J Int Acad Phys Ther Res 2011; 2(2): 267-343
ISSN 2092-8475
www.iaptr.org
http://dx.doi.org/10.5854/JIAPTR.2011.2.2.318

The Effect of Spinal Decompression Therapy on the Pain and Posture in the Patients with Low back Pain

The purpose of this study identify that spinal decompression therapy effect on and pain, length Of leg distance(LLD), and muscle power and flexibility in patient with low back pain.
The participants is 20 female and male with low back pain, and participant assign to decompression therapy group and control group at random. The decompression therapy apply to 20 minute 3 time for a week during 4 weeks. The Measurement items is pain, LLD, and muscle power, flexibility. The comparison between the before and after was Wilcoxon's U test, and 2 group after spinal decompression therapy application compared Mann-Whithney U test.
Spinal decompression therapy reduced statistically significance the pain, LLD, and increased statistically significance the muscle power and flexibility increased the muscle power($p<.05$).
This study showed that spinal decompression therapy does affect pain, LLD, and muscle power and flexibility in patient with low back pain.

Key words: *Back Pain; LLD; Muscle Power; Flexibility; Spinal Decompression Therapy*

Ki Mai Um, Young Sook Bae

Yeoju Institute of Technology, Yeoju, Korea

Received : 30 May 2011
Accepted : 21 September 2011

Address for correspondence
Ki Mai Um, PT, Ph.D
Department of Physical Therapy, Yeoju Institute of Technology, 338 Sejong-ro, Yeoju-eup, Yeoju, Korea
Tel: 82-31-880-5390
E-mail: ukm2000@yit.ac.kr

*Funding for this paper was provided by YIT.

INTRODUCTION

As the modern society develops, the frequency of occurrence of low back pain is increasing due to reduced physical activities(1). Although low back pain is not a disease that threatens life as with internal diseases, it frequently appears in working age groups(2), and in case the symptom is severe, working abilities will be lost due to limited abilities for activities. Furthermore, psychological problems resulting from the loss of personal drive and confidence and economic difficulties will follow the condition to cause even social problems(3). As society develops, low back pain is being reported as the most common musculoskeletal disorder. Low back pain has been experienced by around 80% of adults(4), and is the most frequent disorder among musculoskeletal disorders(5).

In spite of the frequent occurrences of low back pain, no particular diagnostic method has been established in most cases and the anatomical structures that become the cause of the pain have not been clearly elucidated. Despite such lack of diagnostic skills for low back pain, it has been reported that the risk factors for low back pain are the weakening of abdominal muscle power and endurance on the grounds that the weakening of muscles in the abdomen and the back contributes to the onset of low back pain(6).

Treatment performed on low back pain patients include muscle powerening and stretching exercise, joint mobilization, massage, heat therapy, cold therapy, interferential current therapy (ICT), transcutaneous electrical nerve stimulation(TENS), ultrasound therapy, posture awareness training, human dynamics and biofeedback training programs(7, 8, 9, 10). The treatment also include vertebral traction among physical therapy interventions. Vertebral traction is divided into cervical traction and lumbar traction based on the region of traction and into continuous traction, sustained traction and intermittent traction based on the method of traction although methods that are frequently used in clinics are continuous traction and intermittent traction(11).

The objective of vertebral traction is to make the vertebral structure extend in order to remove stimulation

or compression on nerve root thereby relieving pain. Major changes made by traction are the extension of ligaments and muscles around the vertebrae, the expansion of the intervertebral foramen and increases in gaps between vertebrae that lead to increases in gaps between facet joints(12).

Although traction therapy is frequently used on low back pain patients as reviewed above, there are very few basic studies or clinical studies conducted on the effect of spinal decompression therapy applied to low back pain patients. Therefore, it is considered that studies on spinal decompression therapy are necessary.

Therefore, the purpose of this study is to examine the effects of spinal decompression therapy on the pain and postures of low back pain patients and provide data helpful to low back pain treatment.

