

The Immediate Changes in Patients with Acute Exacerbation of Chronic Lower-back Pain Elicited by Direct Stretching of the Tensor Fasciae Latae, the Hamstrings and the Adductor Magnus

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Abstract. [Purpose] The purpose of this study was to compare the immediate changes in patients with chronic lower-back pain (LBP) following LBP exercises and direct stretching (DS) of the tensor fasciae latae, the hamstrings and the adductor magnus. [Subjects] Five females and five males patients with chronic LBP participated in the study. [Method] Exercise therapy of proven effectiveness was performed as the control intervention and DS of the tensor fasciae latae, the hamstrings and the adductor magnus was performed as the experimental intervention in a randomized controlled trial. Pain on a – Visual Analogue Scale (VAS), Finger Floor Distance (FFD), maximum pelvic anterior inclination, maximum pelvic posterior inclination, pelvic range of motion (ROM) and posterior lumbar flexibility (PLF) – were measured before and after the intervention. The six items measured were evaluated in a random order, and analysed using Student's t-test with significance accepted at less than 5%. [Results] Significant improvements in VAS, FFD, maximum pelvic anterior inclination, maximum pelvic posterior inclination, pelvic ROM and PLF were observed after the DS intervention. However, the only improvement observed after the control intervention was in VAS. [Conclusion] The results study has suggest that DS may have an immediate effect on chronic LBP.

Key words: Acute exacerbation of chronic lower back pain, Visual Analogue Scale, Posterior lumbar flexibility

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INTRODUCTION

Is it said that 80–85% of the adult population is affected by or experiences lower-back pain (LBP)¹⁾. Amongst them, there are even cases of severe acute LBP in which the sufferer has difficulty with turning over in bed, as well as walking. In addition to physical therapy, management of daily life and exercise guidance, manipulative physical therapy is often performed with the purpose of alleviating pain in the clinical practice of physical therapy²⁾. It has a good prognosis, rapidly relieving pain of rapid onset and unknown causes in a relatively short time. LBP, including “slipped disk”, is believed to originate from sacroiliac joint pain, lumbar facet joint pain, myofascial LBP or acute trauma of the annulus fibrosus disci intervertebralis, etc³⁾. Amongst these, LBP originating from the facet joint is the most common, comprising 70–80% of all LBP cases⁴⁾. However, treatment of chronic LBP and acute exacerbation of chronic LBP is often difficult due to psychological and economic factors as well as functional impairment resulting from pathological changes in the tissue constituting the lumbar spine. The first choice of treatment for both acute and chronic LBP is conservative treatment which mainly consists of physical

therapy⁵⁾. Rest, medication, block injections, traction therapy and physical therapy are implemented and guidance on Williams' exercises, muscle strengthening, with a focus on the abdominal muscles, and stretching is given, and the exercises are performed according to the reduction in pain⁵⁾. However, in the literature, previous studies, there are reports that patients prefer continuation of daily life to aggressive exercise therapy for the treatment of acute LBP²⁾. It has also been confirmed that the effect of exercise therapy centred on trunk muscle and stretching exercises on chronic LBP is greater than the effect of nonsteroidal anti-inflammatory drugs^{6–8)}. Whether the pain is acute or chronic, the goal of treatment is to alleviate pain⁷⁾. Clinically, we see immediate improvements in posture and gait in addition to pain relief in patients with acute and chronic LBP with no neurological signs present in the legs after direct stretching of the tensor fasciae latae and the hamstring. However, there are few reports on the immediate changes and all have remained at the empirical stage.

The purpose of this study was to compare the immediate changes in 10 patients with acute exacerbation of chronic LBP after LBP exercises and direct stretching of the tensor fasciae latae, the hamstring and the adductor magnus.

