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Effects of Hip Mobilization on Pain and Function for Chronic Low Back Pain Individuals with Limited Range of Hip Joint Motion

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Abstract

Low back pain is the most common injury and almost people is suffered of life span, however, the etiology remains unclear. Poor hip mobility is one of factors cause the low back pain. It is lead to functional limitation. The aim of this study was to investigate the effects of hip mobilization on pain, function, and psychological factors for patients suffering from chronic low back pain with limited range of hipjoint motion. Forty Subjects were recruited from rehabilitation hospital. Patients were randomly assigned to experimental (n=20) or control groups (n=20). Both groups received conventional physical therapy for forty minutes, three times a week for six weeks. Experimental group was performed additional hip mobilization for fifteen minutes, three times a week for six weeks. All of the patients were evaluated for pain, function, and psychological factors before and after intervention. The experimental group showed significantly decreased pain, the index of function disability, and psychological factors ($p<.05$). Also, this group showed remarkably increased range of motion ($p<.05$). The control group showed significantly diminished pain ($p<.05$). This group also demonstrated notably increased range of motion except trunk extension ($p<.05$). There were significant differences between two groups in pain, function, and psychological factors ($p<.05$). The result of this study confirmed that hip mobilization brings positive effects on pain, function and psychological factors for patients with chronic low back pain. Thus, our results strongly recommend hip mobilization as an effective treatment method along with conventional physical therapy for chronic low back pain with limited range of hip joint motion.

Keywords: Function, Hip Joint, Low Back Pain, Mobilization

1. Introduction

It has been reported that 60-80% of people will experience Low Back Pain (LBP) over the course of their lifespan[1]. About 10-40% of acute LBP patients will become chronic LBP patients, and 85% of those will experience non-specific LBP. Those patients whom the disease progresses to non-specific chronic LBP spend a large amount of time trying to resolve spine issues[2,3]. As the incidence of chronic LBP gradually increased, more effective treatment methods will need to be continuously researched. Chronic LBP patients generally undergo management and treatment by physical therapists. However, physical therapists have not yet established a proper management system for this patients[4–6].

It is often difficult to find a cause of LBP clinically[7]. LBP is a complex disorder that could be affected by various factors. It is sometimes caused by psychological factors, such as depression or anxiety, physical factors, and lifestyle factors[8]. These factors can slow recovery, allowing the disorder to be protracted and to become chronic[9]. In order to understand LBP, it is important to understand the lumbar spine, the pelvis, and their relation with the hip joint. The anatomical mechanics of LBP are primarily related to pain originating from the lumbar intervertebral discs, apophyseal joints, and the sacroiliac joint. Repeated bending and compression are also harmful to the spine[10]. Limited motion of the hip joint is one of the major causes of LBP, which can also cause chronic LBP and dysfunction of the lower body[11–13].

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Consecutive and periodic movement of the lumbopelvic region concentrates higher tissue stress, causing micro trauma and LBP[14]. With lateral rotation of the hip joint, in particular, the initial lumbopelvic movement is related to symptom aggravation in LBP patients[15]. LBP patients tend to show larger and faster lumbopelvic rotation during lateral rotation of the hip joint compared to that in people without LBP[16]. In another previous study, it was reported that limited motion of the hip joint was highly associated with LBP[12,17]. Limited hip motion plays a role in increasing force, which potentially result from compensatory motion of the lumbopelvic region[13]. The increased compensatory movement increases low back load and accumulates stress on the lumbopelvic region, ultimately resulting in pain[17].

Therefore, this study aimed to determine a more practical and effective method of improving pain and function by applying manual therapy for hip joint mobilization in chronic LBP patients with limited hip joint motion.

2. Methods

2.1 Subjects and Procedure

For this study, we examined patients who had recently experienced LBP for more than 3 months but who did not show evidence of a specific disease on plain radiography or magnetic resonance imaging at diagnostic check-up from among patients who visited a rehabilitation hospital.

