

# The Effect of Simultaneous Application of Laser Beam and Magnetic in Intervertebral Disc Herniation Treatment

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## Abstract

**Objective:** To evaluate the effect of simultaneous laser beam and magnetic therapy in patients with disc herniation

**Methods:** During a 6 months clinical trial study, 80 patients with intervertebral disc herniation underwent a combined package of treatment including magnetic, laser beam and PRP.

**Results:** Average age of patients was  $51.25 \pm 10.7$  with range of 25 - 71 years. 30 men (37.5%) and 50 women (62.5%) took part in the study. Average weight of patients was  $64.3 \pm 7.2$  with range of 49 - 79 kg. Highest level of disc herniation was L5 - S1 with frequency of 17 cases (21.3%). Disc Herniation was severe in 30 cases before treatment, but it reduced to 3 cases after treatment.

**Conclusion:** According to the results of this study combined treatment using non-invasive laser beam and magnetic therapy is highly effective for patients with disc herniation.

**Keywords:** Disc Herniation, Magnetic therapy, Laser beam

## Introduction

Back pain is one of the most common causes of referring patients to pain, orthopedic, neurosurgery, neurology clinics and internal and general practitioners and its prevalence has been estimated as about 50 to 80 percent [1]. Reasons of back pain can be mentioned as lumbar muscle spasms, trauma, lumbar disc disease, facet joint involvement, spinal stenosis, Spondilo epiphyseal dysplasia, piriformis syndrome, osteomyelitis, primary and metastatic tumors of the spine and abdominal reasons [2].

Most of patients would be improved by simple recommendations such as rest, depend on the patience of the patient. Primary goal of the treatment is reducing nerve inflammation which will result in pain reduction. Unfortunately, many claims are made by different patients and medical groups regarding treatment of herniated disc since most of these methods may even lead to exacerbation, and loss of opportunity for proper medical treatment. In mild to moderate uncomplicated cases (approximately 80 to 90 percent) medical treatment found to be effective. [3]. In these cases, perfect and adequate rest for at least 5 days, keeping warm the lumbar muscles, reduction of inflammation, use of non-steroidal and steroidal compounds and those affecting Neuropathic pain such as pregabalin and gabapentin prescribed by the doctor, can be utilized

[4]. In case of continuation of pain, opiates such as codeine, oxycodone and perhaps tramadol (cautiously) may be useful in short term. In cases of back spasms, spasm-lowering medications such as benzodiazepines, Metacarbamol, Tizanidine and baclofen muscle elasticity and heat-treatment can be useful. Consumption of vitamin B compounds and antioxidants is effective in recovery of the nerve roots [5]. Using surgical methods such as discectomy and laminectomy in severe cases and in cases where there is a risk of paralysis and neurological patients is recommended however, considering the fact that patients often have non-realistic expectations about the recovery and sometimes there is large gap between expectation of the patient and treatment improvement in the view of therapist, medication treatments are not effective in most patients and surgery is either not accepted by the patient or there is no indication for performing it so this study was carried out to evaluate the efficiency of using physical treatment methods such as magnetic and laser therapy simultaneously in treatment of chronic and recurrent hernias of different types of thoracic and lumbar spine disc using a treatment package including laser beam, magnet and PRP [6,7].

## Materials and Methods

It is a clinical trial study which was conducted during 2013 to 2014 in a physical medicine and rehabilitation clinic in Isfahan, Iran. Target population includes patients with intervertebral disc

herniation referring to this clinic.

Inclusion criteria include: disc herniation symptoms such as pain, stiffness, reflex changes, motor and sensory changes, lack of lumbar surgery, chronic lumbar pain, herniated disc levels in MRI (bulge, Protrusion, Extrusion, Sequestration), patients with neurological traditions who have experienced pressure on the nerve roots, patients whose jobs are directly related to low back pain and patient's consent to participate in the study. Patients who did not receive medical package perfectly or underwent parallel treatments or surgery, diabetic patients, pregnant women and patients with heart battery were excluded.

Sample size was specified using sample size estimation formula for comparing ratios considering confidence level as 95 percent, and test power as 80 percent. Considering the prevalence of disc herniation as 0.5, minimum significant difference before and after treatment in severity of pain as 0.15 the sample size was specified as 87.

