocol for the control group consisted of the placebo KT. The tape was placed over the tissue with no tension.

The active ipsilateral flexion (ILF) ROM and contralateral lateral flexion (CLF) ROM of the cervical spine were determined before treatment and immediately after treatment session in both groups.

ROM of the ILF and CLF of the cervical spine were measured using a universal goniometer [29]. For this purpose, the subject was in a sitting position with thoracic and lumbar spine well supported by the back of the chair and the cervical spine is in 0 degree of flexion/extension and rotation. Wooden tongue depressor was held between teeth for reference. The goniometer fulcrums were alongside the tongue depressor and the cervical lateral flexion ROM was measured.

Statistical analysis was performed using SPSS version 17.0. The Student t-test was used to compare the age, weight, and height between two groups. Paired t-test was used to assess any significant difference in ILF and CLF immediately after treatment session compared with pretreatment score in control and treatment group. Analysis of covariance (ANCOVA) was used to determine the significance of differences between the groups in posttest measurements.

3. Result

Demographic data (Mean±SD) for the subjects in both groups are presented in Table 1. Pre- and post-measurement scores for active ILF and CLF of the cervical ROM in the KT group and KT placebo (control) and the results of paired t-test are provided in Table 2.

The mean ILF ROM score increased from 31.5 and 34.26 in pretest to 32.5 and 34.5 in posttest, respectively for KT and placebo group. The mean CLF ROM scores increased from 33.31 and 34.56 before treatment to 33.81 and 34.84 after treatment, respectively in KT and placebo group.

The result of paired t-test revealed no significant change in ILF and CLF ROM after treatment in KT and placebo group compared with before treatment (P>0.05).

The result of ANCOVA (Table 3) showed no significant difference between two groups on the post-measurement score of ILF (P=0.13), and CLF (P=0.09).

Table 1. Demographic characteristics of the subjects.

Variables	KT Placebo (n=16) Mean±SD*	KT (n=16) Mean±SD	P-value
Age (y)	31.62.5±11.43	26.81±11.2	0.11
Weight (kg)	58.15±8.52	57.37±7.59	0.78
Height (cm)	162.81±6.62	163.34±6.53	0.82

*SD=Standard Deviation.

PHYSICAL TREATMENTS

Table 2. Pre- and post-measurement scores for ILF and CLF in the subjects.

Variables	Group	Before Treatment	After Treatment	P-value
		Mean±SD	Mean±SD	
ILF	KT	31.5±6.87	32.5±6.19	0.31
	KT Placebo	34.26±6.66	34.5±6.79	0.42
CLF	KT	33.31±7.01	33.81±7.35	0.33
	KT Placebo	34.56±6.85	34.84±7.6	0.47

Abbreviations: ILF=Ipsilateral flex, CLF=Contralateral flex.

PHYSICAL TREATMENTS

Table 3. The results of ANCOVA in KT and placebo groups.

Variable	Sum of Squares	df	Mean Square	F	P-value
ILF	55.49	1	55.49	2.66	0.13
CLF	58.06	1	58.06	2.9	0.09

PHYSICAL TREATMENTS

4. Discussion

Limitation in ROM is one of the most important strategies in the human body to decrease the muscular injury. This ROM limitation is accompanied by muscle stiffness, especially in chronic musculoskeletal syndromes [20]. In today's sedentary lifestyle, people are in static position for long hours. Postural muscles like UT tend to be tightened. Muscle imbalance between postural and phasic muscles results in myofascial pain syndromes. Tightness in postural muscles can induce limited ROM. Thus, myofascial pain syndromes in the presence of TP may present in the forms of pain, decreased joint motion, and muscle tightness or spasm [4].

Pain signal transferred to the spinal cord induces a nociceptive reflex which continuously results in muscle shortening and TP formation. Prolonged local spasm results in muscle fiber shortening and tightness. Shortened muscle fibers will limit the joint ROM [10].

The result of this study showed no significant change in cervical lateral flexion immediately after KT application compared with pretreatment score in both groups. Our data also showed no significant difference in increasing ILF and increasing CLF score between two groups after treatment.

It is proposed that KT stimulates Aβ mechanoreceptors with slow threshold and increase afferent signals to high levels of central nervous system and finally blocks the pain receptors (Aδ and C fibers) result in nerve depolarization and inhibition of pain-spasm circle [30]. Another theory is that KT increases circulation and improves pain intensity [31]. In our study, KT was applied in slight lengthened position of muscle fibers (slight lateral flexion), therefore it may correct sarcomeres length in TP zone and normalize sarcomeres length. We also tried to deload the TP in muscle. However, we found no immediate effect of KT on ROM.