Participants were eligible if they had at least unilateral limited hip motion, such as hip flexion < 110° on supine, hip extension < 10° on prone, or hip internal or external rotation < 30°. Participants were excluded if they had any neurological disorder, spine fracture, osteoporosis, arthritis, neoplasm, vascular disease, or cognitive disorder, were pregnant, and had undergone surgery within the previous 3 months. All participants signed an informed consent form approved by the Institutional Review Board.

Participants were evaluated for pain (numeric pain rating scale), low back dysfunction (Oswestry disability index, ODI), range of motion of the trunk, and fear avoidance (fear avoidance beliefs questionnaire). After the pre-test, participants were randomly distributed to either the experimental group or the control group using a table of random numbers. The experimental group and the control group both performed the same conservative physical therapy for 6 weeks, consisting of 40 minutes three times a week. Additionally, the experimental group was conducted hip joint mobilization for 15 minutes. After the intervention, all subjects were evaluated to investigate treatment effects.

2.2 Intervention

Each patient was examined by a physical therapist with least 7 years of experience, who worked in an outpatient setting. All patients in the experimental group were repeatedly received for 30 seconds of distraction with grade IV oscillation, twice per second[18]. The therapist performed the distraction by grasping the malleoli of the participants with both hands. The position was set to approximately 10-30° of hip flexion, 15-30° of hip extension, and slight external rotation. The leg was gently distracted (Figure 1.), and then joint mobilization was applied in a limited direction for the hip joint (Table 1).

Figure 1. Distraction for release of the hip joint.

Figure 2. Anterior glide.

All participants in the experimental group also received the following intervention: anterior glide, posterior glide, lateral glide, inferior glide, and distraction. At this time, gliding is applied with grade I distraction (Figures 2 to 5). The control group conducted only conventional therapy, which included 10 min of a hot pack placed on the lower back, 5 min of ultrasound at 1.5 W/cm^2, and 15 min of electrical therapy with an interferential current (4000 Hz, 20 mA, modulation frequency 250 Hz).

Figure 3. Posterior glide.

Figure 4. Lateral glide.

Figure 5. Inferior glide.

2.3 Data Analysis

All statistical analyseswere performed with SPSS 18.0 (SPSS Inc, Chicago, IL). All data were summarized as the mean ± standard deviation. Normality was tested with Shapiro-Wilk tests. A paired t-test was used to compare pre- and post-test results within each group. An independent t-test was used to identify differences between the both groups. Statistical significance for all analyseswas set at $p<0.05$.

Table 1. Hip joint mobilization according to limited motion

Limited direction of hip joint	Hip joint mobilization
Flexion	Posterior glide
Extension	Anterior glide
Abduction	Posterior glide Inferior glide
Adduction	Lateral glide
Internal rotation	Posterior glide Lateral glide
Lateral rotation	Anterior glide

3. Results

A randomized sample of 40 participants took part in this study (male: 20, female: 20). We evaluated general characteristics of each patient, including sex, age, height, weight, and limited side. There were no statistically significant differences between the both groups at baseline (Table 2).

Table 2. General characteristics of the subjects

	Experimental group(n=20)	Control group(n=20)	P
Sex (male/female)	6 / 14	5 / 15	NS
Age (year)	52.70 ± 6.40	55.55± 9.70	NS
Body weight (kg)	60.40 ± 8.53	58.60 ± 9.80	NS
Height (cm)	164.20 ± 6.01	161.75± 8.39	NS
Limited side (unilateral/bilateral)	5 / 15	4 / 16	NS
Limited motion			
Flexion (right / left)	9 / 7	9 / 7	NS
Extension (right / left)	3 / 3	4 / 6	NS
Internal rotation (right / left)	6 / 6	8 / 5	NS
External rotation (right / left)	3 / 3	4 / 4	NS

In the experimental group that applied hip joint mobilization, there was a 63% decrease in pain ($p<0.05$), and a significant difference appeared between

Table 3. Pain and Oswestry disability index between the experimental and control groups

	Numeric pain rating scale (point)			Oswestry disability index (point)		
	Pre-test	Post-test	changes	Pre-test	Post-test	changes
Experimental group (n=20)	6.90 ±1.74	2.55 ± 1.50*	4.35 ± 0.81†	26.40 ± 7.20	18.00 ± 4.48*	8.40 ± 4.68†
Control group (n=20)	6.05 ± 1.54	4.95 ± 1.79*	1.10 ± 0.85	26.00 ± 7.99	26.00 ±11.89	0.00 ± 8.74

Note. Values are presented mean ±standard deviation. *p <0.05: significant difference between baseline and after the intervention. †p<0.05: significant difference between both groups.

the two groups ($p<0.05$). Additionally, the lumbar dysfunction index showed a 31.8% significant increase in the experimental group ($p<0.05$), participants in the experimental group had a significantly better lumbar dysfunction index post-test compared to that in the control group ($p<.05$) (Table 3).