Following taking written consent of patients for participation in the study, patient characteristics such as sex, weight, age, involvement in examination and the intensity in MRI were recorded as basic variables following the justifying of patients on the consequences of treatment method and its complications including decline in patient's performance and mood disorders. In order to determined level of subjective pain, UAS scale was used, and relationship between recovery and treatment package which was used was specified. The number of treatment sessions was considered as 5 sessions for each patient with mild herniation, 7 sessions for patients with moderate herniation, and 12 sessions for severe herniation. Accordingly patients were underwent laser therapy using high energy laser therapy with power 10.5 Watt and magnetic therapy with magnetic field intensity equal to 8 MT.

For laser beam patients were placed in prone position while the area around the disc from lower part to glottal area and a little upper than the disc position was considered as the radiation zone. In cases when the disc was placed in the lower area and the sciatic nerve involvement was detected the radiation zone will be from sciatic nerve until the metatarsus. For magnetic therapy patients was placed in prone position as well. Magnetic is made up of two parts of the solarium (a tunnel that creates a magnetic field) and a flex. The part of the device that has magnetism is located on the paravertebral muscles, as well as on the thigh and legs of the patient. Solenoid placed down to the bottom. Result of treatment, which mainly included pain severity, was recorded at the end of each session in the patient's profile. Data were analyzed using SPSS 22 software and chi-square test, T-test, and Wilcoxon test.

## Results

In this study, 80 patients with disc herniation were studied. In this study, 80 patients with Disc Herniation were studied. In physical examination and history taking, patients are classified into six groups in terms of the place of Herniated disc: L5-S1, L3-L4, L3-L4/L4-L5, L3-L4/L4-L5/L5-S1, L4-L5 and severe narrowing of the spinal canal [8].

Average age of patients was  $51.25 \pm 10.7$  with range of 25 - 71 years. 30 were male (37.5%) and 50 were female (62.5%). Average age of men and women was  $52.3 \pm 9$  and  $50.6 \pm 11.7$  years respectively and there was no significant difference between both genders ( $p = 0.5$ ). Average weight of patients was  $64.3 \pm 7.2$  with range of 49 - 79 kg. Highest level of disc herniation was L5 - S1 with frequency of 17 cases (21.3%). 24 patients (30%) had mild pain, 26 patients (32.5%) with moderate pain and 30 patients (37.5%) with severe pain. Table 1 gives distribution of demographic and general variables of patients in this study.

**Table 1: Distribution of demographic and general variables of patients**

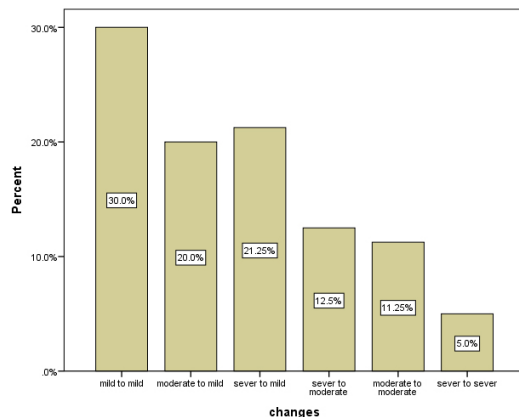
| Variable                        | Variable level        | Mean or Number | Percentage or SD |
|---------------------------------|-----------------------|----------------|------------------|
| Age (year)                      | Mean                  | 51/25          | 10/7             |
|                                 | Under 50 years        | 37             | 46/3             |
|                                 | More than 50 years    | 43             | 53/8             |
| Sex                             | Male                  | 30             | 37/5             |
|                                 | Female                | 50             | 62/5             |
| Weight (Kg)                     | Mean                  | 64/3           | 7/2              |
|                                 | Less than 60          | 24             | 30               |
|                                 | 60-69                 | 36             | 45               |
|                                 | 70 and more           | 20             | 25               |
| Disc Herniated Level            | L5-S1                 | 17             | 21/3             |
|                                 | L3-L4                 | 8              | 10               |
|                                 | L4-L5                 | 19             | 23/8             |
|                                 | L3-L4 & L4-L5         | 9              | 11/3             |
|                                 | L4-L5 & L5-S1         | 13             | 16/3             |
|                                 | L3-L4 & L4-L5 & L5-S1 | 4              | 5                |
|                                 | Spinal canal stenosis | 10             | 12/5             |
| Disease severity in examination | Mild                  | 24             | 30               |
|                                 | Moderate              | 26             | 32/5             |
|                                 | Severe                | 30             | 37/5             |
| Disc type in MRI                | Protrusion            | 18             | 22/5             |
|                                 | Extrusion             | 28             | 35               |
|                                 | Sequestration         | 32             | 40               |
|                                 | Bulge                 | 2              | 2/5              |

