



Original Article

The effects of short-term lumbar stability cross taping on muscle strength of trunk extension and lumbar pain level in patients with chronic back

SUNGBUM JU, PhD¹⁾

¹⁾ Department of Sport and Health Care, Namseoul University: 91 Daehak-ro, Seonghwan-eup, Seobuk-gu, Cheonan-si, Chungcheongnam-do 310-20, Republic of Korea

Abstract. [Purpose] The purpose of this study was to investigate the effects of short-term lumbar stability cross taping program on muscle strength of trunk extension and lumbar pain level in patients with chronic back pain. [Subjects and Methods] The present study divided 14 patients with chronic back pain into the stability cross taping group (SCTG; n=7) and the control group (CONG; n=7). Lumbar cross taping was applied to SCTG for 7 days, but the taping was not applied to CONG. After 7 days of the lumbar stability cross taping application to SCTG, lumbar muscle function and lumbar pain levels were measured using a Medx lumbar extension machine (Medx, USA) and a visual analogue scale (VAS) for the subjects in both SCTG and CONG. [Results] For SCTG, all the elements in lumbar muscle function and were significantly improved and lumbar pain level was also significantly reduced after the application of the 7-day lumbar stability cross taping. However, CONG did not show any statistically significant changes. [Conclusion] The results of the present study showed that the lumbar stability cross taping is an effective rehabilitation to improve lumbar muscle function and reduce lumbar pain level in patients with chronic back pain.

Key words: Lumbar stability cross taping, Muscle strength of trunk extension, Lumbar pain level

(This article was submitted Apr. 11, 2017, and was accepted Jul. 6, 2017)

INTRODUCTION

Lumbar pain is pain which stems from a musculoskeletal system and lasts for more than three days. Lumbar pain, in particular, is caused by the stability reduction of muscle and ligaments supporting lumbar vertebrae rather than the disability of lumbar itself and leads to muscle strength reduction in a lumbosacral part, flexibility reduction, the range of motion limitation of lower extremity joints, and increased pain^{1, 2)}.

Lumbar pain disturbs posture balance performance by distorting normal signal coming into muscle and a sensory system and reduces the ability to keep body balance resulting in abnormal posture and increased epidemiological stress. Moreover, increased stress decreases muscle strength around a spine, damages truncus soft tissue, and causes a degenerative change in a disk³⁾.

Research on chronic back pain removal has been conducted from the perspective of a treatment stressing that an integrated exercise maximizing the coordination of spinal segments by keeping and compensating spinal stability through core muscle stability based on a lumbar extension strength exercise^{4, 5)}. In fact, applying a lumbar muscle function enhancement program has an important meaning for patients with chronic back pain to establish lumbar stabilization.

Unlike a majority of previous studies which emphasized lumbar stabilization with a lumbar muscle function enhancement program³⁻⁵⁾, the present study focused on the application of a lumbar stabilization cross taping method to patients with chronic back pain and its effects on muscle function enhancement and pain control.

Kinesio-taping is an effective therapy that is based on Gate Control Theory which has muscle relaxation effects as taping

Corresponding author. Sungbum Ju (E-mail: accent-ju@nsu.ac.kr)

©2017 The Society of Physical Therapy Science. Published by IPEC Inc.



This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License. (CC-BY-NC-ND 4.0: <http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Table 1. The comparison of lumbar muscle function in the each group

Group	Angle of Medx lumbar extension machine	Pre (mean ± SD) (ft-lbs)	Post (mean ± SD) (ft-lbs)
SCTG	0° *	58.2 ± 17.5	68.7 ± 13.0
	24° *	83.5 ± 12.1	100.5 ± 12.8
	48° *	103.7 ± 11.0	122.8 ± 12.6
	72° *	119.1 ± 11.8	147.8 ± 18.8
CONG	0° *	57.2 ± 13.2	51.2 ± 14.1
	24° *	77.1 ± 18.4	82.1 ± 18.5
	48° *	104.4 ± 22.8	110.1 ± 8.7
	72° *	122.2 ± 17.5	122.2 ± 17.5

*p<0.05, SCTG: stability cross taping group; CONG: control group

Table 2. The comparison of lumbar pain level in the each group

Group	Pre (mean ± SD) (points)	Post (mean ± SD) (points)
SCTG*	5.1 ± 1.3	2.0 ± 1.8
CONG	5.7 ± 1.6	7.1 ± 1.3

*p<0.05, See Table 1 for abbreviation key

is applied to stiff muscle having its full extension and keeping extension state, nerve and blood vessel pressure relief with the appearance of space between skin and stiff muscle caused by skin wrinkle with taping application, trembling phenomena with gamma exercise neural reflex, and reduced pain with taping stimulation⁶). However, the existing kinesio-taping method has its own limitation that it might not be utilized if a patient has widespread pain on an entire lumbar part as patients with chronic back pain.