Range of motion of the trunk significantly improved for both groups ($p<0.05$), with the exception of extension in the control group. A comparison of the groups showed that left side flexion, right side flexion, left rotation, and right rotation were statistically significantly different ($p<0.05$) (Table 4). Psychological factors improved by 21.8% in the experimental group ($p<0.05$), resulting in a significant difference between the two groups ($p<0.05$) (Table 5).

Table 5. Fear avoidance beliefs questionnaire between the experimental and control groups

	Fear avoidance beliefs questionnaire (point)		
	Pre-test	Post-test	changes
Experimental group (n=20)	53.80 ± 20.12	42.05± 16.91*	11.75 ± 7.91†
Control group (n=20)	53.35 ± 18.01	52.35 ± 17.32	1.00 ± 14.21

Note. Values are presented mean ±standard deviation. **p* <0.05: significant difference between baseline and after the intervention. †*p* <0.05: significant difference between both groups.

Table 4. Range of motion of trunk between the experimental and control groups

		Experimental group (n=20)	Control group (n=20)
Flexion			
	Pre-test	51.25 ± 4.25	48.75 ± 9.98
	Post-test	65.25 ± 4.43*	59.75 ± 4.72*
	Changes	14.00 ± 6.60	11.00 ± 7.00
Extension			
	Pre-test	17.75 ± 8.19	18.00 ± 8.01
	Post-test	20.25 ± 7.86*	19.50 ± 6.47
	Changes	2.50 ± 2.56	1.50 ± 4.32
Left side flexion			
	Pre-test	13.50 ± 3.66	13.50 ± 5.87
	Post-test	17.75 ± 3.02*	15.50 ± 6.26*
	Changes	4.25 ± 2.94†	2.00 ± 3.77
Right side flexion			
	Pre-test	13.50 ± 3.66	15.00 ± 6.28
	Post-test	18.00 ± 3.40*	16.75 ± 5.68*
	Changes	4.50 ± 2.76†	1.75 ± 2.94
Left rotation			
	Pre-test	21.50 ± 7.80	19.75 ± 4.13
	Post-test	31.50 ± 6.90*	24.00 ± 3.08*
	Changes	10.00 ± 7.25†	4.25 ± 2.45
Right rotation			
	Pre-test	22.25 ± 8.35	22.00 ± 4.41
	Post-test	31.50 ± 6.90*	25.75 ± 4.06*
	Changes	9.25 ± 7.83†	3.75 ± 3.19

Values are presented as mean ± SD *p<0.05 present significant difference between baseline and after the intervention. †p<0.05 present significant difference between both groups.

4. Discussion

The purpose of this study was to examine whether hip joint mobilization was effective in patients with LBP. Out results suggested that hip joint mobilization improved pain and function in LBP patients with limited hip joint motion.

Some previous studies on LBP patients have reported that factors related to hip joint movement were involved in LBP. In particular, limited medial rotation of the hip joint was strongly associated with LBP[13,19]. In the present study, 50% of participants were found to have limited medial rotation, and the increased range of motion from mobilization was thought to have alleviated their pain. Fernandez-Carnero et al. conducted manual therapy on the cervical vertebrae and observed that pain decreased in the elbow, suggesting that manual therapy can stimulate central control mechanisms. Likewise, decreased pain can lead to improvements in pain-related function, such as a pain-free grip[20]. Although this study was conducted on patients with LBP, this study nonetheless supports the results of decreased pain following manual therapy for hip joint mobilization. Additionally, manual therapy not only can provide stability, since intervention is applied with direct contact between the patient and the therapist, but it also influences psychological changes with incidental effects[21]. It seems that improvements in pain and function also decreased fear, because pain and fear mutually interact in patients with LBP[22].