Table 2 gives frequency distribution of disease severity before and after treatment in patients under study. According to the table, disc herniation was severe in 30 cases before treatment, but it reduced to three cases after treatment. Performing Wilcoxon test on the data showed that the disease severity was significantly reduced after treatment ( $P < 0.001$ ).

**Table 2: Frequency distribution of disease severity before and after treatment**

| Before treatment<br>After treatment | Mild   |            | Moderate |            | Severe |            | Total  |            |
|-------------------------------------|--------|------------|----------|------------|--------|------------|--------|------------|
|                                     | Number | Percentage | Number   | Percentage | Number | Percentage | Number | Percentage |
| Mild                                | 20     | 83/3       | 17       | 65/4       | 16     | 53/3       | 53     | 66/3       |
| Moderate                            | 4      | 16/7       | 9        | 34/6       | 11     | 36/7       | 24     | 30         |
| Severe                              | 0      | 0          | 0        | 0          | 3      | 10         | 3      | 3/8        |
| Total                               | 24     | 100        | 26       | 100        | 30     | 100        | 80     | 100        |

Figure 1 shows the changes in disease severity after treatment in patients under study. According to the figure, disease severity was mild in 24 cases (30%) before and after operation. It reached to mild from moderate in 16 cases (20%) and moderate from severe in 17 cases (21.3%) while found as severe to moderate in 10 cases (12.5%). Four cases (5%) showed to be severe even before or after treatment. Totally it was observed that the disease has no improvement in 37 cases (46.3%) while found to be improved in 43 cases (53.8%).



**Figure 1: Frequency percent of disease severity changes after treatment**

Table 3 indicates frequency distribution of treatment in terms of characteristics of patients and status of disease. According to this table, recovery in terms of disease severity showed significant difference before and after treatment.

**Table 3: Distribution of demographic and general variables of patients under study**

| Disease severity Variable       | Without Change        | Improved   | P        |        |
|---------------------------------|-----------------------|------------|----------|--------|
| Age                             | Mean                  | 10/5±50/05 | 11±52/3  | 0.36   |
|                                 | Under 50 Years        | (6/48)18   | (2/44)19 |        |
|                                 | More than 50 years    | (4/51)19   | (8/55)24 | 0.69   |
| Sex                             | Male                  | (4/32)12   | (9/41)18 | 0.38   |
|                                 | Female                | (6/67)25   | (1/58)25 |        |
| Weight (Kg)                     | Mean                  | 7±2/63     | 3/7±3/65 | 0.36   |
|                                 | Less than 60          | (5/40)15   | (9/20)9  |        |
|                                 | 60-69                 | (5/40)15   | (8/48)21 | 0.14   |
|                                 | 70 and more           | (9/18)7    | (2/30)13 |        |
| Disc Herniated Level            | L5-S1                 | (4/32)12   | (6/11)5  |        |
|                                 | L3-L4                 | (5/13)5    | (7)3     |        |
|                                 | L4-L5                 | (6/21)8    | (6/25)11 | 0.076  |
|                                 | L3-L4 & L4-L5         | (4/5)2     | (3/16)7  |        |
|                                 | L4-L5 & L5-S1         | (1/8)3     | (3/23)10 |        |
|                                 | L3-l4 & l4-l5 & l5-s1 | (7/2)1     | (7)3     |        |
|                                 | Spinal canal stenosis | (2/16)6    | (3/9)4   |        |
| Disease severity in examination | Mild                  | (9/64)24   | (0)0     | <0.001 |
|                                 | Moderate              | (3/24)9    | (5/39)17 |        |
|                                 | Severe                | (8/10)4    | (5/60)26 |        |

|                  |               |          |          |      |
|------------------|---------------|----------|----------|------|
| Disc type in MRI | Protrusion    | (6/21)8  | (3/23)10 | 0.43 |
|                  | Extrusion     | (27)10   | (9/41)18 |      |
|                  | Sequestration | (6/48)18 | (6/32)14 |      |
|                  | bulge         | (7/2)1   | (3/2)1   |      |

