

Influences of spinal decompression therapy and general traction therapy on the pain, disability, and straight leg raising of patients with intervertebral disc herniation

JIOUN CHOI, MS, PT¹⁾, SANGYONG LEE, PhD, PT²⁾, GAK HWANGBO, PhD, PT³⁾*

¹⁾ Department of Rehabilitation Science, Graduate School Daegu University, Republic of Korea

²⁾ Department of Physical Therapy, Youngdong University, Republic of Korea

³⁾ Department of Physical Therapy, College of Rehabilitation Science, Daegu University: 12, 15 Jillyang, Republic of Korea

Abstract. [Purpose] The purpose of this study was to identify how spinal decompression therapy and general traction therapy influence the pain, disability, and straight leg raise (SLR) ability of patients with intervertebral disc herniation. [Subjects] The subjects were 30 patients with chronic lumbar pain who were divided into a spinal decompression therapy group (SDTG, n=15), and a general traction therapy group (GTTG, n=15). [Methods] The SDTG used a spinal decompression device, and the GTTG used a lumbar traction device. Both groups received conservative physical therapy three times a week for four weeks. A visual analog scale (VAS) was used to measure the degree of pain the patients with chronic lumbar pain. The Oswestry Disability Index (ODI) was used to measure the degree of functional disability. A goniometer was used to measure the patients' SLR ability. [Results] Both SDTG and GTTG showed statistically significant decreases in VAS and ODI scores and a statistically significant increase in SLR angle. A comparison of the two groups found no statistically significant differences. [Conclusion] Spinal decompression therapy and general traction therapy are effective at improving the pain, disability, and SLR of patients with intervertebral disc herniation. Thus, selective treatment may be required.

Key words: Spinal decompression therapy, Pain, Straight leg raise

(This article was submitted Jul. 25, 2014, and was accepted Sep. 2, 2014)

INTRODUCTION

Eighty percent of adults experience lumbar pain at least once in their lifetime, and 80% of structures causing lumbar pain are related to intervertebral discs¹⁾. Disc herniation is multifactorial, often related to degenerative processes and mechanical effects, and mostly occurs due to light external injuries of the spine, such as spinal bending and stretching, spinal rotation exercises, and abrupt posture changes²⁾. Both surgical and conservative treatment methods are considered for intervertebral disc herniation. Conservative treatments include medication, exercise therapy, and physical and rehabilitation methods. Among them, one of the most widely used methods is traction therapy. Traction therapy reduces the pressure caused by gravity and soft tissues, and sufficient tension extends spinal separation and the intervertebral disc. Negative pressure within the intervertebral disc increases its

hydration and reduces pressure on the nerve root by removing the force applied to the vertebral pulp³⁾.

Spinal decompression therapy is another method that has recently been used as a conservative treatment for intervertebral disc herniation. Spinal decompression therapy reduces the pressure on the intervertebral disc by supplying nutrients and oxygen to the intervertebral disc. This creates a state of non-gravitation or negative pressure by adjusting the direction and angle of traction to suit the location of the intervertebral disc, which is the target of the treatment. This in turn reduces the pressure inside the intervertebral disc by gradually and softly increasing a specific part of the intervertebral disc through the decompression of a precise part of the lesion⁴⁾.

Although studies of various treatment methods for intervertebral disc herniation have been conducted, comparisons of spinal decompression therapy and general traction therapy remain inadequate. This study aimed to identify how spinal decompression therapy and general traction therapy, which are non-surgical treatment methods, influence the pain, disability, and straight leg raise (SLR) ability of patients with intervertebral disc herniation.

*Corresponding author. Gak Hwangbo (E-mail: hbgak@daegu.ac.kr)

SUBJECTS AND METHODS

The subjects of this study were 30 patients (male: 9, female: 21) who complained of radiating pain caused by chronic lumbar pain. The subjects had suffered from continuous lumbar pain, as diagnosed by an orthopedic specialist, for over three months, and were selected from among patients who visited S Hospital, located in Daegu Metropolitan City, Korea. On average, the spinal decompression therapy group (SDTG, n=15) was 41.3±7.3 years of age, 162.3±8.9 cm in height, and 58.3±12.2 kg in weight, and the general traction therapy group (GTTG, n=15) was 44.0±4.1 years of age, 162.7±8.4 cm in height, and 59.1±11.3 kg in weight. No statistically significant differences were found in their general characteristics. Ethical approval for the study was granted by the Youngdong University Institutional Review Board. All subjects read and signed consent forms in accordance with the ethical principles of the Declaration of Helsinki. Those who had undergone an operation on a lumbar vertebra, had spinal tumors or infections in the intervertebral disc, inflammatory diseases such as rheumatism, fractures, or other contraindications for manual therapy, were excluded from the study.