Burns et al. noted that chronic LBP patients who received three sessions per a week of manual therapy and a home exercise program experienced a 24.4% reduction in ODI. Other study has also reported the effectiveness of manual therapy on function in chronic LBP patients[23]. Giles et al. reported that recovery was found for manual therapy (27.3%), followed by acupuncture (9.4%), and medication (5%) in patients with chronic LBP. Especially, manual therapy achieved the best overall results, with decrease of 50% on the ODI. Thus, manual therapy can be effectively applied to improve pain and function in LBP patients.

As a result of applying manual therapy for hip joint mobilization in this study, the overall range of motion significantly increased ($p<0.05$), however, the range of motion for trunk flexion and extension were not significantly different compared to that in the control group ($p>0.05$). This result strongly suggests that not only is movement of such joints as the spine, pelvis, and hip, but also muscle action is important, with respect to trunk flexion and extension[7]. The hip joint is believed to be a potential cause to LBP. In particular, movement can be limited due to reductions in the hamstring and spine erector muscle[24], therefore, it is considered that muscle enhancement and stretching are necessary. Hip-spine syndrome was described as a biomechanical link between the hip joint and lumbar spine related to LBP[25,26]. LBP patients experience limited flexion, extension, side bending, and rotation of the trunk, which were reported to be related to a limited range of motion for the hip[27]. Thus, the hip mobilization applied in this study seems to have improved the range of motion of the trunk as well.

A limitation of this study is that we did not precisely identify how much the range of motion of the hip joint was improved, because we only assessed the range of motion of the trunk. Since there are diverse causes of limited hip joint movement, some joint-related problems due to limited mobilization could be addressed by the muscle-related problems. Additional clinical treatment methods should be examined in a follow-up study with respect to treating hip joint issues in patients with chronic LBP.

5. Conclusion

Hip joint mobilization was applied to patients affected by LBP with limited motion of the hip joint. Hip joint mobilization was found to be effective in pain reduction and functional improvement. This finding will assist patients with chronic LBP and hip joint problems selecting a treatment strategy. Various strategies will require additional research in order to determine to most effective means of alleviating symptoms of chronic LBP.

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7. References

1. Griffith LE, Hogg-Johnson S, Cole DC, Krause N, Hayden J, Burdorf A, et al. Low-back pain definitions in occupational studies were categorized for a meta-analysis using Delphi consensus methods. J Clin Epidemiol. 2007; 60(6):625–33.
2. Ferreira ML, Ferreira PH, Latimer J, Herbert RD, Hodges PW, Jennings MD, et al. Comparison of general exercise, motor control exercise and spinal manipulative therapy

for chronic low back pain: A randomized trial. Pain. 2007; 131(1-2):31–7.

