



Original Article

Effects of high intensity laser therapy on pain and function of patients with chronic back pain

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Abstract. [Purpose] This study examined the effects of High Intensity Laser Therapy on pain and function of patients with chronic back pain. [Subjects and Methods] This study evenly divided a total of 20 patients with chronic back pain into a conservative physical therapy group that received conservative physical therapy, and a high intensity laser therapy group that received High Intensity Laser Therapy after conservative physical therapy. All patients received the therapy three times a week for four weeks. For the high intensity laser therapy group, treatment was applied to the L1–L5 and S1 regions for 10 minutes by using a high intensity laser device while vertically maintaining the separation distance from handpiece to skin at approximately 1 cm. A visual analog scale was used to measure the pain and Oswestry Disability Index was used for functional evaluation. [Results] In a within-group comparison of the conservative physical therapy and high intensity laser therapy groups, both the visual analog scale and Oswestry Disability Index significantly decreased. In a between-group comparison after treatment, the high intensity laser therapy group showed a significantly lower visual analog scale and Oswestry Disability Index than the conservative physical therapy group. [Conclusion] High Intensity Laser Therapy can be an effective non-surgical intervention method for reducing pain and helping the performance of daily routines of patients who have chronic back pain.

Key words: Low back pain, High intensity laser therapy, Oswestry disability index

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INTRODUCTION

Back pain is a frequently observed disease. Statistics tell us that most people have experienced back pain at least once in their lifetime. The disease affects almost all age groups, inflicting mental and physical burdens on people¹⁾. Risk factors of spinal pain include physical characteristics, general medical health, mental condition, and working environmental factors where age, weight, injury, occupation, or posture can make people experience the pain²⁾. Back pain resulting from these factors causes productivity loss and impairment of quality of life as it limits mobility in people's daily routines³⁾. Symptoms of back pain not only affect sacroiliac articulation and the lumbar region, but also accompany radiating pain that progresses to the lower limbs⁴⁾. Popular treatments for back pain include acupuncture, traction, percutaneous electrical nerve stimula-

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Fig. 1. The high intensity laser therapy

Table 1. Comparison of the VAS and ODI within each group at the HILT

	Group	Pre	Post
VAS (point)	CPTG	7.0 ± 1.2	6.2 ± 1.4 ^{aa}
	HLTG	7.0 ± 0.8	3.4 ± 0.8 ^{aa,bb}
ODI (%)	CPTG	31.6 ± 11.5	29.6 ± 10.7 ^{aa}
	HLTG	33.1 ± 13.0	19.0 ± 10.6 ^{aa,b}

VAS: Visual Analog Scale; ODI: Oswestry Disability Index; CPTG: Conservative Physical Therapy Group; HLTG: High-intensity Laser Therapy Group; ^{aa} $p < 0.01$, paired t-test; ^b $p < 0.05$, independent sample t-tests; ^{bb} $p < 0.01$

tion, massage, ultrasonic waves, and low-intensity laser treatment. Surgery is recommended when these treatment methods are ineffective or when symptoms are very severe⁵). High Intensity Laser Therapy (HILT) has photochemistry effects that stimulate oxidation of mitochondria and ATP creation by delivering high energy output inside tissues. HILT can cause quick absorption of edema and removal of exudates through increased metabolism and blood circulation⁶). Although many nonsurgical treatments for chronic back pain have been introduced so far, there is a paucity of research on HILT. To help answer this shortcoming, this study conducted an experiment to prove the effects of HILT on patients with chronic back pain.

SUBJECTS AND METHODS

Among the hospitalized patients and outpatients in S Orthopedics located in Daegu City, Korea, research subjects of this study included 20 patients between the ages of 30 and 65 who were diagnosed by their doctors with chronic back pain, based on clinical findings and X-ray findings that persisted for more than three months. Excluded from the sample were patients who had surgical history in the lumbar region, had a spinal tumor or disc infection, or had inflammatory diseases such as rheumatism as well as those who had previous fractures and those who had contraindications for manual therapy. Ethical approval for the study was granted by the U1 University institutional review board. All subjects read and signed consent forms, in accordance with the ethical standards of the Declaration of Helsinki.

