Original Article

JER

https://doi.org/10.12965/jer.1734910.455

Journal of Exercise Rehabilitation 2017;13(2):227-231

Effects of a static stretch using a load on low back pain patients with shortened tensor fascia lata

Hae-In Bae[1], Dae-Young Kim[2], Yun-Hee Sung[1,*]

[1]Department of Physical Theraphy, Graduate School of Industry & Business Administration of Kyungnam University, Changwon, Korea
[2]Department of Sports Healthcare, College of Humanities & Social Sciences, Inje University, Gimhae, Korea

Stretch of tensor fascia lata (TFL) improves range of motion on hip and pelvis and it reported to help reduce low back pain. Accordingly, the purpose of this study was to investigate effects of static stretching using a load on TFL in patients with low back pain. Twenty three subjects were recruited according to the selection criteria. The subjects were randomly assigned to static stretching group (control, n=12), and a static stretching using a load group (experimental, n=11). All group performed stretching for 15 min (side for 50 sec per time and a rest for 30 sec) per day in the left side and the right, respectively, for 2 weeks. Before and after the intervention, all groups measured visual analogue scale (VAS), stand and reach test, and the Oswestry disability index (ODI). In the present results, we found that the experimental group showed significant differences in VAS, stand and reach test, and the ODI ($P<0.05$) in before and after the intervention. Therefore, static stretching using a load can be actively utilized for low back pain patients with shortened TFL.

Keywords: Low back pain, Tensor fascia lata, Static stretch, Load

INTRODUCTION

Low back pain is a musculoskeletal disease to cause problems in daily life if it lasts longer than three months (Sherafat et al., 2013). Although the cause of low back pain has not been clearly revealed yet, changes in the lumbar structure due to musculoskeletal damage and the biomechanical factors of surrounding tissues are considered to be the main causes of low back pain. In addition, muscles around the spinal column, which play an important role in maintaining the stability of the spinal column during movement, and muscles that help maintain the normal curvature of the spinal column such as the lumber muscles, the hip flexor muscles, and the hamstring muscle are reported to be muscles associated with low back pain (Kim et al., 2014).

Among the lower extremity muscles, the tensor fascia lata is used in hip joint flexion, adduction, and internal rotation and knee joint extension and external rotation and plays diverse roles in the hip and knee joints (Kendall et al., 2005). Gottschalk et al. (1989) reported that if the tensor fascia lata is shortened, the hip joint will be internally rotated leading to the rotation of the pelvis and that excessive internal rotation of the hip joint will cause the abnormal alignment of the lumbar spine and the hip joint leading to pain in the lumbar region and the pelvis (Gottschalk et al., 1989; Kim and Son, 2009; Schamberger et al., 2002). Therefore, the stretching of the tensor fascia lata should be considered for the treatment of low back pain because it improves the range of motion of the hip joint and the pelvis and reduces low back pain (Kippers and Parker, 1987). In a recent study, Lee et al. (2015) confirmed tension of anterior fibers of the gluteus medius muscle and the tensor fascia lata in patients with chronic low back pain. After exercise for relaxing and strengthening these muscles, pain was relieved.

As methods for low back pain treatment, exercise such as stretching, aerobic exercise, and sling are presented (Hertzman-Miller et al., 2002). Among them, stretching exercise relieves muscle tension, leads to improve blood circulation. Increase the movement in the trunk and legs by stretching improves muscle strength, alleviate low back pain, and help recovery of normal

*Corresponding author: Yun-Hee Sung http://orcid.org/0000-0002-4877-9784
Department of Physical Therapy, Graduate School of Industry & Business Administration of Kyungnam University, 7 Gyeongnamdaehak-ro, Masanhappo-gu, Changwon 51767, Korea
Tel: +82-55-249-6334, Fax: +82-50-5999-2170, E-mail: sungpt97@kyungnam.ac.kr
Received: January 13, 2017 / Accepted: April 2, 2017

pISSN 2288-176X
eISSN 2288-1778

movements (Ylinen, 2008). Among many methods of stretching, static stretching is presented as a safer and more effective method because it does not exceed the normal range of motion of joints. It does not require a high level of fitness, and causes less muscle pain (Matsuo et al., 2015). In particular, static stretching using a load is known to maximize the effects to stretch muscles and tendons (Kim et al., 2015; Peck et al., 2014; Shrier and McHugh, 2012) compared effect of static stretching with or without a load on the shortened hamstring. They reported that the static stretching using a load improves flexibility within a shorter period of time. Most studies reported that stretching has positive effects in healthy individuals instead of patients with diseases. Therefore, the purpose of this study was to investigate the effect of static stretching using a load on the pain, flexibility, and the low back pain disability index on low back pain patients with the shortened tensor fascia lata.