METHODS

Subjects

This study was conducted on 20 chronic low back pain patients in their 20-30s who sufficiently understood the intent of the study and agreed to participate in the study. The mean age of the entire subjects was 21.15±2.12 years, their mean height was 163.31±6.47cm, their mean weight was 55.38±5.47kg and their mean period of pain was 11.85±8.06 months. The gender ratio of the subjects was 8 males (40%) vs. 12 females(60%)(Table 1). The selection criteria for low back pain patients as the study patients were as follows.

- Low back pain patients who had not undergone any surgery for low back pain.
- Those who had not taken drugs due to pain.

Table 1. General characteristics

	Age(year)	Height(cm)	Weight(kg)	Period of pain(month)
Spinal decompression therapy group	19.50±.55	161.00±5.14	52.83±2.79	12.67±9.85
Control group	22.57±1.90	165.29±7.20	57.57±6.43	11.14±6.92

Study Method

Procedure

In all the subject of this study, pain in their lumbar area, apparent differences in leg lengths, muscle power and flexibility were measured before the study was conducted. After the measurement, the subjects were randomly assigned to a spinal decompression therapy group or a control group. On the spinal decompression therapy, spinal decompression therapy was peformed during the same hours(PM 4-6) for 20 minutes per time, three times a week for a total of four weeks. Four weeks after the completion of the study, low back pain, differences in leg lengths(length of leg distance), muscle power and flexibility were measured again in all the subjects in the spinal decompression therapy group and the control group.

Tool

Spinal decompression therapy

The spinal decompression therapy machine(ST-IL, Minamoto, Japan) automatically adjusts the angle of its bed in accordance with patient's conditions when a patient has lied on its bed in a comfortable posture to put the vertebrae of the patient into a state of non-gravitation based on the patient's body type in order to correct the vertebrae of the patient without affecting other parts of the patient's body while the patient is in a comfortable state. The traction power was controlled not exceed 55% of the weight of the patient and the intermittent traction with a ratio of 2:1 between traction time and resting time was adopted. The treatment was performed for 20 minutes in total.

Measurement

Pain

The pain was measured in a Visual Analogue Scale(VAS) and the degree of pain subjectively felt by the patient was indicated in the length of a line so that it can be seen by the eyes. In the VAS measuring method, a 10cm long line is made and the left end of the line(number 0 is indicated) means states where there is no pain at all and the right side of the line means pain that is severer at points closer to the right end of the line and the right end of the line(number 10 is indicated) means a degree of pain that cannot be endured or a state where pain is the most severe.

This method is advantageous in that scales can be made by adding phrases based on the length of the line and pain can be quantified with the length of the line and thus this method is frequently used in measuring subjective pain and the intensity of pain.

Muscle power

As for muscle power, abdominal muscle power and back muscle power were measured. To measure the muscle power, the patient was instructed to stand on the measuring device placing two feet around 15cm away from each other, lean upper body forward and hold the handle of the measuring device and then the handle of the measuring device was adjusted to make the slope between the measuring device and the upper body into 30°. The patient was instructed to pull the handle maximally with two hands while raising upper body slowly to measure the muscle power. Abdominal muscle power was measured by having the subject pull the handle as much as could while slowly bending upper body after extending lumbar by around 30°. In this case, the subject was required not to bend knee or lean backward. These measurements were conducted three times and the mean values were recorded. The unit used was kgf.

Flexibility

As a method to measure lumber flexibility, the modified Scohber test was used. To measure the flexibility, a line was drawn between the posterior superior iliac spines(PSIS) on the two sides and a dot was marked on the lumber at 10cm above the middle point of this line. After having the subject bend trunk forward, the length from the middle point of the PSIS to the point on the lumbar was measured with a tape measure. The unit used was cm.

Length of leg distance(LLD)

The LLD were measured in order to measure the difference between the two legs. The actual leg lengths from the navel to both medial malleoli were measured with a tape measure and the difference between the values measured on the two sides was recorded as the difference in leg lengths. The unit was mm.