SUBJECTS AND METHODS

Five females and five males patients with chronic lower-back pain (LBP) participated in the study. (Table 1). Consent was received from all subjects after they had been informed of the purpose of this study. Chronic LBP is defined as having symptoms of pain in the lower back for three months or longer⁹⁾. In addition to this definition, recurrent LBP due to unknown causes was included. As there are no clear diagnostic criteria for lumbar facet joint pain, it was diagnosed referring to previous studies as well as plain X-ray imaging and physical observations. A diagnosis of lumbar facet joint pain was made on from the fulfillment of the following three criteria: localised tenderness in the lumbar facet joints (interspinous height, about 2 cm from the midline) and pain in the multifidus muscle; the absence of trigger points in the muscle displaying pain; and limited anteflexion and retroflexion of the trunk, particularly limited torsion and retroflexion. Cauda equine and nerve root compression symptoms; neoplastic disease of the spine and inflammatory diseases; medical illnesses such as endometriosis; and psychogenic backache were excluded as differential diagnoses. The control intervention was set as the period during which exercise therapy previously found effective in randomized clinical trials^{6-8, 10)} was performed. The content of the exercise therapy was as follows. (1) Abdominal exercise: Slowly raising the trunk from the supine position with the chin tucked and holding for approximately five seconds at a 45° angle. (2) Back exercise: Slowly raising the upper body from the prone position with the chin tucked and a pillow under the umbilicus, and holding for approximately five seconds at a height of approximately 10 cm. Exercises (1) and (2) were performed in two sets of ten repetitions. (3) Hamstring stretching exercise: Bending one hip joint 90° from the supine position and slowly extending the knee joint while supporting the popliteal region with both hands and holding for approximately ten seconds at maximal extension. (4) Lower back stretching exercise: From the supine position, holding one knee with both hands, pulling it into the chest while breathing deeply and holding the position for approximately ten seconds. (5) Tensor fasciae latae stretches: With the assistance of a physical therapist, extending and internally rotating the hip joint on the stretched side from a lateral recumbent position and holding for approximately ten seconds. Exercises (3), (4) and (5) were performed for two sets of ten repetitions on the left and right sides. All exercises (1) – (5) were performed in approximately 30 minutes. For the experimental intervention, direct stretching (DS) of the (1) tensor fasciae latae, (2) hamstring, and (3) adductor magnus was performed for about ten minutes per muscle. A approximately 30 seconds rest was taken every five minutes. The site of the stretching was the right and left muscle-tendon transition. For exercise (2) the site was the hard side of the hamstring under palpation. Adding transitive pressure in a vertical direction to the running of the muscle was the method used to stretch the muscle directly, bypassing joint motion. Anti-inflammatory analgesics were prescribed as drug therapy and dosing continued. Pain on a– Visual Analogue Scale (VAS), Finger Floor Distance

Table 1. Characteristics of the subjects

Age (yrs)	32.7 ± 12.1
Height (cm)	165.4 ± 9.3
Weight (kg)	54.9 ± 9.5
BMI	19.9 ± 1.9

(FFD), maximum pelvic anterior inclination, maximum pelvic posterior inclination, pelvic range of motion (ROM) and posterior lumbar flexibility (PLF) were measured in a random order. For the FFD measurement, subjects were asked to bend forward without bending their knees, reach towards the ground with their fingertips and stop when they felt lower back pain. The distance between their fingertips and the ground was then measured. For pelvic inclination, the angle between the horizon and the line connecting the anterior superior iliac spine and greater trochanter was measured by a goniometer while the subject sat in a chair. The maximum pelvic anterior inclination and maximum pelvic posterior inclination were the angles at the time of maximum pelvic anteversion and retroversion while seated. The pelvic ROM was the difference between the maximum pelvic anterior inclination and maximum pelvic posterior inclination. A PLF test was used as to evaluate of posterior lumbar flexibility. In this test, the leg starting position is a 45° bend in both hip joints, and the hip joint of the highly-placed leg is flexed to examine whether or not the thigh can reach the chest without resistance. The angle at the time the patient complained of pain during flexion was recorded as the index of posterior lumbar flexibility.

