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Original Article

The effects of manual manipulation therapy on pain and dysfunction in patients with lumbar spinal stenosis

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Abstract. [Purpose] This study investigated the effects of manual manipulation therapy on the pain and dysfunction of patients with lumbar spinal stenosis. [Participants and Methods] In this study, 30 patients with chronic back pain were evenly divided into an experimental group, who received manual traction therapy, and a control group, who received intermittent traction therapy. Both groups received therapy three times a week for eight weeks. A visual analogue scale was used to measure participants' back pain, and the Oswestry disability index (ODI) was used to check the functional impediment they experienced as a result. [Results] The intragroup comparison showed that the visual analog scale and the ODI significantly decreased in the control group and the experimental group, respectively. The intergroup comparison after treatment showed that the visual analog scale and the ODI of the experimental group were significantly lower than in the control group. [Conclusion] The results of this study suggest that manual manipulation therapy is an effective intervention for treating pain and dysfunction in patients with lumbar spinal stenosis.

Key words: Manual manipulation therapy, Pain, Lumbar spinal stenosis

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Lumbar spinal stenosis is a representative degenerative spine disease. The spinal canal in which the nerves from the spinal cord come out between vertebrae narrows due to various causes, which compresses the nerves and causes nerve paralysis. The prevalence of spinal stenosis is increasing due to the aging of the population[1)]. Spinal stenosis causes backache and various neurological problems[2)], intermittent claudication, radiating pain in the lower extremities, dysesthesia of the lower extremities, and weakness in the lower extremities. When these symptoms worsen, it becomes difficult to walk and stand, limiting the activities of daily living[3)]. Treatment of lumbar spinal stenosis can be broadly divided into conservative and surgical approaches. Surgical treatment is considered if cauda equina syndrome appears due to dysfunction of the sacral nerve root, if muscle strength is severely weakened, or if normal living is difficult due to neurological claudication[2)]. Conservative treatments include physical therapy, corrective and exercise therapy, medication, and manual manipulation therapy. Of these, manual manipulation therapy is most often used[4)]. Among the manual manipulation therapies, the flexion-distraction technique pulls a specific part of the lumbar bone and intensively exercises the epiphyseal joint, thus distracting the anterior and posterior longitudinal ligaments and rearranging the intervertebral disc. Furthermore, this therapy relaxes the facet joint—the only synovial joint in the spine that constitutes the posterior lateral joint and supports around 30% of the load applied to the spine—thereby restoring the physiological movements of the spinal joint and relieving pain[5)]. Cox[6)] reported that the flexion-distraction technique effectively treated sciatica and backache, and Kim et al.[7)] also reported that it yielded significant

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results in spinal stenosis patients. Although the manual manipulation therapy are widely used for various spinal diseases, the evidence of their effects has not been firmly established.

Therefore, this study was conducted to apply manual manipulation therapy, which is widely applied to various spinal diseases, to patients with lumbar spinal stenosis and to present scientific bases for its clinical treatment effects.

PARTICIPANTS AND METHODS

The participants in this study were 30 patients (10 males, 20 females), aged 50 to under 70 years, who were diagnosed with lumbar spinal stenosis after visiting B hospital in Daegu, South Korea, with the main complaint of backache, radiating pain in the lower extremities, and intermittent claudication, who had no structural anomalies, such as fracture or tumor, and who had no history of surgery or infectious diseases.

The control group (CG, n=15) had a mean age of 64.4 ± 3.9 years, a mean height of 159.5 ± 7.4 cm, and a mean weight of 62.2 ± 11.1 kg. The experimental group (EG, n=15) had a mean age of 64.5 ± 4.3 years, a mean height of 160.9 ± 7.8 cm, and a mean weight of 64.2 ± 9.6 kg. Ethical approval for the study was granted by the U1 University institutional review board (U1IRB2020-1). All participants read and signed consent forms, in accordance with the ethical standards of the Declaration of Helsinki.

The CG received general conservative physiotherapy consisting of hot pack treatment (20 min), interference wave treatment (100 bps, 15 min), and ultrasonic treatment (1 MHz, 1.5 W/cm^2, 5 min), totaling 40 min per session.