All subjects were treated three times each week for four weeks. The SDTG were treated with a spinal decompression therapy device (MID 4 M Series, WIZ Medical, Korea) for 20 minutes each time. The GTTG were treated with a lumbar traction therapy device (OL 110, Dong Bang Medical, Japan) for 20 minutes each time. Hot packs (20 minutes), interferential current therapy (15 minutes), and ultrasound (5 minutes) were used to treat both groups during the conservative physical therapy.

Each subject of the SDTG, which received the spinal decompression therapy, lay on his/her back on the device's bed and had the pelvic and thoracic regions fixed with an air belt. The slipping of the fixed parts was prevented by fixing the patient's head with a strap. The region of the cervical vertebrae was stretched by applying the robotic jog system, and a sacrum treatment device that supports the sacrum was used to maintain lumbar lordosis. Traction started with a strength level of 5 to 6; the power level was increased by a certain ratio during each phase. When pain occurred due to an increase in traction, the existing power level of traction was lowered or maintained. The ratio of the hold time to the rest time was set at 2:1, and standard and divided compression methods were used simultaneously. Each subject of the GTTG, which received lumbar traction therapy, lay on his/her back on a traction table and had a knee support placed under each knee. Traction was first applied at one third of the subject's weight. Then, the traction was increased after each treatment, up to 50% of the subject's weight. When an increase in traction caused pain, the existing traction was lowered or maintained.

A visual analogue scale (VAS) was used to evaluate the degree of pain. The Oswestry Disability Index (ODI) was employed to evaluate the degree of disability. Nine questions were scored from 0 to 5 according to functional performance with higher scores indicating higher degrees of disability. Percentage (%) values were obtained by adding the score measured from each item and dividing the sum of all items

Table 1. Comparison of the VAS, ODI and SLR within each group

	Group	Pre	Post
VAS (point)	SDTG**	6.2±1.7	4.3±1.5
	GTTG**	5.7±1.4	4.6±1.5
ODI (%)	SDTG**	30.1±15.1	20.3±14.1
	GTTG**	30.2±14.4	23.3±12.0
SLR (degree)	SDTG**	53.5±11.3	62.3±10.5
	GTTG**	58.1±9.7	63.3±8.7

VAS: visual analog scale, ODI: Oswestry disability index, SLR: straight leg raise, SDTG: spinal decompression therapy group, GTTG: general traction therapy group, **: p<0.01

by the maximum score of 45 points. A SLR test was performed to determine whether the nerves under pressure due to intervertebral disc herniation had tension⁵). For the SLR test, each patient lay on his/her back and relaxed by stretching both legs. While slowly raising the subject's straight leg on the affected side, the tester used a goniometer to measure the angle when lumbar pain or radiating pain in the legs occurred.

The paired t-test was conducted to compare values before and after the treatment within each group to identify the pain, disability, and SLR of patients with chronic lumbar pain. The independent t-test was performed to compare differences between the two groups. This study performed statistical analyses using SPSS 12.0 for Windows, and the level of statistical significance was chosen as $\alpha=0.05$

RESULTS

The SDTG and GTTG showed statistically significant declines in the VAS and the ODI scores ($p<0.05$), and a statistically significant increase in the angle of SLR ($p<0.05$). On the other hand, the comparison of the two groups found no statistically significant differences ($p>0.05$) (Table 1).

DISCUSSION

Spinal decompression therapy resolves problems with the disc and removes the pressure applied to the disc by supplying nutrients and oxygen to the disc. This creates a state of non-gravitation or negative pressure within the spinal canal and reduces pressure inside the intervertebral disc by softly increasing a specific part of the disc through the decompression of a precise part of the lesion⁶).

Borman et al.⁷) reported that a group treated with general physical therapy and intermittent traction therapy showed statistically significant declines in ODI and VAS scores. Meszaros et al.⁸) reported that traction therapy for 10 patients, who had a SLR angle of 45° and complained of lumbar or nerve root pain, resulted in an increase in SLR angle after the treatment. Gose et al.⁹) noted that spinal decompression therapy decreased pain and increased mobility and showed statistically significant effects in MRI images. Gionis and Groteke¹⁰) reported that after spinal decompression therapy, 86% of 219 patients reported pain reduction. Ramos and Martin⁶) reported that spinal decompression therapy yielded

statistically significant effects on MRI images. Moreover, in a study by Yang¹¹⁾, a group that received spinal decompression therapy showed statistically significant declines in VAS and ODI scores. Kang¹²⁾ conducted spinal decompression therapy and manual therapy for patients with lumbar intervertebral disc herniation, and reported that after the treatment, the SLR angle showed a statistically significant increase. Lee et al.¹³⁾ reported that a group that received spinal decompression therapy and manual therapy showed a larger degree of pain reduction and a higher increase in the range of motion (ROM) of the hip joint than a group that received spinal decompression therapy and general physical therapy.