MATERIALS AND METHODS

Participants

In this study, 23 patients with low back pain who were positive in the shortening test of the tensor fascia lata (Ober Test) were selected. We explained procedure and purpose of the study and they signed the agreement. The general characteristics of the subjects are as shown in Table 1. All subjects were randomly assigned to a control group (n = 12) and an experimental group (n = 11). The control group held the hands above the head in a standing position, and bent trunk to the opposite direction of the leg being stretched, adducted, internally rotated in the leg being stretched. The experimental group fixed the upper body in a supine position and bent, adducted, internally rotated one leg to drop it to below the bed thereby stretching it using the leg weight as a load. All the stretching exercises were performed for 15 min (6 times for 50 sec per time and 7 times per week for 2 weeks) in right and left leg.

Visual analogue scale

The subjects were requested to mark degree of subjective pain on a 10-cm-long transverse line and the marks were scored. Zero centimeter indicates no pain at all, and 10 cm indicates the most intense pain.

Stand and reach test

Each subject put both soles into contact with the instrument in a standing position, stretched their knees completely, and stretched their arms downwardly. In this state, we measured the distance from the instrument to the tip of the middle finger. The vertical plane of the instrument was given 0 and when the zero point is not reached, data were expressed as a minus sign.

Table 1. General characteristics in the participants (n = 23)

Characteristic	Control group (n = 12)	Experimental group (n = 11)
Sex	12	11
Male:female	2:10	3:8
Age (yr)	44.16 ± 17.28	44.18 ± 15.98
Height (cm)	161.83 ± 6.47	161.00 ± 13.92
Weight (kg)	59.08 ± 8.56	61.40 ± 9.47

Values are presented as number or mean ± standard deviation.

Oswestry disability index

Physical disabilities due to chronic low back pain were assessed using the self-administered questionnaire Oswestry's disability index. The Oswestry disability index (ODI) consists of 10 items. However, a version with nine areas except for sexual life was used. The degree of participants' performance was assessed on a 6-point scale. Higher scores mean that the subject has severer functional disabilities.

Statistical analysis

Statistical processing was performed using IBM SPSS Statistics ver. 21.0 (IBM Co., Armonk, NY, USA). The independent *t*-test was conducted to compare intergroup differences between before and after exercises and the paired *t*-test was conducted to compare intragroup differences between before and after exercises. The statistical significance level was defined as 0.05 or less. All tests were evaluated before and after stretching, and in all tests, the exercises were performed three times and the average values were used.

RESULTS

Pain

The visual analogue scale was used to examine changes in pain. The control group showed significant differences between before and after intervention ($P < 0.05$) and the experimental group also did so ($P < 0.05$). However, there was no significant difference between the two groups ($P > 0$ .05) (Table 2).

Disability in the daily life

The ODI was used to measure disability in patients with low back pain. The control group showed significant difference between before and after the intervention ($P < 0.05$), and the experi-

https://doi.org/10.12965/jer.1734910.455

Table 2. Change of pain in patients with low back pain (n=23)

	Group	Pre	Post	*F*	*P*-value
VAS (score)	Control	4.25±1.28	2.83±1.33	2.927	0.014*
	Experimental	5.31±1.87	2.00±0.92	5.209	0.000*
	F	1.767	1.125		
	P	1.579	1.752		

Values are presented as mean±standard deviation.
VAS, visual analogue scale.
*$P<0.05$.

Table 3. Disability of the daily life in patients with low back pain (n=23)

	Group	Pre	Post	*F*	*P*-value
ODI (score)	Control	8.75±3.44	4.58±3.55	9.840	0.000*
	Experimental	8.00±3.09	2.90±2.42	6.732	0.000*
	F	0.090	0.431		
	P	0.550	1.329		

Values are presented as mean±standard deviation.
ODI, Oswestry disability index.
*$P<0.05$.

