

The effects of extracorporeal shock wave therapy on pain, disability, and depression of chronic low back pain patients

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Abstract. [Purpose] The purpose of this study was to examine the effects of extracorporeal shock wave therapy on pain, disability, and depression of chronic low back pain patients. [Subjects] In this study, 30 chronic low back pain patients were divided into an extracorporeal shock wave therapy group (ESWTG, n=15) and a conservative physical therapy group (CPTG, n=15). [Methods] The ESWTG received extracorporeal shock wave therapy and the CPTG received general conservative physical therapy two times per week for six weeks. Pain was measured using a visual analog scale (VAS), the degree of disability of the patients was assessed using the Oswestry Disability Index (ODI), and their degree of depression was measured using the Beck depression index (BDI). [Results] In intra-group comparisons, ESWTG and CPTG showed significant decreases in VAS, ODI, and BDI scores. Intergroup comparisons revealed that these decreases in VAS, ODI, and BDI scores were significantly larger in ESWTG than in CPTG. [Conclusion] Extracorporeal shock wave therapy is an effective intervention for the treatment of pain, disability, and depression in chronic low back pain patients.

Key words: Extracorporeal shock wave therapy, Pain, Depression

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INTRODUCTION

Low back pain is a disease that frequently occurs in daily life. Apart from headache, it is the most common pain experienced by humans. Approximately 80% of people in the entire population experience low back pain at least once during their lives. This pain is one of the factors that greatly affect the quality of life of patients because it leads to socio-economic problems associated with increases in the costs of treatment, together with problems in daily living activities¹⁾.

Simple low back pain can often be prevented by forming the habit of sitting with a proper posture and avoiding maintaining a sitting posture for prolonged periods. However, many types of low back pain are treated with therapeutic methods that are as diverse as the causes of low back pain. In most cases, therapeutic methods such as bed rest, assistive devices, traction treatment, hyperthermia, electric stimulation, and manual therapy are the first choice treatments²⁾.

When these fail, invasive therapeutic methods such as selective nerve root blocks and epidural injections are used, and surgery is performed if no response to the other treatments is seen, or if the condition of the disease is serious³⁾. Recently, new conservative treatments have been adopted, including extracorporeal shock wave therapy (ESWT)⁴⁾.

ESWT is a therapeutic method that applies shock waves to lesions from the outside of the body to promote revascularization and to stimulate or reactivate the curing process of connective tissues including tendons and bones, thereby relieving pain and improving function⁵⁾. ESWT can be used for pain relief as well as for muscle strength improvement through appropriate motor stimulation of muscles and tendons by the shock waves⁶⁾. Currently, ESWT is administered for musculoskeletal system diseases, but studies of the effects of ESWT on chronic low back pain are rare, and few studies have examined its effects on pain, disability, and depression. The purpose of this study was to examine the effects of extracorporeal shock wave therapy on pain, disability, and depression of chronic low back pain patients.

SUBJECTS AND METHODS

This study was conducted with 30 patients (male: 9, female: 21) who had been diagnosed as having chronic low back pain by specialists in orthopedics, who had low back

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pain that had persisted for at least three months, and who had visited S Orthopedics Hospital located in Daegu, Korea. The subjects were divided into a conservative physical therapy group (CPTG; n=15; mean age 46.0±8.9 years, mean height 163.7±9.1 cm, and mean weight 61.9±14.3 kg) and an extracorporeal shock wave therapy group (ESWTG; n=15; mean age 49.7±8.3 years, mean height 161.3±5.9 cm, and mean weight 62.2±9.3 kg). Ethical approval for the study was granted by the Youngdong University Institutional Review Board. The study subjects had not received any surgery to the lumbar vertebrae region; had no vertebral compression fractures, spinal tumors, or intervertebral disc infections; were free of inflammatory diseases such as rheumatism; and had no heart disease or structural abnormalities. The intention of this study and the experimental procedures were sufficiently explained to the study subjects and their voluntary agreement to participation was obtained before conducting the experiment.

A VITERA (Comed, Korea) was used to conduct extracorporeal shock wave therapy for ESWTG. Each patient assumed a prone position, and 1,000 shock waves (7 times per sec) were applied at 2.5 Hz at low energy flux densities of 0.01–0.16 mJ/mm² using a 17 mm head. The treatment was conducted at the quadratus lumborum muscle and the sacroiliac joint, where the patients complained of pain. CPTG was treated with hyperthermia using hot packs (20 minutes), ultrasound (5 minutes), and electrotherapy using TENS (15 minutes). All subjects were treated two times per week for six weeks.

Pain was evaluated using a Visual Analogue Scale (VAS). Disability was evaluated using the Oswestry Disability Index (ODI). This scale has 10 items which are scored on a scale of 0–5 points based on functional performance, with higher scores indicating more severe disabilities. In this study, nine items were assessed, excepting the item for sex life considering subjects without spouses. Each of the nine items has six choice alternatives. The scores measured for individual items were summed and the results were divided by the maximum score of 45 points. The resulting values were converted into percentages. Depression was assessed using the Beck depression index (BDI) developed by Beck et al.⁷⁾. This index consists of 21 items. Scores from 0–9 indicate conditions free of depression, from 10–15 indicate slightly depressed conditions, from 16–23 indicate quite depressed conditions, and from 24–63 indicate seriously depressed conditions.

