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Original Article

Effects of flexion-distraction manipulation therapy on pain and disability in patients with lumbar spinal stenosis

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Abstract. [Purpose] This study examined the effects of flexion-distraction manipulation therapy on pain and disability in patients with lumbar spinal stenosis. [Subjects] Thirty patients with lumbar spinal stenosis were divided into two groups: a conservative treatment group (n=15) and a flexion-distraction manipulation group (n=15). [Methods] The conservative treatment group received conservative physical therapy, and the flexion-distraction group received both conservative physical therapy and flexion-distraction manipulation therapy. Both groups received treatment 3 times a week for 6 weeks. The Visual Analog Scale was used to measure pain intensity, and the Oswestry Disability Index was used to evaluate the level of disability caused by the pain. [Results] The Visual Analog Scale scores for pain were significantly decreased in both groups. In the between-group comparison, the decrease in pain was more significant in the flexion-distraction group. According to the Oswestry Disability Index, the level of disability was significantly decreased in both groups, but the decrease was more significant in the flexion-distraction group. [Conclusion] Flexion-distraction manipulation appears to be an effective intervention for pain and disability among patients with lumbar spinal stenosis.
Key words: Spinal stenosis, Flexion-distraction manipulation, Disability

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INTRODUCTION

Lumbar pain is commonly caused by decreased muscle strength, lack of exercise, and maintaining a poor posture for extended periods during activities[1)]. These factors lead to an increased load on the back, which aggravates lumbar pain[1)]. Lumbar spinal stenosis is classified into congenital and acquired types[2)]. The causes of acquired lumbar spinal stenosis include degenerative, and traumatic factors, and spondylolisthesis or spondylosis[2)]. The spinal canal narrows due to spondylosis, disc bulging, hypertrophy, or ossification of the ligamentum flavum[3)] causing various complex neurological signs and symptoms of the lumbar spine or lower limbs[4)]. In addition, acquired lumbar spinal stenosis causes stenosis of the nervous pathway, producing pain in the hips, femoral region, and lower legs, in addition to tingling, paresthesia, and decreased muscle strength. The typical clinical symptoms of lumbar spinal stenosis are lumbar pain, intermittent claudication, and radicular pain. These symptoms are particularly prevalent when extension of lumbar spine is induced through gait or during standing for a prolonged period, and they disappear when the body is stabilized[5)].

Existing treatment methods of lumbar spinal stenosis can be classified into conservative and surgical types. Conservative treatment includes physical therapy, posture and pelvic correction, exercise therapy, drug treatment, and manipulation therapy. Among manipulation therapies, distraction manipulation therapy is used for various types of lumbar pain, including simple distortion and contusion. Distraction manipulation therapy elevates the intervertebral disc, prevents distortion of the tip of the annulus fibrosus, which is sensitive to pain, and reduces internal pressure on the disc[6)]. This reverts the vertebral pulp bulge toward the center by producing a centripetal force in the disc[6)]. Amelioration of displacement of the facet joint maintains a normal range of spinal movement and reduces pain[6)]. The treatment includes exercises to improve function, and posture[6)].

Several studies have investigated the conservative treatment method. Johnsson et al.[7)] observed the natural history of lumbar spinal stenosis in 32 patients for an average duration of 4 years. They reported that the symptoms remained unchanged in 70% of the patients, whereas they worsened in 15% and improved in 15%. Whang and Do[8)] reported that conservative treatment improved pain in lumbar spinal ste-

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nosis patients. Many studies have applied flexion-distraction manipulation therapy to treat patients with a lumbar herniated intervertebral disc. However, few studies have applied it to lumbar spinal stenosis. Therefore, this study applied flexion-distraction manipulation therapy to lumbar spinal stenosis patients and examined the effect of the therapy on pain and disability.

SUBJECTS AND METHODS

The study included 30 patients (male: *n*=9, female: *n*=21) who were diagnosed with lumbar spinal stenosis by an orthopedist at the S Orthopedic Hospitals in Daegu, Korea. The subjects were between 40 and 70 years old and had symptoms of lumbar pain, radicular pain, and intermittent claudication. The patients were divided into a conservative treatment group (CTG, *n*=16) and a flexion-distraction manipulation group (FMG, *n*=15). The mean age of the patients in the CTG was 58.2±5.0 years, the mean height was 162.8±8.5 cm, and the mean weight was 64.0±12.5 kg. In the FMG group, the mean age was 58.9±5.6 years, the mean height was 160.3±4.9 cm, and the mean weight was 63.6±8.1 kg. Ethical approval for the study was granted by the institutional review board of Youngdong University. All the subjects read and signed consent forms in accordance with the ethical standards of the Declaration of Helsinki. The subjects did not have any structural abnormalities such as tumors or fractures, history of previous surgery, or other infectious diseases.