Data Analysis

Technical statistics were used in order to obtain the mean values and standard deviations of the heights, ages and weights of the subjects of this study. Differences in pain, muscle power and flexibility of the spinal decompression therapy group and the control group between before and after the study were compared and analyzed using Wilcoxon's U test and the differences between the two groups before and after the study were analyzed using Mann-Whitney test. The statistical significance level of this study α = .05.

RESULTS

Changes in Pain, LLD, Flexibility and Muscle Power within the Groups between Before and After the Study

In order to identify the effect of the spinal decompression therapy applied to the low back pain patients for 4 weeks, changes in the pain, LLD, muscle power and flexibility of the spinal decompression therapy group and the control group between before and after the study were measured and the results are as follows.

Table 2. Changes in pain and leg length differences within the groups between before and after the study

	Group	Time	M±SD	Z	p
VAS(score)	Spinal decompression therapy group	Before	6.00±1.09	−2.214	.027*
		After	3.50±1.05		
	Control group	Before	5.00±1.83	−1.720	.089
		After	4.29±1.89		
LLD(mm)	Spinal decompression therapy group	Before	6.67±1.68	−2.032	.042*
		After	4.50±.83		
	Control group	Before	5.57±1.99	−1.633	.102
		After	5.00±1.52		

* p<.05

Table 3. Changes in flexibility and muscle power within the groups between before and after the study

		Group	Time	M±SD	Z	p
Flexibility(cm)		Spinal decompression therapy group	Before	5.05±1.10	−2.226	.026*
			After	6.17±1.09		
		Control group	Before	4.67±.73	−1.016	.310
			After	4.31±.97		
Muscle power (kgf)	Abdominal muscle	Spinal decompression therapy group	Before	54.28±30.75	−2.023	.043*
			After	64.00±29.35		
		Control group	Before	81.14±34.75	−1.378	.168
			After	78.57±34.65		
	Back muscle	Spinal decompression therapy group	Before	69.75±29.73	−1.892	.049*
			After	77.75±9.64		
		Control group	Before	88.43±35.36	−.169	.866
			After	88.64±88.64		

* p<.05

In the spinal decompression therapy group, pain and LLD significantly decreased(p<.05) and flexibility, abdominal muscle power and back muscle power significantly increased(p<.05) after the study. However, in the control group, there was no change in any variables(Table 2, 3).

Comparison of Changes in Pain, LLD, Flexibility and Muscle Power between Before and After the Study between the Groups

In order to identify the effect of the spinal decompression therapy applied to the low back pain patients for 4 weeks, changes in pain, LLD, muscle power and flexibility between before and after the study of the spinal decompression therapy group and the control group were compared with each other and the results are as follows.

Between before and after the study, pain changed by −2.50±1.05 in the spinal decompression therapy group and by −.71±.76 in the control group and LLD changed by −2.167±1.72(mm) in the spinal decompression therapy group and by −.57±.79(mm) in the control group. Back muscle power changed by 6.00±6.97(kgf) in the spinal decompression therapy group and by .21±2.39(kgf) in the control group and thus there were significant differences(p<.05). Flexibility changed by .97±.67(cm) in the spinal decompression therapy group and by −.57±0.82(cm) in the control group to show quite significant differences (p<0.01)(Table 4).

Table 4. Comparison between the groups of changes in pain, LLD, flexibility and muscle power between before and after the study

		Spinal decompression therapy group	Control group	Z	p
VAS(score)		−2.50±1.05	−.71±.76	−2.568	.010*
LLD(mm)		−2.17±1.72	−.57±.79	−2.003	.045*
Flexibility(cm)		.97±.67	−.57±.82	−2.650	.008**
Muscle power (Kgf)	Back muscle power	6.00±6.97	.21±2.39	−2.158	.031*
	Abdominal muscle power	9.71±6.73	−2.57±5.10	−1.933	.053

* p<.05, **p<.01

DISCUSSION

It has been reported that the incidence of low back pain reaches around 52 per a population of 1,000 and of them, around 4 show serious disorders(13). Although many low back pain inducing factors are discussed, some of them are the shapes of vertebrae, mechanical pressure, repeated lifting of heavy objects, living styles of working in sitting positions, weakened abdominal muscles, vibratory working conditions, smoking, obesity, and mental pressure(14).