Follow up of patients under treatment up to 6 months after cutting the current intervention showed that the disease had recurrence in five cases (6.3%) and 75 cases (93.8%) were in recovery status. It should be noted that in five cases with recurrence two cases were in patients with mild disease and four cases were in patients with severe disease. According to Fisher's exact test, occurrence showed significant difference in terms of disease severity ( $p = 0.045$ ). In terms of place of disc herniation, one case of recurrence in L4-L5, two cases in L4-L5 & L5-S1, one case in L3-L4, L4-L5 & L5-S1 and one case in SCS were observed. According to Fisher's exact test, occurrence showed no significant difference in terms of place of disc herniation ( $p = 0.34$ ).

## Discussion

The aim of the study was to determine the effect of using laser beam and magnetic therapy as couple in treatment of intervertebral disc herniation. In this study, 80 patients with disc herniation were studied. Average age of patients was  $51.25 \pm 10.7$  including 30 men (37.5%) and 50 women (62.5%). Highest level of disc herniation was in L4-L5 with frequency of 21.3 percent and L5-S1 with frequency of 23.8 percent and L4-L5 & L5-S1 with frequency of 16.3 percent, and thus disc herniation prevalence in two areas constituted overall 56.4 percent of the disease. Other studies showed occurrence of disc herniation in these two areas as 56.4 percent. According to other studies, occurrence of intervertebral disc herniation is due to the non-standard physical activities and high pressure in these two areas during physical activities [8]. In terms of disease severity, 70 percent of reference was for patients with moderate and severe disc herniation, so that at the beginning of the study, 30 percent of patients had mild disc herniation, 32.5 percent of patients had moderate, and 22.5 percent of them showed severe pattern of the disease, while it reached to mild from moderate in 20 percent of disease cases, mild from severe in 21.3 percent of disease cases and moderate from severe in 12.5 percent of disease cases after treatment. Thus, providing this treatment package improved disease severity in 53.8 percent of patients. Of course, changes in disease severity showed no relationship with characteristics of patients and variables of age, gender, weight, disc herniation level, and type of disc in MRI.

Previous studies on patients undergoing surgical treatments showed that the effect of surgical treatments on improvement of this disease was relatively low and disc recurrence was observed in most cases, while in our study, among 80 patients underwent the treatment only 5 cases (6.25%) showed disc recurrence 6 months after treatment [9]. He et al. (2006) in a clinical trial study compared 60 patients with back disc herniation in two groups ( $n = 30$ ) receiving magnetic therapy or medication therapy and at the end of fourth week of the treatment, recovery was significantly higher in group treated by magnetic therapy [10]. Gronemeyer et al. (2003) in their study followed-up 200 patients with back disc herniation treated by laser therapy and found that laser therapy in 74 percent of diseases reduced the pain and symptoms of intervertebral disc herniation, and 148 patients (74%) were satisfied with the outcome of the treatment [11]. Thus, since medication

treatments are not effective in all patients with intervertebral disc herniation, and on the other hand, surgery operation does not have indication in all patients and it is recommended only for patients with severe symptoms of neural root and resistant pains or severe pains resistant to treatment, use of physical methods such as laser therapy and magnetic therapy in patients with mild to moderate disc herniation and in some cases in patients with severe disc herniation would be effective, and it would be acceptable by such patients. It should be noted that the disease recurrence in each treatment method highly depends on care of the patient, and hence, patients should receive information on effective options of self-care after treatment, and they should be recommended to be active so that they do not find high muscular sensitivity to pain and they should know mobility and exercise facilitates recovery process and prevention from disease complications [6].

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