Student's t-test was used to examine the immediate changes in each evaluated item after control and DS intervention and significance was accepted for values of $p < 0.05$.

RESULTS

The baseline values of each evaluated item of chronic LBP are displayed in Table 2. Table 2 also displays the change in each item after intervention. A significant improvement in all items was observed in the patients with acute exacerbation of chronic LBP after experimental intervention. After control intervention, only a significant improvement in the VAS index was seen (Table 2)($p < 0.05$).

DISCUSSION

Noxious stimuli occurring in the facet joint cause reflex spasm of the multifidus muscle, and findings of tenderness in the multifidus muscle are thought to be important¹¹⁾. Persistent LBP in cases of multifidus tenderness is thought to be the result of mechanical stimulation of the facet joint, due to prolonged standing, causing reflex spasm of the multifidus muscle. However, it is presumed that in chronic LBP in such cases, a vicious pain cycle is created through an increased flight reflex and adoption of new movement patterns due to enhanced secondary pain at the spinal level, etc, in addition to persistent spasm of the multifidus muscle¹²⁾. The intense

Table 2. The change in each index after intervention

	Base line	Control intervention	Direct stretching intervention
VAS	8.2 ± 0.82	7.5 ± 0.8*	1.7 ± 0.7*
FFD(cm)	21.6 ± 5.9	20.6 ± 7.0	6.5 ± 4.0*
pelvic anterior inclination(°)	71.6 ± 6.9	64.7 ± 7.2	58.6 ± 6.9*
pelvic posterior inclination(°)	92.7 ± 3.5	85.1 ± 3.0	95.3 ± 5.5*
pelvic inclination(°)	21.1 ± 8.2	20.4 ± 8.2	36.6 ± 9.5*
posterior lumbar flexibility(°)	106.1 ± 2.4	96.2 ± 2.7	111.5 ± 7.7*

* p<0.05. VAS: Visual Analog Scale. FFD: Finger Floor Distance

pain caused along with reflex spasm of the multifidus muscle due to noxious stimuli occurring in the facet joint leads to lumbar immobility. New movement patterns associated with the increased flight reflex are adopted, and the hip joint below the lumbar region is forced to move excessively in compensation. Shortening and muscle spasm of the tensor fasciae latae increases iliotibial band tension and results in anterior inclination of the pelvis. In addition, shortening and muscle spasm of the hamstrings result in posterior inclination of the pelvis. Essentially, the simultaneous contraction of the two muscles reduces flexibility of the pelvis and increases lumbar stress in everyday life situations. We view the resulting compensatory muscle contraction around the hip joint as a secondary disorder and presume it is a factor that could lead to LBP becoming chronic and more intense. We believe that the manipulative extension of the tensor fasciae latae and hamstrings in this study significantly increased the hip joint and pelvic ROM and was associated with decrease in LBP. The reason for focusing on extension at the muscle-tendon transition is because flexibility at that location is poor. A significant decrease in FFD was also observed in this study. Kippers et al.¹³⁾ found a correlation between standing forward flexion of the body and leg elevation and extension, however, they argued that standing forward flexion of the body is reflected in hamstring extendability and the correlation between standing forward flexion of the body and lumbar flexion is low. We think the immediate improvement seen in FFD in this study was the to be a result of a change in hamstring extendability. Another result of this study was a significant increase in the average PLF values. Generally, posterior lumbar flexibility decreases in cases of lumbar facet joint pain due to persistent spasms of the multifidus muscle and contracture of the facet joint itself. Increased posterior lumbar flexibility suggests relaxation of the multifidus muscle and improvement in the range of motion of the lumbar facet.

Exercise therapy found effective in randomised clinical trials was performed as the control intervention but didn't result in major changes in any of the evaluated items. A

trend of decrease was, however, observed in VAS. In the case of chronic LBP, it is possible that the pain is caused by a decrease in muscle tissue flexibility, and circulatory failure. We presume that the recovery in muscle tissue flexibility and the improvement in circulation were the results of the back exercises and stretches that were performed.

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