Table 4. Difference of flexibility in between before and after intervention (n=23)

	Group	Post–Pre	*F*	*P*-value
Stand RT (cm)	Control	1.88±3.78	0.30	0.046*
	Experimental	5.61±4.55		

Values are presented as mean±standard deviation.
Stand RT, stand and reach test.
*$P<0.05$.

mental group also did so ($P<0.05$). However, there was no significant difference between the two groups ($P>0$ .05) (Table 3).

Flexibility

The sit and reach test was used to assess flexibility. We analyzed difference between before and after intervention in stand and reach test. There was significant difference between the two groups ($P<0.05$) (Table 4).

DISCUSSION

Most people experience low one back pain at least once while they are living (Park et al., 2005). To effectively treat low back pain, reducing pain and increasing strength and flexibility are important (Rainville et al., 2004). The application of stretching to the lumbar and leg muscles is known to alleviate low back pain and help restoration (Paek et al., 2014). Among them, the stretching of the tensor fascia lata has been reported to improve the range of motion of the hip joint and pelvis and relieve low back pain (Kippers and Parker, 1987). Therefore, we investigated the effect of static stretching using a load on the tensor fascia lata on the on pain, flexibility, and low back pain disability index in patients with low back pain.

Pain is a primary symptom of low back pain or is an important to confirm treatment outcome. Patients with low back pain want to minimize movements to relieve pain. This is because the sensitivity of tissues increases around the pain region (Goubert et al., 2004). In particular, when movement patterns to avoid pain, such as the reduction of the range of motion of the lumbar spine and the reduction of tilting and curvature of the vertebrae appear, the patient becomes to experience difficulties even in basic activities of daily living (Faas, 1996; Zusman, 1992). In the present study, the application of stretching to the tensor fascia lata reduced pain in patients with low back pain and helped their return to daily life. These effects are attributable to the fact that the application of stretching relaxed surrounding muscles leading to the expansion of the capillaries, resulting in increased blood supply to the muscle cells, so that metabolites are reduced and sufficient oxygen is supplied to reduce pain (Park et al., 2005; West et al., 2014). In addition, pain can change activation of muscle and recruitment pattern (Hodges and Richardson, 1999). Therefore, we supposed that the application of stretching to the tensor fascia lata reduced the pain so that the tension of the lower extremity muscles was relieved and the unbalance in the functional aspect was improved to help recovery of daily life.

For the musculoskeletal system to function properly, not only all joints should maintain proper ranges of motion, but also the extensibility of the muscles, tendons, articular capsules, and ligaments (Shephard et al., 1990). Sahrmann (2002) reported that most low back pain would be relieved if the trunk muscles were controlled and the flexibility of the lower extremities was increased. Paek et al. (2014) reported that stretching and pinch lift and rubbing manual therapies applied to patient with lower back pain were effective for muscle strengthening, pain relief, and flexibility. The result of this study also showed that the application of stretching using a load on the tensor fascia lata connected from the pelvis to the lower extremity increased flexibility. Many researchers apply stretching with a load to increase flexibility. This method is known to maximize the effect to stretch muscles and tendons (Peck et al., 2014). Kim et al. (2015) also reported that the application of stretching using a load to the hamstring showed faster flexibility effects than group treated only stretching. In this case, 10% of one-repetition maximum (1RM) was applied as a load during stretching. This method has shortcomings as it is difficult to measure 1RM from the patient and it cannot be easily used by those who do not have the tool to apply the load suitable for them. In the present study, we used the weight of the lower extremity of the subject without any tool. It can be easily used by patient with low back pain for flexibility.

In conclusion, static stretching using a load on the tensor fascia lata affected the pain relief and flexibility increases in patients with low back pain and its positive effects for return to daily life were identified. Therefore, stretching using a load is considered to be utilizable as a more effective intervention method than applying only stretching to low back pain patients with the shortened tensor fascia lata. However, the results of this study cannot be sufficiently generalized because experiments were conducted with a small number of subjects and this study has a limitation as the effects of stretching applied to the tensor fascia lata on the pelvis and low back were not analyzed and observed in three dimensions.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

Faas A. Exercises: which ones are worth trying, for which patients, and when? Spine (Phila Pa 1976) 1996;21:2874-2878.

Gottschalk F, Kourosh S, Leveau B. The functional anatomy of tensor fasciae latae and gluteus medius and minimus. J Anat 1989;166:179-189.