Therefore, the present study purported to develop a lumbar stability cross taping inducing lumbar stability and controlling pain as a new kinesio-taping method and to investigate lumbar muscle function enhancement and pain reduction by applying it to patients with chronic back pain.

SUBJECTS AND METHODS

For the research subjects, 14 female patients who were diagnosed a chronic back pain patients for more than 6 months based on a simple x-ray test and an orthopedist's medical opinion were divided into the stability cross taping group (SCTG, n=7) and the control group (CONG, n=7). The study participants in SCTG had the age of 65.7 ± 3.5 , the height of 152.4 ± 5.1 cm, the weight of 64.7 ± 2.3 kg, whereas the participants in CONG showed the age of 65.1 ± 2.9 , the height of 153.1 ± 4.5 cm, the weight of 60.6 ± 7.6 kg. The two groups were proved to be statistically identical based on the comparison of age, height, and weight ($p < 0.05$). The description on the purpose and procedure of the present study was given to potential patients before the beginning of the study, and the potential participants signed a study consent form with their own will.

For the lumbar cross taping application, we used Kinesio-tape with the 2.5 cm width (Nitto Denko Co., Japan). The five taping applications started from the point where the top of iliac crest and iliac spine meet to the end of the 12th false rib, the 12th thoracic vertebrae spur, the opposite 12th false rib, the body trunk end at the direction of the elbow, and the top of the opposite iliac crest, and the five taping on the opposite side were identically applied, showing lattice shapes which help to stabilize lumbar stability only in SCTG for 7 days. In order to compare muscle function and pain levels before and after the 7-day lumbar stability cross taping application, a Medx lumbar extension machine 96 (Florida Medical University, USA & Medx 96, USA) and a visual analogue scale (VAS) were utilized, respectively. A paired t-test was conducted to compare muscle function and pain levels before and after the 7-day lumbar stability cross taping program using SPSS 21.0 windows. Statistical significance level was set at 0.05.

This study was approved by Namseoul University's Institutional Review Board, and the subjects were safely protected throughout every stage of the experiment. All of the subjects understood the purpose of this study and provided written informed consent prior to their participation in accordance with the ethical standards of the Declaration of Helsinki.

RESULTS

For SCTG, all the elements in lumbar function and were significantly improved and lumbar pain level was also significantly reduced after the application of the 7-day lumbar stability cross taping ($p < 0.05$). However, CONG did not show any statistically significant changes in neither lumbar muscle function nor pain levels after 7 days (Tables 1, 2).

DISCUSSION

The present study purported to investigate the effects of lumbar stability cross taping on muscle function and pain and an application possibility of lumbar stability cross taping to patients with chronic back pain as a rehabilitation program. The reduction of lumbar extension muscle strength is a main cause of chronic back pain, and, in most cases, patients with

chronic back pain show a decrease in lumbar muscle strength along with the imbalance between bending muscle strength and extension muscle strength, stressing that a proper exercise treatment is important in these patients^{7, 8}).

However, the occurrence of chronic back pain has a negative impact on participation into an exercise treatment. Given this, it is important to investigate the effects of a treatment that improves lumbar stability or reduces pain before a lumbar extension exercise program in patients with chronic back pain. Thus, unlike the basic taping that applies taping on lumbar backbone erector and quadratus lumborum muscle, we developed a new lumbar stability cross taping method which applies taping from the direction of the 12th thoracic vertebrae to the opposite iliac crest and applied it to SCTG for 7 days.

Consequently, SCTG showed statistically significant improvement in all the elements of lumbar muscle function after the 7-day lumbar stability cross taping program ($p < 0.05$). In particular, when lumbar stability cross taping was applied to the study subjects, the taping on the both right and left lumbar parts showed crossed tapings with lattice shapes and improved lumbar stability. It seems that the lumbar muscle enhancement resulted from the maximization of muscle function as the crossed tapings supported the lumbar part, which is back trunk⁹), promoted the blood circulation with the activation of muscle, and provided a positional stimulus to fascial tissue and an appropriate afferent input to the central nervous system patients¹⁰).