Similar findings have been reported elsewhere. Gonzales et al. [32] showed that KT application in patients with whiplash injury cannot immediately improve the cervical ROM. It is probable that the tension applied by the real application might have induced neural feedback to the subjects during cervical motion, thus facilitating their capability to move the neck with a reduced mechanical irritation of the connective tissues. The tension in the KT may have also caused tension in the soft tissue structures when the patient returned the head to a neutral position. However, since the time of KT over the soft tissue is short we can find significant difference in the cervical ROM. It seems that more time is needed to investigate the clinical effectiveness of KT application in the cervical ROM in patients with TP in UT muscle. Future studies are suggested to assess the clinical effectiveness of the KT in these patients. Furthermore, because fear of movement is related to pain intensity in patients with TP in the muscles, it is possible that application of KT induces a proper sensory feedback to the patients. However, since more time is necessary for pain relief, finding no significant difference in cervical ROM might be due to pain intensity in subjects with TP in UT muscle.

Another reason for no statistical differences in ILF and CLF can be due to the relatively small difference observed between groups. In conclusion, application of KT cannot immediately improve ILF and CLF in subjects with TP in UT muscles.

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Conflict of Interest

The authors declared no conflict of interests.

References

[1] Rickards LD. The effectiveness of non-invasive treatments for active myofascial trigger point pain: a systematic review of the literature. International Journal of Osteopathic Medicine. 2006; 9(4):120-36. doi: 10.1016/j.ijosm.2006.07.007

[2] Tough EA, White AR, Richards S, Campbell J. Variability of criteria used to diagnose myofascial trigger point pain syndrome-evidence from a review of the literature. Clinical Journal of Pain. 2007; 23(3):278-86. doi: 10.1097/ajp.0b013e31802fda7c

[3] Yap E. Myofascial pain-an overview. Annals-Academy of Medicine Singapore. 2007; 36(1):43-48. PMID: 17285185

[4] Hanten WP, Olson SL, Butts NL, Nowicki AL. Effectiveness of a home program of ischemic pressure followed by sustained stretch for treatment of myofascial trigger points. Physical Therapy. 2000; 80(10):997-1003. PMID: 11002435

[5] Luke DR. Therapeutic needling in osteopathic practice: An evidence-informed perspective. International Journal of Osteopathic Medicine. 2009; 12(1):2-13. doi: 10.1016/j.ijosm.2009.01.003

[6] Tough EA, White AR, Cummings TM, Richards SH, Campbell JL. Acupuncture and dry needling in the management of myofascial trigger point pain: a systematic review and meta-analysis of randomised controlled trials. European Journal of Pain. 2009; 13(1):3-10. doi: 10.1016/j.ejpain.2008.02.006

[7] Borg-Stein J, Simons DG. Myofascial pain. Archives of Physical Medicine and Rehabilitation. 2002; 83(3):40-47. doi: 10.1053/apmr.2002.32155

[8] Shah JP, Danoff JV, Desai MJ, Parikh S, Nakamura LY, Phillips TM, et al. Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points. Archives of Physical Medicine and Rehabilitation. 2008; 89(1):16-23. doi: 10.1016/j.apmr.2007.10.018

[9] Cummings M, Baldry P. Regional myofascial pain: diagnosis and management. Best Practice & Research Clinical Rheumatology. 2007; 21(2):367-87. doi: 10.1016/j.berh.2006.12.006

[10] Shah JP. Integrating dry needling with new concepts of myofascial pain, muscle physiology, and sensitization. In: Audette JF, Bailey A, editors. Integrative Pain Medicine. New York: Humana Press; 2008, p. 107-21.

[11] Dommerholt J. Dry needling in orthopedic physical therapy practice. Journal of Manual & Manipulative Therapy. 2004; 16(3):15-20. doi: 10.1179/106698111X13129729552065

[12] Hsieh YL, Kao MJ, Kuan TS, Chen SM, Chen JT, Hong CZ. Dry needling to a key myofascial trigger point may reduce the irritability of satellite MTrPs. American Journal of Physical Medicine & Rehabilitation. 2007; 86(5):397-403. doi: 10.1097/phm.0b013e31804a554d

[13] Chaitow L, Fritz S, King RK, Chambers G. A massage therapist's guide to understanding, locating and treating myofascial trigger points. London: Churchill Livingstone; 2006.