In the present study, SDTG and GTTG showed statistically significant declines in VAS and ODI scores, and a statistically significant increase in the angle of SLR. A possible explanation for these results is that spinal decompression therapy and traction therapy reduce the pressure generated by gravity and soft tissues, and increase spinal separation and the diameters of the intervertebral disc and intervertebral foramen. In addition, the generation of negative pressure within the space of the intervertebral disc may have led the part of the disc, which had been pushed out to the rear of the intervertebral disc, to return inside, thereby reducing neural sensitivity. No statistically significant differences were found between the two groups. This is likely due to the fact that spinal decompression therapy and traction therapy have similar basic principles: both therapies relax the overall lumbar region by loosening pressed nerves and tense muscles reducing the pressure on the intervertebral disc. Therefore, the two treatment methods may not have notable differences in terms of therapeutic effects. In addition, since general traction therapy is covered by health insurance but decompression therapy is not in Korea, physical therapists are required to select treatments considering patients' expenses. However, increasing the number of treatments or lengthening the treatment period might produce different findings.

This study examined the clinical effects of conducting spinal decompression therapy and general traction therapy, which are non-surgical treatment methods, for patients

with intervertebral disc herniation. In conclusion, physical therapists may be required to select an appropriate treatment method considering the condition of a patient, cost, and time. Follow-up studies should be conducted on the long-term effects of these therapies, increasing the treatment period and the number of treatments.

REFERENCES

- 1) Spangfort EV: The lumbar disc herniation. A computer-aided analysis of 2,504 operations. *Acta Orthop Scand Suppl*, 1972, 142: 1–95. [[Medline](#)] [[CrossRef](#)]
- 2) Adams MA, Freeman BJ, Morrison HP, et al.: Mechanical initiation of intervertebral disc degeneration. *Spine*, 2000, 25: 1625–1636. [[Medline](#)] [[CrossRef](#)]
- 3) Jung OH: The effects of traditional physical therapy on pain reduction and depression level of patients with chronic low back pain. 2000. Dan-kook University, Dissertation of master's degree, 2000.
- 4) Macario A, Pergolizzi JV: Systematic literature review of spinal decompression via motorized traction for chronic discogenic low back pain. *Pain Pract*, 2006, 6: 171–178. [[Medline](#)] [[CrossRef](#)]
- 5) Kosteljanetz M, Bang F, Schmidt-Olsen S: The clinical significance of straight-leg raising (Lasègue's sign) in the diagnosis of prolapsed lumbar disc. Interobserver variation and correlation with surgical finding. *Spine*, 1988, 13: 393–395. [[Medline](#)] [[CrossRef](#)]
- 6) Ramos G, Martin W: Effects of vertebral axial decompression on intradiscal pressure. *J Neurosurg*, 1994, 81: 350–353. [[Medline](#)] [[CrossRef](#)]
- 7) Borman P, Keskin D, Bodur H: The efficacy of lumbar traction in the management of patients with low back pain. *Rheumatol Int*, 2003, 23: 82–86. [[Medline](#)]
- 8) Meszaros TF, Olson R, Kulig K, et al.: Effect of 10%, 30%, and 60% body weight traction on the straight leg raise test of symptomatic patients with low back pain. *J Orthop Sports Phys Ther*, 2000, 30: 595–601. [[Medline](#)] [[CrossRef](#)]
- 9) Gose EE, Naguszewski WK, Naguszewski RK: Vertebral axial decompression therapy for pain associated with herniated or degenerated discs or facet syndrome: an outcome study. *Neurol Res*, 1998, 20: 186–190. [[Medline](#)]
- 10) Gionis TA, Groteke E: Spinal decompression. *Ortho Tech Rev*, 2003, 5: 36–39.
- 11) Yang HS: The effects of lumbar traction and decompression traction on HIVD patients. Dan-kook University, Dissertation of master's degree, 2008.
- 12) Kang DY: The effects of spinal decompression therapy and manual therapy on the pain, flexibility and muscle activity in patient with herniated intervertebral lumbar disc. Korea University, Dissertation of master's degree, 2011.
- 13) Lee Y, Lee CR, Cho M: Effect of decompression therapy combined with joint mobilization on patients with lumbar herniated nucleus pulposus. *J Phys Ther Sci*, 2012, 24: 829–832. [[CrossRef](#)]