The patients with chronic back pain were randomly and evenly divided into a Conservative Physical Therapy Group (CPTG) that received conservative physical therapy, and a High-intensity Laser Therapy Group (HLTG) that received both conservative physical therapy and HILT. The treatment was applied three times a week for a total of four weeks. The CPTG subjects had an mean age of 47.1 ± 9.6 years, an mean height of 164.4 ± 10.0 cm, and an mean weight of 62.7 ± 15.6 kg. For the HILT subjects, mean age was 48.3 ± 9.0 years, mean height was 160.13 ± 5.5 cm, and mean weight was 62.6 ± 10.2 kg. CPTG received a 20-minute hot pack treatment, 15-minute interference wave treatment, and 5-minute deep heat injection treatment using ultrasonic waves. HLTG received high intensity laser therapy after the identical conservative physical therapy was applied. A HILT device (SALUS-Heallaser, Remed Inc.) was applied to the L1–L5 and S1 regions for 10 minutes while vertically maintaining the separation distance from handpiece to skin at approximately 1 cm. The laser was applied in three phases including initial phase, trigger point, and final phase, with a total energy of $1,378 \text{ mJ/cm}^2$ (Fig 1). All patients received therapy three times a week for four weeks.

In this study, a Visual Analogue Scale (VAS) was used to investigate the intensity of pain and the Oswestry Disability Index (ODI) was used to evaluate the function of patients with chronic back pain. VAS and ODI of both of CPTG and HLTG were measured before and after the four-week treatment using identical methods. As for the statistical analysis in this study, paired t-test was conducted to examine the within-group change and independent t-test was conducted for the between-group comparison. SPSS/PC Ver. 13.0 was used for statistical treatment in this study where significance level α was set at 0.05.

RESULTS

In this study, VAS and ODI significantly decreased in a within-group comparison of CPTG and HLTG ($p < 0.05$). In a between-group comparison after the treatment, VAS and ODI of HLTG were significantly lower than CPTG ($p < 0.05$) (Table 1).

DISCUSSION

Noninvasive treatment is receiving increasing attention following the widespread recognition of avoiding surgery and side effects. This study attempted to find out how high intensity laser therapy affects the pain and function of patients with chronic back pain.

Alayat et al.³⁾ reported that the HLTG included exercise showed increased ROM, reduced pain, and functional disability compared to the HLTG, and the Sham Laser Group that included exercise. Alayat et al.³⁾ applied HILT to female patients with chronic back pain and reported its effectiveness in pain reduction. In this study, applying HILT to patients with chronic back pain for four weeks resulted in statistically significant improvement of VAS in HLTG. It is conjectured that HILT increased metabolism and stimulated blood circulation through systemic vasodilatation, causing reabsorption of unnecessary tissue-liquid that was accumulated in body and quick removal of exudates⁶⁾. In this study, function of patients with chronic back pain that was measured by ODI showed a statistically significant difference in HLTG. Kheshie et al.⁷⁾ compared between HILT and low-intensity laser treatment using 53 female patients with degenerative knee arthritis as a sample and reported that HILT is more effective in pain reduction and functional improvement. Alayat et al.³⁾ applied HILT to 72 female patients with chronic back pain and reported its effectiveness in enhancing the range of mobility and function, supporting the results of this study. Here, HILT affected homeostasis as it enhanced ATP production by inducing thermal effects through photothermal interaction⁸⁾. It can also be attributed to the fact that HILT relaxed stiffened tissue by increasing expansibility inside collagen tissue through a stimulation of metabolism of cells that was caused by decreased infection and increased temperature of the local area^{9, 10)}.

This study has several limitations. First, the number of subjects was small. The sample only included patients who visited our hospital during one four-week period. Second, we could not perfectly control the daily routine of the subjects. Third, as the treatment duration was short, we could not check the long-term effects. We believe that many new studies on the effects of HILT will be required in order to complement the limitations of this study.

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