Moreover, it also appears that the taping on the wide lumbar area enabled lumbar stability¹¹) and reduced back pain resulting in lumbar muscle function enhancement which could not be induced due to back pain

SCTG showed a significant decrease in lumbar pain level after the 7-day lumbar stability cross taping program ($p < 0.05$). The Gate Control Theory, which the physical stimulus of taping reaches the spinal cord before fibers delivering pain does, is a generally accepted theory behind the pain reduction with a taping therapy¹²). It seems that the lumbar stability cross taping removed physical pain with the pressure elimination on nerve and blood vessels as the spaces were created between tape-applied skin and muscle, the edema reduction with an exudation induced by topical circulation enhancement, and an increase in blood and lymph fluid through muscle¹⁰). Additionally, the pain reduction with the lumbar stability cross taping seems to result from the settlement of the synchia of connective tissue around muscle where pain occurs¹³).

Based on the findings of the present study, it can be suggested that future research emphasizing a lumbar stability cross taping as an effective short-term rehabilitation program as well as an integrated application of the cross taping with a variety of exercise therapies in patients with chronic back pain might be necessary. It is expected that the findings of this study with the lumbar stability cross taping can provide a useful therapeutic method regarding muscle function enhancement and lumbar pain level reduction in patients with chronic back pain.

ACKNOWLEDGEMENT

Funding for this paper was provided by Namseoul University.

REFERENCES

- 1) Fast A: Low back disorders: conservative management. *Arch Phys Med Rehabil*, 1988, 69: 880–891. [[Medline](#)]
- 2) Risch SV, Norvell NK, Pollock ML, et al.: Lumbar strengthening in chronic low back pain patients. Physiologic and psychological benefits. *Spine*, 1993, 18: 232–238. [[Medline](#)] [[CrossRef](#)]
- 3) Anders C, Brose G, Hofmann GO, et al.: Evaluation of the EMG-force relationship of trunk muscles during whole body tilt. *J Biomech*, 2008, 41: 333–339. [[Medline](#)] [[CrossRef](#)]
- 4) Marshall PW, Murphy BA: Core stability exercises on and off a Swiss ball. *Arch Phys Med Rehabil*, 2005, 86: 242–249. [[Medline](#)] [[CrossRef](#)]
- 5) Akuthota V, Nadler SF: Core strengthening. *Arch Phys Med Rehabil*, 2004, 85: S86–S92. [[Medline](#)] [[CrossRef](#)]
- 6) Ju SB, Lee WJ: The effects of kinesio taping and exercise therapy program on lumbar extension muscle strength, visual analogue scale in operation patients of lumbar disk herniation. *Korean J Phys Educ*, 2005, 45: 537–546.
- 7) Hasue M, Fujiwara M, Kikuchi S: A new method of quantitative measurement of abdominal and back muscle strength. *Spine*, 1980, 5: 143–148. [[Medline](#)] [[CrossRef](#)]
- 8) Suzuki N, Endo S: A quantitative study of trunk muscle strength and fatigability in the low-back-pain syndrome. *Spine*, 1983, 8: 69–74. [[Medline](#)] [[CrossRef](#)]
- 9) Kottke FJ, Lehmann JF: *Krusens handbook of physical medicine and rehabilitation*, 4th ed. Philadelphia: Saunders, 1995.
- 10) González-Iglesias J, Fernández-de-Las-Peñas C, Cleland JA, et al.: Short-term effects of cervical kinesio taping on pain and cervical range of motion in patients with acute whiplash injury: a randomized clinical trial. *J Orthop Sports Phys Ther*, 2009, 39: 515–521. [[Medline](#)] [[CrossRef](#)]
- 11) Park GD, Ju SB: The effects of physical Fitness and lumbar back strength of the chronic low back pain patient's apply with lumbar strength exercise program and manipulation. *Korean J Phys Educ*, 2005, 44: 497–506.
- 12) Karlsson J, Andreasson GO: The effect of external ankle support in chronic lateral ankle joint instability. An electromyographic study. *Am J Sports Med*, 1992, 20: 257–261. [[Medline](#)] [[CrossRef](#)]
- 13) Graves JE, Pollock ML, Carpenter DM, et al.: Quantitative assessment of full range-of-motion isometric lumbar extension strength. *Spine*, 1990, 15: 289–294. [[Medline](#)] [[CrossRef](#)]