[14] Sarrafzadeh J, Ahmadi A, Yassin M. The Effects of Pressure Release, Phonophoresis of Hydrocortisone, and Ultrasound on Upper Trapezius Latent Myofascial Trigger Point. Archives of Physical Medicine and Rehabilitation. 2012; 93(1):72-77. doi: 10.1016/j.apmr.2011.08.001

[15] Sciotti VM, Mittak VL, DiMarco L, Ford LM, Plezbert J, Santipadri E, et al. Clinical precision of myofascial trigger point location in the trapezius muscle. Pain. 2001; 93(3):259-66. doi: 10.1016/s0304-3959(01)00325-6

[16] Gemmell H, Allen A. Relative immediate effect of ischaemic compression and activator trigger point therapy on active upper trapezius trigger points: A randomised trial. Clinical Chiropractic. 2008; 11(4):175-81. doi: 10.1016/j.clch.2009.01.007

[17] Lucas N, Macaskill P, Irwig L, Moran R, Bogduk N. Reliability of physical examination for diagnosis of myofascial trigger points: a systematic review of the literature. Clinical Journal of Pain. 2009; 25(1):80-89. doi: 10.1097/ajp.0b013e31817e13b6

[18] Rudin NJ. Evaluation of treatments for myofascial pain syndrome and fibromyalgia. Current Pain and Headache Reports. 2003; 7(6):433-42. doi: 10.1007/s11916-003-0059-4

[19] Fernández-de-Las-Peñas C, Alonso-Blanco C, Miangolarra J. Myofascial trigger points in subjects presenting with mechanical neck pain: A blinded, controlled study. Manual Therapy. 2007; 12(1):29-33. doi: 10.1016/j.math.2006.02.002

[20] Lederman E. Neuromuscular rehabilitation in manual and physical therapies: principles to practice. London: Churchill Livingstone; 2010.

[21] Dommerholt J, del Moral OM, Gröbli C. Trigger point dry needling. Journal of Manual & Manipulative Therapy. 2006; 14(4):70-87. doi: 10.1179/jmt.2006.14.4.70e

[22] de las Peñas CF, Sohrbeck Campo M, Fernández Carnero J, Miangolarra Page JC. Manual therapies in myofascial trigger point treatment: a systematic review. Journal of Bodywork and Movement Therapies. 2005; 9(1):27-34. doi: 10.1016/j.jbmt.2003.11.001

[23] Kase K, Wallis J, Kase T, Association KT. Clinical therapeutic applications of the Kinesio taping methods. Kinesio Taping Association; 2003.

[24] Terrazas J. Kinesiotaping Association International webmaster [Internet]. 2010 [cited 24 February 2011]. Available from: www.kinesiotaping.com

[25] O' Leary S, Leary S, Carroll M, Mellor R, Scott A, Vicenzino B. The effect of soft tissue deloading tape on thoracic spine pressure pain thresholds in asymptomatic subjects. Manual Therapy. 2002; 7(3):150–53. doi: 10.1054/math.2002.0459

[26] Aguilera F, Martín DP, Masanet RA, Botella AC, Soler LB, Morell FB. Immediate effect of ultrasound and ischemic compression techniques for the treatment of trapezius latent myofascial trigger points in healthy subjects: a randomized controlled study. Journal of Manipulative and Physiological Therapeutics. 2009; 32(7):515-20. doi: 10.1016/j.jmpt.2009.08.001

[27] Gemmell H, Miller P, Nordstrom H. Immediate effect of ischaemic compression and trigger point pressure release on neck pain and upper trapezius trigger points: A randomised controlled trial. Clinical Chiropractic. 2008; 11(1):30-36. doi: 10.1016/j.clch.2007.09.001

[28] Hashemirad F, Karimi N, Keshavarz R. The effect of Kinesio taping technique on trigger points of the piriformis muscle. Journal of Bodywork and Movement Therapies. 2016. doi: 10.1016/j.jbmt.2016.02.002

[29] Hislop HJ, Montgomery J, Connolly BH. Daniels and Worthingham's muscle testing: techniques of manual examination. Philadelphia: WB Saunders; 1995.

[30] Meidan VM, Michniak BB. Emerging technologies in transdermal therapeutics. American Journal of Therapeutics. 2004; 11(4):312–16. doi: 10.1097/01.mjt.0000101826.94820.6b

[31] Revel M, Andre-Deshays C, Minguet M. Cervicocephalic kinesthetic sensibility in patients with cervical pain. Archives of Physical Medicine and Rehabilitation. 1991; 72(5):288–91. PMID: 2009044

[32] González-Iglesias J, Fernández-de-Las-Peñas C, Cleland JA, Huijbregts P, Del Rosario Gutiérrez-Vega M. Short-term effects of cervical kinesio taping on pain and cervical range of motion in patients with acute whiplash injury: a randomized clinical trial. Journal of Orthopaedic & Sports Physical Therapy. 2009; 39(7):515-21. doi: 10.2519/jospt.2009.3072