The FMG received conservative physical therapy (hot pack for 20 min, interference current therapy [ICT] for 15 min, and ultrasound therapy for 5 min) for 40 min/session, followed by flexion-distraction manipulation therapy on a Zenith-Cox Flexion distraction table (Zenith-100, Williams Healthcare Systems, Elgin, IL, USA), with full-spine elevation. This equipment stabilizes the upper limb and manually moves the distal radius. The patient was placed in a prone position, with both ankles fixed to the table with cuffs. During the therapy, the therapist's right hand was placed on the patient's L4 spinous process, and the left hand was placed on the cuff. The therapist's left hand then moved to under the table, and the pelvis was moved in the caudal-ventral direction and maintained in that position for 4 sec. The patients received flexion-distraction manipulation therapy 5 times and maintained flexion-distraction manipulation for a total of 20 sec. The therapy was performed for 3 sets of 5 repetitions. The CTG was treated with a hot pack (20 min), ICT (15 min), and ultrasound (5 min) for 40 min/session.

The Visual Analog Scale (VAS) was used to measure pain intensity, and the Oswestry Disability Index (ODI) was used to evaluate the level of disability caused by pain. Ten questions were scaled from 0 to 5, depending on functional performance ability, with a high score denoting severe disability. To calculate the percentage, the sum of each question was divided by the total possible score of 45. To measure the pain intensity and the level of disability caused by pain, this study used a paired sample t-test for within-group comparisons and an independent sample t-test for intergroup comparisons. The SPSS 12.0 Windows program was used for statistical analysis, with a significance level of 0.05.

Table 1. Between-group comparison of the VAS and ODI

	Group	Pre-treatment	Post-treatment
VAS (points)	CTG**	7.7±1.0	6.2±1.1
	FMG**	7.8±1.0	4.0±1.0††
ODI (%)	CTG**	35.3±8.6	29.5±10.1
	FMG**	34.5±9.4	19.9±7.3††

VAS: Visual Analog Scale, ODI: Oswestry Disability Index, CTG: conservative treatment group, FMG: flexion-distraction manipulation group, †: independent t-test, *: paired t-test, ††: $p<0.01$, **: $p<0.01$

RESULTS

The VAS for pain decreased significantly in both the CTG and FMG. In the between-group comparison, the decrease was more significant in the FMG ($p<0.05$). The ODI scores of both groups decreased significantly. In the between-group comparison, the decrease was more significant in the FMG ($p<0.05$) (Table 1).

DISCUSSION

Manipulation therapies are applied frequently as conservative treatment methods for lumbar spinal stenosis. Among such therapies, flexion-distraction manipulation is aimed at reducing stenosis of the ligament around the spine, decreasing intradiscal pressure, and expanding the intervertebral foramen, thereby aiding the recovery of damaged spinal nerves and functional recovery of the surrounding structures.

Schliesser et al.[9] treated 39 patients who were diagnosed with a cervical herniated intervertebral disc with flexion-distraction manipulation therapy and reported that it significantly decreased pain. The application of flexion-distraction manipulation therapy in chronic back pain patients for 4 weeks was effective in relieving their pain[10]. Cox et al.[11] applied distraction manipulation therapy in patients with lumbar and lower limb pain and found that 73% of patients had good to excellent results. In their study, 50% of the lumbar and lower limb pain was relieved in 50% of the patients after an average of 15.95 days and 10.8 treatment sessions. Cox[12] reported that the VAS scores of patients with a lumbar herniated intervertebral disc and lumbar neuropathy improved after distraction manipulation therapy. Han[13] applied conservative therapy (oriental medicine) to lumbar spinal stenosis patients and stated that the patients reported decreased pain. Kim et al.[14] prescribed a 4-week home exercise program to 15 lumbar spinal stenosis patients and reported a significant decrease in self-reported scores on a questionnaire about pain intensity. According to Sasaki et al.[15], in patients with lumbar stenosis, there is a correlation between muscle strength during active straight leg raising and walking capacity, and this correlation is not affected by age. Moreover, Sasaki et al.[16] reported that patients with degenerative lumbar spinal stenosis face a higher risk of falling subsequent to the onset of neurogenic intermittent claudication.

According to the results of this study, the VAS and ODI scores showed a greater decrease in the FMG than in the CTG. This finding may be due to flexion-distraction manipulation therapy ameliorating stress posteriorly with facet joint distraction. Flexion-distraction manipulation therapy also overcomes the distortion of the facet joints associated with lumbar stenosis, thereby enabling a normal range of posterior spinal movement. In addition, it strengthens adhesive tissues around joints to stimulate mechanical receptors and normalizes fixed joints and abnormal movements of the spine[6]. Moreover, distraction manipulation elevates the intervertebral disc and improves the distortion of the tip of the annulus fibrosus, which is sensitive to pain, resulting in increased movement of metabolites in the discs and decreased internal pressure on the discs due to expansion of the spinal canal[17].

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