Goubert L, Crombez G, Van Damme S, Vlaeyen JW, Bijttebier P, Roelofs J. Confirmatory factor analysis of the Tampa Scale for Kinesiophobia: invariant two-factor model across low back pain patients and fibromyalgia patients. Clin J Pain 2004;20:103-110.

Hertzman-Miller RP, Morgenstern H, Hurwitz EL, Yu F, Adams AH, Harber P, Kominski GF. Comparing the satisfaction of low back pain patients randomized to receive medical or chiropractic care: results from the UCLA low-back pain study. Am J Public Health 2002;92:1628-1633.

Hodges PW, Richardson CA. Altered trunk muscle recruitment in people with low back pain with upper limb movement at different speeds. Arch Phys Med Rehabil 1999;80:1005-1012.

Kendall FP, McCreary EK, Provance PG, Rodgers MM, Romani WR. Muscles: testing and function with posture and pain. 5th ed. Baltimore (MD): Lippincott Williams & Wilkins; 2005.

Kim AR, Kwon JH, Lee HS. The effect of static stretching loading on hamstring flexibility in healty individuals. Korean J Sports Sci 2015;24:1341-1348.

Kim BK, Son JH. The effect of tensor fasciealatae length on the rotation of pelvic during one leg stance. Korean J Orthop Man Ther 2009;15:63-68.

Kim K, Kim EK, Lee DG. Effects of PNF patterns exercise on pain, functional disability and fear avoidance belief in chronic low back pain patients. J Korean Soc Phys Ther 2014;26:110-116.

Kippers V, Parker AW. Toe-touch test. A measure of its validity. Phys Ther 1987;67:1680-1684.

Lee SW, Kim SY, Yang JM, Park SD. Comparison of difference of the gluteus medius muscle fiber thickness during maximum muscle contraction between chronic low back pain with gluteus medius weakness and healthy subject. J Kor Soc Phys Med 2015;10:71-82.

Matsuo S, Suzuki S, Iwata M, Hatano G, Nosaka K. Changes in force and stiffness after static stretching of eccentrically-damaged hamstrings. Eur J Appl Physiol 2015;115:981-991.

Paek YW, Min S, Lee BH, Shin MG. Changes in pain, muscle strength and flexibility according to pinch lift and rubbing manual therapy and stretching application for low back pain. J Korean Biol Nurs Sci 2014;16:1-7.

Park JS, Lee KI, Lee CG. The effectiveness of selected stretching exercise by surface EMG on back pain patients. Korean J Sport Biomech 2005;15:139-146.

Peck E, Chomko G, Gaz DV, Farrell AM. The effects of stretching on performance. Curr Sports Med Rep 2014;13:179-185.

Rainville J, Hartigan C, Martinez E, Limke J, Jouve C, Finno M. Exercise

 https://doi.org/10.12965/jer.1734910.455

as a treatment for chronic low back pain. Spine J 2004;4:106-115.
Sahrmann S. Diagnosis and treatment of movement impairment syndrome. St. Louis (MO): Mosby; 2002.
Schamberger W, Samorodin FT, Webster C. The malalignment syndrome: implications for medicine and sport. Edinburgh: Churchill Livingstone; 2002.
Shephard RJ, Berridge M, Montelpare W. On the generality of the "sit and reach" test: an analysis of flexibility data for an aging population. Res Q Exerc Sport 1990;61:326-330.
Sherafat S, Salavati M, Ebrahimi Takamjani I, Akhbari B, Mohammadirad S, Mazaheri M, Negahban H. Intrasession and intersession reliability of postural control in participants with and without nonspecific low back pain using the Biodex Balance System. J Manipulative Physiol Ther 2013;36:111-118.
Shrier I, McHugh M. Does static stretching reduce maximal muscle performance? A review. Clin J Sport Med 2012;22:450-451.
West AD, Cooke MB, LaBounty PM, Byars AG, Greenwood M. Effects of G-trainer, cycle ergometry, and stretching on physiological and psychological recovery from endurance exercise. J Strength Cond Res 2014;28:3453-3461.
Ylinen JJ. Stretching therapy: for sport and manual therapies. New York: Churchill Livingstone/Elsevier; 2008.
Zusman M. Central nervous system contribution to mechanically produced motor and sensory responses. Aust J Physiother 1992;38:245-255.