For statistical processing, the degrees of the chronic low back pain patients' pain, disability, and depression were examined using the paired sample t-test to analyze intra-group differences and the independent sample t-test for analysis of intergroup differences. SPSS 12.0 for Windows was used for statistical processing and the significance level, α , was chosen as 0.05.

RESULTS

Intra-group comparisons revealed significant decreases in VAS, ODI, and BDI scores of ESWTG and the CPTG at the end of the experimental period. Intergroup comparisons showed that the decreases in VAS, ODI, and BDI scores

Table 1. Intra- and inter-group comparisons of VAS, ODI, and BDI scores

	Group	Pre	Post
VAS (point)	CPTG**	6.6±1.5	4.9±1.3
	ESWTG**	7.0±0.76	3.6±1.1†
ODI (%)	CPTG**	30.4±11.7	25.0±11.4
	ESWTG**	30.1±12.4	17.5±8.1††
BDI (point)	CPTG**	18.7±6.4	16.3±4.5
	ESWTG**	19.6±6.7	12.5±5.7††

VAS: visual analog scale, ODI: Oswestry disability index, BDI: Beck depression index, CPTG: conservative physical therapy group, ESWTG: extracorporeal shock wave therapy group, *: paired t-test, †: independent sample t-tests †: p<0.05, **, ††: p<0.01

were larger in ESWTG than in CPTG (Table 1).

DISCUSSION

Chronic low back pain that brings about discomfort and inconvenience in daily life tends not to respond to conservative therapy in many cases, which has prompted a search for other therapeutic methods.

Rompe et al.⁸⁾ reported that when one-off wave therapy was implemented for patients with calcific tendinitis of the shoulder, 60% of the patients recovered to their normal states and 72% of the patients recovered to the extent that they felt only intermittent discomfort as assessed by the Constant and Murley scale. Lee SB⁵⁾ reported that when ESWT was applied to patients with lateral epicondylitis of the elbow joint, the patients' pain was relieved, their simple elbow test scores improved significantly, and 83% of the patients showed satisfactory outcomes. Cho et al.⁹⁾ reported that when patients with lateral epicondylitis of the elbow joint were treated with ESWT, the patients' pain significantly decreased and their muscle strength increased significantly. Na JY³⁾ found that when ESWT was administered to chronic low back pain patients, the patients' pain significantly decreased. In addition, some researchers have suggested that ESWT is an effective and non-invasive new therapeutic method for the treatment of lateral epicondylitis of the elbow joint that does not respond to conservative therapy. Lee et al.¹⁰⁾ reported that when ESWT was implemented for chronic low back pain patients, exercise programs used together with extracorporeal shock wave therapy relieved pain and improved dynamic balance ability to a greater extent than was seen with a combination of exercise programs and conservative physical therapy.

The intra-group comparisons in the present study revealed that there were significant decreases in the VAS, ODI, and VAS scores of ESWTG and CPTG at the end of the intervention. The intergroup comparison revealed that these decreases were larger in ESWTG than in the CPTG. Rompe et al.⁸⁾ advised that minute and repetitive stimuli applied through shock wave therapy were effective at relieving pain. Hammer et al.¹¹⁾ recognized that breaking calculi and gallstones with extracorporeal shock waves increases the blood flow rate and rate of revascularization, and used this

effect to stimulate and activate the curing processes of tendons, surrounding tissues, and bones to remove and stabilize inflammations in the tendons and ligaments, which resulted in pain relief.

The results of the present study also indicate that decreases in VAS scores were occurring through mechanisms described by presented in previous studies. In addition, ESWT appeared to relieve chronic low back pain, thereby improving the patients' physical functions and consequently their ability to perform daily living activities, leading to significant decreases in low back pain disability indexes. Holmes¹²⁾ argued that the limitations or disability in patients' daily living would cause psychosocial problems that would further impair the quality of their lives. Depression is closely related to physical disability and chronic pain in chronic disease patients, and it is an important element that interferes with pain relief by delaying recovery or aggravating diseases¹³⁾. In the present study, ESWT relieved pain and reduced disability indexes, thereby improving the patients' physical functions and ability to perform daily living activities, which in turn had positive effects on the patients' psychological, emotional, and cognitive states, decreasing the degree of their depression. Decreased pain in chronic low back pain patients is a more influential factor than disability and depression. But we regard research is necessary to elucidate other factors.

This study had some limitations. First, the number of chronic low back pain patient subjects was limited, so the results cannot be generalized. Second, the lumbar lesion sites were limited and the subjects' daily lives could not be completely controlled. Third, no previous studies have measured the effects of ESWT on depression, so our present results could not be compared with those of other studies.

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