Low back pain can be said to be a factor that can affect psychological, social and occupational lives and family life(15), and the restriction on physical activities due to physical pain can be said to be a problem mainly suffered by low back pain patients(16). It has been reported that the restriction on physical activities due to physical pain as such may be induced by musculoskeletal factors such as muscle spasm, decreased ROM and decreased muscle power and endurance(17). It was also reported that low back pain patients have very low back muscle power in most cases(18), and back muscle power is closely related with the prevention of low back pain(19, 20, 21, 22). Based on the results of this study, it was thought that when pain significantly decreased in the spinal decompression therapy group, back muscle power should have increased significantly and that the back muscle power increased because spinal decompression therapy reduced pain and thus it could be identified that low back pain and back muscle power are closely related with each other.

Abdominal muscle power also increased significantly. It is thought that significant increases in back muscle power and abdominal muscle power protected the vertebrae from bending power or twisting power and reduced burdens on the disc thereby relieving pain. Therefore, it can be said that a method to prevent the recurrence of low back pain or fundamentally relieve low back pain is just constantly maintaining proper postures and reinforcing muscles in the abdomen and the lumbar to reduce burdens on the lumbar(23).

It has been reported that low back pain patients have reduced ranges of motion of joints in the lumbar and thus increase in flexibility in the lumbar is an indicator of relief from low back pain(24). Flexibility is determined by factors such as joint integrity, the lengths of connecting muscles and the extensibility of soft tissues around joints and it is an ability to have single or multiple joints move within the range of motion of the joints without restriction or pain(25). It has been reported that increases in lumbar flexibility is helpful in preventing low back pain and Koo and Jung indicated that muscle tension in the lumbar would increase the possibility of occurrence of low back pain(26). Based on the results of this study, flexibility significantly increased in the spinal decompression therapy group and showed significant differences between the two groups in changes between before and after the treatment and thus it is considered that spinal decompression therapy significantly affects the flexibility of soft tissues around the vertebrae.

Treatment of low back pain should focus on preventing these low back pain patients from becoming chronic patients. To this end, it can be said to be desirable to shorten periods of the condition and prevent recurrences while performing functional rehabilitation therapy on chronic low back pain patients(27, 28, 29).

From the results of this study, it could be identified that spinal decompression therapy reduced low back pain and LLD and increased flexibility, back muscle power and abdominal muscle power. Since studies on the treatment of low back pain have been conducted focusing on kinesitherapy or surgical treatment thus far, it is true that studies on spinal decompression therapy are insufficient. Since comprehensive rehabilitative therapy bring about good outcomes in low back pain treatment, it is thought that studies on spinal decompression therapy should be continuously conducted.

CONCLUSION

In this study, spinal decompression therapy was performed three times a week for 20 minutes each time for four weeks on 20 patients in their 20–30s who reported low back pain for at least three months without dividing between males and females and their pain, LLD, flexibility and muscle power were measured after the treatment. Based on the results, the following conclusions were obtained.

1. After the treatment by spinal decompression therapy, pain and LLD significantly decreased($p<.05$).

2. After the treatment by spinal decompression therapy flexibility, back muscle power and abdominal muscle power significantly increased($p<.05$).

3. Between the two groups, significant differences were shown in changes in pain, LLD and back muscle power ($p<.05$) and quite significant differences were shown in changes in flexibility($p<.01$)

Based on the results mentioned above, it was identified that spinal decompression therapy is effective in decreasing low back pain and increasing flexibility, back muscle power and abdominal muscle power and thus it is thought that spinal decompression therapy can be a positive treatment method when treating low back pain patients in clinics.