The EG received general conservative physiotherapy followed by manual manipulation therapy performed using a Leander Table (IWS-7000, Iwellness.co.kr, Korea). For the manual manipulation therapy, flexion-distraction techniques were used. In particular, the sacral-occipital stretch technique and the localized spinal segmental stretch technique were applied for 10 min. For the basic sacral-occipital stretch technique, the patient lay face down on the Leander Table, the researcher held the base of the occipital bone close to the patient's spine with the upper palm, and pushed the back hand upward and toward the head. In addition, the researcher put his lower hand against the base of the patient's sacrum and applied pressure each time the table was bent, and released the pressure when the table returned to the original position. For the localized spinal segmental stretch technique, the researcher contacted both transverse processes of the patient at both sides of the jammed spinal segment with both thumbs and applied forward and upward pressure (toward the table bottom) with both thumbs when the table went down, and released the force when the table went up. Conservative physiotherapy and manual manipulation therapy were used by physical therapists with more than 20 years of clinical experience. All treatments were provided three times per week for eight weeks.

The degree of pain was evaluated using the visual analogue scale (VAS), and dysfunction was assessed using the Oswestry Disability Index (ODI). The test consists of 10 questions measuring functional performance ability with a score of 0 to 5 points per question. A higher score indicates a more severe disorder. The scores of all questions were summed, and the total was divided by 45 and converted to a percentage.

For statistical processing of these findings, to determine the degree of pain and dysfunction of lumbar spinal stenosis patients, we conducted a paired t-test for intragroup comparison and an independent sample t-test for intergroup comparison. The statistical processing used Microsoft Excel 369 (Microsoft Office Inc., Korea) software, and the significance level (α) was set to 0.05.

RESULTS

The intragroup comparisons of VAS and ODI showed significant decreases in the CG and EG, respectively ($p<0.05$). The intergroup comparisons of VAS and ODI after treatment showed that the VAS and ODI of the EG were significantly lower than those of the CG ($p<0.05$) (Table 1).

Table 1. Comparison of visual analogue scale and Oswestry Disability Index scores within each group

	Group	Pre	Post
VAS (points)	CG	7.7 ± 0.6	6.6 ± 0.8**
	EG	7.6 ± 1.0	3.4 ± 1.5 $^{**, ††}$
ODI (%)	CG	35.7 ± 9.4	29.2 ± 10.1**
	EG	30.1 ± 12.4	17.8 ± 9.6 $^{**, ††}$

G: control group; EG: experimental group; ††: independent t-test; **: paired t-test; ††: $p<0.01$; **: $p<0.01$.

DISCUSSION

In this study, 30 patients diagnosed with lumbar spinal stenosis were randomized to control and experimental groups and treated three times a week for six weeks. The effects of the treatments on pain and function were examined. Among manual manipulation therapies, the flexion-distraction technique was applied, as devised and developed by Cox[6] for treatment of lumbar herniated intervertebral disc, spondylolisthesis, vertebral facet joint syndrome, and scoliosis not requiring surgery. The technique is designed to restore the normal arrangement of the spinal joints and normalize the spinal movement function[8]. Negative pressure is generated in the intervertebral disc space by widening the gap between spinous processes, and the posterior longitudinal ligament at the back of the intervertebral disc is simultaneously extended so that the part that is pushed back from the intervertebral disc will enter inside again[9]. Gay et al.[10] performed the flexion-distraction technique, and measured the nucleus pulposus pressure and the annulus fibrosus compressive stress. They reported that the flexion-distraction technique decreased the pressure inside the intervertebral disc by 65%. Adams and Hutton[11] claimed that the flexion-distraction manipulation technique is effective not only for relieving backache but also for reducing the pain of a severely prolapsed intervertebral disc and restoring physical functions. Furthermore, Kim et al.[7] applied the flexion-distraction technique to patients with lumbar stenosis, and both the pain and function indices showed significant improvement. In our study, the experimental group to which the flexion-distraction technique was applied showed significantly lower pain and dysfunction than the control group. This is because the flexion-distraction technique opened the facet joints, reducing the stress on the posterior disc and restoring the subluxed facet joints, thereby maintaining the normal range of the posterior spinal movement and extending the adhered periarticular tissues[12]. Furthermore, it gently relaxed the intervertebral disc, which lowered the internal pressure, created a large sagittal diameter inside the spinal canal, and increased the height of the intervertebral disc[13], thereby relaxing the compressed nerves.

This study has limitations in that the sample size was small because only the patients who visited our hospital for 8 weeks were included in the study, it was difficult to completely control the daily lives of the patients, and long-term treatment was not provided. Therefore, it will be necessary to supplement these limitations in the future to demonstrate the various effects of the flexion-distraction treatment technique.

Conflict of interest

None.

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