3. Macedo LG, Maher CG, Latimer J, McAuley JH. Motor control exercise for persistent, nonspecific low back pain: A systematic review. Phys Ther. 2009; 89(1):9–25.
4. Guzman J, Esmail R, Karjalainen K, Malmivaara A, Irvin E, Bombardier C. Multidisciplinary bio-psycho-social rehabilitation for chronic low back pain. The Cochrane database of systematic reviews. 2002; (1):CD000963.
5. Kernan T, Rainville J. Observed outcomes associated with a quota-based exercise approach on measures of kinesiophobia in patients with chronic low back pain. The Journal of Orthopaedic and Sports Physical Therapy. 2007; 37(11):679–87.
6. Moseley GL. Evidence for a direct relationship between cognitive and physical change during an education intervention in people with chronic low back pain. European Journal of Pain (London, England). 2004; 8(1):39–45.
7. Reiman MP, Weisbach PC, Glynn PE. The hips influence on low back pain: A distal link to a proximal problem. J Sport Rehabil. 2009; 18(1):24–32.
8. O'Sullivan P. It's time for change with the management of non-specific chronic low back pain. Br J Sports Med. 2012; 46(4):224–7.
9. Kendall NA. Psychosocial approaches to the prevention of chronic pain: the low back paradigm. Bailliere's Best Practice andResearch Clinical Rheumatology. 1999; 13(3):545–54.
10. Adams MA. Biomechanics of back pain. Acupuncture in medicine: Journal of the British Medical Acupuncture Society. 2004; 22(4):178–88.
11. Murray E, Birley E, Twycross-Lewis R, Morrissey D. The relationship between hip rotation range of movement and low back pain prevalence in amateur golfers: an observational study. Physical therapy in sport. Official Journal of the Association of Chartered Physiotherapists in Sports Medicine. 2009; 10(4):131–5.
12. Sjolie AN. Low-back pain in adolescents is associated with poor hip mobility and high body mass index. Scandinavian Journal of Medicine andScience in Sports. 2004; 14(3):168–75.
13. Vad VB, Bhat AL, Basrai D, Gebeh A, Aspergren DD, Andrews JR. Low back pain in professional golfers: The role of associated hip and low back range-of-motion deficits. The American Journal of Sports Medicine. 2004; 32(2):494–7.
14. McGill SM. The biomechanics of low back injury: Implications on current practice in industry and the clinic. Journal of Biomechanics. 1997; 30(5):465–75.
15. Scholtes SA, Van Dillen LR. Gender-related differences in prevalence of lumbopelvic region movement impairments in people with low back pain. The Journal of Orthopaedic and Sports Physical Therapy. 2007; 37(12):744–53.
16. Scholtes SA, Gombatto SP, Van Dillen LR. Differences in lumbopelvic motion between people with and people without low back pain during two lower limb movement tests. Clinical Biomechanics (Bristol, Avon). 2009; 24(1):7–12.
17. Van Dillen LR, Bloom NJ, Gombatto SP, Susco TM. Hip rotation range of motion in people with and without low back pain who participate in rotation-related sports. Physical therapy in sport. Official Journal of the Association of Chartered Physiotherapists in Sports Medicine. 2008; 9(2):72–81.
18. Maitland GD. Manipulation - mobilisation. Physiotherapy. 1966; 52(11):382–5.
19. Hoffman SL, Johnson MB, Zou D, Van Dillen LR. Sex differences in lumbopelvic movement patterns during hip medial rotation in people with chronic low back pain. Archives of Physical Medicine and Rehabilitation. 2011; 92(7):1053–9.
20. Fernandez-Carnero J, Fernandez-de-las-Penas C, Cleland JA. Immediate hypoalgesic and motor effects after a single cervical spine manipulation in subjects with lateral epicondylalgia. Journal of Manipulative and Physiological Therapeutics. 2008; 31(9):675–81.
21. Williams NH, Hendry M, Lewis R, Russell I, Westmoreland A, Wilkinson C. Psychological response in spinal manipulation (PRISM): A systematic review of psychological outcomes in randomised controlled trials. Complementary Therapies in Medicine. 2007; 15(4):271–83.
22. Crombez G, Vlaeyen JW, Heuts PH, Lysens R. Pain-related fear is more disabling than pain itself: Evidence on the role of pain-related fear in chronic back pain disability. Pain. 1999; 80(1-2):329–39.
23. Giles LG, Muller R. Chronic spinal pain: A randomized clinical trial comparing medication, acupuncture, and spinal manipulation. Spine. 2003; 28(14):1490–502.
24. Czaprowski D, Leszczewska J, Kolwicz A, Pawlowska P, Kedra A, Janusz P, et al. The comparison of the effects of three physiotherapy techniques on hamstring flexibility in children: A prospective, randomized, single-blind study. PloS one. 2013; 8(8):e72026.
25. Ben-Galim P, Ben-Galim T, Rand N, Haim A, Hipp J, Dekel S, et al. Hip-spine syndrome: The effect of total hip replacement surgery on low back pain in severe osteoarthritis of the hip. Spine. 2007; 32(19):2099–102.
26. Offierski CM, MacNab I. Hip-spine syndrome. Spine. 1983; 8(3):316–21.
27. Wong TK, Lee RY. Effects of low back pain on the relationship between the movements of the lumbar spine and hip. Human Movement Science. 2004; 23(1):21–34.