REFERENCES

1. Yun EH. Comparing the effect of lumbar stabilization exercise and McKenzie exercise on the range of motion and pain of the patient with low back pain. Graduate school of special education 2003.
2. Cha SE, Park SR, Kim JD. Environmental factors related to low. Journal of the Korean Society of Safety 1994; 9(1); 165-173.
3. Sin MH. The relationship between health locus of control and compliance. Nrusing education major, Graduate school of education korea university 1993.
4. Anthony HW. Diagnosis and management of low back pain and sciatica. Amam Physician 1995; 52; 1333-1341.
5. O'Sullivan PB, Twomey LT, Allison GT. Evaluation of specific stabilizing exercise in the treatment of chronic low back pain with radiologic diagnosis of spondylosis or spondylolis thesis. Spine 1997; 22(24); 2959-2967.
6. Thorsteinsson G, Arvidson A. Trunk Muscle strength and low back pain. Scand J Rehabil Med 1982; 14; 69-75.
7. Choe H. Treatment of low back pain. The Journal of the Korean pain society 1990; 3(1); 4-10.
8. Ehmann-Feldman E, Rossignol M, Alvenhaim L et al. Physician referral to physical therapy in a cohort of workers compensated for low back pain. Phy Ther 1996; 76(2); 150-157.
9. Poitras S, Blais R, Swaine B, et al. Management of work-related low back pain: A population-based survey of physical therapists. Phys Ther 2005; 85(11); 1168-1181.
10. Choi JH. The effect of laser and ultrasound treatment on subacute low back pain. KAUTPT 2007; 14(2); 76-84.
11. Cailliet R. Scoliosis; diagnosis and management. 7th ed. Philadelphia : F.A. Davis 1981; 78-88.
12. Colachis SC, & Strohm BR. Effects of intermittent traction on seperation of lumbar vertebrae. Arch Phys Med Rehabil 1969; 50; 251-158.
13. Kelsey JL, Haven N, White AA, et al. The impact of musculo-skeletal disorders on the population of the United States. J Bone Joint Surg(Am) 1979; 61; 959-963.
14. Frymoyer JW, Pope MH. The role of trauma in low back pain. A review. The Journal of Trauma 1978; 18; 628-634.
15. Harper AC, Haper DA, Lambert LJ et al. Symptom of impairment, disability, and handicap in low back pain: a texonomy. Pain. 1992; 50; 189-195.
16. Jette DU. Jette AM. Physical therapy and health outcome in patients with spinal impairment. Phys Ther 1997; 76; 930-941.
17. Lee JH. Therapeutic exercise. Univercity of book 1987.
18. Mutoh Y, Mori T, Nakamura Y, et al. M. IN Biomechanics Ⅷ. The relation between sit-up exercise and the occurrence of Low Back Pain. Champaign IL. Human Kinetics Publishing Co 1983.
19. Kim SL. Risk Factors of Low Back Pain of the Workers in an Automobile Industry. The Journal of Catholic Medical College 1993; 45(4); 1751-1769.
20. Lee GU. Therapeutic exercise in low back pain. The Journal of Korean Academy of Rehabilitation Medicine 1995; 19(2); 203-208.
21. Choi SY. The effect of exercise program on chronic low back in female teachers of elementary school. Graduate school of catholic univercity 2000.
22. Risch SV, Norvell NK, Pollack et al. Lumbar strengthening in chronic back pain patients. Spine 1993; 18; 232-238.
23. Farfan HF. Muscular mechanism of lumbar spine and the position of power and effuciency. Orthop Clin North Am 1975; 6; 135-144.
24. Langrana NA, Lee CK, Alexander H, and Mayott CW. Quantitative assessment of back strength using isokinetic testing. Spine 1984; 9(3); 287-290.
25. Min GY. Therapeutic exercise. Hanulthral 2005.
26. Gyoo HS, Jung JY. The prevention and treatment of low back pain. Mckenzie exercise. Hyuemoonsa 1992.
27. Nachman A. Work for all. For those with low back pain as well. Clin Orthop. 1983;179 :77-85.
28. Frymoyer JW. Predicting disability from low back pain. Clin Orthop 1991;279, 101-109.
29. Versllot JM, Rozeman A, van Son AM, van Akkerveeken PF. The cost effectiveness of a back school program in industry-A longitudinal controlled field study. Spine 1992; 17; 22-27.